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The Canadian Mining Journal

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Editor

REGINALD E. HORE

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CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd, 1879."

CONTENTS.

ALBERTA OIL

The citizens of Calgary are suffering from another acute attack of oil madness and a number of promoters and brokers are doing their utmost to spread the disorder. According to recent despatches, syndicates are being hastily formed to absorb any money which a gullible public may part with while the mania lasts.

The results obtained at the discovery well of the Calgary Petroleum Products Company have been excellent so far. Some months ago oil was found at a depth of 1,560 ft. at Black Diamond, sixteen miles west of Okotoks, Alberta. This was a light colored oil, evidently consisting largely of gasoline. As such "white oil" is seldom found in large quantity the chief importance attached to its discovery was the probability of a larger deposit being nearby. Recently at a depth of about 2,700 ft. a larger deposit has been found. According to the reports the oil has risen several hundred feet in the well and has on occasions come to the surface. As gas exists in the higher horizons gushes are liable to occur at intervals.

Prospects for a large body of oil existing at considerable depth have been for some time regarded as good and the recent discovery may result in the development of an oil field of great importance. It would be a great boon to Alberta and to the Dominion. Those who have had the courage to drill to such depth deserve the rich reward which they have won and the thanks of the citizens of Calgary and of Canadians generally.

It would be well, however, for prospective buyers of Calgary oil company shares to make some investigation concerning what they are buying. That they will be offered shares in worthless property is to be expected. Such has always been the case in other oil fields. In the new field the same old game is being worked again.

Some time ago the Calgary Board of Trade issued a warning against speculation in the shares then being offered. It would be well if the Board would undertake a rigorous investigation of the offerings now before the public, with the object of exposing some of the worst of them. The earlier warnings have apparently been forgotten.

THE IRON INDUSTRY

The report of the Dominion Steel Corporation for the financial year ending March 31 reflects conditions common just now to nearly all producers. Decline in orders resulted in partial shutting down of the plants with large stocks of raw materials on hand.

Net earnings of the Corporation and its constituent companies amounted to $4,442,031.82. There was produced at the mines 5,047,683 tons of coal and 763,250 tons iron ore as compared with 5,053,100 tons coal and 757,003 tons iron ore in the previous year.

The production of iron and steel was, in tons: pig iron, 339,919; steel ingots, 331,256; blooms and billets, not further finished 35,299; rails, 176,027; rods, 30,-764; bars, wire nails, etc., 41,522.

The figures show that production of coal, iron ore, pig iron and steel was about the same as in the previous year. The report indicates, however, that during the present year there will be a smaller production from the mines. The steel plant is in good condition for a large output, but orders are scarce.

MR. A. A. COLE'S REPORT

The annual report on the mining industry in that part of Northern Ontario served by the T. &. N. O. railway, has been issued. Like the previous reports, this one contains much useful information and is well illustrated.

Mr. Cole calls attention to the development of the district served by the railway and shows conclusively that the mining industry has contributed largely to the success of the railway and the development of the districts. In 1913 the freight revenue credited to mining was $444,499.55, or 48 per cent. of the total.

The gold production of the Porcupine district is shown to have amounted in 1913 to 29 per cent. of the gold production of the Dominion and 95 per cent. of that of Ontario. A considerable increase in 1914 is expected. The production at Porcupine in 1913, according to Mr. Cole, was $4,284,928.

The silver output of the Cobalt district in 1913 is valued at $16,555,001 as compared with $17,390,218 in 1912. Milling operations assumed much larger proportions than ever before. There was milled in 1913 664,845 tons of ore as compared with 455,517 tons in 1912. Of the total there was treated in cyanide mills 133,297 tons and in water concentrating mills, 531,548 tons.

The report contains a number of illustrated descriptions of the mills and the processes of treatment, and reflects the constantly growing importance of Cobalt and Porcupine as metallurgical centres.

CORRESPONDENCE

THE KIRKLAND LAKE PORPHYRY.

Editor Canadian Mining Journal:

Sir,—In regard to the porphyry of the Kirkland Lake District the name "diorite-porphyry" as suggested by Messrs. Tyrrell and Bell, is probably the most appropriate that can be applied to the acid porphyries of the district in general, yet there are many graduations. Some types have predominating orthoclase phenocrysts, and some have predominating plagioclase phenocrysts. Probably the porphyry with predominating plagioclase phenocrysts is the most widespread. The thin sections examined by myself were made from rock selected near the ore bodies and not from other parts of the field. From hand specimens selected from different parts of the field, it appears that soda-lime plagioclase rocks predominate, but this distinction matters little apparently from the standpoint of the genesis of the deposits. The deposits are associated with a porphyritic rock having acid feldspar phenocrysts and little or no quartz, ranging from syenite porphyry on one hand to diorite-porphyry on the other.

In my article in the May 15 issue of the Journal it is stated that "many of the pebbles in the uptitled Temiskaming conglomerate are typical feldspar porphyry pebbles identical with pre-Temiskaming feldspar porphyries exposed in the Kirkland Lake District." The latter part of this sentence should read "identical with the acid feldspar porphyries as exposed in the Kirkland Lake District, which shows a period of intrusion pre-Temiskaming in age."

CHAS. SPEARMAN.

Haileybury, May 18, 1914.

MINE ACCIDENTS IN BRITISH COLUMBIA.

Inaccurate statements relative to mine fatalities in British Columbia having repeatedly been made, both on the public platform by ill-informed speakers and in printed publications, the Minister of Mines for the Province has adopted the recommendation of the Chief Inspector of Mines, Mr. Thos. Graham, that an official report of the number of fatal accidents in coal and metal mines for the province be published quarterly. Accordingly, the statement for the first quarter of 1914, compiled by Mr. Graham, has been printed and distributed. This gives the information that the reports received from district inspector of mines and from operating mining companies show that during three months ended March 31, 1914, there were 12 fatal accidents, of which 7 occurred in coal-mines and 5 in metal-mines. Comparative tables exhibit (1) the number of fatalities in each month of the quarter, with figures for the corresponding period in 1913: (2) the collieries and metal-mines, respectively, at which the fatalities occurred; and (3) a classification of the causes of the accidents that led to death.

