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CONTENTS.

PRESENT CONDITION OF COBALT MINES

Cobalt has made a remarkable record since its discovery, and promises to be an important producer of silver for many years to come. In the years 1904 to 1912, inclusive, the district produced 155,832,615, ounces of silver valued at over $80,000,000, and made a profit to the mine owners of over one-half of the value of the silver. The output is not only large, but the cost per ounce has been remarkably low, and the industry consequently an unusually profitable one.

The great profit has been made possible by the richness of the ore. To treat low grade ore several mills were built and are proving of great value. The profit being made is still largely from high grade ore; but the concentrators have each year contributed a larger percentage of the output. During the last two years a further advance has been made in treating the high grade ore at Cobalt, instead of shipping it to smelters. This process, worked out and now in operation at the Nipissing mine, gives a high recovery and yields a product of refined silver ready for the mint. A similar process is now in use at the Buffalo mine.

In mining the low grade ore to supply the mills it has been found that the number of high grade veins is more numerous than was expected. It is a common occurrence to break into narrow veins of rich ore a few feet from the openings which were made in following another vein. It has been found that in places where the high grade veins split up into stringers or apparently pinched out, the silver is distributed over a much greater width. Usually a large tonnage of milling ore occurs in such places.

The present condition of the mines indicates clearly that there is still a large quantity of high grade ore to be mined from veins already opened up, and that the mining of low grade ore must be expected to uncover many more small but rich veins. There is, as yet, no satisfactory evidence that the mines will prove profitable at great depth; but there is no doubt whatever that the tonnage of low grade ore to be mined within a few hundred feet of the surface is enormously large. As high grade ore fails, the profits will necessarily fall off. A comparatively small, but still handsome profit per ounce, will be made from the much larger tonnage of low grade ore, if the cost per ton can be kept at a reasonable figure. At present, owing to the nature, of the deposits, the costs are high and there is some ground to fear that the cost next year will be higher instead of lower.

Nearly all the mines which have ever been worked profitably are still making money, and there are a few

which have only just this last year begun to earn dividends. Some of the mines have doubtless seen their best days, for the bonanza veins have been pretty well worked out; but even these will be important producers and have unexplored territory in which there is a reasonable chance that more ore will be found. In the mines which still have considerable quantities of high grade ore in sight, a large percentage of the definitely known ore has been taken out, and it is not likely that an equal quantity of such bonanza ore will be found. Some ore of equal richness and a large quantity of lower grade ore is, however, almost certain to be discovered as development proceeds.

Among mines which are certain to produce a large tonnage of high grade ore, Nipissing, Coniagas, and Crown Reserve are in remarkably good condition. Three mines, Townsite, Cobalt Lake and Casey Cobalt have only recently become important producers, and may be expected to figure more largely in future shipments. The Drummond mine has been re-opened with satisfactory results, and the Seneca-Superior has made several shipments of rich ore from a vein discovered only last summer.

With improved methods of mining, careful sorting and jigging of the ore as it is brought from the mine, treatment of high grade ore by the amalgamation-cyanide process, and of low grade ore by straight concentration and of slime tails by cyanidation, a very satisfactory recovery of silver is made at a low cost. Without allowing for further improvements made as experience is gained, it is evident that 12-ounce ore, enclosing occasional small veins of high grade ore, can be profitably mined. With this assurance and a knowledge of present conditions, one may well hesitate to predict the life of Cobalt as a silver producer. In any case, a large production for several years is assured. The profit that will be made during this period will depend largely on the amount of high grade ore that is discovered during development. How long the process of exhaustion will take is beyond human ken. But, considering the past production and the present conditions, it is safe to assume that Cobalt will be producing silver for many years to come.

SUDBURY, COBALT AND PORCUPINE GEOLOGY

In the June 7 issue of the Engineering and Mining Journal, New York, Dr. W. G. Miller and C. W. Knight discuss the geology of Ontario's three most important mining districts. As the authors state in their opening paragraphs, the pre-Cambrian areas south of Lake Superior have for several years been closely studied by a large number of geologists and engineers on account of their great deposits of iron and copper. Similar formations in Ontario are much less well known; but the discovery of nickel, silver and gold ores and the large production that has resulted from the development of such deposits, has shown the desirability of much closer study of the geology of Northern Ontario. At Sudbury, Cobalt, and Porcupine, much has been learned in the past few years. Some relationships between these districts are brought out by the authors.

Sudbury is the oldest and most important district, having produced about 167,000 tons of nickel and 107,000 tons of copper. Cobalt, though much younger than Sudbury, is, perhaps, more widely known. Since the first discovery, in 1903, the district has produced about 170,000,000 ounces silver, valued at about $90,000,000, and netting the mine owners about $50,000,000. During the past year, Cobalt produced about one-eighth the total yield of the world, making Canada as a source of silver second only to Mexico and United States. Porcupine is still younger, gold having been first found in important quantity there in 1909. Already, in spite of many serious handicaps, this district has assumed considerable importance, two large deposits and a few smaller ones having been developed to such an extent that a production of several million dollars is assured.

The nickel, silver and gold deposits of these three districts are very dissimilar. They belong to three distinct types. There are, however, some features in common and it is these features which the authors deal with.

"The ore deposits of all three of these areas are in rocks that are classified as of pre-Cambrian age. While the deposits differ greatly, both as regards form and mineral content, it is believed that all of them owe their origin to igneous intrusions. At Sudbury, the intrusive rock is quartz-norite, at Cobalt quartz-diabase, and at Porcupine, granite."

As the paper is a short one, the authors do not elaborate arguments to account for their belief as to the origin of the ores, but state briefly that:

"In the opinion of most observers who have studied them, the Sudbury ores, essentially a mixture of pyrrhotite and copper pyrites, are direct segregation deposits from the norite magma, but there may also have been some later deposition of ore minerals.

"The Cobalt ores, essentially arsenides of cobalt and nickel with native silver, are, like those of Sudbury, believed to be directly connected with intrusions of igneous rocks. Not only at Cobalt, but in the surrounding region, about 5,000 square miles in extent, the ores are associated with quartz-diabase in such a way as to lead to the belief that they were deposited from heated, impure waters that followed the diabase intrusion. Thus both the Sudbury and Cobalt ores may be considered as coming from molten magmas, the former by direct segregation with the intervention of little water, while those of Cobalt may be looked on as the end product of the diabase intrusion, deposition taking place from aqueous solution.

"While granite is not exposed at most of the Porcupine mines, it surrounds the gold area. The rocks in which the veins occur form what may be called a large

island-like area upon the granite, which probably underlies most of the area. The presence of feldspar, tourmaline and scheelite in the quartz of the gold veins suggests a close connection between the veins and the granite intrusions.

"It is of interest to note that, at least, most of the silver at Cobalt and most of the gold at Porcupine was deposited in the veins after the latter had been fractured and disturbed. At Cobalt, the vein filling before the disturbance took place, consisted essentially of cobalt-nickel minerals and dolomite, and at Porcupine of quartz."

The greater part of the paper is devoted to a discussion of the several series of rocks occurring in the three districts. The Sudbury norite and the Cobalt diabase masses are compared, and age relationships of the several rock groups are stated.

"Although the triangle-shaped region that includes the three areas is 8,000 square miles in extent, there is a close resemblance of the rocks of one area to those of the others. Broadly speaking, there are five or six great groups of pre-Cambrian rocks in the region. Insofar as it is possible to correlate them, each of these groups, with the possible exception of the Animikie, of Sudbury, is present in each of the mining areas, although some are more prominent in one area than in the others, and vice versa."

In order of age the groups referred to are Keewatin, Laurentian granite and gneiss, Timiskaming series, Lorrain granite, Cobalt series, Nipissing diabase, dikes of aplite, diabase, etc. It is suggested by the authors that part of the rocks classed as Keewatin may be of the same age as the Grenville series of Eastern Ontario.

The authors suggest that the dual system of classification of the pre-Cambrian be discarded, because of the thickness of the Grenville series in Eastern Ontario.

The classification of the pre-Cambrian rocks of the Lake Superior states into Huronian and Archean was at one time understood to imply for each district a separation of sedimentary from igneous formations. By several members of the United States Geological Survey it was thought that this was the case; but it has now long been known by these same men that this view was erroneous. The Huronian in some of the iron mining districts is largely sedimentary; but in others it is largely igneous. It is none the less true, however, that there is a remarkable difference between the older or Archean group, including Keewatin and Laurentian, and the younger group known as the Huronian. The Huronian group has suffered much less deformation than the Archean. The Lake Superior geologists have not discarded the classification of the pre-Cambrian which has been long in use; but they no longer consider that the Archean is wholly igneous or the Huronian sedimentary. In some districts the Keewatin is largely sedimentary and in a few the Huronian is largely igneous. The three Ontario districts discussed by Dr. Miller and Mr. Knight are not unlike some in Michigan.

ROYAL ONTARIO MUSEUM OF MINERALOGY

The Province of Ontario and the University of Toronto have had until recently no adequate quarters for the display of minerals. A splendid new building has been constructed and the collections are now being arranged. The systematic collection of minerals is one of the most complete, so far as the number of species is concerned, on the continent. The Director of the Museum, Dr. T. L. Walker, is endeavouring to make the collection of Ontario minerals a very extensive one. Circulars have been sent out announcing the occupancy of new quarters and asking for donations of specimens. Large pieces of ore can be used to advantage. The specimens when exhibited will in all instances be credited to the donor. The fact that the Geological Congress meets in Toronto this summer makes it specially desirable that the material be received at an early date.

It is to be hoped that the request will meet with a liberal response so that it will be possible to make a display that will be a credit to the Province.

VALUATION OF IRON MINES

The paper by Mr. J. R. Finlay on this subject presented at the New York meeting, February, 1912, of the A.I.M.E. has provoked considerable discussion and brought out interesting statements from some of the members of the Institute. Mr. Finlay's method is to determine mine valuation upon an apparent profit per ton based upon the difference between the selling price of ore and the expense of mining and marketing it for a term of years or for the expected life of the mine. Mr. E. E. White, however, considers that the factors assumed in applying this method are not justified. Of the five factors necessary to apply the method to any mine (1) the average cost per ton, (2) the ore reserves, (3) the production per year, (4) the average selling price, (5) the present value of a $1 per year dividend, Mr. White considers that (1) and (2) may be determined with fair accuracy, although in many cases the ore reserves are only estimates based on drilling, and although the average cost may only be determined by past experience, and may be different in the future, due to varying costs of labour, increasing cost and poorer quality of timber, and the possibility of even greater taxation. The production per year is a known factor. The last two factors Mr. White considers to be purely matters of personal opinion. He believes Mr. Finlay's method may be successfully used, but that the five factors for operating iron mines in Michigan should be determined as follows: (1) The average cost of production at lower lake ports for five years, plus or minus the difference in cost per ton of taxes due to such revaluation; (2) the estimated ore reserves: ore based on diamond drilling to be estimated very conservatively; (3) the average production per year for the last five years, if the mine has been equipped

to produce actively for that length of time, otherwise for the number of years during which it has been so equipped; (4) the average selling price at lower lake ports for 18 years; (5) the present value of a $1 per year dividend based upon a 10 per cent. return on the investment, and capital returned in ten years of operation by investment of an annual sum at 3 per cent.

Mr. Finlay, in reply, states that Mr. White's method gives a valuation for the Michigan mines, on an 18-year life, of $42,000,000, and states that in his opinion the properties cannot be bought for three times this valuation.

It is not likely that the mine owners and the State will ever agree entirely on the question; but open discussion will lead to a fuller knowledge of the facts. It is to be expected that Mr. Finlay will endeavour to make it clear that his method is correct, and it is also to be expected that those interested in the mines taxed on his valuation will endeavour to show that his figures are too high. From the discussion we may learn how to put a fair price on a Lake Superior iron mine. In a recent judicial decision Mr. Finlay's method has been upheld by the courts.

SECONDARY ENRICHMENT OF SULPHIDES

Those engineers and geologists who for economic or purely scientific purposes had occasion to study carefully the sulphide deposits of many of the Western and Southern mining districts of North America, found that the deposits showed three more or less well defined zones. A shallow zone of lean or barren vein material, an intermediate zone of rich ore and a deeper zone of leaner ore. Often the intermediate zone proved to be the only portion which could be profitably mined, and its relation to the others became a question of first importance. Independently three geologists, from the facts observed by many men who were familiar with the deposits, and from their own observations, formulated the theory of secondary enrichment. This satisfactorily explained the phenomena and assisted materially in obtaining an intelligent idea of the character of many orebodies.

The deep ore is considered as primary, having been but little altered since the deposit was first formed. The shallow zone is supposed to have lost considerable of its metallic content by solution and downward migration of metallic sulphides. The intermediate rich zone has supposedly been formed by the redeposition of sulphides from the downward migrating solutions.

Like most theories, this one of secondary enrichment seems to fail in many cases to explain the facts. It has so often been demonstrated as the true explanation, however, that it has proven a very useful guide in the valuing and developing of many deposits.

Unfortunately, it is frequently applied to deposits which differ fundamentally from those in which were observed the phenomena which led to the formulation of the theory. In such districts as Northern Ontario, where glaciation has removed the weathered zone, the theory without modification has no legitimate application. There the present surface must be regarded in most cases as having no necessarily close relation to the richest portion of an orebody. It is rather a chance surface due to the varying degrees of erosion after the deposits had reached practically their present condition.

It is, therefore, of interest to read in Mr. W. H. Emmons' recently published U. S. G. S. bulletin on the Enrichment of Sulphide Ores, that he does not consider many of the ore deposits of Canada to be correctly referred to as examples of secondary enrichment. Some paragraphs from his discussion on glaciated deposits will be found elsewhere in this issue.

SEE THE MINES OF CANADA

The excursions to be held in connection with the International Geological Congress this summer will include trips to nearly all of the leading mining districts of Canada. Those who join the Congress will have unusual opportunity of visiting the producing mines. Coal, asbestos, silver, copper, nickel, lead, gold, and natural oil and gas properties will be inspected. Complete guide books and maps will be available. There will be special private trains, and the railroads have made remarkable reductions in rates for the period, June 15 to October 31.

CORRESPONDENCE

THAT "SUGGESTION FROM THE WEST"

Editor Canadian Mining Journal:

Sir,—May I add to the later part of your editorial comment of June 1, on the suggestion of the British Columbia Mining Association, that Mr. R. F. Green, M.P. for Kootenay, British Columbia, be appointed Minister of Mines for Canada, that the report of the meeting of the Association published in the Daily News, of Nelson, B.C., includes a misstatement, which is contained in the following excerpt from that report: "Mr. Retallack moved the resolution, urging the Government to create a separate portfolio of Minister of Mines, and to appoint the member for Kootenay, and quoted a resolution passed by the Canadian Mining Institute which suggested Mr. Green for the position." The point I wish to make quite clear is that at no time has the Canadian Mining Institute even considered a resolution suggesting Mr. Green for the position of Minister of Mines, not to say passed one. I may add that the seconder of the resolution moved by Mr. Retallack at the meeting of the Association above referred to has informed me that Mr. Retallack did not make the quotation as stated.

E. JACOBS.

Victoria, B.C., June 7, 1913.

SURFACE PROSPECTING AT COBALT

The first discoveries at Cobalt were made by examining the rock outcrops. The ore, disintegrated for a few feet by weathering, was usually partly decomposed, the silver being tarnished and the arsenides oxidized. The oxidation of the cobalt minerals to pink erythrite, or cobalt bloom, furnished a remarkably good indicator. Thin films of bloom were commonly found when the rock near a vein was broken. The erythrite, however, does not retain its colour long when directly exposed to the weather, and is, therefore, of comparatively little value as an indicator until the rock is broken.

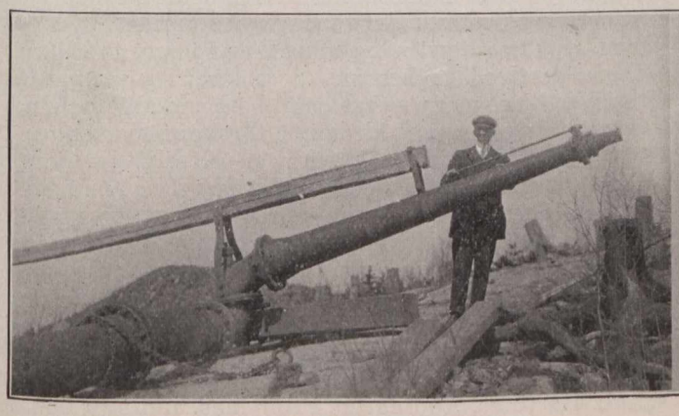
Cleaning Rock Surface, Nipissing Mine

The early prospecting consisted of examining all small crevices in the exposed rocks. The presence of ore was usually detected by the crevice yielding a soft black mud—cobalt oxide—containing nuggets of native silver, or by the brightly coloured arsenates of cobalt and nickel found a few inches below the surface.

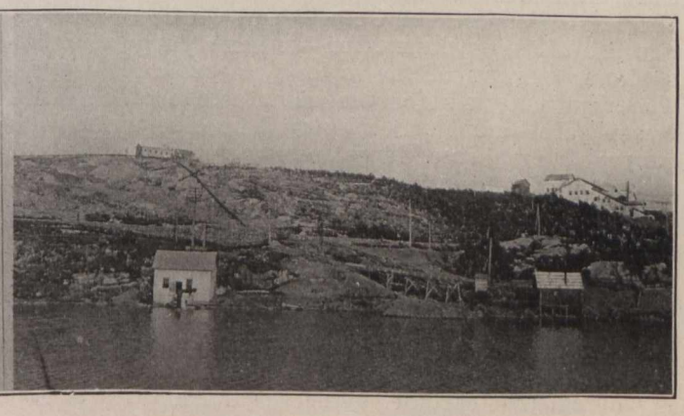
After the well-exposed rocks had been closely examined, the practice of digging trenches to bed rock was begun. Where not actually exposed, the rock is usually covered with only a few feet of glacial debris—sand, gravel and boulders. This practice proved successful and many veins were thus discovered. The first trenches were run irregularly and in the most easily prospected places. Later, in areas which proved productive, trenches and cross-trenches were run at short intervals—50 to 100 feet. The digging of the trench is followed by thorough cleaning of the bed rock. This is then carefully examined. Any crevices found are stripped for some distance and the rock is broken frequently along them. It is a common occurrence for such diligent following up of mere cracks to be rewarded by the discovery of narrow veins of rich ore.

Recognizing the advantage of having the overburden removed, the Nipissing Mining Company in 1906 pumped up water and washed the soil completely from a small area of the property near the shore of Peterson Lake. Later a pump of much larger capacity was installed, and in 1912 hydraulic prospecting began in earnest at the Nipissing.

At the shore of Cobalt Lake an electric-driven turbine is pumping water up Nipissing Hill to clean the rock surface. From the 3½-inch nozzle, 4,800 gallons of water per minute is directed against the glacial deb-



Giant Nozzle, Nipissing Mine

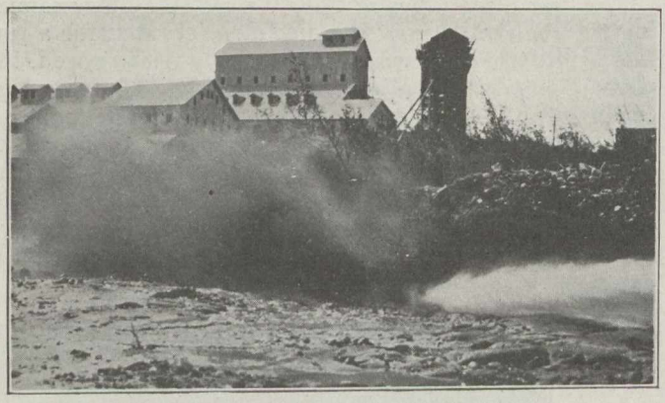


Pumping Plant and Pipe Line

ris. The sand and gravel are quickly washed away. To break rock and scatter beds of heavy boulders dynamite is used. The practice is not to wash the soil down into the lake, and very little finds its way thither. After an area has been thoroughly cleaned of debris it is carefully examined and surveyed. Subsequently in clearing an adjoining area the first is allowed to become covered again.

Already the work done at the Nipissing has been rewarded by the uncovering of several narrow veins of good ore, and it seems likely that this unusual method of surface prospecting will prove very profitable. Cheap power is available at Cobalt, and the cost of hydraulic prospecting is consequently much lower than in localities where steam-developed power is used.

The accompanying photos show the pump house, pipe line, and nozzle. A pressure gauge at the nozzle registers, under present working conditions, about 130 pounds.



Stream Washing Sand and Gravel from Rock Surface

MINING AND THE CANADIAN NORTHERN RAILWAY

(Continued from June 1st Issue).

"The St. Lawrence lowlands, floored with nearly horizontal Palaeozoic strata, and bounded on the north by the southern edge of the Laurentian plateau, represent in Canada the north-eastern extension of the great plain-like area of the interior of the continent. Commencing near the city of Quebec, the lowlands stretch southwesterly on both sides of the St. Lawrence with slightly diverging boundaries, until, at Montreal, the level country is approximately 120 miles wide. Beyond Montreal, the northern boundary pursues a westerly course up the Ottawa valley to a point about fifty miles beyond Ottawa city, where a ridge of broken country—a low spur of the Laurentian highlands—projects southerly, crossing the St. Lawrence between Brockville and Kingston to join the elevated Adirondack region of northern New York. Near Kingston, at the foot of Lake Ontario, the lowlands again commence and occupy the portion of the Ontario peninsula lying between Lakes Huron, Erie and Ontario, and bounded on the north by a nearly straight east and west line from Kingston to the foot of Georgian Bay, Lake Huron.

"The widespread clays of glacial and post-glacial age that often completely hide the underlying rocks over considerable areas of the St. Lawrence lowlands have furnished the material for numerous brick and tile industries both in Ontario and Quebec. Advantage has also been taken, for the same purpose, of the shales in various of the lower Palaeozoic formations. The raw materials for the manufacture of Portland cement are abundantly displayed in the region, and support a number of large industries. Some of these utilize marls—deposits of calcium carbonate in lakes scattered over the uneven surface of the post-glacial deposits, and the clay beds of these deposits, while others use Palaeozoic limestone. These limestones of several of the formations, and more especially of the Trenton group, are also extensively quarried both for building stones and for the production of lime. At several points the limestones are also used in the making of calcium carbide, while the dolomites are used in the manufacture of pulp.

"The Laurentian Plateau region, surrounding Hudson Bay with a U-shaped form, has an area of over 2,000,000 square miles. Limited in the east by the North Atlantic and by the gulf and estuary of the St. Lawrence as far as the City of Quebec, its southern boundary there passes inland and up the Ottawa river to beyond the City of Ottawa, then turns abruptly to the south and crosses the International boundary at Brockville. Farther west, at the foot of Lake Ontario, it crosses back into Canada and follows a nearly due east and west line to the foot of Georgian Bay, from which point the two upper Great Lakes form the bounding line. West of Lake Superior the Laurentian plateau region extends south into the United States. In southeastern Manitoba the boundary again enters Canada, and from there passes along a general northwesterly course through Lake Winnipeg, Great Slave Lake, and Great Bear Lake, to the shores of the Arctic Ocean.

"Noted for its timber resources, the Laurentian plateau, where best known, is no less important from the standpoint of mineral wealth. Along the southern margin occur the noted copper and nickel ores of Sudbury, and to the north of these lie the Cobalt silver deposits. In eastern Ontario, and the adjoining portion of Quebec, are numerous and important deposits of graphite and mica. All through the region occur iron deposits, some now being mined, and many in the near future destined to become commercially important. Besides these, many other ores, both metallic and non-metallic, are known, although the country connot in any sense be said to have been closely prospected. Nor do these mineralized belts seem to be confined to the southern part of the country, but everywhere through the Laurentian Plateau region the general conditions appear to be similar, and it is certain that many deposits of economic value yet remain to be discovered.

Gold.—"In Eastern Ontario the auriferous deposits appear to be confined to a belt of varying width and about seventy miles long, extending through Peterborough, Hastings, Addington, Frontenac, and into Lanark County. This region is occupied by crystalline lime-

stones, various types of schists, and bodies of dark basic rocks, all commonly grouped as the Hastings-Grenville series, and cut by bodies of granite. The gold deposits occur in the older rocks, generally near granite intrusions and along lines of fissures containing quartz veins or lenses, and, commonly, with abundantly associated mispickel, sometimes mined for arsenic.

Copper.—"Most of the copper won in the Laurentian plateau comes from the nickel-copper mines of Sudbury.

"In the Parry Sound district a number of discoveries of copper ore have been made. At a point about two miles east of Parry Sound a schistose diorite is more or less charged with bornite, chalcocite, and chalcopyrite, over a zone about 1,000 feet long and 250 feet to 400 feet wide. In places the ore is associated with stringers of quartz, but in general it occurs in bunches or pockets through the impregnated rock. At another locality in the same district, about eight miles south of Parry Sound, a garnetiferous gneiss is impregnated with copper and iron sulphides, over a band about 1,000 feet long and 30 to 75 feet wide.

Zinc.—"Zinc blende, usually accompanied by galena, occurs in workable deposits at a number of points in Quebec and Ontario. The Olden or Richardson mine, in Frontenac County, has been worked in recent years. The ore consists of a mixture of zinc blende and argentiferous galena. The deposit is irregular, and occurs in a band of crystalline limestone of the Hastings-Grenville group. Some work has been done on zinc deposits at Calumet.

Iron.—"Throughout Eastern Ontario and adjoining portions of Quebec, in the districts in which the Hastings-Grenville series occurs, are numerous deposits of magnetite. Many of these have been worked for years, and some are being mined at the present time. The deposits, though usually irregular in shape and distribution, are often of considerable size. In one instance, at the Mayo mine, Hastings County, the ore has been worked from an open pit 1,100 feet long by 220 feet broad, while a drill hole was sunk 140 feet without passing out of ore.

"In many cases the ore bodies lie along the contact of crystalline limestone and granitic or other igneous bodies. At times considerable pyrite is present, necessitating the cobbing of the ore. The general conclusion is that the ores are of contact metamorphic origin. Other iron ore deposits of the Hastings-Grenville districts lie within bodies of basic igneous rocks, are characteristically irregular in their occurrence, and doubtless are of direct igneous origin. Somewhat related in type are the masses of highly titaniferous magnetites so often associated with the various anorthosite bodies occurring throughout the eastern part of the Laurentian plateau. In size these titaniferous ore bodies vary widely, sometimes reaching large dimensions."

Recently some of the magnetite deposits of Eastern Ontario, referred to by Dr. Young, have been more energetically worked and a concentrator is now in operation at Trenton, treating the ore produced by the Canada Iron Mines, Ltd. A description of the mines and plant follows.

THE CANADA IRON MINES, LIMITED.*

The Canada Iron Mines, Limited, was organized for the purpose of operating the important magnetite deposits along the line of the Central Ontario Railway. It owns the Bessemer and Childs group of mines near L'Amable Station, the Coe Hill mines at Coe Hill, and the Blairton mines near Marmora.

The Canada Iron Mines, Limited, ships the ores to its concentrating plant at Trenton, where it undergoes magnetic concentration, making a marketable product. In this manner, by a centralization of treatment and of administration it is able to achieve low costs, and by mining the various ores in their proper proportion according to their different characters, it is able to produce a product admirably suited to the blast furnace.

It has been necessary so far to open only the Bessemer and Childs group, and we will consider these mines first.

The Bessemer and Childs group comprise 3,100 acres of mineral lands situated in the Townships of Mayo and Dungannon in the County of Hastings. These mines are not directly on the Central Ontario Railway, but are five to seven miles east from L'Amable Station on that railway. The Bessemer and Barry's Bay Railway connects the mines with the Central Ontario near L'Amable. It is owned and operated by the Canada Iron Mines, Limited.

Bessemer Post Office is situated five miles from the junction of the Central Ontario Railway and Bessemer & Barry's Bay Railway, and here is located the mine office, store, club and settlement, etc., for both Bessemer and Childs mines.

Bessemer No. 4 mine is the most important mine at Bessemer and is the only one being operated at the present. At this mine two large ore bodies are being developed—the north lens and the south lens. The latter lies to some extent under Little Mullet Lake, and although opened up considerably under this lake, the workings are unusually dry. Of course a thick pillar is left between the workings and the lake bottom. The ore bodies are both of large size and permit mining methods to be used which give low costs for underground mining. The ore is extracted by overhand stoping on the shrinkage system, no timber being used.

Hammer drills are used for stoping. Three and one-quarter piston drills are used for all drifting. Hammer sinkers were tried for shaft sinking, but have not yet been a success owing to a great breakage of steel. This will be overcome by using 1⅛-inch hollow hexagon, instead of 1-inch as now used.

The ore is hoisted in a one-ton skip and is dumped directly into a No. 6 "K" Gates gyratory crusher. The crusher discharges onto a 22-inch troughed belt conveyor equipped with ball-bearing idlers. The conveyor is 44 feet long and is installed on a slope of 18½ degrees to gain headroom. The conveyor discharges either into the car loading bins, or into the tramcar for stockpiling.

The management intends to install a magnetic cobber at the head of this conveyor to reject clean rock. At the present time this is handpicked to some extent.

Very little pumping is required at this mine, as the ground is free from fissures. There is just enough dampness to keep the mine from being dusty.

Power is produced entirely by steam. The boiler plant consists of two 150 horsepower horizontal return tubular boilers. The compressor is a Nordberg cross-compound, two-stage machine of a capacity of 1,400 cubic feet of free air per minute. It has an independent jet condenser. The hoist is a duplex 12 x 22 engine with a single drum 6 x 5 feet.

In the blacksmith shop is installed a Leyner Drill Sharpener, which sharpens the drill steel for both the Bessemer and Childs mines.

The ore deposit at Bessemer is very large, there being 200,000 tons of ore developed by the present work-

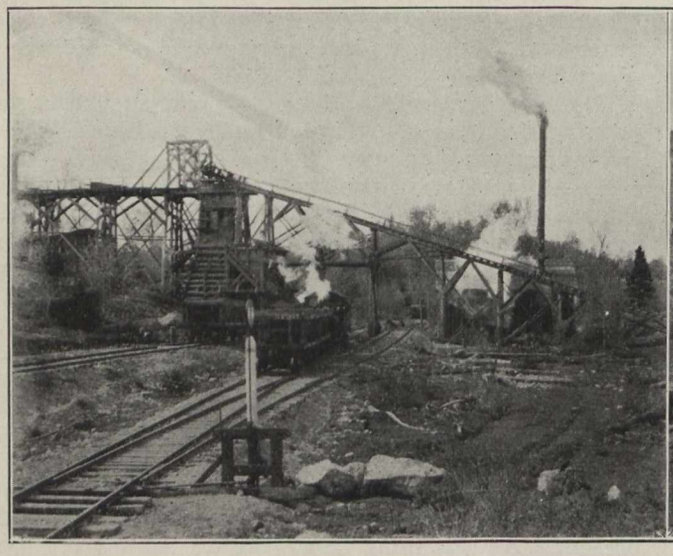
*Written by W. D. B. Motter, Jr., Manager, Canada Iron Mines, Ltd., and published by courtesy of R. H. Flaherty, Chief of Mines Dept., Mackenzie, Mann & Co., Ltd.

ings, and the mine has really been only superficially opened. One of the accompanying photographs shows a general view of Bessemer mine, and the stockpile in the foreground.

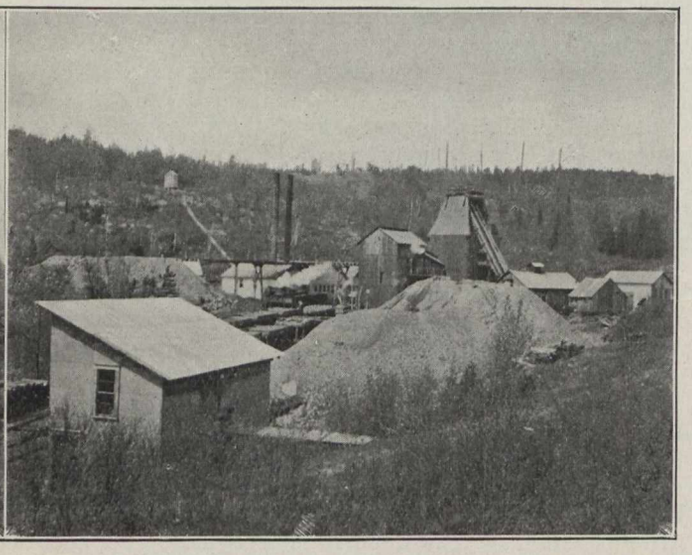
The Childs mine is situated two miles northeast of Bessemer, and is the present terminus of the Bessemer & Barry's Bay Railway. This is a very large deposit which is now being developed. It has been explored by diamond drilling to a depth of about 300 feet, proving the existence of an ore body containing one and a half million tons above that depth. The ore body is wide even at that elevation, showing no signs of its being near the bottom of the deposit. The management is confident that the total ore reserves will be much in excess of the above estimate.

The above ore body is known as Childs No. 1, and there is also a second deposit about 300 feet north of No. 1, which has a very large tonnage, but is not of such a good grade as the No. 1 deposit, and is therefore not being opened at the present.

The Childs No. 1 deposit is being developed as an open pit mine. The ore body is about 100 feet wide, but is divided into several lenses by narrow igneous dikes, consisting mostly of syenite. These dikes complicate the mining method to a certain extent, as it is necessary to do some dead work in opening up the working faces. The deposit is being attacked at several places, one of the accompanying photographs showing the opening near the eastern end. This is the latest opening. The hanging wall of the deposit is shown at the left of the photograph. The footwall is in the swamp at the extreme right.



Crushing Plant, Childs Mine.



Bessemer Mine, Hastings Co., Ont.

Eastern End, Childs Mine

The ore is broken down by one steam drill at each working face. It is hand loaded into low bodied wooden end-dump tramcars of the coal mine type. These cars have a capacity of two and one-half tons, and are 36-inch gauge. The loaded cars are gathered and hauled by a 12½-ton dinkey locomotive to the foot of the hoisting incline.

The ore tramcars are hoisted up the inclined trestle as shown in photograph. They dump automatically into the No. 5 "K" Gates gyratory crusher, which rests on the crib foundation. The crusher discharges into the loading bins, thence into the railway cars.

It is intended to install here also a magnetic cobbing plant to reject clean rock and thus raise the grade of shipping ore.

There is enough ore in the Childs mine, above the 300-foot depth to ship 500 tons per day for ten years. Owing to the low cost of open pit mining, a large proportion of the above ore can be mined very cheaply, and even as an underground mine, the costs should be low owing to the large size of the deposit, and the mining methods that can be used.

The Coe Hill mines are situated in the Village of Coe Hill, for many years the terminus of the Central Ontario Railway. In fact, this railway was originally built from Trenton to Coe Hill, principally to handle the ore from the Coe Hill mines.

The Canada Iron Mines, Limited, has not done any work at Coe Hill, as it is necessary to do some additional experimenting, owing to the complexity of the ore.

The mine is full of water, but was formerly opened to a depth of 130 feet, and it is stated that the width of clean ore at that depth is about fifty feet. The workings extend to the surface where they form an open cut. The ore here varies from 10 feet to 60 feet in width. It is stated that some 100,000 tons have been mined during the time the mine was operated, which was from 1882 to 1886.

There is now on the stockpile about 30,000 tons of ore ready to be shipped, and according to the diamond drilling, a very large tonnage of ore underground.

The Blairton mines are located on the shore of Crow Lake, Township of Belmont, County of Peterboro, about four miles from the Town of Marmora on the Central Ontario Railway.

These mines have been worked to a greater or less extent until 1873, having produced, it is claimed, 300,000 tons.

These mines are being held in reserve. The deposit has been drilled and a large tonnage of ore proven. It will be necessary to construct a railroad from the Town of Marmora, and to fully equip the mine.

Development work will have a very good start owing to the former workings.

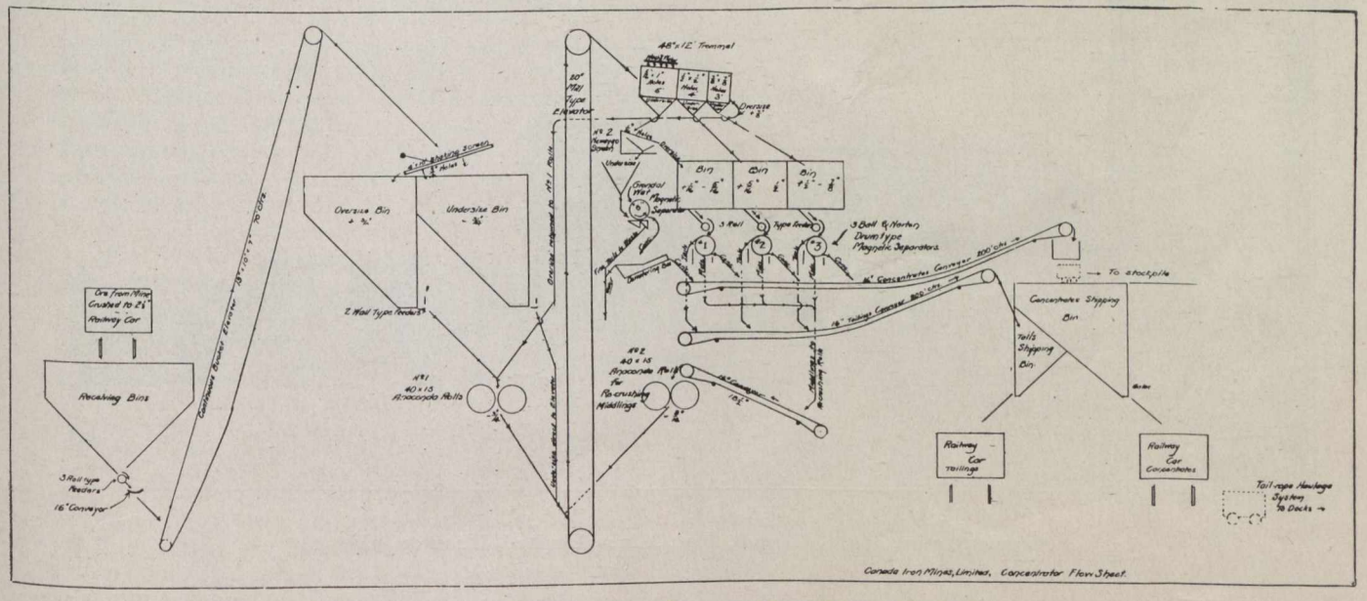
The concentrator is located in the Town of Trenton. Trenton has splendid shipping facilities, being a divisional point of the Central Ontario, the Canadian Northern and Canadian Pacific Railways, and also on the Grand Trunk. The Canadian Pacific is at present under construction. Besides the above railway facilities, Trenton is at the southern terminus of the Trent Valley Canal, now building, and is on the Bay of Quinte.

Very favourable rail freight rates are going into effect this month for shipments to Pennsylvania. Shipments to Lake Erie points will be made by water. It is probable that all shipments to Canadian furnaces will be by rail.

The concentrating plant was laid out on the basis of treating 1,000 tons of crude ore per day of 20 hours. This plant was divided into three units of a capacity of 330 tons each. It was considered best to build only one unit completely and to construct the other two in skeleton. It will be necessary only to install the machinery and some interior work in the building, etc., to complete the plant to its full capacity, as the steel building, trestle, etc., are all constructed for the entire plant.

The two stacks shown in photograph of concentrator are remnants of a saw mill which previously occupied this site, only one stack is now used, and is for the heating boiler in cold weather. The low brick buildings are also old, and are used for a warehouse and a shop.

The main building is of steel structure covered with a specially pressed sheet steel, which will later be cemented over to form reinforced concrete curtain walls. The interior finishing of the building, and the trestle,



Concentrator flow sheet, Canada Iron Mines Limited

Power conditions are very favourable at Trenton, owing to the great development of hydro-electric power along the Trent Canal system, in the immediate vicinity. This will furnish plenty of cheap power for any allied industries, which are expected to be developed later.

The Canada Iron Mines, Limited, own as a concentrator site 40 acres of land on the east side of the Trent River at the point of its confluence with the Bay of Quinte. This site consists also of an additional 40 acres of water lot on the Trent River and Bay of Quinte. Ore docks are under construction for water shipments. The Bay of Quinte, which now has a maximum draft of 10½ feet at low water is being dredged to a depth of 14 feet. The Murray Canal, which forms the western outlet of the Bay of Quinte into Lake Ontario, is also being deepened. When this work is completed vessels can be loaded to the full draft of the Welland Canal. At the present they can be loaded to a draft of 10½ feet only, at low stages of the water.