From the first table it is gathered that the coal-mine accidents occurred in months as follows, the figures in parentheses being for 1913 and the others for 1914: In January 1 (2), February 4 (1), March 2 (4); total, 7 (7). Table 2 shows that of this year's fatalities, 3 occurred at the Canadian Pacific Railway Co.'s Hosmer colliery, one at the Crow's Nest Pass Coal Co.'s Michel colliery, two at the Cumberland (Comox) colliery of the Canadian Collieries (Dunsmuir) Limited, and one at the Western Fuel Co.'s colliery at Nanaimo. From Table 3 it is learned that causes of death were: From falls of roof and rock 2 (5), falls of coal 1, mine-cars and haulage 1 (2), suffocation in fine coal 2, and—on surface—killed by a coke-oven larry 1.

Tables relating to metal-mine fatalities show that deaths occurred in the following months: January 1 (2) and March 4 (1); total, 5 (3). Table 2 shows that there was one death at the Rambler-Cariboo mine, Slocan; 1 at the War Eagle, Rossland; 1 at Anyox, Skeena mining division; and 2 at the Jewel mine, Boundary. Table 3 gives causes of death as follows: Picking or drilling into unexploded powder 1 (1), premature blasts 2 (1), suffocation by powder fumes 1, falling into winzes, etc., 1 and falls of ground none (1).

JACKET WATER

By Geo A. Guess, Professor of Metallurgy, University of Toronto.

Very little information is available regarding the water necessary for the jackets in a modern copper blast furnace, or the amount of heat that is carried away by such water. It would be very interesting if some of those now engaged in such work would publish the figures for their particular plants. Where water is plentiful and cheap there is usually permitted to run through the jackets an excessive amount. The result is that the jackets are kept cold and a little more heat is lost from the furnace charge. The difference in the heat lost from the furnace when the jacket water is run cold and when run hot is really insignificant. Where, however, water is scarce, or the pumping an important item in the plant, the jacket water is run as hot as possible in order to cut down the water used or the pumping to be done. Economy in the use of water is difficult to enforce, as furnace men are apt to carry plenty of water in order to avoid the troubles from a boiling jacket.

Corrosion of pipes.—Jacket water may run to waste but is usually pumped back to the stock tank, from which it flows by gravity again to the jackets. If plenty of water is kept in circulation, or if a considerable amount of new water is introduced in the system, the temperature of the water may be kept down. This new water not only keeps down the temperature, but keeps down the acidity. Circulating water is bound to pick up considerable flue dust, which will contain soluble sulphates and some free sulphuric acid, and the result is that pipe lines are destroyed and pipe fitttings about the furnace, particularly nipples, are eaten through. So when new water is not available, we find the circulating water becoming acid and also hot.

Cooling towers.—In a country not troubled with frosts and where the humidity is low, the logical treatment for hot water is the cooling tower. Where the humidity is at all high, the cooling tower is, however, quite useless. Such towers are rectangular, with sloping sides, about 20 ft. high, having a sump at the bottom. The warm water is distributed from launders over its top. It may have, say, 20 storeys, the floors being of 1 in. stuff, about 4 in. wide, laid 4 in. apart. The boards are staggered so that the gap on one floor corresponds to the board above or below. Louvres protect the sides, and also permit free access of air. This free access of air is essential. and cooling towers are made narrow, to get efficiency, and long in order to get capacity. If wide, the central portion of a cooling tower does very little work. The capacity of a properly constructed cooling tower depends on:

1. The difference between the temperature of the water and the air.
2. The humidity of the air.

The capacity is conveniently expressed in B. t. u.' s per sq. ft. of wetted surface per minute.

The capacity of a cooling tower that was built too wide was found to be from 11 to 12 B. t. u.' s per minute per square ft. of upper wetted surface of slats when the difference between the air and water temperature was 30° F. and the humidity was 5 per cent.

The choosing of a site for a cooling tower is a matter of importance. In the first place it should occupy an exposed position, so that the air has free access, and its sump should be high enough to supply the furnace jackets. It should never be placed where sulphur smoke may be carried to it. If the wind carries sulphurous smoke to the tower, the falling water will become quite acid in a few hours.

The distributing launders should give a uniform distribution of water and should be provided with gates, so that their feed may be shut off and the accumulated mud and slime removed periodically.

When the jacket supply circulates with a minimum amount of new water it not only becomes acid; but will deposit in the dump of the cooling tower mud composed of fine dust, fume, ferric salts and insoluble sulphates. It will be necessary to renew the whole of the circulatory water occasionally. The dump should be accessible for cleaning on these occasions.

The most satisfactory neutralizer for jacket water acidity is sodium carbonate. The amount necessary to add may be calculated from a titration of a sample of the water. Although a small amount of arsenious acid in the water will protect iron in many cases; it does not seem to be effective in protecting pipes, etc., carrying jacket water.

The amount of heat carried away from a furnace through the jackets is not as large as might be supposed. This is due to the formation of a crust next the jacket, which will have a low heat conductivity. The hot jackets that would result when blowing in a furnace, if plenty of water were not used, is due to the absence of this crust. Some measurements taken by the writer over a month's operations showed that 4,750 ton calories per ft. of furnace length per day were lost in the water. This was for a plant smelting copper ore in the ordinary manner, with about 10 per cent. of coke on the charge. During the month 2,635 U. S. gals. per min. circulated for 8 furnaces, aggregating 111 ft. in length. In pyritic smelting, 1,490 ton calories per ft. of furnace length per day was found to be normal. The lessened heat loss is due to the thicker protecting crusts on the pyritic furnace.

INTERNATIONAL ENGINEERING CONGRESS, 1915

Among the general subjects to be treated before the International Engineering Congress, 1915, probably the one having the broadest interest is that of Materials of Engineering Construction, which enters into all phases of engineering activity.