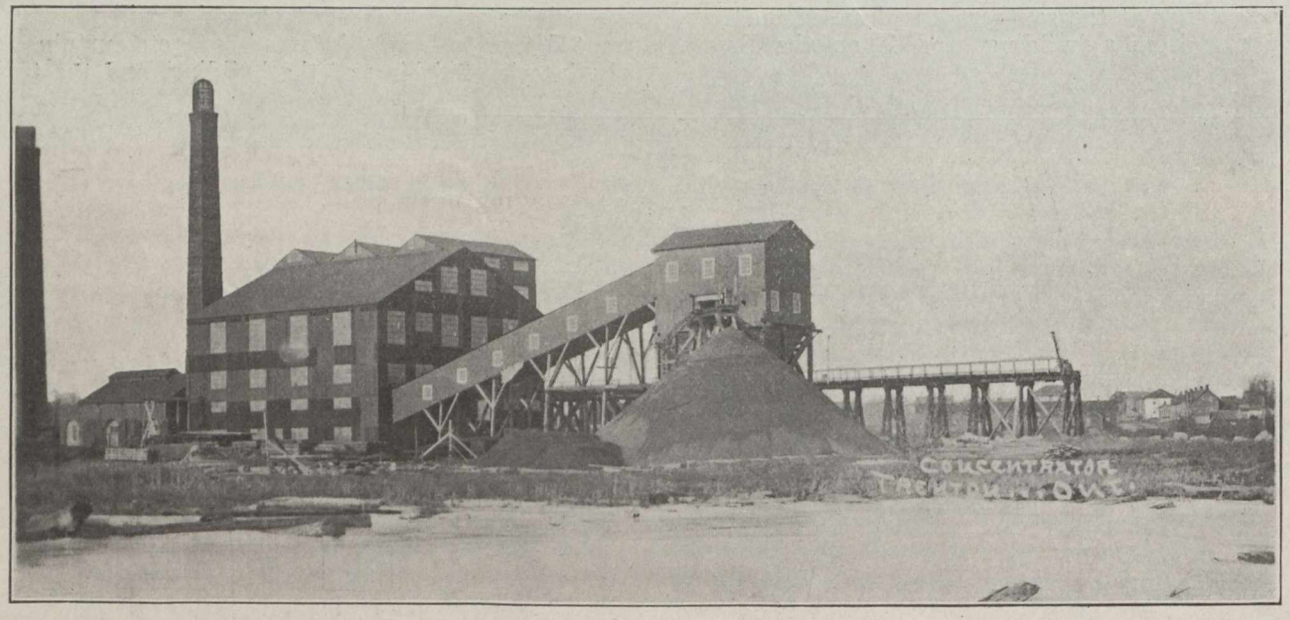
and also the inclined conveyor housing and bins, are of slow burning mill construction.

In order to make the plan of the treatment which the ore receives in the process of concentration perfectly plain, a diagrammatic mill flow sheet is shown here. Starting at the left hand side of this diagram, the ore is received from the mine in standard gauge ore cars. These are delivered on the trestle over the receiving bins into which the ore is dumped. It is drawn off from these bins by three roll type feeders, which deliver it onto a short 16-inch belt conveyor. This conveyor discharges through a chute into the buckets of the inclined continuous elevator, which elevates the ore into the mill proper, and delivers onto the shaking screen. This screen has ¾-inch square holes. The oversize goes into its bin over the rolls, and passes through an oscillating feeder to the No. 1 rolls. These are 40 x 15 inch Anaconda rolls set at ¾ inch. The crushed material then is delivered into the boot of the 20-inch vertical mill type elevator.

The undersize from the shaking screen, which is material ¾ inch in diameter and smaller, falls into its bin. This is a duplicate of the above-mentioned oversize bin. These are steel bins, lined with oak. The undersize is delivered from its bin by another oscillating feeder directly to the above vertical elevator. The entire crushed and fine product is discharged into the trommel.

The trommel or revolving screen is 48 inches in diameter by 12 feet long. It serves to grade the crushed ore in accordance with its sizes, in order that the magnetic separators will have the advantage of a sized product to treat. The first section of the trommel is punched plate five feet long with holes 5-16 inch by 1 inch. The second section is woven wire screen four feet long with ½-inch square holes. The third section is woven wire screen three feet long with ⅞-inch square holes. Wash water is added to the chute between the elevator and the trommel and also over the first section of the trommel.

mixes with the fresh ore entering the rolls. The treatment of the three different sizes in the separator bins is identical, the only difference being in the adjustments of the separators. The material is drawn from the bins by roll type feeders, which distribute it across the face of the drums of the separators. These are single drum Ball-Norton magnetic separators. Owing to the method of wiring used on these machines it is possible to make a three-part separation. The three products consist of clean tailings, clean concentrates and middlings, or particles containing both magnetite and gangue or rock. The tailings fall to the coarse tailings conveyor and are carried out to a car loading bin. The concentrates fall onto the concentrates conveyor. The middlings fall onto a short inclined middlings conveyor, which carries them to the No. 2 or recrushing rolls. These are duplicates to the No. 1 rolls, being 40 x 15 Anaconda rolls, but they revolve at much higher speed. They are set to crush to 3-16 inch. The recrushed middlings enter the system again in the boot of the vertical elevator, to be rescreened and retreated.



Concentrating Plant, Canada Iron Mines Limited, Trenton, Ont.

The material passing through the first section is delivered to a No. 2 "Newaygo" wet screen. This has a screening surface of woven wire with 1-16-inch or 1.6 mm. holes. This screen makes two products, an undersize and an oversize. The former is carried in a wet launder through a wooden feed box to "B" magnetic separator. This is a Grondal wet separator, and makes concentrates and tails. The latter are discarded as fine tailings, being used to make land.

The concentrates from the Grondal separator pass through a dewatering machine, which drains off most of the free moisture, and delivers them to the concentrates conveyor.

The oversize from the "Newaygo" screen is discharged into the bin over No. 1 separator. The undersize through the second and third sections of the trommel is discharged into bins over separators Nos. 2 and 3 respectively. The oversize from the trommel is material that will not pass through a ⅞-inch square hole, and is returned to No. 1 rolls to be crushed again. It

The concentrates conveyor collects the concentrates from all the magnetic separators and conveys and elevates them to a small pocket over the concentrates bin. It is then drawn off either into the concentrates shipping bin or a small tramcar to the stockpile. Railway cars are loaded from the concentrates shipping bins for rail shipments. A tail rope haulage system will convey the concentrates to the docks for water shipments.

The coarse tailings are also a marketable product, and the entire supply has been contracted for for several years. The revenue derived from their sale will amount to a considerable figure when the plant is running at its full capacity.

Although the plant was designed for a capacity of 330 tons per unit, in operation it can treat over 300 tons per ten-hour shift, and its capacity is from 500 to 600 tons per unit per day of twenty hours. The present ratio of concentration is about one and one-third

tons of crude ore to one ton of concentrates. Therefore the daily production of concentrates from one unit will amount to from 375 to 450 tons per day when running two shifts. The operations are being pushed to this point as rapidly as possible.

It will be necessary to install the second and possibly the third units of the concentrates before opening up Coe Hill and Blairton mines.

The ore reserves guarantee a future ore supply for the concentrator at full capacity for many years.

(To be Continued.)

EFFICIENCY IN UNDERGROUND PRACTICE*

By Andre Formis.

In consequence of the increased cost of labour and supplies in the process of mining it has become advisable to investigate the various steps in the production of tonnage with a view to reducing waste factors to a minimum. The paper submitted this evening hopes to bring out a discussion on the subject of rock-drilling, the most important of the underground operations.

Considering that the labour factor in mining is about 75 per cent. of the total cost, it is evident that the savings effected in this item are proportionately of greater importance than in the matter of the other 25 per cent. of the cost. However, owing to the nature of this larger factor it is also much more difficult to accomplish any results with it, partly on account of the evident distrust of the so-called old-time mining captains of anything suggested by a technical graduate, partly on account of the inertia of labour itself, and partly on account of the natural hesitancy of some mine managements to permit anything that may seem a radical departure from ancient and honorable customs. Yet it can be shown by actual tests, supplemented by correct cost figures—by these I mean costs based on observed and recorded facts and not pro-rated costs—that material savings are easily made without departures in any manner radical in underground practice.

In order to arrive at a correct analysis of any set of conditions it is, of course, important that the observations of these conditions be as accurate as possible. It is also obvious that a long continued set of observations is more nearly correct than a short one.

In the practice of rock-drilling many different methods are employed, many sizes and shapes of drills are used. Some of these drills are better than others; sometimes, perhaps, one only is the best for a certain class of work. Careful study and patient investigation are required to come to any definite conclusion. The selection of the drill depends on a large number of factors, the most apparent of which are:

1. Hardness of the rock to be drilled.
2. Irregularities of the rock, causing the steel to bind in the holes.
3. Diameter of drill cylinder.
4. Piston stroke if any.
5. Weight of moving parts.
6. Effective blow.
7. Total weight of drill.
8. Depth of holes to be drilled and diameter of holes.
9. Style of chuck.
10. Shape of bits.
11. Use of water in holes.
12. Hollow steel with water or air jet.
13. Wages of miners, based on company account, tonnage contract, or footage drilled.
14. Cost of power.
15. Various other factors, depending on locality, etc.

Each of the foregoing factors determines in a manner the proper drill to be used. What appears to be the proper drill having been selected, first an investigation of the amount of air it consumes should be made, second, a time study of its operation.

For the first of these studies may be used the graphic air-flow meter which has been perfected by the General Electric Company (see Bulletins No. 4004, No. 4827, and No. 4941), which measures in cubic feet the air consumed by any device connected to it. The record is made on a moving roll of paper. The interpretation of the record is simple.

The principle of operation of the meter is based on the velocity head. Consider a small pipe inserted in the air-line in such a manner that the leading opening faces against the direction of flow and the trailing openings face in the direction of flow. These two pipes are connected to a vertical U-tube containing mercury. Thus the air flowing in the pipe impinges against the leading opening and sets up a pressure in the leading pipe which equals the static pressure plus a pressure due to the velocity head. The drag of the air on the trailing openings lowers the pressure in the trailing pipe. Due to the differential pressure, the mercury in the U-tube is deflected until the unbalanced column exactly balances the differential pressure. Since the leading set of openings extends approximately across the diameter of the pipe, the velocity pressure transmitted to the meter is the mean velocity pressure due to the flow of air, rather than the velocity at a single point in the pipe.

One of these meters was installed at the property with which I am connected. The meter was first used on the 1900-foot level to measure the amount consumed by a R 3 drill and a Butterfly drill No. C100. Only one drill was working on the line at a time. A recording air-gauge was also connected to the line, to ascertain the air-pressure near the drill for comparison at any instant with the graphic flow-meter records.

For a fairly accurate time study of the operations of the drill, nothing more is needed than a watch and a note book. Mr. R. T. Dana and Mr. W. L. Saunders in their work on rock-drilling have published a formula which permits of a set of short observations being used for an estimate of drilling performance. The formula is:

Time to drill one hole $=(e—fd)\ D/f—(l—g—k)$ in which the quantities signify as in the table following. The table includes also the figures obtained at our mine.

e=average time to change steel	our figure,	4.00	min.
d=average time to drill one foot	our figure,	4.87	min.
l=average time to move drill	our figure,	16.00	min.
g=average time to set up drill	our figure,	12.00	min.
k=average time to blow, blast holes, etc.	our figure,	24.00	min.
D=depth of holes in feet	our figure,	8.1	ft.
f=length of feed	our figure,	2	ft.
fd=time to drill length of feed	our figure,	9.6	min.
Number of bits per hole	our figure,	4.0	

Then if 540 is the number of working minutes per day shift, the number of holes per day shift=

$$\frac{540}{(e—fd)\ D/f—(1—g—k)}$$

*A paper presented at Michigan College of Mines Club, Houghton, and published in the M. C. M. Alumnus April, 1913.

It may be seen that a slight difference from average values will materially affect the result.

The time record taken from the chart of a single shift —day shift, January 31, 1913—is as follows:

Drill reciprocating	36.5%	
Changing steel	14.4	
Moving drill on post	17.5	
		69.4%
Mucking out out for post	10.7%	
Time lost going to face	4.1	
Getting drill steel and water	2.2	
Cleaning and charging holes	2.8	
Blasting	2.9	
Blowing smoke	7.8	
		30.5%

Number of holes per shift, 6.
Feet drilled per shift, 40.5 (medium hard amygdaloid).
Cutting speed, 4.205 ft. per min.

The air pressure was about 96 lb. absolute, the consumption of air around 110 cu. ft.,—for the C110 drill 85 cu. ft.

From this time study it appears that the first three factors, amounting to 69.4 per cent., are inherent in the operation of the particular drill and cannot well be reduced. The other factors, amounting to 30.5 per cent., may be reduced for the benefit of the former,—that is, for more actual drilling time. This may be accomplished by a change in the method of drilling holes or by employing additional labor to perform part of the 30.5 per cent. time-loss, always with the condition that the cost of the additional labour is repaid by the increased footage obtained. In our case it is not.

GLACIATION OF ORE DEPOSITS*

By W. H. Emmons.

In comparatively late geologic time a considerable portion of North America was capped by a continental ice sheet, which removed by erosion the loose debris and the surface rock over great areas. Glaciation was most extensive in northern latitudes, but the continental glacier extended southward as far as Ohio and Missouri rivers, and smaller glaciers accumulated in the more lofty mountain ranges of the American Cordillera. Many of the ore deposits that lay in the paths of the glaciers were planed off, and the ores in their upper zones were scattered in the rocky material which was left when the ice had melted. Erratic fragments of such deposits have been carried far from their sources and have been the cause of much fruitless prospecting.

The outcrop of an ore body may be removed gradually by erosion by water, but weathering generally precedes erosion. The solutions may leach the valuable minerals from the outcrop and may precipitate them at a lower level, where they will be preserved. But weathering does not attend erosion by ice, and chemical action of low temperatures is slight; consequently the metals present in the portions of the deposits that are removed are likely to be scattered. The extent to which the ore deposits in a glaciated region were weathered or otherwise altered by surface agencies before the glacial period began can not be estimated. The amount of rock removed by the continental ice sheet is known to be considerable, however, for the drift which it deposited is in many places more than 200 feet thick. It is probable that glacial erosion was in places equally great or greater. Whatever the amount of ice erosion, it appears to have been sufficient to remove the highly altered zones in most parts of northern North America.

As stated already, the processes of solution and enrichment are retarded in regions of low temperature. The areas in which ice erosion has been most vigorous are those in which the lower temperatures prevail today, and there is reason to suppose that the deposits in these areas were not so deeply altered before the glacial epoch as were similar deposits at lower latitudes. In Canada and in Alaska there are few large deposits of sulphide ores which are clearly of secondary origin. If the deposit at the Bonanza mine in the Chitina copper region, Alaska, is primary no large rich secondary sulphide deposits in Alaska are known to me. The sulphide ores now exploited in Canada, except possibly the deposits at Cobalt, in the silver-bearing region of Ontario (which some have considered of secondary origin), and certain well-authenticated examples in British Columbia, are generally believed to be primary. I know of no important secondary deposits in New England. Small deposits of chalcocite ores were exploited in the Ely district, Vermont. In a copper deposit at Milan, N.H., where the sulphides outcrop at the very surface, no considerable amount of oxidation has taken place below 30 feet, and in general oxidation is trivial at even shallower depths. Only a little chalcocite enrichment has taken place, the secondary ore consisting of primary yellow sulphides coated with thin films of chalcocite, adding to its value probably not more than 1 per cent.*

In Norway and Sweden, according to Vogt, the surface has been polished clean by the Quaternary ice sheet, and secondary alteration is insignificant.

Glaciers do not erode their beds equally at all places. In their higher portions, where the ice is accumulating, pressures are greater, the ice is more rigid, and erosion is more vigorous. Near the margins, where the ice is melting, deposition exceeds erosion and the deposit of drift protects the surface from wear. These differences are very conspicuous in some mountainous sections of the West where the glaciers covered only portions of the country and the processes are more clearly shown. In some of the ranges of Montana, Colorado, and Utah, where ore deposits are numerous and varied, the evidences of mountain glaciation are conspicuously preserved. At some places the mountain glaciers seem to have removed very little of the altered ore, for the secondary sulphide zones and even the oxidized ores are intact, and some of these appear to be too extensive to have formed since the Quaternary glacial epoch. The Amethyst lode at Creede, Colo., has an extensive secondary zone, and one end of this lode was over-ridden by the ice in late geologic time. In general, erosion by mountain glaciers has been localized, the maximum wear taking place near the heads of the glaciers.

Erosion by the continental glaciers is also somewhat erratic, for great differences in the effect of the action of ice may be seen in a comparatively small area. In the Mesabi range of Minnesota the hard, fresh country rock is polished clean in places, whereas a few rods away and at but slightly lower elevations thick bodies of cellular, almost powdery iron-oxide ore remain intact. These facts suggest that other important secondary zones may be encountered when the area overridden by the continental ice sheet is more thoroughly developed.

*Extract from Bull. No. 529, U. S. G. S., "The Enrichment of Sulphide Ores."
*Vogt, J. H. L., "Problems in the Geology of Ore Deposits," by Posepny, Franz. The Genesis of Ore Deposits, 1902, p. 675.

RAISING SHAFT AT ROLLING MILL MINE, NEGAUNEE, MICH.*

By Edwin N. Cory.

The new shaft of the Rolling Mill Mine of the Jones & Laughlin Steel Co., was raised from the 621-foot level to the surface by the following method:

The work was started from this level and carried through to surface with one continuous raise. A force of nine miners divided into three shifts of three men on each shift working eight hours per day was employed. These men also trammed the material from the raise to No. 1 shaft, a distance of 750 feet, and put in the timber. The difficulties of raising so great a distance were successfully overcome and no accidents or delays occurred during the progress of the work.

The raise was 8x8 feet in size and was divided into three compartments. One compartment, 4x4 feet, including the timber, was used as a bucket way for hoisting tools and timber and a station was cut at the bottom of this compartment on the main level, in which was placed a small hoist. Another compartment, 4x4 feet, was used for ladders and an 8-inch pipe from air fan, also one 1¼-inch pipe for speaking tube and one 1½-inch air pipe for the power drills. The other half of the raise, 4x8 feet, was used for the rock broken in the raise, and was not timbered but kept filled with rock up to the height of the timber in the other compartments. A chute was constructed in the bottom of this compartment through which the rock was run when loading into tram cars. (See Fig. 1). A fan was placed at No. 1 shaft which forced the air through the 8-inch pipe up to the top of the raise, the current being down through one of the compartments, thus securing perfect ventilation.

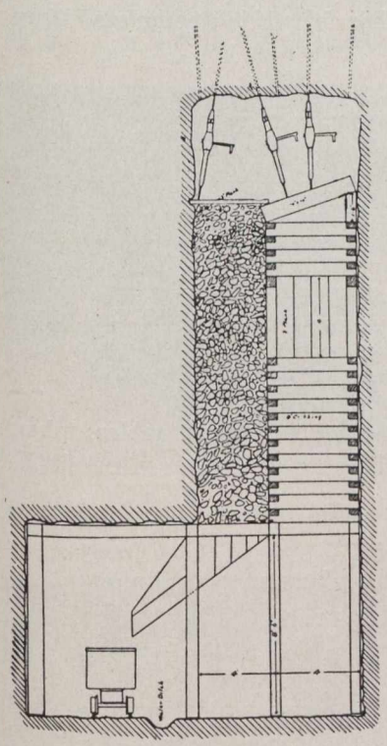


Fig. 1.

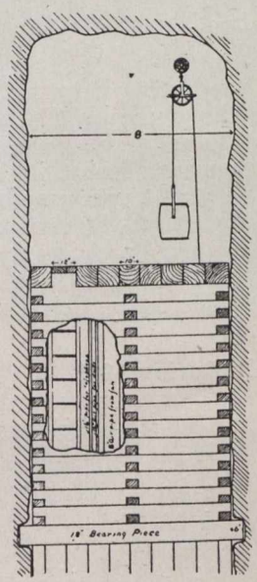


Fig. 2.

Method of raising shaft through rock.

The type drill used was an Ingersoll-Rand, 2-inch cylinder B. C. 21, butterfly valve hammer drill. Three drills were operated at one time to drill the raise over, which consisted of 18 holes in three rows, six holes in each row. The cutting-in holes were drilled, so as to cut a space when blasted through the entire length of the raise directly over the rock compartment (Fig. 1) so that the other holes would throw the rock toward this opening and fall into the rock compartment. Before blasting, the ladder and bucket compartments were covered with 10-inch round timber, flattened on two sides to prevent rolling, and placed at an angle to deflect the falling rock into the rock compartment, necessitating only a minimum amount of shovelling. The space directly over the ladder compartment, was covered with 3-inch plank to permit the men to get away quickly when blasting, also to give them perfect protection in going up and down the raise (Fig. 2). The blasting was all done with fuse cut in various lengths to give the desired results. After blasting, and while the smoke was clearing out of the raise, the miners would tram enough rock out of the chute so that timbering could be commenced at the top of the raise. A gin-pole was erected about 8 feet from the last set of timber on which was hung a 10-inch sheave wheel for the rope used in hoisting the timber from the level below (Fig. 2). After the timber had been put in it was also used for hoisting the sharp drills and machines to start drilling. The drilling machines were thoroughly overhauled after each round of holes while the miners were blasting and timbering, and no delay was occasioned during the work.

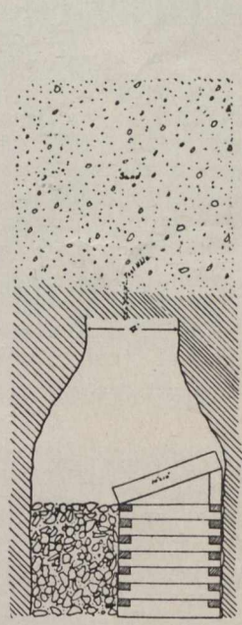


Fig 3.

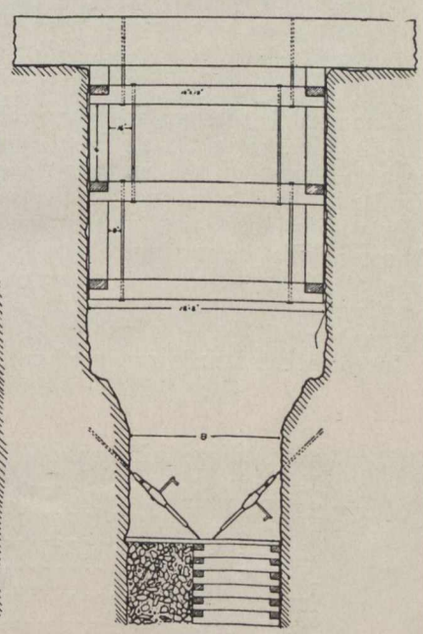


Fig 4.

Method of raising to surface and enlarging shaft

When the raise had been carried to a height of about 200 feet, hitches were cut in the rock and a set of bearing pieces put in about four feet above the last set of timber, and planked up with 3-inch plank. This

*Prepared for Houghton Meeting of the Lake Superior Mining Institute, and published in Vol. XVII of the Transactions, pp. 112-116.

was done to take the weight of the timber for the next 200 feet instead of letting it rest upon the timbers below. (See Figs. 1 and 2). A station 15 feet long was cut in the side of the raise about every 200 feet, to shelter the men when blasting instead of going down the ladders the whole distance to the level below.

In this manner the raise was carried to the height of 570 feet, which was 51 feet from the surface, when a smaller raise was carried up as is shown in Fig. 3, a test hole being drilled in advance of the top of the raise to ascertain the depth of the sand. When within 18 feet from the surface, sand was reached by the test hole, and the raise continued by carefully working through the sand to within 10 feet of the surface. A hole was then drilled from the surface, blasting the sand through to the opening below.

The work of enlarging the shaft was then begun. The surface at the opening made by the blast was levelled off and two stringers, 2 feet 6 inches in diameter and 25 feet long, were placed in position for timbering through the same. The dimensions of the shaft are 10 feet 2 inches by 12 feet 2 inches within timbers; 12x12 inch fir timber was used and the plan of timbering is shown in Fig. 4. The principal feature of this work was the method used in enlarging the opening made by the raise to the dimensions required by the permanent shaft. The type of hammer drills used in raising was also used for this work. The rock was drawn off through the chute at the 621-foot level as in raising until it was lowered about 15 feet. The timber from the raise was then pulled out for a distance of 15 feet and the two smaller compartments covered over as before. The holes were drilled upwards as in raising, but at an angle of 45 degrees, and were started 10 feet below the permanent shaft timber and so located as to strip 5 feet of the shaft at one blast, thus making room for one set of the shaft timber.

Ordinarily this work is done by drilling holes downward, but, as the above method proved very successful, it was continued for the entire shaft, and I think the use of the hammer drill a great improvement over the reciprocating type with shaft bars or tripods.

The progress made in the work was as follows:

Raising—621 feet; No. days, 125; average per day, 5 feet.

Cutting down—621 feet; No. days, 114; average per day, 5.44 feet.

Work started September 5th, 1911; completed July 15th, 1912.

CONCENTRATION OF COBALT SILVER ORES

By Reginald E. Hore.

Remarkable success has been obtained in treating Cobalt silver ores by straight concentration. Experience led most of the millmen to screen the ore first, hand pick the large and jig the small sizes, crush the tails with stamps, and concentrate the pulp on tables. At some mills the sorting belt tailings go direct to stamp bins, at others the ore is first recrushed and then sent to the jigs. The tails from the tables are usually run over canvas.

In some cases rolls are used instead of stamps, and at the Buffalo they are said to work very satisfactorily. At the Coniagas, Krupp ball mills were used at first; but these were discarded in favour of stamps. The equipment of most of the newer mills with stamps indicates that experience has shown this to be the most efficient method of crushing to the desired fineness.

The results obtained by concentration at Cobalt during 1912 are given in the accompanying tables, taken from Mr. A. A. Cole's report to the T. & N. O. Commission:

Concentration in Cobalt During 1912.

	Mills and Mines.	Tons Milled.	Concentrates. Jigs.	Tables.	Totals.	Concentration Ratio.
1.	Beaver	14,602.0	113.4	129.3	242.7	60—1
2.	Buffalo	51,900.0	....	....	1,242.2	42—1
3.	Casey Cobalt	1,585.0	....	43.2	43.2	36—1
4.	Cobalt Lake	1,585.0	182.2	477.3	659.5	36—1
5.	Colonial	7,692.0	....	....	86.0	89—1
6.	Coniagas	52,797.5	253.0	919.0	1,172.0	45—1
7.	Hudson Bay	21,509.0	177.0	453.0	630.0	34—1
8.	King Edward	9,895.5	65.7	200.0	265.7	37—1
	City of Cobalt					
9.	McKinley-Darragh	51,897.0	516.9	1,406.4	1,923.3	22—1
10.	Nipissing Reduction,					
	Cobalt Lake	1,803.4	62.7	16.8	79.5	23—1
	Green Meehan	795.5	7.3	6.9	14.2	56—1
	Nipissing	14,251.0	87.0	97.5	184.5	78—1
	Silver Queen	219.8	2.8	1.6	4.4	50—1
11.	Northern Customs,					
	Drummond	3,427.0	....	111.1	111.1	31—1
	La Rose	33,984.0	....	1,210.5	1,210.5	28—1
	Townsite	27,898.0	....	1,074.0	1,074.0	26—1
12.	Penn Canadian.					
	Penn Canadian	5,400.0	....	....	95.3	57—1
	Hargraves	546.0	....	....	4.2	130—1
13.	Temiskaming	40,056.0	280.7	609.3	890.0	45—1
14.	Trethewey	26,803.9	159.6	435.1	594.7	45—1
	Total	390,473.0			10,527.0	37—1

	Tons. Treated.	Bullion Produced. Ozs.
Cyanide Mills.		
15. Dominion Reduction		
Crown Reserve	15,704.0	346,234
Kerr Lake	5,983.0	130,075
16. Nipissing	3,447.0	57,875
17. O'Brien	39,909.5	229,360
	65,043.5	763,544
Total tons milled by water concentrating mills		390,473.0
Total tons milled by cyanide mills		65,043.5
Total tons milled, 1912		455,516.5

In the plants using concentration processes only there is considerable variety. The Coniagas mill has a comparatively simple flow sheet. The flow sheets of the Hudson Bay and Cobalt Lake concentrating plants are of special interest, because these mills are of recent construction.

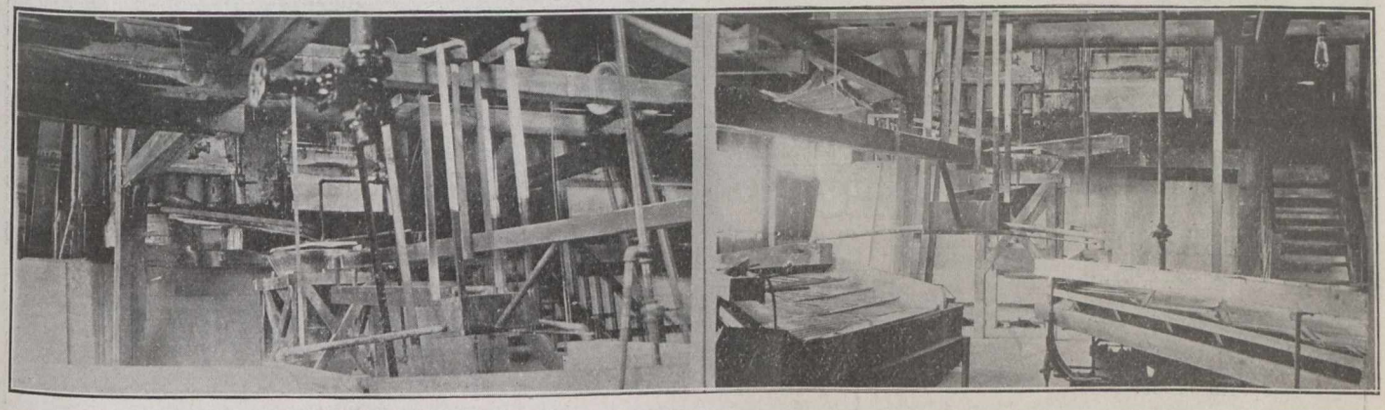
The Coniagas Concentrator.

At the Coniagas property during the past year about 44 per cent. of the silver produced was from ore treated in the mill. Fifty-six per cent. was in high grade ore recovered without concentration. The mill output for the year 1911-12 was 803.3 tons high-grade concentrates and 484.2 tons low-grade slimes.

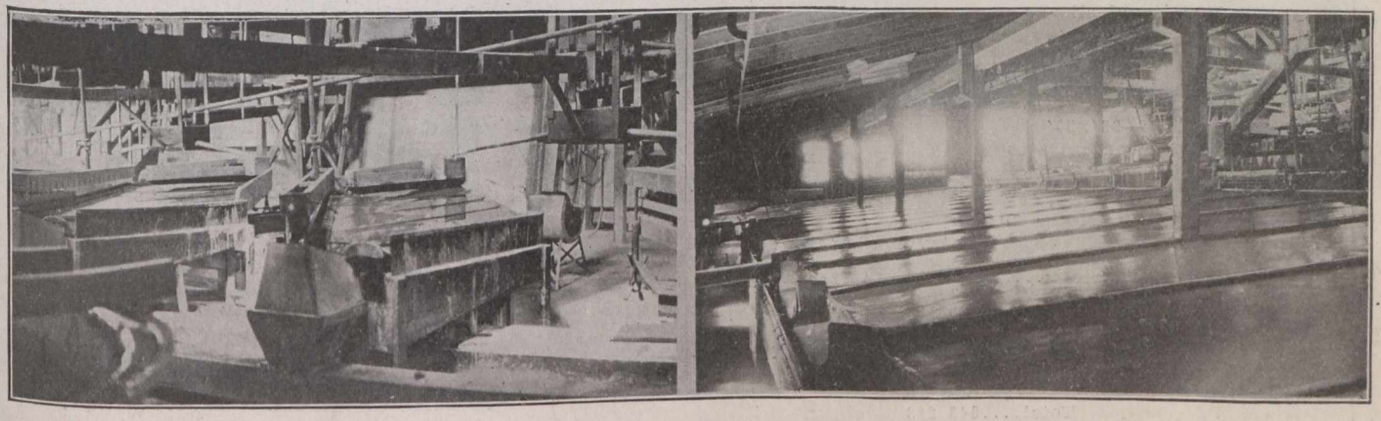
The ore from the mine is emptied from a self-dumping skip into a chute down which it runs to the mill bin. A grizzly, with 1¼-inch spaces, screens out the fine ore. The oversize is crushed to about 4 inches in a Blake crusher, elevated to bins and thence fed automatically to a gyratory crusher, the product of which is under 2 inches. The fines from the shaft-house grizzly join this crushed ore, which is then elevated and sized in No. 1 trommel, having 5-16 inch and 1¼-inch holes.

The oversize of 1¼-inch goes to a sorting belt, where ore averaging 1,500 to 2,000 ounces per ton is picked out by hand. The tails from the sorting belt are conveyed by portable belt conveyor to the stamp bins.

The undersize of 1¼-inch and over 5-16 inch goes to coarse jigs.



Two views showing stamps, setting cones, distributors and Deister Tables, Coniagas mill



Deister Tables, Coniagas mill.

Canvas tables, Coniagas mill.

The undersize of 5/16 inch is sized in No. 2 trommel, which has 3.5 mm. openings. The oversize goes to fine jigs. The undersize is classified in a drag classifier from which sands go to a Wilfley table and slimes to settling tanks. These mine slimes, which average 150 to 200 ounces silver per ton, are collected and shipped to smelter without further treatment.

The tails from all jigs and the Wilfley table unite and are elevated to a drag classifier, dewatered, and conveyed to the stamp bins. The water from the classifier with some slimes runs to a Callow settling tank.

Chute
Grizzles 1¼"
Tram to mill bin
Storage bin 400 tons

1

Blake crusher 9 x 15" to 3½"
Bucket elevator 14"x7" Style "M"
Storage bins 50 tons each
Wall type feeder to
2—Double—2 Comp Hartz Jigs
1—Wilfley table
1—Drag classifier
No. 4—Gates Short Head
Plunger feeder to
Bucket elevator 14"x7", Style "R"
1—24"x10'—Trommel screens =½" and 1½"
1—24"x10' 0' 3mm trommel
1—Bucket elevator—Dewatering
Buckets 12"x6"—Perforated—⅛" 0 holes
1—Sorting belt 18"—to

1—Portable conveyor 12"—to Stamp storage bins=800 tons
10—Nelson feeders
2—Challenge feeders
60—1250 lb. stamps. Fraser and Chalmers
Crushing to 16 mesh
6—3' pulp thickening tanks Callow's type
1—Sloughing-off tank Screen

13—No. 2—Deister tables
1—Wilfley table

10—8' Callow's tanks

1—Drag classifier

8—No. 3 Deister slimers

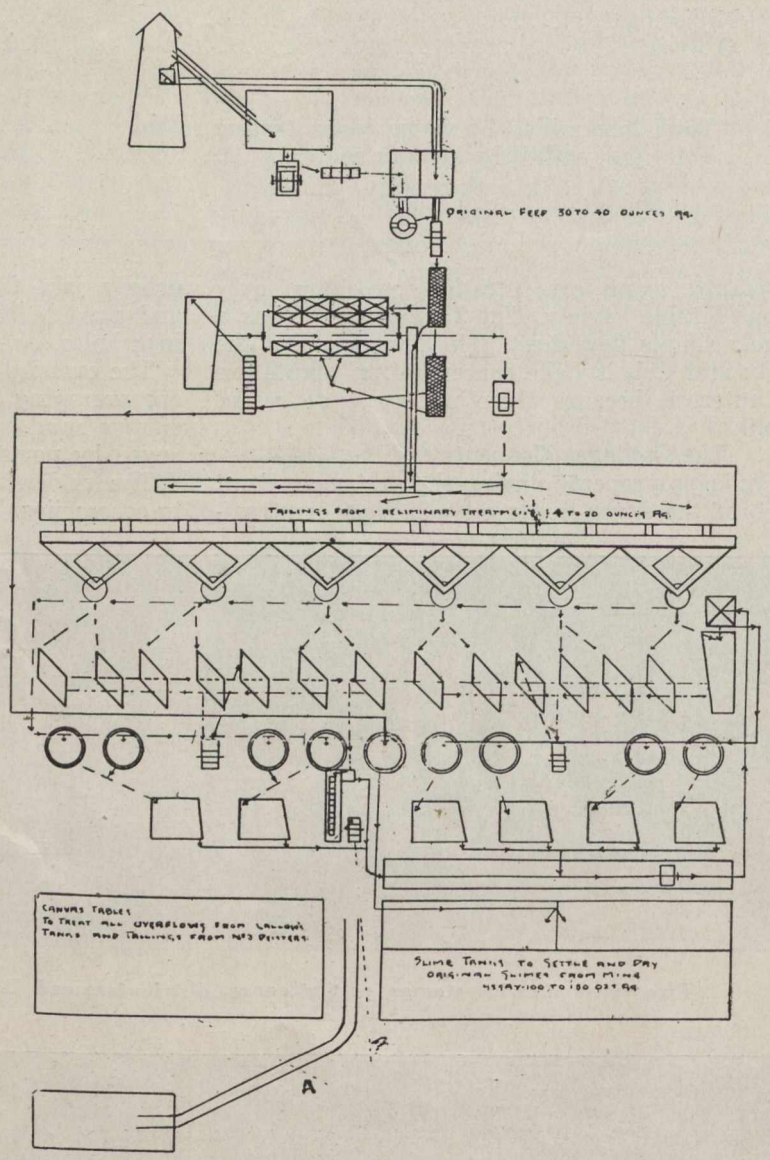
1—James slimer

1—Tailings elevator—buckets=10"x6'
1—Automatic tailings sampler
1—3" Centrifugal slime pump

2—9 ton—1—18 ton slime tanks
Steam coils in bottom

Canvas tables—96'x20'
Tramway for concentrates

Drier



(A) Slime tails
(B) Sand tails

Motor List.

For.	No.	H.P.	Av. oper'ing H.P.
Coarse Crushing and Preliminary Treatment ...	1	100	32=64 12 hrs.
Portable Conveyor	1	3	1= 2 12 hrs.
Stamps	2	200	160
No. 2 Deister Tables.....	2	10	14
Slimer Floor—Including Elevators and Pump ..	1	10	10
Tailings Elevator	1	5	3
	1	5	3
Total....	343		223
Slime Return Pump	10		7
Slime Storage Pump	20		15
	245		

LINE NOTATION

Original Mill Feed—Slimes From Lower Drag Classifier and Slimer Middlings.
Tailings from Preliminary Treatment and Stamp Discharge.
No. 2 Deister Middlings.
No. 2 Deister Tailings.
Tailings from Drag Classifier.
Concentrates are skimmed from Jigs and sacked—From Tables go to Settling Tanks.
Hutch Product from Jigs Returned to No. 2 Elevator—Retreated on Fine Jigs and Wilfley.

THE CONIAGAS MINES, LTD.,
Cobalt, Ontario.

CONCENTRATOR FLOW SHEET,
Capacity 180 Tons per 24 hours.
Date, Nov. 14, 1911.
F. D. REID,
Mill Supt.

The overflow from this tank returns to the jigs. The slimes go through the system again, and uniting with the mine slimes are eventually caught in the settling tank. The accompanying flow sheet was prepared by Mr. F. D. Reid, mill superintendent, November 4th, 1911.

The treatment of the ore before stamping results in the recovery of about one-half of the silver contained in it. From heads averaging 36 ounces per ton, 18 ounces is recovered by the picking, jigging, and table concentration. Of this 18 ounces, about 49 per cent. is recovered by the jigs, 11 per cent. on the Wilfley table and 40 per cent. on the picking belt.

The sixty Fraser-Chalmers 1250-lb. stamps each crush 2.8 to 3 tons per 24 hours to pass 16 mesh. From the screen the pulp runs to 3-foot cone classifiers, of which there is one for every ten stamps. Sands from the classifier are concentrated on No. 2 Deister tables. The overflow runs to 8-foot Callow tanks, the underflow from which is treated on Reid's improved Deister slime tables. The overflow from the tank, along with slimes from all slime tables, runs over canvas tables. Tailings from the sand tables are dewatered in a classifier and the sands elevated and stacked on the property. A sample is taken of the sands as they are elevated, and this is treated in the mill on a Deister table. There is thus a constant running test being made on both sand and slime tails.

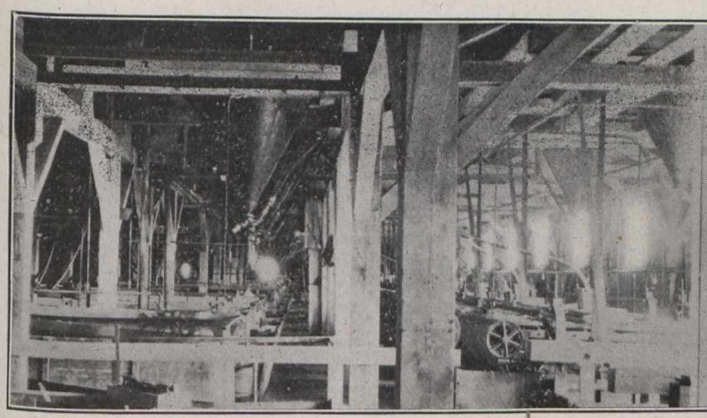
Overflow from the Drag classifier unites with middlings from the tables and is pumped back to a series of two classifiers. The coarse sands from this are treated on a No. 2 Deister, and the fine sands on a second Deister, while the overflow slimes are pumped back to four Callow tanks, re-treated on four slimers and then on canvas tables. Tailings from the canvas tables are pumped to storage pond; but a sample of this product is being retreated in the mill on one of the Reid-Deister slime tables.

The ore fed to the stamps averages about 17 ounces silver per ton. About 30 to 35 per cent. of this is slimed in crushing and the slimes are usually richer than the sands, the relative content being about 5 to 4. The slime tails average 6 to 8 ounces and are being saved for possible future treatment. The sand tails average 3.5 to 4.5 ounces and are being stacked beside the mill at a cost of about $250 per year, during which time the product is about 35,000 tons of sand tails.