The papers to be presented from the United States have already been arranged for from the recognized leading authorities on the various topics. Arrangements for the papers from foreign authors are being rapidly concluded, and the aggregation of papers which will be presented will constitute a broad review of the field and be of the highest value.

Marked interest in the Congress from foreign countries continues, and there is every evidence that the attendance from abroad will be large.

Full information concerning the Congress, the price of subscription, and the arrangement for purchase of volumes of the proceedings, may be obtained by addressing the Committee of Management, as follows:

International Engineering Congress, 1915.
Foxcroft Building.
San Francisco, Cal., U. S. A.

HIDDEN COAL FIELDS

By F. W. Gray.

At the annual general meeting of the Institution of Mining and Metallurgy, held on March 26th, the president of the institution, Dr. F. H. Hatch, took for his presidential address the subject, "The Relation of Geology to Mining." Dr. Hatch's remarks on concealed coal fields are of particular interest to the mining engineers of Great Britain, where remarkable discoveries of hidden coal fields have followed the application of inductive geological reasoning.

From the report of the address given in the "Iron and Coal Trades Review," the following interesting observations are abstracted:

"Specific instances, continued Dr. Hatch, of the successful application of geological knowledge to mining work can, of course, be given in abundance. In this country (Great Britain) the proving of the underground extension of the coal fields beneath the younger rocks surrounding them is of paramount importance to its industrial welfare. One of the first pieces of work in this direction resulted from the admirable mapping of the Midland coal field by Beete Jukes, a distinguished member of the Geological Survey of England and Wales. The entire correctness of his theories was demonstrated by the proving of the prolongation of the South Staffordshire coal field to the east under the fringe of overlying red rocks. Similarly, the discovery of a buried coal field in the southeast of England was the direct result of a piece of pure scientific deduction. Goldwin-Austen argued that the tectonic folds in the Paleozoic floor, by which the existence of coal basins are determined, would be traceable even when covered by a great thickness of newer rocks, because a line of disturbance, whether of faulting or folding, tends to be the locus of subsequent movement, and thus to set its mark on the newer strata. The correctness of this tectonic principle was demonstrated by the successful borings in the neighborhood of Dover, which showed that deeply buried under Mesozoic and Tertiary strata is a coal field, situated on the line connecting the seams worked in northern France and Belgium with those of South Wales and Bristol; and it appears not improbable that other coal areas might be found, if the underground geology of this line of country were systematically explored. A satisfactory feature of the discovery of buried coal fields in England is the large additions thereby made to our coal resources, as to which previous estimates had been rather pessimistic."

A line connecting the coalfields of northern France with those of Kent, the Forest of Dean and South Wales approaches very closely to London, and it does not require much imagination to see the industrial possibilities of the South of England if coal fields were to be discovered at a workable depth in a district that has London for its centre. Similar scientific deductions to those referred to by Dr. Hatch have led to the finding of buried extensions of coal fields in the Campine district of Belgium and in the Lippe Valley in Germany.

In Cape Breton Island and in New Brunswick the carboniferous appears to have been the latest formation laid down, and there does not appear to be any likelihood of the discovery of concealed coal fields, because of the absence of formations younger than the carboniferous. But in the Pictou and Cumberland counties there is a possibility of finding the coal measures under a mantle of younger strata. The possible occurrence of a coal area beneath the Neo-Carboniferous or Permian strata of Pictou county was discussed in a paper read before the Canadian Mining Institute by Dr. H. M. Ami, who set forth the extreme probability of a possible coal field "beneath the newer outlying series, and in the inclined beds below" in that portion of Pictou county north of the "North Fault." The greatest development of younger rocks under which there is a probability of the presence of coal seams is in Cumberland county. The tract of country bordered by Chignecto Bay on the west, having the Joggins mines at one extremity and the mouth of the Apple River at the other, and bounded by the Cobequid Hills on the east, running from Apple river to Halfway river, thence to Springhill Mines and back to the Joggins Mines, is covered by strata younger than the Carboniferous, and this district affords greater possibilities in the way of concealed coal seams than any other part of Nova Scotia.

Prince Edward Island should by all geological reasoning contain coal seams, but whether these seams are present at a workable depth will depend on the existence of folds in the presumably concealed Carboniferous formation. In a borehole, which was put down near Miminegash, at the extreme western end of the Island, the depth of the red Permian beds was only 950 ft., the remaining 710 ft. being in the lower grey beds of the Permo-Carboniferous. This borehole was most unfortunately lost before the Carboniferous rocks had been tested, but sufficient evidence was obtained to prove the very interesting field Prince Edward Island presents for just such geological deduction as has led to the discovery of hidden coal fields in such old world districts as Kent and the Belgian Campine.

In commenting on Dr. Hatch's address, the "Colliery Guardian" editorially remarks: "Whatever may be the theoretical arguments in favor of a concealed coal field, the borehole must necessarily become a final test, but without the aid of tectonic geology no borehole evidence can be properly and fully interpreted." It is to be deplored that the Miminegash boring was so inconclusive in demonstrating whether the productive measures of the Carboniferous are to be found under Prince Edward Island or not, but whatever evidence was obtained pointed rather to the probability of the presence of the productive measures than otherwise. Enough has been cited, however, to point out that all the possibilities of the Maritime Provinces in the matter of coal fields have not been exhausted.

CANADIAN OIL FIELDS.

There are comparatively few important oil producing districts in Canada. The principal production is from Southwestern Ontario between Lake Huron and Lake Erie. Lambton, Kent and Brant counties yield large quantities.

Some oil is produced in the district south of Moncton, New Brunswick.

PETERSON LAKE.

The first dividend on Peterson Lake is payable June 15th to stock on record May 15th, Dividends of 1¾ per cent. will be paid quarterly.

CALUMET AND HECLA REGRINDING PLANT

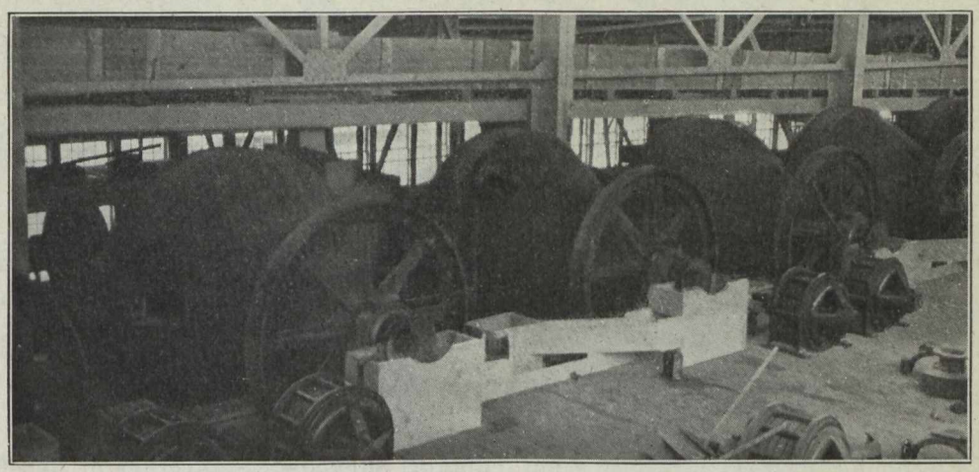
During the many years of operation of the Calumet & Hecla stamp mills, there has accumulated an enormous tonnage of tailings, which it is now proposed to retreat. A few years ago it was estimated that the 30,000,000 tons of sand could be profitably treated to yield about 150,000,000 lb. of copper. It is now estimated that a considerably larger recovery can be profitably made by a combined concentration and leaching process. The concentration will be effected on Wilfley tables after regrinding of the sands in Hardinge pebble mills. The leaching process devised has not yet been made public.

The recrushing process has been satisfactorily demonstrated and a large plant has been recently erected and will soon be in operation. To raise the sands from the lake a steel dredge has been built. Centrifugal pumps will be used to raise the sand and deliver it at a "shore plant." Thence, after draining, the sand will be elevated on a belt conveyor to the regrinding plant.

This plant is housed in a steel building 123 by 432 ft. in size. On the upper floor are, or will be, 64 Hardinge conical pebble. On the lower floor are the Wilfley tables.

The mills being installed are 8 ft. in diameter and have a cylindrical length of 18 in. Various lengths of cylinder have been tried in and the short cylinder, after long trial, was selected as the most economical. Each mill is driven direct by a separate motor.

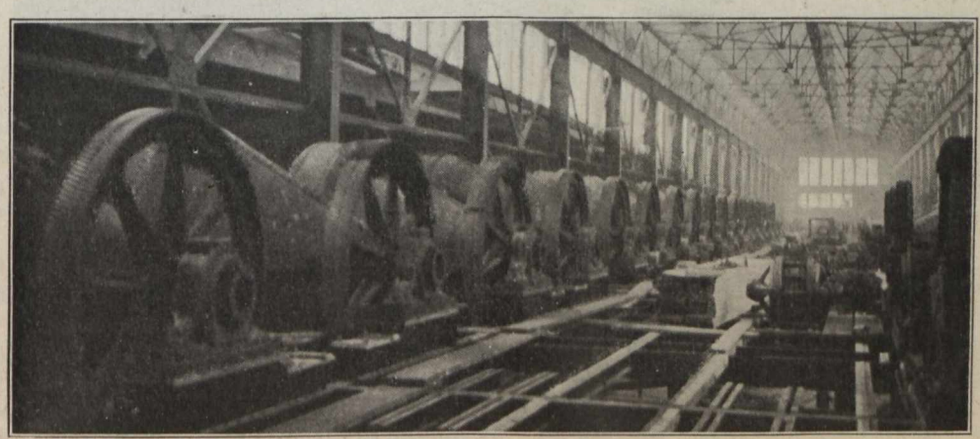
The accompanying photographs show general view of the regrinding floor as it appeared in January and a view of a completed section as it appeared in April. The second photograph shows the discharge end of the mills, the launders, and the individual motors which drive the mills.



Hardinge Mills in Calumet and Hecla Regrinding Plant

In addition to the Wilfley tables on which the reground material is treated, the building houses several Wilfley tables which will be used to treat the fine material separated from the coarser sand in settling boxes at the shore plant.

Assuming a recovery of 5 lb. copper per ton at a profit of 5 cents per pound, the profit from the treatment of the Calumet and Hecla sands by regrinding and concentration should be $7,500,000. A further large profit will be obtained by the leaching process if it proves as successful as the experiments indicate.

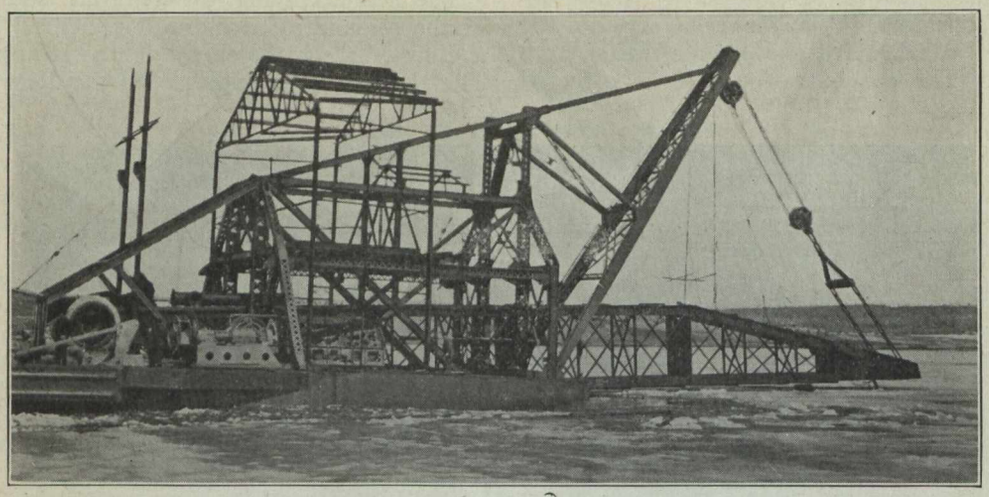


Calumet and Hecla Regrinding Plant, Lake Linden, Mich.