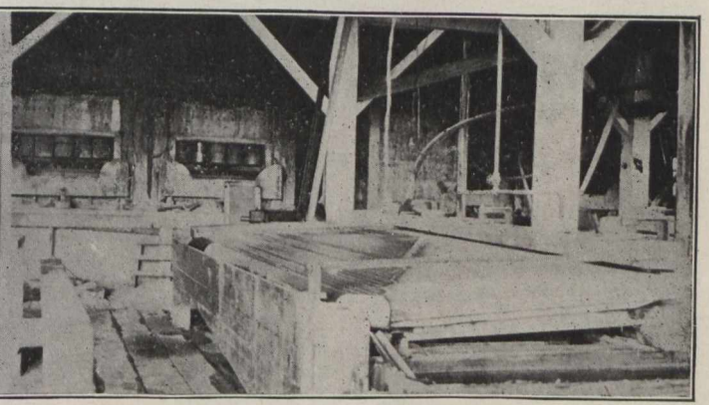
The shipping of mine slimes without treatment in the mill brings down the concentration ratio very considerably; but experience has shown that it is not advisable to mix these slimes with the lower grade slimes from the stamps. At present from 30 to 40 tons of the mine slimes per month is being shipped.

An especially interesting feature of the Coniagas mill is the great increase in efficiency of the Deister tables resulting in modifications introduced by Mr. Fraser Reid. The table deck has been changed from the standard type to one that not only does the work better, but is also much simpler in construction. Run in competition with other tables the superiority of Mr. Reid's modified deck has been conclusively proved. The concentrate produced by the new style table is said to average about 1,000 ounces, while that from the old style was 300 to 500 ounces.

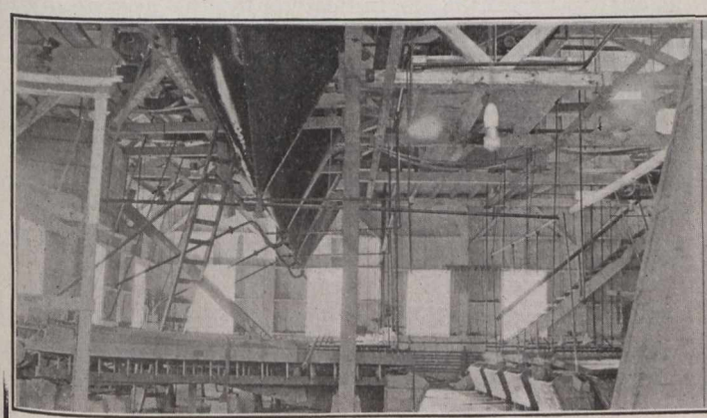
The mining company's report for the year 1910-1911 shows that during that period the mill crushed 52,320 tons of ore, an average of 169 tons per day and shipped



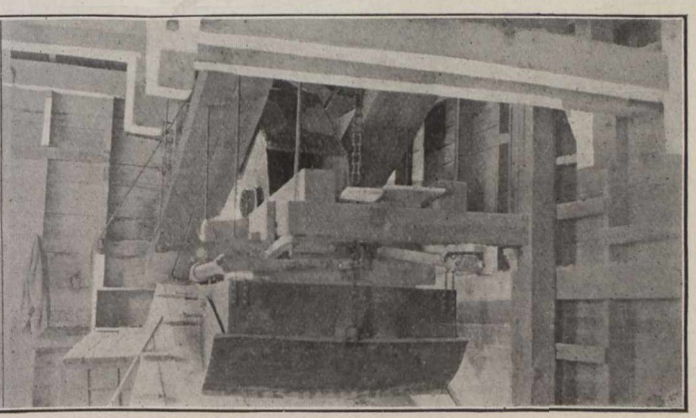
Wilfley tables, Callow tanks, and Frue vanners, Northern Customs mill



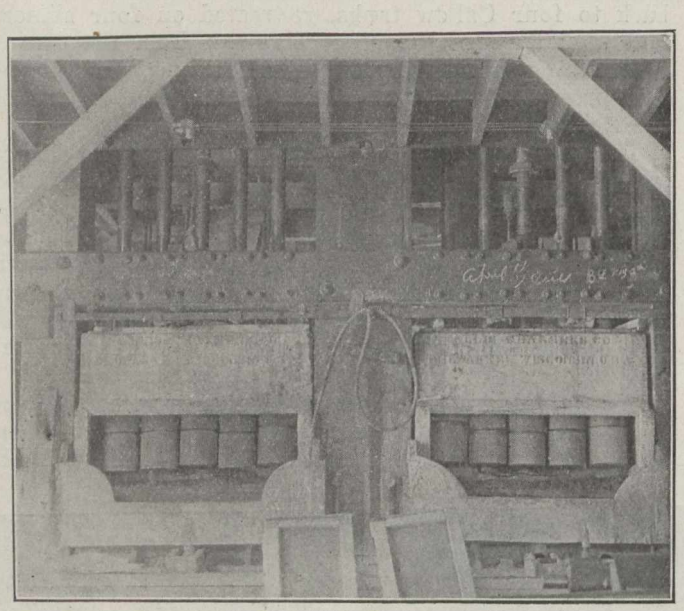
Stamps and Wilfley tables, Northern Customs mill



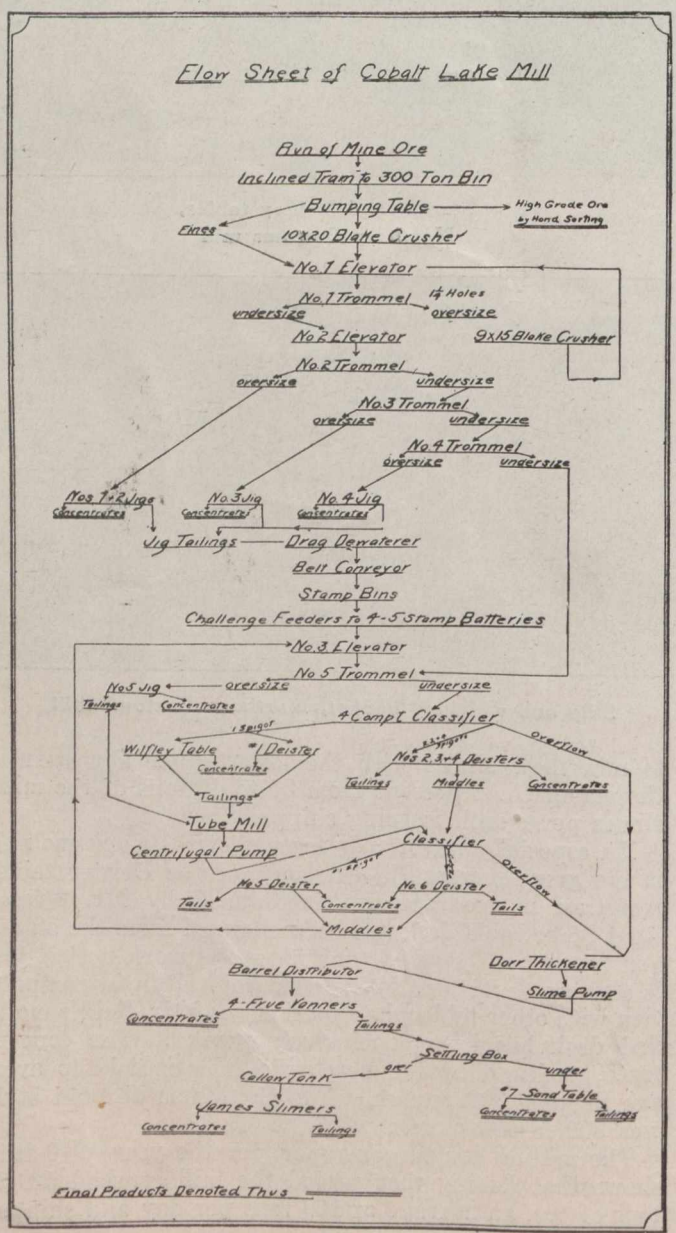
Tanks and tables, Beaver mill

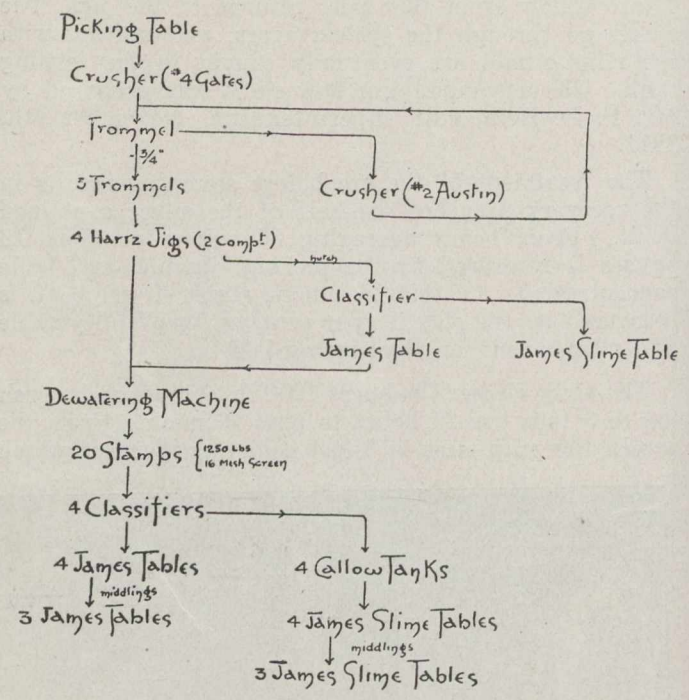


Skip and weighing bucket, Northern Customs mill



Stamps, Northern Customs mill





FLOW SHEET, HUDSON BAY CONCENTRATOR.

1,418.4 tons of concentrates containing 1,643,616 ounces of silver. The recovery was about 87 per cent. Sand tailings, containing 4 to 8 per cent. slime, averaged 3.8 ounces silver per ton. Slime tails, 85 per cent. of which was 200 mesh or finer, averaged 6.6 ounces silver per ton.

Hudson Bay and Cobalt Lake Concentrators.

The method of treating ore at the Hudson Bay and Cobalt Lake Mills is indicated by the accompanying flow sheets, the first taken from Mr. A. A. Cole's report and the second from the Mining Company's annual report. These two plants are among those most recently constructed.

Armstrong Whitworth Company to Have Canadian Branch Plant.

It is announced that a site has been secured on the south shore of the St. Lawrence River, within Montreal harbour, by the well-known English company, Sir W. G. Armstrong Whitworth & Co., Ltd. A plant to cost about $1,000,000 will be erected for the manufacture of machinery, tool steel, etc. It is not intended that the Canadian branch will do any military or naval work.

The credit of bringing this new industry to Canada is said to be largely due to M. J. Butler, formerly general manager of the Dominion Steel Corporation and to Sir Percy Girouard, who is a director of the English company.

The announcement, coming while the United States Steel Corporation is establishing a branch plant at Ojibway, Ontario, indicates clearly that English steel makers, as well as those of the United States, believe that Canada offers a profitable field for investment. Armstrong Whitworth & Co. on May 31 announced an issue at par of £1,000,000 five per cent. shares. This is supposedly made to finance the Canadian undertaking; but the company's circular does not state the purpose of the issue.

GEOLOGICAL SURVEY FIELD WORK IN 1913

Owing to the meeting of the International Geological Congress in Canada this year, the field work of the Geological Survey will be somewhat curtailed, as many of the officers are required for the work of the Congress, but as will be seen from the following programme of field operations, its work will still be comprehensive and extensive. Most of the parties have left for their respective fields.

Canadian Arctic Expedition.

On the Canadian Arctic Expedition of V. Stefansson, George Malloch will be geologist and geographer for the Northern party, which will explore the unknown seas and lands north of the mouth of the MacKenzie and west of Banks and Prince Patrick's Land.

For the Southern party the following officers have been detailed: R. M. Anderson, zoologist; K. G. Chipman, geographer; J. R. Cox, assistant geographer; J. J. O'Neill, geologist; H. Beuchat, ethnologist; D. Jenness, ethnologist.

The Southern party will investigate the region about Coronation Gulf, including the Coppermine River basin and Victoria Land. The occurrence of copper-bearing rocks in this region makes the geological examination and mapping of great importance. The copper companies are interested in the possibilities of the region, as there are no physical difficulties that would prevent mining. Geological and geographical data are required for the guidance of prospecting for copper in this territory. Should copper be discovered in commercial quantities it would mean the opening up, by transportation, of the whole MacKenzie River valley and the Arctic Coast.

GEOLOGICAL SURVEY FIELD PARTIES IN OTHER PORTIONS OF THE DOMINION.

Geological Division.

Maritime Provinces.

Bell, W. A.—Areal mapping of the Windsor and Horton series in an area comprising about 200 square miles, in the vicinity of Windsor, designated the Windsor map.

Faribault, E. R.—Revision and completion of the geological mapping of the western portions of Sheets 94 and 95, Lunenburg County. Completion if possible of Geological Sheets 91 and 92, Shelburne and Queen's Counties.

Goldthwait, J. W.—Investigation of the glacial features and physiographic history of Nova Scotia. General examination of sand, clay and gravel deposits not hitherto reported on.

Hayes, A. O.—Areal mapping (geological) of the St. John Sheet.

Hyde, J. E.—Continuation of investigation of the Carboniferous areas of Nova Scotia.

Wright, W. J.—Areal mapping (geological) of the Moncton Sheet. Preliminary examination of geological sections at Dorchester and Joggins.

Quebec.

Harvie, R.—Completion of the mapping of the geological sections between Knowlton Landing and Cowansville. Completion if possible of Orford map.

Mailhiot, A.—Detailed petrographical and mineralogical investigation of the granitic areas of the Eastern Townships, which may contain gold, scheelite and tinstone(?).

Keele, J.—Continuation of the investigation of the clay deposits of Quebec.

Stansfield, J.—Completion of field work between Quebec and Mattawa, including the survey of the raised beaches on the Island of Montreal.

Wilson, M. E.—Areal mapping (geological) of the Buckingham Sheet (apatite, mica, graphite area).

Ontario.

Barlow, A. E.—Detailed investigation of the corundum deposits at and near Craigmont.

Collins, W. H.—Completion of areal mapping (geological) of the Onaping Sheet (139). Commence revision of Sudbury Sheet.

Johnston, W. A.—Areal mapping of the calcareous drift which forms the valuable agricultural lands northwards from the International Boundary.

Taylor, F. B.—Continuation of investigation of glacial drift forms in Southwestern Ontario.

Uglow, W. L.—Completion of work between Port Arthur and Fort Frances, Can. Nor. Ry.

Williams, M. Y.—Continuation of investigation on the Silurian of Southwestern Ontario.

Manitoba.

MacLean, A., and Wallace, R. A.—Investigation of the gypsum, anhydrite and associated beds of the Gypsumville districts and the beds furnishing the saline springs along the west shore of Lake Winnipegosis and of the phosphatic shales west of the Winnipeg Lakes.

Saskatchewan.

Rose, B.—Completion of field work between Banff and Golden. Preparation of guide book of the Rocky Mountain Park at Banff.

Cairnes, D. D.—Areal mapping (geological) of the White River copper district. Examination and immediate report on the copper deposits of Valdez Island. Reconnaissance of the placer area southeast of Teslin Lake.

Camsell, C.—Reconnaissance in the Similkameen district.

Clapp, C. H.—Completion of areal mapping (geological) of the Duncan Sheet and the Sooke Special Sheet, Vancouver Island. Examination of alunite deposits on Kyuquot Sound, V.I.

Drysdale, C. W.—Completion of investigations of the gold-copper deposits of Rossland, including the South Belt.

Leach, W. W.—Examination of area being investigated for oil, Sheep Creek, Alta. Completion of areal mapping (geological) of Flathead Special. Commence areal mapping of Crow's Nest Sheet.

McConnell, R. G.—Examination of copper deposits at Granby Bay and Britannia. Reconnaissance of copper-bearing area of Rainy Hollow.

MacKenzie, J. D.—Areal mapping of the coal measures of Graham Island.

Ries, H.—Continuation of the investigation on the clay deposits of Western Canada.

Schofield, S. J.—Completion of areal mapping (geological) of East Kootenay sections, extending them to Kootenay Lake. Completion of geological section at Elko.

Whittaker, E. J.—Examination of geological sections of Mesozoic formations along Old Man River and Race Horse Creek, Race Horse map area. Preliminary examination of Cretaceous sections in escarpment west of Dawson Bay, Lake Winnipegosis.

General Work.

Burling, L. D.—Collection of fossils, with the assistance of W. D. Matthews, from Matthews type localities in the Cambrian near St. John, N.B. Study sections which may be expected to afford data for the proper correlation of the constituent parts of the lower portions of the Quebec group. Stratigraphical palaeontology of section north of Yukon River, along 141st meridian.

Daly, R. A.—Field work between Golden and Vancouver.

Dowling, D. B.—Review coal development in Western Canada.

Kindle, E. M.—Examination of sections of the Devonian and Silurian in Quebec, New Brunswick and Nova Scotia. Supervision of certain stratigraphical palaeontological field parties.

LeRoy, O. E.—General supervision of field parties. General Congress work. Act as guide on C-2 Excursion (I.G.C.).

Young, G. A.—Supervision of certain eastern field parties.

Lambe, L.—Examinations of beds containing vertebrate remains in Western Canada.

Ingall, E. D.—Examination of bore holes, Ottawa and vicinity.

Topographical Division.

W. E. Lawson, White River District, Yukon; S. C. McLean, Similkameen District, B.C.; A. C. T. Sheppard, Crow's Nest Map-area, B.C.; A. G. Haultain, Windermere Map-area, B.C.; E. E. Freeland, Lillooet Map-area, B.C.; F. S. Falconer, Flathead and Sooke Map-areas, B.C.; D. A. Nichols, Thetford Map-area, Que.; B. R. MacKay, Pictou Map-area, N.S.

The Anthropological and Biological Divisions of the Geological Survey will also have parties in the field.

THE HARRIS MINES, NEAR HAZELTON, B.C.

By E. Jacobs.

Now that the Grand Trunk Pacific Railway has been constructed through the Hazelton district of Omineca mining division, more mining development work is being done in that part of the Skeena River country than was practicable at reasonable cost when the district was entirely without railway transportation facilities. In a recent number of the Omineca Herald, published at New Hazelton, there was printed some information designed to show what progress had been made in the development of the American Boy group, now known as the Harris Mines.

The Hazelton district was visited in the summer of 1911 by Mr. Wm. Fleet Robertson, Provincial Mineralogist for British Columbia, who, as he stated in his published report, "proceeded to examine the various mineral claims in the district within possible reach of the approaching railway transportation." The report on the numerous claims examined is contained in the "Annual Report of the Minister of Mines, 1911," which may be obtained on application to the Department of Mines, Victoria, B.C. (until out of print). The two sketch maps prepared to illustrate the report on parts of the Omineca and Skeena country are useful, for they give an excellent outline of the districts concerned. So that the impressions of the Government official of what he saw may be placed at disposal of readers, extracts have been made below from his report, and these are followed by the first above-mentioned particulars from the Omineca Herald. It should be kept in mind that the information quoted from the Provincial Mineralogist's report relates to what he saw two years ago, while the newspaper account gives particulars of the conditions after much development work has been done.

Two-Mile Camp.

Under this heading the Provincial Mineralogist reported, in part: "The American Boy group, consisting of eight claims, owned by Harris Bros. and Mullen, of Hazelton, is situated on the eastern slope of Two-mile creek at an elevation of about 3,200 ft., and distant from Hazelton, by the trail, some seven miles.

"The camp and the various workings are on an easily sloping bench on the eastern side of, and several hundred feet higher than, the valley of Two-mile creek, in a dense growth of large hemlock, spruce, and balsam timber. The camp consists of a very good log-cabin with tents.

"The development of the property has been done by the owners, with little outside assistance, and is made up chiefly of stripping trenches in surface soil, uncovering the veins, and two small shafts.

"There are at least three parallel veins shown by the work done, and these are all of about the same general character, having a general north-and-south strike and a steep dip.

"No. 3 vein is probably the most promising and has received the most development; it occurs on a very easily-sloping hillside at an elevation of 3,200 ft., having been developed by an inclined shaft sunk 25 ft. in an argillite country-rock, and shows a very well-defined quartz vein, averaging about 24 in. wide, containing a heavy percentage of galena, with some zinc-blende, iron-pyrites, and arseno-pyrite. The vein has a strike approximately north and south and dips about 75 degrees; it is very regular and continues, as has been proved, for some distance.

"An open-cut about 20 ft. to the north of the shaft exposes the vein for a length of 10 ft., in which the vein shows clearly about 27 in. of white quartz with, disseminated through it, bunches and stringers of galena, etc.

"In the shaft, a few feet underground, there appears on the hanging-wall a light-coloured dike which did not show in the surface workings. The vein, as exposed in shaft, continues quite as strong to the bottom, varying somewhat in its width, but maintaining an average of 24 in. The mineralization in the vein also remains strong to the depth shown.