THE TRAINING OF MINING GEOLOGISTS IN GREAT BRITAIN.

Sir Thomas H. Holland, in an address dealing with the university training of mining men, says in reference to the mining geologist:

"While the training of the mine manager should be about three-parts of purely technical methods supplemented by about one part of scientific principles, in the education of the mining geologist the ratio of these ingredients should be inverted. One is a technical man; the other is a technologist. One is trained mainly at the mine, supplemented by out-of-shift classes; the other may be educated at the university, and obtain a smaller practical experience at more than one class of mine. The mining geologist need not be able to handle as an expert every form of machinery at a mine; but he should know enough of the methods of mining to know how to direct his prospecting operations in an undeveloped area in such a way as to take into account the conditions that may or may not make subsequent mining operations possible. His experience of mining methods would be more general and less intensive than that of the man trained to be a manager, while his knowledge of economic mineralogy would naturally be wider than that of the manager who handles but one or two kinds of products. He would bridge the embarrassing gap that now exists between our purely academic geologists and our technically trained miners. For the training of this class little has so far been accomplished by British Universities; but it is the out-turn of men approximately of the kind just defined that has mainly made the good name of the Royal School of Mines."



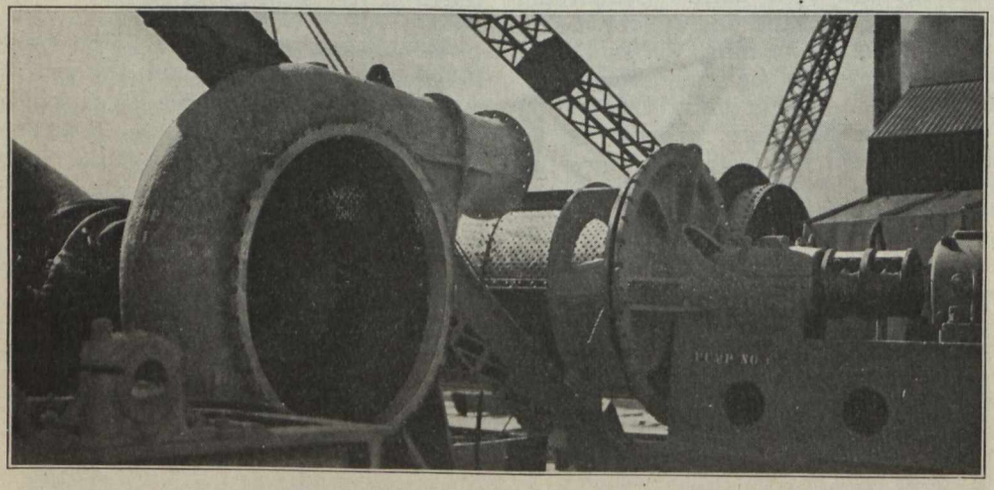
Dredge No, 1. Calumet and Hecla Mining Co.

HOLLINGER.

Gross profits of Hollinger Gold Mines for the four weeks ending April 22nd 1914 amounted to $123,523,-15, $9,305.63 was expended on plant. Working costs totaled $61,660.48, an average of $4,349 per ton of ore milled. Mr. A. R. Globe, assistant general manager, reports as follows: "The average value of ore hoisted was $13.69. Waste rock from development amounting to 1,364 tons was hoisted, bringing the total of ore and waste up to 16,387 tons. The mill ran 93% of the possible running time, treating 15,191 tons, of which 1,013 tons were treated for the Acme Gold Mines, Limited.

"The average value of Hollinger ore treated was $13.69 per ton; approximate extraction was 95.1%. Milling costs were $1,083 per ton.

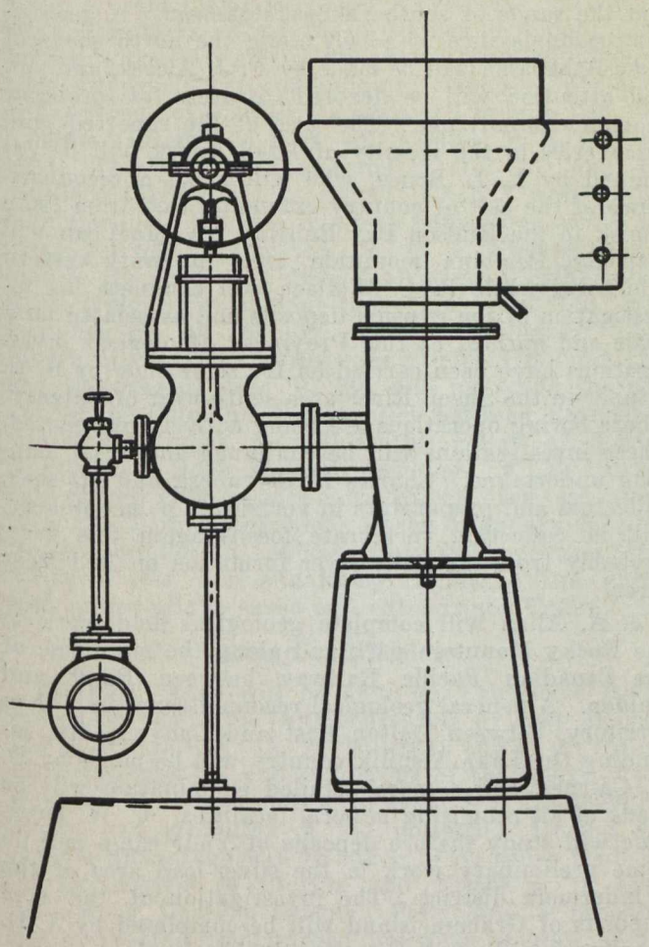
Work in the mine continues to yield satisfactory results. By means of diamond drilling on the 100-feet level No. 13 and No. 36 veins were located, showing a medium grade of ore, six and seven feet in width respectively. The 550 feet level has been sufficiently developed to permit sinking on No. 8 winze which is being sunk to the 675 feet level.