"As indicating the proportion of ore in the vein, it was noted that there was a pile of ore on the dump, amounting to about 30 tons, taken from the shaft in sinking the 25 ft. A sample taken by the writer, as roughly representing this ore-pile, assayed: Lead, 11.5 per cent.; silver, 138 oz., and gold, 0.2 oz. to the ton. A second sample taken of the ore in another vein on the property assayed: Lead, 48 per cent.; silver, 125 oz., and gold, 0.02 oz. to the ton.

"No. 2 vein is a couple of hundred yards down the hill from No. 3, and has been exposed by stripping and open-cuts for several hundred feet, which show it to be

unusually regular and persistent, having a strike of N. 40 deg. W. and a dip of about 80 degrees to northeast, with a width of from 2 to 3 ft. The vein-filling is white quartz containing galena and a little zinc-blende, pretty generally disseminated through the vein, but in variable amounts at different places. The ore does not occur in a sufficiently concentrated form to be shipped direct, but would make a good concentrating ore.

"No. 1 vein lies still farther to the south, having about the same strike and dip as has No. 2 vein; it is some 3 ft. wide and has been traced by stripping for from 300 to 400 ft.; the vein-matter and mineralization being similar to No. 2 vein.

"A shaft has been sunk on this vein for a depth of 35 ft., and it is reported that a drift 20 ft. long has been made at the bottom, but as the shaft was partly filled with water, this could not be seen.

"The property is one of much promise as a concentrating proposition, and is ideally situated for cheap mining. When the development in the present location at the outcrops shall justify it, an adit can be driven from the valley of Two-mile creek, where the plant would be situated and all the ore brought out."

A Present-Day Account.

The following account of the development, etc., of the property, as at May 24, has been published in the Omineca Herald, admittedly by a firm having for its object the sale of shares in the Harris Company, to provide money for continuing development and making an output of ore:

"No. 1 vein opened by shaft 100 ft. deep in ore. Drift north 40 ft., on ore from the 100-ft. level. Ore along this drift is not of shipping grade, but vein and size of orebody all along very strong. At 80 ft. farther to the north on surface this vein is 3 ft. wide, with 16 in. of solid clean shipping ore averaging $90 per ton in silver and lead. The drift will be driven on the 100-ft. level to this point where it is reasonable to suppose a fine shoot of ore will be encountered.

"No. 2 vein opened by a crosscut tunnel 360 ft. long and taps the vein at 120 ft. depth. Drifting 45 ft. determines that the vein is badly broken at this point, but very high-grade ore in spots. Engineers advise active prosecution of work on this vein.

"No. 3 Vein.—Incline shaft to 19-ft. level. Vein and ore strong and continuous all the way down; ore averaging $100 per ton, varying in width from 6 in. to 3 ft. Drift off the 190-ft. level north is now in 170-ft. Shoot of extremely high-grade ore encountered at this point in the past week. The shoot is now 2 ft. 6 in. wide in the face, with 14 in. of solid clean galena streaked with grey copper averaging $300 per ton, while the remainder of the vein averages $155 per ton. From a point 75 ft. north in this shaft a fine shoot of ore was encountered which is continuous to date. The first carload of ore was shipped to the smeltery at Trail from this shoot in the past month and the net returns were $73 per ton, or $2,190 for the 30 tons. Another carload is about ready and will be shipped from New Hazelton in a short time. A drift run south on this same level shows the vein and ore of the same high-grade character as in the north drift. A drift was also run north from the 100-ft. level a distance of 90 ft. and shipping ore was continuous. A particularly fine shoot was encountered at a distance of 70 ft.

"No. 4 vein has been opened by surface cuts along the length of the vein and shows ore of equally good shipping grade as No. 3 vein.

"No. 5 Vein.—Open-cuts and surface stripping show much the same as Nos. 3 and 4. In spots the ore is of the highest value yet discovered. This will be opened by incline shaft this summer.

"The company owns eight adjoining claims (400 acres) and much of the surface has not been thoroughly prospected.

"All work to date has given good results. The high grade of the ore, continuity of the veins, and uniformity of the orebodies have satisfied practical mining men of the district that this property will be a good producer and a profit-maker. The depth at present obtained—about 200 ft.—has proved that the orebodies are larger and richer than at the surface, and such marked improvement at depth as a general rule insures the life of the ore.

"The total expenditure to date has been $19,000; some 1,500 ft. of development has been done. In addition, much surface prospecting has been done, and cabins, bunkhouses, etc., have been built. The four Harris Bros. have given the best part of two-and-a-half years to the property, besides having employed miners at wages. . . .

"To develop the mine further, by sinking another 100-ft. on the proved orebodies, it will be necessary to use machinery. To purchase this machinery and to defray the cost of sinking 100 ft. deeper, 100,000 shares of treasury stock are to be offered to the public. With the proposed work accomplished and a similar grade of ore at depth, the mine will be in a fair way toward becoming a dividend-payer. The profits from the ore from the drifts and stopes will, from now on, be used to further develop Nos. 1, 2 and 5 veins. The net proceeds from each car should average $2,000, taking the net profit from the first 30 tons as a basis. In view of the recent strike of high-grade ore the average may run much higher. . . ."

The McGillivray Creek Coal and Coke Company, operating a colliery at Carbondale, near Coleman, Southwest Alberta, held the annual meeting in Spokane, Washington, on June 5th. Officers and directors were re-elected, as follows: Lorne A Campbell, Rossland, B.C., president and general manager; James A. Nowell, Spokane, vice-president; W. E. Cullen, Spokane, secretary-treasurer. These, with P. M. Paine, Glencoe, Minnesota, and Fitzhugh Burns, St. Paul, Minnesota, constitute the directorate. Official reports presented at the meeting indicated satisfactory conditions at the mine, from which coal is being shipped regularly. Plans for increasing the output are under consideration.

The Standard Silver-Lead Mining Company, operating the Standard mine and concentrating mill near Silverton, Slocan Lake, B.C., for the calendar year 1912 reports as follows: Receipts: From 9,703 tons of silver-lead ore and concentrate shipped, $680,000; from silver-zinc concentrate, $41,340; from Government of Canada, bounty on lead produced, $20,240; from boarding house receipts, $16,500; total, $758,080. Disbursements: For supplies, $85,820; for labour, $113,954; balance, being net profit for year, $558,306. Dividends paid to shareholders totalled $425,000, leaving balance on hand, $133,306. The directors and officers of the company for the current year are: W. J. C. Wakefield, president; John A. Finch, vice-president; Chas. Hussey, secretary-treasurer; Geo. H. Aylard, manager, and P. Clark.

A MACHINE-DRILL COMPETITION

A unique contest, in which teams from most of the copper mines in Michigan took part, was held at Calumet on August 23, 1912. The competitors used only drills made by one firm—and the contest was chiefly in speed of rigging up the machines. After rigging up the miners turned on full air for 2 minutes, and then turned it off and changed steel. No account was taken of the depth of the hole bored, and the prizes went to the team that took the shortest time for the complete operation.

Owing to the large number of contestants two blocks of granite were used, and the drills rigged up on opposite faces. In this way four faces could be used at once. The rules of the day were as follows:

9. Numbers will be marked on rock and cap and contestants will draw for position and place in contest.

10. Machines, drill steel and hose and complete equipment will be furnished.

11. The drilling will be on flat, dry holes.

Provision was made for 1-man and 2-man contests. Two men rigged up a Rand 3 B and one man a C 113 Butterfly machine. The Ingersoll-Rand Company donated three prizes of $100, $50 and $25 for each class. The Calumet and Hecla Mining Company furnished compressed air delivered at the drills at about 85-lb. pressure. The accompanying photographs show how the frameworks for the granite blocks were constructed.

Drilling Contest, Calumet, Mich.

1. Only one entry will be accepted for each contest, from each mine.

2. Complete outfit to be placed 10 ft. from place of rigging.

3. Nuts on clamp and arm to be even with the bolt, at the start.

4. One standard wrench to be used.

5. A 50-ft. length of hose coiled, one end connected with the air supply.

6. Both chuck bolts to be tightened.

7. Jack screws to be flush with bottom of jack, at the start, and collar to be stationary on the post.

8. Each contestant to rig up, turn on full air, and run his drill 2 minutes and change steel at the finish and tighten both chuck bolts.

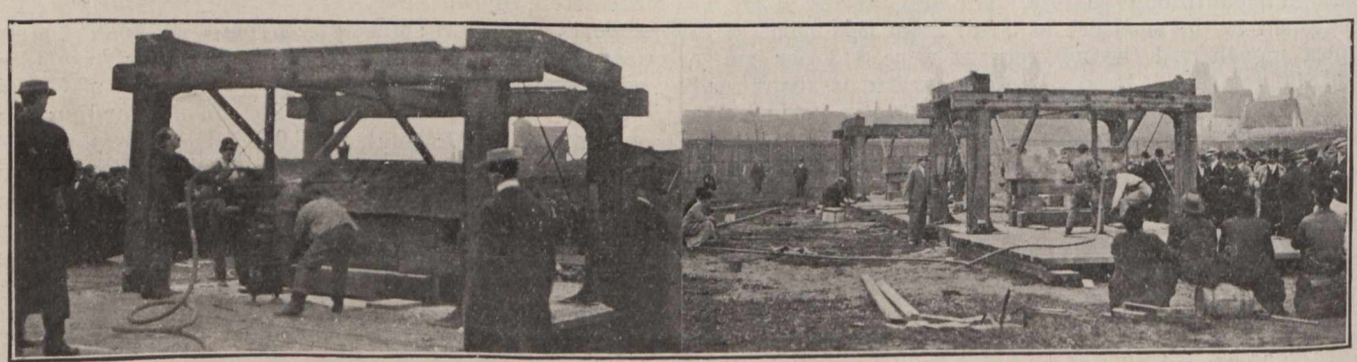
Thirty-eight teams were entered.

The 1-man contest was won in 4 min. 33 sec., and the 2-man in 3 min. 42 sec.

After the rigging-up contests a match between a machine drill and two hammers and drill, resulted in a victory for the machine. The hand-drillers made 49 ins. in 15 minutes. The machine-drill made over 50 ins. in 14 minutes.

The rules for this match provided that each competitor should drill for 15 minutes, in a block of granite, but the machine operator pierced the block before the expiration of the time allowed.

The hand drillers started with a 1¼-inch bit and finished with a ¾-inch. The machine operator started with a 2-inch and finished with a 1⅛-inch bit.



PERSONAL AND GENERAL

MR. E. T. CORKILL, INSPECTOR OF MINES, RESIGNS TO TAKE POSITION WITH CANADIAN COPPER COMPANY.

The Canadian Mining Journal has recently learned of the resignation of Mr. E. T. Corkill, Chief Inspector of Mines for the Province of Ontario, during the past nine years. The resignation comes as a result of the inauguration by the Canadian Copper Company of a new policy in connection with their mines and metallurgical plants, whereby the company creates the position of safety engineer, which is to be filled by Mr. Corkill.

There is without doubt no man who has such an intimate knowledge of the mines of Ontario, and at the same time, of the great nickel deposits of the Sudbury area. The Canadian Copper Company would go far afield before securing a more capable, efficient and energetic official than the former inspector of mines. Aside from the pecuniary benefits which will certainly accrue to this great company, the humane and laudable efforts to decrease the number of accidents, and to inculcate methods of safety among the employees will meet with the hearty approbation of the responsible mining fraternity and the general public.

Mr. Corkill, who has won the respect of the mining men of Ontario, has made a host of friends in the north country, and filled the difficult positon of inspector of mines with firmness and dignity. To criticize, without arousing antagonism, the mining method of men who were often much older and more experienced than himself, required the possession of rare tact and good judgment. With these qualities Mr. Corkill is endowed.

Born in Frontenac County, Ontario, in the year 1880, it was perhaps natural that Mr. Corkill should take kindly to the mining profession, since that country is unsurpassed for the quality of its mica and feldspar, and is the seat of the well-known School of Mining at Kingston. He received his early education at the Sydenham High School, from which he matriculated in 1897, entering the School of Mining, Kingston, three years later. Fitted by temperament and physique for the onerous work of mining engineer, he early entered with enthusiasm into the spirit of his profession. Part of his college course was under the guidance of Willet G. Miller, who was then professor of geology at Queen's University. In 1904 Mr. Corkill received the degree of B.Sc., and the following year the degree of mining engineer. During his undergraduate course he gained considerable experience while working in the summer months for the Canadian Copper Company and the mines department of the General Electric Company. After graduating in 1904 he was appointed superintendent for the General Electric Company's mica mines in New Hampshire, which position he held until appointed in 1905, by the Ontario Government, to the important post of inspector of mines for the Province and later chief inspector. The latter appointment he has held continuously up to the present time.

The Ontario Government loses a valuable official, and it is certain that Dr. Miller, the Provincial geologist, and Mr. Gibson, the Deputy Minister of Mines, will keenly regret his departure, while, at the same time, wishing him success in the larger field he has entered.

It is regrettable that the salaries of Government officials cannot be raised to correspond with increased usefulness of the men. A large fund of information gathered during several years of careful observation, and invaluable on many occasions is lost to the country because of the policy of making the compensation for faithful service so small that the men are attracted by numerous better offers from outside, and eventually leave the service.

D'Arcy Weatherbe announces that he has withdrawn as partner from the firm of Bainbridge, Seymour & Co., and has taken offices and will continue practice at 62 London Wall, London, E.C.

Mr. C. W. Meek, superintendent of the Dome Mines, has left for a trip through the States and to California which will take about three months. His place is being looked after by Mr. De Pencier, of Copper Cliff. Mr. Hansen, who resigned as mill superintendent, has also gone to the States. His position was taken by Mr. J. Longworth.

Mr. John S. MacLean has been appointed to take charge of the publicity and advertising work of the Canadian General Electric Company, Limited, and of the Canadian Allis-Chalmers, Limited, with headquarters in Toronto. The latter company, in addition to manufacturing an extensive line of machinery and appliance, will also act as sales agents for all the products of the Canada Foundry Company, Limited. Mr. MacLean held a similar position with Allis-Chalmers-Bullock, Limited, for a number of years.

Mr. C. Ivan Murray, B.Sc., McGill, has accepted a position as metallurgical engineer with the Pittsburg Electric Furnace Co., Pittsburg.

The Sullivan Machinery Co. have just published three new bulletins, No. 38-M, No. 66-M, and No. 112, describing different types of air compressors and hammer drills.

Mr. Frank Loring has returned from a trip to Western Ontario.

It is reported that the Mond Nickel Company has taken over the old Worthington nickel mine in the Sudbury district.

Mr. D. W. Brunton, of Denver, Colorado, has been on a visit to his son, Mr. Frederic K. Brunton, who is assistant superintendent at the British Columbia Copper Co.'s smelting works at Greenwood, B.C.

Mr. Chas. A. Banks, manager for the Jewel & Denero Mines, Ltd., operating a gold mine and stamp-mill in Long Lake Camp, Boundary District of British Columbia, has returned from a visit to England.

Mr. T. Walter Beam recently returned to Denver, Colorado, from the Similkameen district, B.C. He is prospecting with the diamond drill a group of mineral claims in Hedley camp, Similkameen.

Mr. J. J. Campbell, of Nelson district, British Columbia, who some years ago was commercial manager for the Hall Mining and Smelting Co., with his fellow-members of the British Columbia Agricultural Commission, travelling about that Province obtaining information relative to its agricultural industry.

Mr. Chas. H. Clapp, of the Geological Survey of Canada, is reported to have accepted a position on the Faculty of the School of Mines of the University of Arizona at Tucson, Arizona, U.S.A.

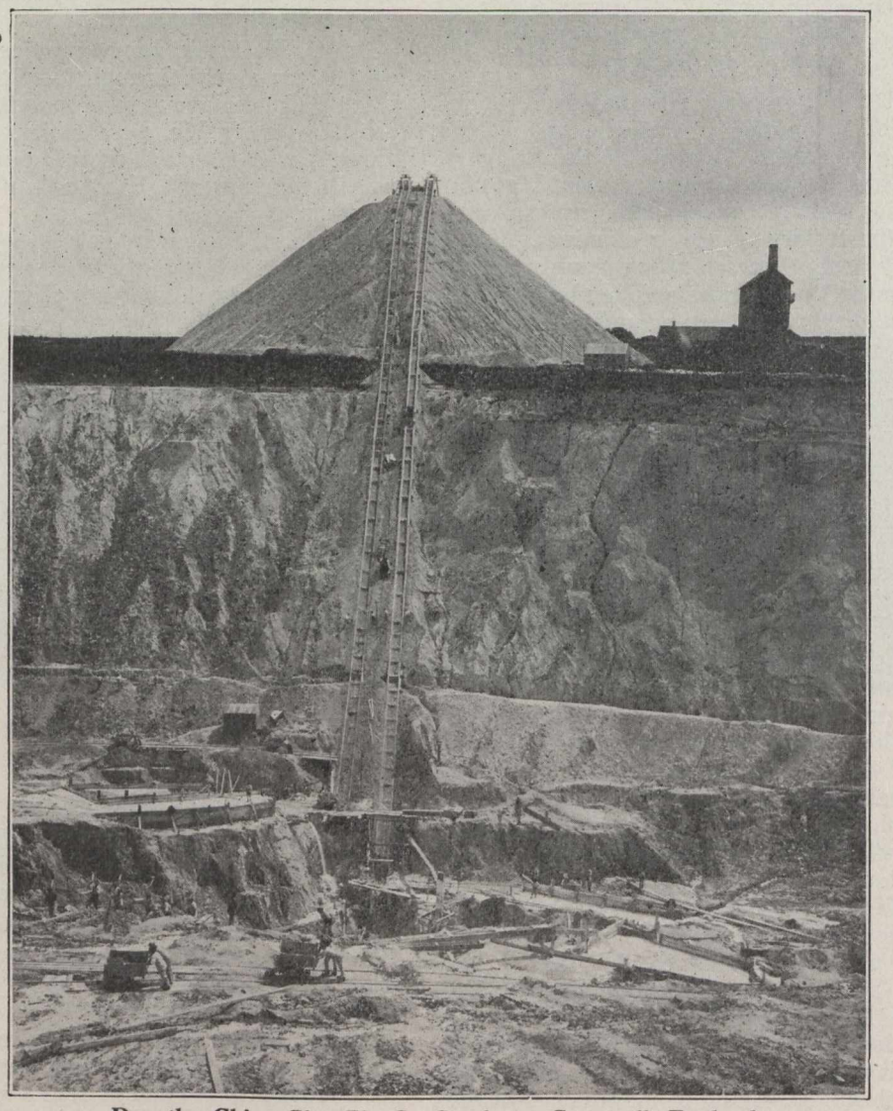
Mr. A. W. Davis is now in charge of mining operations at the Consolidated Mining and Smelting Co.'s No. 7 mine, in Boundary district, B.C.

Mr. James Finlay, for several years actively connected with the management of the Sullivan mine and smelting works in East Kootenay, B.C., is now manager of the Maple Leaf coal mine, near Frank, Southwest Alberta.

Mr. Albert I. Goodell, formerly manager of the copper smelting works at Boundary Falls, B.C., and afterwards of the Le Roi Mining Co.'s smeltery at Northport, Washington, is now manager for the Idaho-Continental Mining Co. He represents the Ryan interests, which have advanced the company $325,000 for expenditure on development of its mine and equipment of its concentrator, situated about 26 miles from Porthill, Idaho. Latterly, Mr. Goodell had been district representative of the International Smelting and Refining Co., and had made Spokane his headquarters.

Mr. A. L. Gatsinger, of New York, is spending some time on the property of the Dividend-Lakeview Consolidated Gold Mining Co., Ltd., on Dividend Mountain, Osoyoos mining division, British Columbia, in which developing property he is interested.

M. Beatty & Sons, Ltd., will be represented in Toronto by H. W. Petrie, Ltd.



Dorothy China Clay Pit, St. Stephens, Cornwall, England

THE CORNISH CHINA CLAY INDUSTRY.

Kaolin, as it was called, was first used by those ingenious people of China in the manufacture of their own domestic vessels, but those who were better skilled in this crude art, made finer specimens which they exported. The secret of this ancient industry was well kept for many generations, until it was unravelled by some missionaries, who were travelling in the Celestial Empire. The ware took its name from the country of its origin and when the raw material was eventually discovered by William Cookworthy in the St. Austell or Mid-Cornwall district in the year 1755, the original name was still retained. Kaolin or China clay is the result of the partial decomposition of granite rock and one of the most remarkable and interesting features is that whereas there are many plastic clays derived from other strata, yet none of these can be employed for the purposes for which pure clay or kaolin is most essential. Such clays are, however, used in large quantities for the manufacture of earthenware pipes, floor-tiles and coarser kinds of pottery.

Kaolin is derived from feldspar, one of the principal constituents of granite. The granite disintegrates and the feldspar becomes decomposed, and thus the substance called kaolin is originated.

When it is considered that only two generations ago, less than 1,000 tons of China clay were produced in Cornwall and the output last year amounted to considerably over 900,000 tons, one has some conception of the advance made in recent years of this great Cornish industry. Of this vast production about two-thirds is used in the great paper manufactories of the world.—Pulp and Paper Magazine.