Centrifugal Pump, Dredge No. 1. Calumet and Hecla Mining Co,

THE SHIELDS & THIELMANN JIG

A machine has been designed at the Quincy stamp mills, Michigan, that tends to revolutionize the treatment of the so-called roughing floor material. It has been in successful operation for eight months, and the results have been better than was expected. The machine takes up a space of about 12 ft. by 4 ft. and has a capacity of 500 tons.



THE SHIELDS & THIELMANN JIG

The machine is called a sectional positive jig Classifier. It is made up of a number of sections, which are divided into pockets of 6 by 12 in. and 12 by 12 in. in size, each having a positive plunger, and an independent adjustable stroke ranging from 2½ in. to 0.

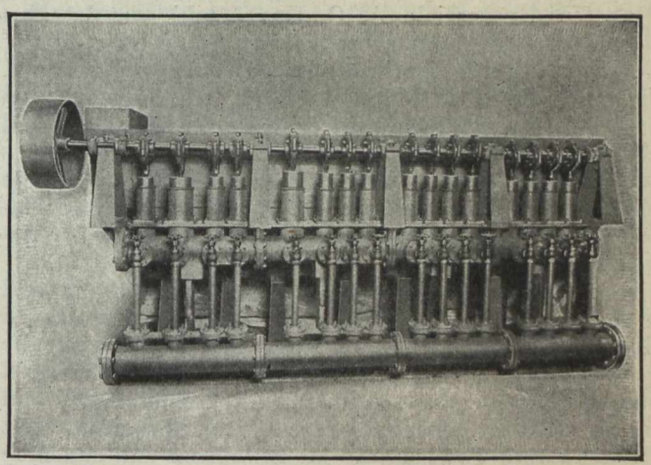
This is very essential as to the treatment of the different sizes of material, ranging from ⅝ in. to 100 mesh. The plungers are all made of brass, and each plunger carries an oil bath inside submerging the pin on the plunger at all times in a bath of oil. The plunger casings are made of cast iron, and are independent of each other, and can easily be removed or replaced.

The sections are lined with a cast iron box to protect the sections proper from wear and at the same time they conform as to shape with the partitions in the hutch pockets. Each pocket has a plug of its own, and the material from each pocket is discharged independently.

At the Quincy mill the feed that enters the jig comes direct from the stamp and is an unsized feed from ⅝ in. down to slime product. The heavy ⅝ in. copper, ½ in. copper and a large portion of the ⅜ in. copper and under is discharged from plugs Nos. 1, 2 and 3 above the sieve. The hutch copper, which ranges from ⅜ in. down to table copper, is discharged through the sieve into the hutch of section No. 1 as clean concentrates. Clean concentrates are discharged also from the second section into the hutch.

The very fine slimes, containing the very fine copper, are held in suspension and discharged at the tail end of the machine in the form of slime ranging from 80 to 100 mesh.

The amount of copper taken out by this machine is 70 per cent. of the total copper from the stamp head. This product will assay 80 to 95 per cent. copper. The amount of ⅝ in. gravel taken out by this machine is 125 tons per 24 hours, which is taken out of plugs Nos. 4 and 5, which replace the trommel screens. The amount of middlings taken out to be ground is 100 tons, which is taken out of plugs Nos. 9 and 10. Plugs 6, 7 and 8 are left blank to accumulate concentrates, which may be drawn off when necessary. Rich middlings accumulate in the second section.



The third section discharges material from the sieve. This requires only a table treatment, as the material is too poor to grind. The material, however, from the Nos. 3 and 4 sections is all classified, ranging from ⅛ in. to 40 mesh, and amounts to about 150 tons, classified into eight different products. The hutch product is enriched from Nos. 3 and 4 sections and makes an ideal table product, no further treatment being necessary. This hutch product amounts to about 50 tons per 24 hours.

Among the advantages claimed for the machine are: It has an adjustable sieve for deepening or lessening the bed. It has an independent motion for every pocket. It has an independent water supply for every pocket. The motion is positive at all times, and does away with ponderous sieve frames, plunger boards, sieve wire, power space, etc. It is a concentrating mill by itself, and handles from 450 to 500 tons per 24 hours.

DOME LAKE.

A by-law providing for a new issue of 100,000 shares of stock to be sold at 50 cents was introduced at a recent meeting of the Dome Lake directors. It is understood that the money raised will be used in installing a cyanide plant and in carrying on development work.

FIELD WORK OF THE GEOLOGICAL SURVEY DURING 1914

Geology.

Under the direction of O. E. LeRoy, who is in charge of field work in geology, a large number of parties will be carrying on detailed geological investigations, reconnaissance and exploratory work throughout the country.

The examination and areal mapping of the gold-bearing series of Nova Scotia as developed in portions of Queens and Shelburne counties will be continued by E. R. Faribault. W. A. Bell will complete the investigation and areal mapping of the Windsor and Horton series in the vicinity of Windsor, Nova Scotia and a palaeontological study of the Windsor and Point Edward series between St. Ann Harbor and Glace Bay, will be carried on by J. E. Hyde. J. W. Goldthwait will continue a physiographical survey of Nova Scotia, giving particular attention to problems arising from glaciation. F. H. McLearn will complete a field study of the Silurian system at Arisaig.

In New Brunswick, A. O. Hayes will complete his work in the St. John area, making a special study of materials suitable for building stone and road metal. The mapping of the Moncton area will be completed by W. J. Wright, who will investigate the geological relations of the oil shales and make a study of the gas and oil fields. Palaeontological investigations will be conducted in the Maritime Provinces, Quebec and Ontario by E. M. Kindle, and in Quebec and New Brunswick by L. D. Burling.