SPECIAL CORRESPONDENCE

COBALT, SOUTH LORRAIN AND GOWGANDA.

The May production of McKinley-Darragh-Savage Mine reached a total of 206,781 ounces, which showed an increase of more than 40,000 ounces over April, and is the highest for the present year. The increase in production was partly due to a better grade of ore being treated and partly to the starting of the new mill extension. Of the total ounces produced only 42,662 ounces came from the Savage mine. 75 tons daily is being transported from the Savage by the aerial tramway to the McKinley concentrator. This ore is being taken from the Savage dumps. A total battery of fifty stamps is now in operation.

The production of the Cobalt Townsite for the two weeks ending June 7th was 81,900 ounces. The production of the Casey Cobalt for the same period was 40,400 ounces.

The Cobalt Lake Mining Company this month went on a regular production basis of 35,000 ounces. All forty stamps are now dropping in the mill and about 150 tons are being treated daily. The plant has a capacity of about 175 tons daily, which will probably be reached shortly. Underground some high grade ore has been discovered in what has been called No. 1 vein. It is most probably a continuation of one of the best producers of the Cobalt Townsite, and has been opened up within a few hundred feet of the Townsite extension line. There is a continuous shoot of high grade ore for ninety feet on this vein, and it promises to be one of the most important on the Lake property. A considerable tonnage of ore is being run through the mill from the dump at No. 6 shaft.

The King Edward, another old mine, once abandoned, is showing up well. It is leased and operated by the York Ontario. The general manager, Mr. Jackman, reports to shareholders that since February the developments at the mine have been satisfactory. Silver ore has been found on numerous veins. This ore varies from small veins of high grade ore to several feet of milling ore. At the end of April it was reported that there was on hand about 7 tons of high grade silver ore assaying about a thousand ounces to the ton and about 3 tons of second grade assaying 200 ounces to the ton. Three drills are working in the mine and the small plant is treating ore at a customs rate of $3.00 per ton.

The Meteor Mining Company is now working again. Some years ago this company bought the Powell claim on Diabase Mountain and ran a tunnel for some distance into the side of the hill. From this tunnel a shaft was sunk 100 ft. Work is being resumed at this point.

PORCUPINE, SWASTIKA AND KIRKLAND LAKE.

The strike at Porcupine is virtually over. Twice it was brought forward at the union meeting that the strike should be declared off, but on both occasions it was decided that it should be continued. At the last meeting, however, it was felt by the leaders that they could no longer hold their men, and while they did not declare the strike off they gave the union men permission to seek work. This they did with alacrity. The married men went the rounds first; and after they had had a chance to secure berths, the single men followed. Any company in Porcupine that desires to work can now get a full complement of men.

Upwards of a thousand men went on strike last September, but not a third of these were in camp when the strike virtually ended. For the past two months they have been drifting out of camp to other Northern Ontario fields, to Cobalt, and to Kirkland Lake and Swastika. Some dozen of them accepted government work on the Kirkland Lake road at two dollars a day and board.

The strike began last September with the determination of the McEnaney, Jupiter, Plenaurum, McIntyre and Vipond to cut wages, owing to better conditions prevailing in the camp. A conciliation board was formed and heard evidence. The strike followed when the award was made, the men refusing to accept it. It has been attended with more violence than is usual in a Canadian strike, although no one has been seriously injured. For instance, the last Hollinger report chronicles the fact that one of the houses of the shift bosses had been burned down and when investigation was made it was found to have been sprinkled with petroleum.

Now that the strike is virtually off, the camp has already begun to show signs of mending. The mines that fought the strike have, as a matter of fact, been steadily improving; but many in the prospective stage decided that it would be more advantageous to shut down till the strike was over rather than to incur the expense of fighting it. These will now start up again almost at once. The industrial conditions in the Porcupine camp have been subjected to a unique succession of disasters. There was first the big fire which swept out of existence the work of a busy six months. the boom that followed it was almost as disastrous since it was inevitably followed by a depression, then just as business was picking up again in the various settlements the strike arrested progress again. Now it would seem there is again a clear sky and the camp should be in a good position in every respect in the fall.

Hollinger May Report.—Owing to the fact that the mill only ran 49 per cent. of the time possible for the four weeks ending May 20th the net profits for the Hollinger Gold Mines were only $48,611.34. Mr. P. A. Robbins gives the cause as due to a total shut down of power for twelve days, owing to mishaps at the power plants in the camp. However, conditions are again normal, and the mine and the mill producing satisfactorily.

The profits from the first of the year to May 20th are $598,505.70.

Mr. P. A. Robbins' report says, in part: During the shut down the mine was operated at reduced capacity by means of steam-driven compressors and the development ore was not hoisted from the mine until the resumption of milling operations. In order to get the mine clear it was necessary to mill this development rock when milling operations were resumed and the month's operations, therefore, show a falling off in grade as well as a great reduction (one-half) in tonnage treated. Having milled only 50 per cent. of the usual output, and having been put to a heavy policing cost, it will be understood that the total costs per ton are of necessity abnormally high, but the present period will show a reduction in costs to a figure considerably below those previously published. The approximate average value of all ore hoisted was $17.53 per ton. Mining costs:

Production	3.506 per ton milled.
Exploration	$0.227 per ton milled.
Development	0.745 per ton milled.
Total	$4.478 per ton milled.

The mill treated a total of 6,560 tons, average value of ore treated $17.53 per ton., approximate extraction 95 per cent., milling costs $2.280 per ton milled.

Goldfields, Limited.—Forty stamps are dropping in the mill of the Goldfields, Limited, at Larder Lake, some eighty tons per day going through to the tables. Tube mills have been ordered and a cyanide plant will be installed with the intention of increasing the capacity very largely and also the extraction, which by the simple amalgamation now in vogue is not high. All the ore is coming from a "glory hole," the mining being very expensive. The ore body is large, but the grade is very low. The shaft is now being put down another hundred feet, and the open cut will be carried through.

At the Mine d'Or Huronia, a Montreal property, situated halfway between Larder Lake and the Kirkland Lake section a compressor plant and boilers are being set up. The company has a ten-stamp mill; but it has not been set up yet nor are the foundations in. While there is a good surface showing there is practically no underground development work done.

At the Hughes Porcupine the small mill is now running after a stoppage of two months and a half. The first bar was melted on the property last week. A vein has been struck between the 200 and 300-foot levels, and is said to be good ore.

At the Teck Hughes, Kirkland Lake, the compressor plant is now running. The shaft will be put down to the 100-foot level before any cross-cutting is attempted.

The Government Road.—Good progress is being made with the work on the Government road between Swastika and Kirkland Lake. 150 men are employed and the right of way has already been cut as far as Gull Lake. It is the intention of the Government to put in an excellent road and an appropriation of over $3,000 a mile has been made.

Prospectors have this year been more active than for several springs past, but are being driven out of the woods by the flies, which are this season unusually severe.

NOVA SCOTIA.

Dominion Coal Outputs.—The output of the Glace Bay mines for June will be about 395,000 tons. This will be slightly in excess of June last year. Outputs are a little restricted by a shortage of labour, the supply not being quite equal to the rapid expansion of the mines. A large number of men returned to Europe at the outbreak of the Balkan War, and none of these have returned. If the long-promised demobilization of troops takes place no doubt men will commence to come back, but in any case immigration from Southeastern Europe will be small for a long time to come.

No. 11 Colliery, which was unwatered only in April, is now producing an output of almost 200 tons daily. The unwatering of No. 17 Colliery is proceeding satisfactorily, but it is not likely that this mine will be a producer until next year.

The No. 2 Bankhead of the Nova Scotia Steel Co. was destroyed by fire in the middle of the month. The restriction of output caused by this mishap will be very small, as the hoisting arrangements were only slightly damaged. The bankhead was a wooden one of old design, and fully covered by insurance.

The Cape Breton Coal Iron & Railway Co. are now producing a small output from the Broughton mine. It is understood that orders have been passed for coal cars and locomotives, and some small shipments will probably be made by the autumn.

Nova Scotia and Immigration.—Nova Scotia, and the Island of Cape Breton, in particular, has never received a "square deal" in the matter of immigration and labour supply. The overwhelming bulk of the advertising literature that issues from the Dominion and floods the countries of Europe paints the lure of the "last, best West," but who in Europe, outside a few specialists, hears of Nova Scotia? There are people even in Toronto who regard Cape Breton as a close approximation to the wilds of the Yukon, and who have a vague idea that the country and the climate resemble northern Labrador. It is only a short while ago that a letter was received in Glace Bay addressed to the "Old Dominion Coal Company, Little Glace Bay, South Cape Breton." The letter came from one of the Government Departments at Ottawa, and the address had evidently been extracted from a directory at least twenty-five years old. Why the word "old" was prefixed to the address is a mystery, unless the idea was to give the address a thoroughly antiquarian flavour. A metropolitan newspaper recently referred to Glace Bay as "a little cove on the Bay of Fundy." These incidents are trivial, but illustrate the prevailing ignorance of Nova Scotia. Most people think of Glace Bay as a place where Marconigrams are received for the New York dailies, and if they remain in ignorance of the existence of the greatest coal industry in Canada, it cannot be said that the advertising agencies of the Dominion make much ado to enlighten them.

The immigrant fare on the railway from Halifax to Montreal and Toronto is very much less than the fare from Halifax to Sydney, i.e., an immigrant is carried from Halifax to a city over a thousand miles distant for a less charge than for conveyance from Halifax to Sydney, a distance of less than three hundred miles.

The regulation which demands that every intending immigrant into Canada must show $25.00 of his own money in addition to transportation to destination, was temporarily held in abeyance, but becomes effective again at the 1st of July, because of alleged signs of financial depression. It may be that frantic speculation and foolish inflation of values in the West are being reduced to saner dimensions by the existing tightness of the world's money markets, but no financial depression exists in Nova Scotia, nor any threatened surplus of workers. Since 1906 there has been a chronic labour shortage in Nova Scotia. The Province needs immigrants, particularly miners and mine labourers. Farm labourers and railway labourers are admitted into Canada without restriction. Why should not mine labourers be considered equally necessary? Canada is not wholly dependent on farmers and railways, though to judge from some of the regulations of the Immigration Department some people apparently think so.

It is an absurdity to expect a European miner to emigrate who can raise $25.00 in addition to steamer fares and rail fares, and an outfit. This means an expenditure of from $100.00 to $150.00 for the miner who wishes to emigrate from Germany or England. The miner in Europe who can boast of such a sum has no need to emigrate, but there are hundreds of miners who cannot pay their way across who would gladly come were they able. It is not fair to judge conditions as to labour in Cape Breton by the congested areas of Western boom cities, or the winter soup kitchens of Toronto and Montreal.

Nova Scotia should demand a separate Immigration Department of her own, unhampered by Federal control. The immigration needs of the Province are pressing and peculiar, and no industry in Nova Scotia should

be in the least degree hampered by regulations framed to meet conditions prevailing in the other Provinces of the Dominion, but not present in Nova Scotia. Halifax is the great gateway for immigration—to the West. The newspapers report 5,000 immigrants in one day, of which number not fifty stay east of Montreal. It is even said that immigrants brought especially to Nova Scotia through the efforts of the paid immigration officers of the Province have been detained and threatened with deportation under Federal laws administered by Federal officials. Surely it is time Nova Scotia said what immigrants should or should not come through her principal port, and insisted on equal terms with the West.

BRITISH COLUMBIA.

War Eagle Mine Headworks Burned.

The Rossland "Miner" has printed the following account of the destruction by fire, on June 1, of the big shafthouse and other buildings comprising the head works of the War Eagle mine at Rossland, British Columbia, which mine is one of the well-known Centre Star group of mines, owned by the Consolidated Mining and Smelting Company, of Canada, Ltd.

"One of Rossland's chief landmarks was destroyed by fire on Sunday evening, when the War eagle shafthouse, standing as it did on one of the slopes of Red Mountain, so that it could be seen from every portion of the city, went up in smoke and flames. The shafthouse contained, beside the plant, a lot of very dry mining timber, ready for use in the mine, and this also burned very rapidly.

"The fire was successfully fought from the shaft of the War Eagle. One bulkhead was put in on the 100-ft. level of the mine, and another on the 200-ft. level. The flames were prevented from entering the mine by means of well-directed streams of water from the collar of the shaft and from the 100-ft. level. Only about 25 ft. of the timbers below the collar was burned.

"After the fire had burned for nearly an hour, the structural steel frame of the building and the steel gallows-frame, collapsed as easily as though they had been of cardboard.

"The flames continued their work of destruction until about 11 o'clock at night, but in the meanwhile the streams of water were kept constantly at work until finally the fire was extinguished. The loss is estimated at about $50,000; it is partially covered by insurance.

"On Monday morning work was continued as usual in the mine, and a number of men were employed on the surface in clearing away the debris. The War Eagle hoist has been used to lower and bring up men and to handle waste and timber. The ore has been sent up through the Centre Star shaft, so the destruction of the War Eagle shafthouse will not seriously affect the production of ore nor reduce in numbers the underground working force. The Centre Star hoist can do, and is doing, the work that had been done by the War Eagle hoist, so that the disaster is not nearly so serious as would have been the case had the Centre Star headworks been destroyed instead of that of the War Eagle.

"The War Eagle shafthouse was erected in 1898-9, soon after the Gooderham-Blackstock syndicate acquired the mine."

Placer-Mining on Granite Creek, B.C.

The Similkameen Star says: "R. A. Lambert has again replaced the dam on Granite creek, near the north fork, which was washed away by high water last year. He has made the present dam as secure as possible, having anchored it in the solid rock on either side. Its dimensions are: 80 ft. long, 10 ft. deep, 12 ft. 6 in. wide, and an apron of 30 ft. Much interest is taken in Mr. Lambert's work, which, if proven successful, will give an immense impetus to placer-mining throughout the district. Gold and platinum are known to be in the creeks and rivers and it is hoped Mr. Lambert may demonstrate the successful mining of these placers. His flume is 950 ft. long, 5 ft. 6 in. by 3 ft. inside, and will carry the creek at low water."

The following excerpt from a paper by Mr. Chas. Camsell, of the Geological Survey of Canada, taken from Vol. XIII, 1910, of the "Journal of the Canadian Mining Institute," is of interest in connection with the foregoing news:

"A short distance above the mouth of the north fork, on the main Granite creek, Messrs. R. A. Lambert and Stewart are doing the only serious placer-mining in the whole district. The preliminary development has been carried on by five men for the past three seasons, but the actual sluicing of the gravel may only commence in the coming season. Lambert and Stewart have a lease of one-and-a-half miles of the creek bed above the north fork, a very small part of which had been worked in former times. The gold recovered from these portions was very coarse, though the bedrock was reached in only one spot. In this particular portion, which was but 200 ft. in length, the yield is said to have been $1,200 to the length of a sluice box, where the gravel in the stream bed had a width of 40 to 50 ft. This yield included nuggets, the gold value of which was from $100 to $150; the platinum, however, was fine. The remainder of the creek bed covered by the lease is deep ground and could not be bottomed. Lambert and Stewart are now engaged in cutting down the bed of the stream in the lower part of their lease, in order to reach bedrock and recover the gold and platinum lying on it. Commencing at the lower end of their ground, a dam has been constructed across the stream bed, while 600 ft. of a board flume carries the water over the portion of the channel which it is proposed to first work. The large boulders and rock in the lower part were blasted away, thus enabling the removal by ground-sluicing of a depth of about 25 ft. of gravel, which before formed the bed of the stream. The depth of gravel overlying the bedrock is now about 5 ft. and the point has been reached when the gravel can be shovelled into the sluice boxes. This, however, can only be done after the season of high water has been passed. The returns should show a proportion of about four parts of gold to one of platinum, and should amply repay the cost of the preparatory work."

Conditions in Metal Mining Camps.—With the return of summer there is general activity in the chief metal mining camps of the Province. Although there is still an unsettled feeling in parts of Slocan district owing to the persistence of the agitating element of the Miners' Union, there has not been any stoppage of mining operations from labour troubles. Whether or not there will yet be seems uncertain, but it is understood that a considerable number of the miners are opposed to a strike. There does not appear to be a similar feeling in either Rossland or Boundary camps, or at least nothing was heard during a recent visit suggestive of any serious interference with mining operations. On the Coast, the situation at the Britannia Co.'s camp is stated to be similar to what it has been ever since the company made up its full number of miners and helpers from non-union sources.

In the coal mining districts matters are as usual, with the exception that the mines at and about Nanaimo, Vancouver Island, are still non-productive. Whether the operators will be able to resume production without first coming to an agreement with the United Mine Workers of America, which organization called the strike, is not yet clear; certainly they are endeavouring to make arrangements with a sufficient number of their employees to get things running again independently of the sanction of the union. At the time of writing no information is available as to the prospects for success or failure in this direction.

Kaslo.—On July 13 the "Spokesman-Review," of Spokane, Washington, published the following concerning the Rambler-Cariboo, one of the best-known mining properties in Slocan district: "According to a report received yesterday by Walter J. Nicholls & Co., the Rambler-Cariboo mine, in Slocan district, B.C., up to May 1, had shipped 250 tons more ore to the smeltery at Trail than the total output of the mine in 1912. The shipments for the period covered by the report aggregated 1,403 tons, as against 1,153 tons for the whole of 1912. Last week the quantity shipped amounted to 189 tons, and the company is preparing to increase operations. The new concentrator is turning out 300 tons of concentrates weekly and the output is to be augmented, according to the report, as a higher-grade mill-feed is being extracted for treatment. All kinds of rumors are being circulated locally in explanation of the sudden drop in the price of Rambler-Cariboo shares, the most persistent being that the concentrator, completed but recently, will have to be rebuilt, the system having proved inefficient, but officials of the company vigorously deny this and assert there is nothing in the financial condition of the company to warrant the break, and that there is nothing wrong with the property physically. There are between 350 and 375 shareholders in the Rambler-Cariboo Company, most of them residents in the Inland Empire, and the recent rapid decline in the price of the shares, coupled with the resignation of Mr. W. E. Zwicky, the former general manager, has caused some uneasiness among them."

New Denver.—Now that the snow is off the wagon-road to the Idaho-Alamo mines, the repairing gang has been putting the road in good condition for hauling. Two cars of silver-lead ore will be at once hauled to the railway at Alamo, for shipment to Trail.

Capella Mine.—The trail to the Capella is being cleared and supplies will shortly be taken up, so that W. R. Will may resume work in this mine. Some very rich silver ore has been taken from the Capella in past years, one carload having returned more than $10,000.

Silverton.—With the melting of the snow the wagon-road and trail to the L. H. group, in the mountains a few miles south of Silverton, is once more fit for travel, so the British Columbia Copper Co. is arranging to resume development work on the Slocan property, on which it has an option of purchase. There is here a body of ore of considerable size and averaging $7 or $8 in gold.

The Consolidated Mining and Smelting Co. has taken under option a group of claims in Four-mile camp, near where the old Wakefield concentrating mill stood before it was burned. Thos. J. Lloyd has been prospecting this group and having developed a good showing has bonded it to the Consolidated Co., which is arranging to do further development work.

Silverton Mines, Ltd.—The concentrating mill recently put in by the Silverton Mines, Ltd., is reported to be working satisfactorily on ore from that company's Hewitt-Lorna Doone group of mines at which development work has been kept up for a number of years. One unit of the Minerals Separation flotation process plant has been included in the equipment of the new concentrator.

Greenwood.—The work of hauling to the Jewel gold mill at Long Lake, some 40 or 50 tons of new machinery, which lately reached Eholt from England, was in progress late in May and early in June. C. A. Banks, manager for the Jewel-Denero Mines, Ltd., immediately set about installing this additional plant. Lumber for use in the erection of another building for the accommodation of men employed at the Jewel has also been taken up from Eholt. It is stated that operation of mine and mill will shortly be undertaken to full capacity and that there will consequently be more activity in Long Lake camp than for a number of years.

More than 3,000 tons of ore has been shipped from the Consolidated Mining and Smelting Co.'s No. 7 mine since work was resumed in it several weeks ago. The ore is quartz, containing value in gold and silver; it is conveyed by aerial tramway down to the Canadian Pacific Railway at Boundary Falls and hauled thence to the smeltery at Trail.

Hedley.—From the Gazette it is learned that T. Walter Beam left Hedley late in May for Denver, Colorado, intending to return in June to spend part of the summer in the camp. Before leaving he saw that arrangements for prospecting the properties he and his associates lately bonded were well forward, and diamond-drilling had been commenced. The country over which power and water lines had to be taken is rough and it was somewhat difficult to do the requisite preliminary work in the rocky canyons in which much of the drilling is to be done. It is stated that three drills will be kept in continuous operation, and some 25 men will be employed. Gomer P. Jones, general superintendent for the Hedley Gold Mining Co., will have the oversight of this work as well as continuing his ordinary duties.