In Quebec both exploratory and detailed work will be carried on. H. C. Cooke will explore Broadback river from Evans lake to James bay, including the route between Evans and Gull lakes. R. Harvie will complete a geological section across Brome county and make a general reconnaissance of the serpentine belt of the Eastern Townships. M. E. Wilson will continue the study of the geology of the Buckingham district, giving special attention to the deposits of graphite, apatite and mica. The geology of Mount Royal tunnel will be further studied by J. A. Bancroft. The economic possibilities of the granites of the south-eastern part of the Eastern Townships will be investigated by A. Mailhiot and a geological reconnaissance of a part of the Harricanaw basin will be made by T. L. Tanton.

In Ontario an examination will be made of the iron deposits of the township of Lount by W. H. Collins, who will also make a study of the Pre-Cambrian formations between Sudbury and Lake Huron. W. A. Johnston will complete the mapping of the Lake Simcoe district and of the calcareous drift areas between Rainy lake and Lake of the Woods. J. Keele and N. B. Davies will carry on investigations of the clay and shale deposits of Ontario with relation to the industries based upon these. The investigation of materials suitable for road metal will be in charge of L. Reinecke, who will confine his attention this year principally to occurrences in Ontario and Quebec. M. Y. Williams will continue a study of the Silurian rocks of south-western Ontario, giving special attention to those formations important in the manufacture of cement, lime, building stone and road metal. Certain mineral areas of Ontario, Quebec and the Maritime Provinces will be examined by S. Brunton and C. W. Robinson, and search will be made for radio-active minerals.

Exploratory reconnaissance and detailed work will be conducted in the prairie Provinces. C. Camsell will make an exploratory geological traverse between Black bay on Lake Athabaska and Christie bay on Great Slave lake. D. B. Dowling will make general examinations of the coal deposits of western Canada, while B. Rose will study the coal deposits, the clays and the sands of southern Saskatchewan. A geological reconnaissance of a belt along the north shore of Lake Athabaska will be made by F. J. Alcock, and special attention will be devoted to areas of probable economic importance. The area of the reported gold discoveries in the vicinity of Lake Amisk will be examined by E. L. Bruce, who will make a reconnaissance of the belt of country extending east from Lake Amisk to the Hudson Bay Railway. A. MacLean will map the Pembina mountain area in south-western Manitoba, while R. C. Wallace will complete his investigation of the gypsum deposits and associated minerals and springs of this Province. Geological investigations have been carried on for some time by S. E. Slipper in the Sheep River area south-west of Calgary, where boring operations are being actively prosecuted. These investigations will be continued and areal mapping undertaken. Charles H. Sternberg and his sons, collectors and preparators in vertebrate palaeontology, will be collecting vertebrate fossils again this year, probably from the Belly river formation on Red Deer river.

J. A. Allan will complete geological field work in the Rocky Mountain park and along the main line of the Canadian Pacific Railway between Banff and Golden. A general geological reconnaissance in Yukon territory, between Dalton Post and Canyon City, including the Lake Aishilik country will be made by D. D. Cairnes, and a more detailed examination will be made of all promising mineral localities. C. W. Drysdale will study the ore deposits of Ymir camp and do some preliminary work in the silver-lead area of the Windermere district. The investigation of the coal deposits of Graham island will be completed by J. D. MacKenzie, who will also map the Flathead coal basin. R. G. McConnell will be engaged in mapping and conducting geological investigations along the Grand Trunk Pacific Railway in the Hazelton-Aldermere district. A detailed examination of the Mesozoic formations along the Crowsnest branch of the Canadian Pacific Railway will be made by F. H. MacLearn. S. J. Schofield will complete the mapping of the area between the Cranbrook map and Kootenay lake, and will study the silver-lead ore bodies at Ainsworth and the recently discovered tin deposit in the Lardeau district. J. S. Stewart will map the coal-bearing formations comprised in the Flathead and Crowsnest map sheets.

Topography.

Under the direction of W. H. Boyd, chief topographer, topographical mapping will be carried on at various points throughout the country.

Certain pieces of work that were initiated last year will be carried to completion. These are the New Glasgow map sheet, by B. R. MacKay, on a scale of 2,000 ft. to 1 in. and a contour interval of 10 ft.; the Thetford map sheet, by D. A. Nichols, on a scale of 1 mile to 1 in. and a contour interval of 20 ft.; and the Flathead sheet, by A. C. T. Sheppard. S. C. McLean

will complete the Similkameen triangulation via Okanagan lake to the Railway Belt triangulation by the Department of the Interior. This gives the first triangulation connection between the International boundary and the main line of the Canadian Pacific Railway, and furnishes the control for surveys in the Similkameen and Okanagan districts.

Considerable new topographic work is being undertaken. A control traverse is being run by S. C. McLean in southern Nova Scotia. A. G. Haultain will make a transit and micrometer eye-piece survey of Lake Athabaska on a scale of 4 miles to 1 inch. This survey will serve as the hub control for all exploratory surveys in the surrounding country. Mapping of the Sheep river area on a scale of 1 mile to 1 in. and a contour interval of 10 ft. will be done by E. E. Freeland. This includes townships 19 and 20, and the southern third of 21 in ranges 2 and 3 west of the fifth meridian, the area in which boring operations are being actively prosecuted. A. C. T. Sheppard will map in the Crowsnest district an area of 1,500 square miles lying between longitudes 114° and 115° and latitudes 49° 30′ and 50°. The mapping of 1,500 square miles lying between longitudes 118° and 119° and latitudes 51° and 51° 30′, and including the portion of the Columbia River valley between Revelstoke and Downie creek, as well as the valley of Jordan river will be done by F. S. Falconer. W. E. Lawson will survey 1,000 square miles of an area extending from the British Columbia Alaska boundary in a direction parallel to Chilkat river and embracing the valley of this river and Rainy Hollow. The northeast corner of the sheet will extend into Yukon.

Botany and Zoology.