New Hazelton.—At the Erie, on Four-mile mountain, the tunnel was in 170 ft. by the end of May. Another car of ore is to be shipped, this time to the Consolidated Co.'s smeltery at Trail. Some time since the district gold commissioner reported that a shaft had been sunk 75 ft., while open-cuts had been made in the outcrop of the vein along a distance of 300 ft. The vein had been found to have an average width of 14 ft. and to contain an ore-shoot ranging from 18 in. up to 4 ft. 6 in.

There are now about 30 men employed at the Silver Standard, on Glen mountain, and three power drills are being worked. The cross-cut adit is being advanced about 6 ft. a day and it is expected that the vein will be reached before the end of June. After the provincial mineralogist visited this property two years ago, he reported that much prospecting work had been done on a system of several veins varying in width up to 6 ft. of vein-matter, chiefly quartz. The work done had shown the veins to be continuous and permanent and to contain in places shoots of ore, principally galena. A sample taken by that official gave returns on assay: Lead, 58 per cent.; silver, 303 oz.; and gold, 0.24 oz. to the ton. Since then underground development has proved the occurrence of much ore of excellent grade, and the property has been sold to a railway contractors' syndicate—Stewart, McLeod and McHugh.

COMPANY NOTES

VIPOND PORCUPINE GOLD MINES COMPANY

Manager C. H. Poirier, under date of May 23rd, 1913, says in part: "The total amount of development to date is as follows: Shafts, 385 feet; drifts, 2,517 feet; crosscuts, 1,832 feet, raises, 220 feet; 1,070 feet of drifts on the various veins has been timbered, chutes placed at intervals, and stopes started.

"The installation consists of the following: One Sullivan two-stage belt-driven compressor of 873 cubic feet capacity per minute, driven by a 150 h.p. G. E. motor, one 9x12 Jenckes hoist, one 100 h.p. Robb-Munford boiler, three transformers of 225 kw. capacity, mill installation of the Hardinge type of 120 tons daily capacity, fully equipped with motors, etc., and 600 square feet of amalgamating plate. Blacksmith shop with all necessary furnishings, change house, fitted with shower baths, for the convenience of the men. Powder magazine, powder thaw house, three cottages, store house and stable. Suitable buildings housing all machinery, headframe and plant. Necessary lighting and heating equipment.

"The main shaft has been sunk to a depth of 325 feet, crosscuts have been run at 100-foot intervals, intersecting both the Godfrey and the Davidson veins, the limits of the main oreshoots on these veins have been reached on both the 100 and 200-foot levels, and both shoots have been partially explored on the 300-foot level. Surface prospecting has shown the existence of at least one additional oreshoot on the Davidson vein which has not yet been explored underground. A very small amount of drifting would prospect this oreshoot at a depth of 300 feet.

"A conservative estimate of ore blocked out above the 200-foot level shows 40,000 tons of an average assay value of $10.00 per ton. Development on the 300-foot level shows the continuance of the known oreshoots above on both the Godfrey and Davidson veins to that depth, and as far as the work has gone there is apparently no change in values or widths. The ore occurrence being erratic, the above estimate includes only ore blocks that have been exposed on at least three sides. An additional probable tonnage of at least 15,000 tons between the 200-foot and the 300-foot levels can reasonably be figured on.

"Based on the mining and milling of over 5,000 tons of ore, it is estimated that the total cost of extracting 95 per cent. of the values in the above ore reserves will average approximately $4.45 per ton. Tailings impounded from ore already treated should yield a net recovery of over $15,000.

"The gross bullion output to date has been $20,928.00, this represents a recovery of 48 per cent. of the values in the ore milled. The low extraction is accounted for by the high percentage of sulphides, found in the ore from the Davidson vein, and the difficulty in securing the necessary supply of water for amalgamation. Numerous tests have shown that the addition of a suitable cyanide plant to our present installation, will insure a recovery of at least 95 per cent.

"A cyanide plant should be erected as an annex to the present mill installation, the tailings resulting from past operations cyanided, work underground started, in time to insure a full supply of ore for the mill, when the tailings have been disposed of and development of the known ore bodies carried on at a rate commensurate with the output of the mine."

Henry H. Ward, president of the company, in a letter to shareholders states that he and his associates, in addition to paying in $125,000 for stock at 50 cents a share, have advanced since January 1st, 1912, upwards of $60,000. Other shareholders were asked to subscribe $50,000. On May 23rd, 1913, shareholders of the Porcupine Gold Mines Company were offered for subscription at par, $125,000 bonds of the Vipond Porcupine Mines Company, Limited.

President Ward, in a letter accompanying the offer of bonds, says in part:

"Pursuant to an agreement made in October, 1911, a syndicate composed for the most part of the Directors of the Company, bought and paid for 250,000 shares of the Treasury Stock of the Company at 50 cents per share, a price at that time somewhat higher than the market value. This realized the sum of $125,000 for the Company. Under the agreement entered into at the time this amount was to be paid in before January 1st, 1913. Full payment of the amount, however, was completed on June 14th, 1912. After that date further amounts, aggregating in excess of $62,000, were advanced to the Company by certain shareholders. Other indebtedness of the Company amounts to somewhat more than $18,000.00.

"At the time that the agreement was entered into by which the Company was provided with the $125,000.00 it was expected that the machinery which was to be purchased with the funds so provided would be installed and in operation certainly not later than April 1st, 1912. There was various unforeseen and unavoidable delay in connection with the installation of this machinery, and as it was not considered wise to halt development work pending its installation, the funds thus provided had to be used not only for the purchase of machinery, but to carry on development work for a considerably longer period than had been anticipated. It resulted, therefore, that when the mill was finally ready to operate, about July 1st, 1912, the $125,000.00 had been spent, and it was necessary for further money to be advanced before the mill could be put on a paying basis.

"Even then it was hoped that the operation of the mill, treating the ore by the amalgamation process alone, would pay for operating expenses, provide for a reasonable amount of development, and soon put us in a position where, if additional plant was required, it could be purchased without its being necessary to undertake any new financing of the company. However, although the mill was found to be satisfactory in every way, so far as its design and installation were concerned, it was found that the ore under conditions existing could not be treated by the amalgamation process with an extraction sufficient to carry out this program as expected. It was found, too, when the actual stoping of the mine was undertaken, that in many parts of the workings, the walls were of such a character that considerably more waste was broken with the ore than had been calculated upon. This reduced the head assays considerably, and, while the amount of ore, or ore and waste, treated was thereby somewhat increased, the expense of extracting a given amount of value increased also.

"Another difficulty encountered in the operation of the mill was the lack of sufficient water to satisfactorily treat the ore by the amalgamation process alone.

"Before determining on further steps to be taken, an examination of the property was made by competent engineers, and, as a result of their report, it was decided that it would be necessary and desirable to install a cyanide plant. The cost of this installation should not exceed $30,000.00.

"From the statements of our engineers and from examination of other similar cyanide plants in operation, it is confidently expected that with the erection of the cyanide plant our extraction will be not less than 95 per cent. Moreover, the difficulty as to the water supply will be eliminated as the available supply of water is at all times sufficient to run the mill to its full capacity using the cyanide process.

"In November, 1912, the mine operatives of the Porcupine District went on a strike, shutting down practically all of the plants in that district including our own, and in view of the conditions existing we have considered it wiser not to resume operations until the cyanide plant is provided and ready for operation. In the meantime our staff has been reduced to the lowest possible limit, and our monthly expenses cut down correspondingly.

"As will be seen from the foregoing, certain shareholders of the Company in addition to providing on terms most liberal to the company the amount of $125,000, have further advanced the considerable sum of $62,000, for the further operations and development of the property. The indebtedness of the Company to these shareholders and other creditors now amounts to $80,000+. The Directors have used their best efforts not only to carry the work on economically, but to provide or obtain the necessary funds, without calling on the general body of shareholders. Under present circumstances, and in view of the large amounts already advanced, and in view of the other debts of the Company, it becomes necessary in the interests of all shareholders to provide for an early liquidation of these debts and provide at the same time sufficient additional funds to erect further plant and put the property on a paying basis. In the event that a sufficiently large amount of subscriptions are not received it will obviously be necessary for the present creditors to take such steps as may be necessary for the protection of their own interests. Should this course be forced upon them the interests of the shareholders at large may suffer. It is, therefore, in the best interests of all concerned that shareholders respond generally and liberally to this call."

SIR W. G. ARMSTRONG WHITWORTH AND CO., LIMITED.

The certified profits for the past three years, after providing for Depreciation, Interest on the Debenture Stock and the Dividend on the four per cent. Preference Shares, have been as follows:

For the year ended—

December 31st, 1910	£487,864 18 0
December 31st, 1911	467,826 3 7
December 31st, 1912	635,526 11 6

Dividends have been paid on the ordinary shares for the past five years as follows: 1908 to 1910, 10 per cent.; 1911 and 1912, 12½ per cent. In the year 1912, after providing for the interest on the Debenture Stock the dividend on the four per cent. Preference Shares and the above-mentioned dividend for 1912 of 12½ per cent., there was carried forward to the credit of Profit and Loss Account the sum of £335,849 10s.

The company's works at Newcastle, Manchester and elsewhere are fully occupied, and orders are in hand which the directors consider sufficient to justify them in estimating that the rate of profit above indicated will be maintained.

The Directors of the Company are: Sir Andrew Noble, Bart., K.C.B., F.R.S., Chairman; The Right Hon. Lord Rendel, Vice-Chairman; Herbert Hanbury Smith Carington, Esq.; John Meade Falkner, Esq.; Colonel Sir Edouard Percy Cranwill Girouard, K.C.M.G.; Henry Neville Gladstone, Esq.; The Right Hon. Sir George Herbert Murray, G.C.B.; John Henry Brunel Noble, Esq.; Saxton William Armstrong Noble, Esq.; Rear-Admiral Sir Charles Langdale Ottley, K.C.M.G.; Henry Whitehead, Esq., M.V.O.

Rambler-Cariboo Mines.—Early in June directors and shareholders in the Rambler-Cariboo Mines, Ltd., from several cities in the State of Washington proceeded to Kaslo, B.C., to there attend the annual meeting of the company, convened for Tuesday, June 10th. Before the meeting was held a visit was paid to the Rambler-Cariboo mine, in McGuigan Basin, Slocan, and the concentrating mill on the middle fork of Carpenter Creek, about three miles above Three Forks. The party included Dr. John Armstrong, Tacoma; Mr. Frank Bowman, Seattle; Dr. B. W. McPhee, Col. John Hunter and Mr. Alfred Coolidge, of Spokane. At the meeting, Messrs. Coolidge and A. M. McLaine, and Dr. McPhee, all of Spokane; Dr. Armstrong and Rev. Father S. P. Hylebos, of Tacoma; and Dr. John Benson, of Colfax, were re-elected directors of the company. Mr. W. E. Zwicky, of Kaslo, for many years manager of the company, tendered his resignation. Mr. John Rinta, also with the company a long while, as mine superintendent, is named as likely to succeed Mr. Zwicky as manager.

STATISTICS AND RETURNS

BRITISH COLUMBIA ORE SHIPMENTS.

For week ending June 14, and for this year to date, ore production and smelter receipts, in tons, are:

	Week.	Year.
Boundary.		
Nickel Plate, milled	1,500	36,000
Granby	21,991	563,379
Motherlode	4,830	151,462
Rawhide	5,298	119,653
Napoleon	245	16,203
Unnamed	198	3,268
Knob Hill	79	1,251
Ben Hur	445	5,540
United Copper	204	2,234
No. 7	337	3,490
Hope	56	250
Other mines	...	3,430
Total	35,183	906,160
Slocan and Ainsworth.		
Standard, milled	500	12,000
Van Roi, milled	725	15,608
Rambler-Cariboo, milled	300	7,200
Bluebell, milled	1,200	28,600
Richmond-Eureka	35	355
Standard	263	6,788
Bluebell	208	3,711
Eastmount	33	150
Rambler-Cariboo	106	1,509
No. 1	168	1,598
Other mines	...	3,068
Total	3,538	80,587

Lardeau.		
Other mines	...	233
Nelson.		
Motherlode, milled	500	12,000
Queen, milled	350	5,775
Second Relief, milled	200	4,200
Queen Victoria	407	12,084
Other mines	...	8,357
Total	1,457	42,416
East Kootenay.		
Sullivan	344	16,826
Other mines	...	757
Total	344	17,583
Rossland.		
Le Roi No. 2, milled	350	8,400
Inland Empire, milled	275	825
Centre Star	2,787	65,845
Le Roi	386	27,024
Le Roi No. 2	89	9,615
Other mines	.....	199
Total	3,887	111,908
Granby Smelter Receipts.		
Grand Forks, B.C.		
Granby	21,991	563,379
B. C. Copper Co.'s Receipts.		
Greenwood, B.C.		
Motherlode	4,830	151,462
Rawhide	5,298	119,653
Napoleon	245	16,203
Queen Victoria	407	12,084
Unnamed	198	3,268
Total	10,978	302,670
Consolidated Co.'s Receipts.		
Trail, B.C.		
Knob Hill	79	1,251
Ben Hur	445	5,540
United Copper	204	2,234
No. 7	337	3,490
Hope	56	250
Richmond-Eureka	35	355
Standard	263	6,788
Bluebell	208	3,711
Eastmount	33	150
Rambler-Cariboo	106	1,509
No 1	168	1,598
Sullivan	344	16,826
Centre Star	2,787	65,845
Le Roi	386	27,024
Le Roi No. 2	89	9,615
Other mines	..	11,307
Total	5,540	157,493

COBALT ORE SHIPMENTS.

June 21, 1913.

The ore shipments for the week are:

Mine.	High.	Low.	Pounds.
Cobalt Townsite	1		50,180
Crown Reserve	1		40,000
McKinley-Darragh	2		126,072
Nipissing		2	129,824
La Rose		1	100,000
Cobalt Lake	1		63,100
Hudson Bay	1		64,582
Temiskaming	1		62,421
	7	3	636,129

The shipments from the Cobalt mines to date are:

Mine.	High.	Low.	Tons.
Coniagas	25		832.41
Trethewey	6	6	332.43
Nipissing	2	33	1,094.94
Dominion Red.	10		318.66
Hudson Bay	9		336.46
Cobalt Townsite	30		1,073.56
McKinley-Darragh	35		1,213.21
Kerr Lake	9	1	355.89
Beaver	7		194.41
La Rose	31	2	1,349.27
Peterson Lake (Seneca-Sup.)	4	3	250,76
Temiskaming	10	1	340.38
Crown Reserve	7		289.95
Chambers-Ferland	1	4	159.20
Colonial	1		21.56
Cobalt Lake	13		453.99
Penn-Canadian	3		87.22
Drummond	3		87.22
General Mines		1	8.89
O'Brien	6		221.26
Silver Queen		1	60.34
Bailey	4	1	102.44
Casey Cobalt	3		109.72
Right of Way	1	1	62.19
City of Cobalt	4		147.20
Silver Bar		1	20.00
York-Ontario	1		20.00
Buffalo	2		66.13
Silver Cliff	1		20.00
	236	55	9,852.38

The bullion shipments for the week ending June 21 are:

Mine.	Bars.	Ounces.	Value.
Nipissing	109	123,279	$72,734.61
Kerr Lake	3	3,393	2,001.87
Dominion Red.	43	48,633	28,693.47
	155	175,305	$103,429.95

Bullion shipments to date, June 21, are:

Mine.	Ounces.	Value.
Nipissing	2,614,638.09	$1,499,496.73
Penn.-Canadian	4,363.60	2,700.00
Buffalo	714,216.90	459,478.68
Crown Reserve	190,991.00	121,495.25
Dominion Red.	254,917.40	146,104.02
Townsite	10,909.00	6,647.00
Miscellaneous	3,920.00	1,623.00
Temiskaming	9,469.20	5,443.72
O'Brien	66,201.77	32,713.95
Wettlaufer	4,715.00	2,925.00
Miller Lake	1,734.20	970.15
Colonial	635.00	374.00
Trethewey	9,176.00	5,725.40
Casey Cobalt	2,394.00	1,520.00
Kerr Lake	14,279.98	9,047.98
Bailey	1,839.00	1,103.40
Wettlaufer	4,391.00	2,634.60
City of Cobalt	1,755.45	1,053.00
	6,428,587.39	$4,854,059.58

STOCK MARKETS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.)

June 23rd, 1913.

New York Curb.

	Bid	Ask
British Copper	2.00	2.25
Braden Copper	6.00	6.25
Chino Copper	33.00	33.12½
Giroux Copper	1.50	1.56¼
Goldfield Cons.	1.75	1.81¼
Greene Can.	5.87½	6.00
Inspiration Copper	14.50	14.87½
Miami Copper	20.25	21.00
Ray Cons. Copper	16.25	16.50
Standard Oil of N. J.	340.00	350.00
Standard Oil of N. Y.	139.00	141.00
Standard Oil Old Stock	1020.00	.....
Standard Oil Subs	700.00	.....
Tonopah Mining	4.18¾	4.25
Tonopah Belmont	6.12½	6.37½
Yukon Gold	2.25	2.37½
Nevada Cons. Cop.	16.25	16.75

Cobalt Stocks.

	Bid	Ask
Bailey.	.08	.08¼
Beaver.	.32	.34
Canadian.	.21	.23
Chambers-Ferland.	.20½	.21½
City of Cobalt	.50	.52
Cobalt Lake	.66	.69
Coniagas.	7.00	8.00
Crown Reserve	3.47	3.55
Foster.	.05	.08
Gifford.	.05	.06
Gould.	.03	.03½
Great Northern	.16	.17
Hargraves.	.03	.03½
Hudson Bay	65.00	68.00
Kerr Lake	3.15	3.30
La Rose	2.35	2.50
McKinley.	1.65	1.75
Nipissing.	8.75	9.00
Peterson Lake	.22¾	.23¼
Right of Way	.05	.06
Rochester.	.03	.03¼
Leaf.	.02⅞	.03
Cochrane.	1.30	1.40
Silver Queen.	.04	.06
Temiskaming.	.33	.35
Trethewey.	.33	.36
Wettlaufer.	.11	.13
Seneca Superior	1.90	2.20

Porcupine Stocks.

	Bid	Ask
Apex.	.01	.02
Crown Chartered	.00½	.00¾
Dome Extension.	.09	.09¼
Dome Lake	1.05	1.25
Dome Mines	12.50	15.00
Eldorado.	.....	.....
Foley O'Brien	.26	.26½
Hollinger.	15.75	16.25
Jupiter.	.35	.38
McIntyre.	2.20	2.40
Moneta.	.04	.06
North Dome	.40	.50
Northern Exploration	1.00	2.00
Pearl Lake	.31	.33
Plenaurum.	.95	1.00
Porcupine Gold.	.11	.12
Imperial.	.02½	.03½
Porcupine Reserve	...	.14
Preston East Dome	.02½	.03½
Rea.	.15	.30
Standard	.00½	.01
Swastika.	.05½	.06
United.	.01	.01½
West Dome.	.15	.25

Sundry.

	Bid	Ask
American Marconi	4.00	4.25
Canadian Marconi	2.00	3.00

TORONTO MARKETS.

June 24—(Quotations from Canada Metal Co., Toronto).
Spelter, 6¼ cents per pound.
Lead, 5½ cents per pound.
Tin, 48 cents per pound.
Antimony, 10 cents per pound.
Copper, casting, 15½ cents per pound.
Electrolytic, 15½ cents per pound.
Ingot brass, 11 to 15 cents per pound.

June 24—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $20.00 to $20.50 (f.o.b. Toronto).
Midland No. 2, $20.00 to $20.50 (f.o.b. Toronto).

June 24—(Quotations from Elias Rogers Co., Ltd., Toronto).
Coal, anthracite, $7.50 per ton.
Coal, bituminous, $5.00 per ton for 1¼-inch lump.

GENERAL MARKETS.

Coke.

June 20—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, $2.10 per ton.
Foundry coke, prompt, $2.75 to $3.00 per ton.

June 20—Tin, straits, 43.60 cents.
Copper, Prime Lake, 14.87½ cents.
Electrolytic copper, 14.62½ cents.
Copper wire, 16.00 cents.
Lead, 4.35 to 4.40 cents.
Spelter, 5.15 to 5.20 cents.
Sheet zinc (f.o.b. smelter), 7.25 cents.
Antimony, Cookson's, 8.55 to 8.65 cents.
Aluminium, 24.00 to 25.50 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $46.00 per ounce.
Platinum, hard, $51.00 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $30.00 per 75-lb. flask.

SILVER PRICES.

		New York cents.	London pence.
June	5	59⅛	27⅝
"	6	59⅜	27 11/16
"	7	59⅝	27½
"	9	59¾	27 3/16
"	10	59¾	27½
"	11	59½	27 7/16
"	12	59¼	27⅝
"	13	59⅛	27¼
"	14	59⅛	27¼
"	16	59¼	27 5/16
"	17	59⅛	27¼
"	18	58⅝	27
"	19	58⅜	26⅞
"	20	58⅛	26 13/16