Botanical work will be done on Vancouver Island and on islands in the Gulf of Georgia by John Macoun and J. M. Macoun. P. A. Taverner and C. H. Young will study the life and conditions of the fauna of the Maritime Provinces and make collections for scientific studies and exhibition in the museum. During the summer advantage will be taken of an order made by the Department of Marine and Fisheries, to scale Perce-Rock, Gaspe peninsula. Perce-Rock is probably one of the few undisturbed breeding grounds of the gannet in America, and there is no authentic record that this rock has ever been scaled. Francis Harper will accompany an exploratory expedition into the country between Athabaska and Great Slave lakes under the leadership of C. Camsell. This will be a new field for zoological study. C. L. Patch will do some collecting in the vicinity of Ottawa.

Anthropology and Archaeology.

The field parties of this division will be widely distributed throughout the country. E. Sapir, the chief anthropologist, C. M. Barbeau and F. W. Waugh will in addition to completing certain reports, attending to office routine and museum work, make occasional field trips. Field work will be conducted among the Ojibways of Ontario and Manitoba, the Sioux of Manitoba, the Iroquois of Ontario and Quebec by Paul Radin, W. D. Wallis and F. H. J. Knowles respectively. A. A. Goldenweiser will carry on work among the Iroquois of Ontario, and E. W. Hawkes among the Eskimos of Labrador. A study will probably be made of the Micmacs of the Maritime Provinces by W. H. Mechling, while J. A. Teit will carry on work among the Interior Salish and Northern Athapaskan of British Columbia.

Harlan I. Smith, archaeologist, will carry on intensive exploration in the shell-heaps of Merigomish, Nova Scotia, where important results are anticipated, especially since the country lying around the Gulf of St. Lawrence was formerly inhabited by no less than four totally different peoples. W. B. Nickerson will continue explorations in the mounds, earth works and village sites of south-western Manitoba, and W. J. Wintemberg will explore a section of country between Prescott and Peterborough for a site of a culture different from that of more easterly parts of Ontario.

PETERSON LAKE ANNUAL REPORT

The eighth annual report of the Peterson Lake Silver Cobalt Mining Company, covering the financial year ending April 30th, 1914, is the most satisfactory yet presented. The company made a profit of $167,377.76 during the year. The cash balance on hand is $209,-24555, and the balance of assets is $246,938.20.

Income from royalties during the year amounted to $181,824.89. Ore bagged is estimated at $18,000. Interest and rent brought in $7,541.39.

Expenditures included: Mining and supplies, $15,-691.87; power and light, $5,259.49; depreciation written off, $11,663.99; other expenses, $7,373.17.

Mr. R. B. Lamb, consulting engineer says of the vein discovered at No. 2 shaft in January:

"The work of re-equipping and unwatering No. 2 shaft was commenced December 1st, 1913, and actual development work started January 21st, 1914. Both surface and underground equipment is adequate for the present. Later on it may be advisable to enlarge the rock house and install additional dressing machinery in order to recover the silver in the fines from the bumping table. The cost of equipping this property was $5,645.00, for hoist, pumps, drills and drill steel, pipe and fittings, cars, tracks, cage, ore scales, etc., including also the erection of a new change and ore storage house. In addition to unwatering and cleaning up the mine, installing necessary pumps, water and air pipes, new guides in the shaft, track, switches and otherwise putting the mine into proper working condition, the station at the 200 ft. level has been widened and double-tracked to facilitate handling the cars: suitable ventilating pipes carried to all headings and electric lights installed on the station and at switches along the main crosscut. A concrete dam has been built in front of the winze from the 200 to the 300 ft. level, the hoist chamber enlarged and winze re-timbered part of the way, thus putting it into proper order to resume work on the third level at short notice.

"When the company commenced work on the No. 7 vein, the upper part of the drift was in conglomerate. After seventeen feet of driving an oreshoot was encountered on January 31st. The first sample assayed 69 oz. silver. After the next round it assayed 141 oz., and after the succeeding round 1,506 oz. The average is over 1,300 oz. The first thirty feet of driving on the vein was in the conglomerate-Keewatin contact. This indicates that the contact is somewhat flatter than was expected. Twenty feet after striking the oreshoot the vein split. The branch which continued along the original strike carried silver in niccolite for twenty-one feet. The vein was followed for fourteen feet beyond the point where the values ceased when a water seam was cut and the vein disappeared. The other branch turned south and it is from this portion that the greater part of the ore has been mined to date. The ore proved to be 110 ft. long in the drift.

"The vein is irregular as to width and values; sometimes two or three stringers half an inch to an inch in width showing; at other points a solid vein of one and a half inches to three and a half inches wide is found. The principal mineral along this branch is smaltite, although niccolite stringers have frequently been encountered crossing the smaltite vein. In drifting, three mineralized cross stringers were cut. These were at twenty-two feet, forty-eight feet and fifty-six feet, respectively, from the split in the main vein. The first and third were followed as far as the mineralization persisted; the first to the east for twelve feet and the third ten feet to the east and fourteen feet to the west. Drifting will be continued on this stringer west. Where the third stringer crosses the vein we are now sinking a winze.

"The main vein was stoped an average height of twelve feet for a length of 120 ft., making 1,440 square ft. stoped on the vein. The ore in the stope has been patchy. We may be near the top of the shoot. The best ore is in the drift under foot. The stope has produced 25 tons of ore of an estimated value of 1,300 oz. per ton, and 2 tons of an assay value of 200 oz.

"On April 28th we encountered a second oreshoot in No. 7 Drift, 35 ft. south of the shoot just described. The vein is regular and an average of two inches wide. Too little development has been done to say more about it."

RUSSIAN ASBESTOS.

While the Canadian production of asbestos seems to grow steadily at an almost equal pace, the production of the Russian production in lagging behind its regular rate of increase. Last year's production in the Urals was 1.033.003 poods as against 1.007,679 poods in the year 1912. There is a hesitancy on the part of the Russian producers of asbestos and it is difficult to see the cause for this. The Canadian asbestos is in good demand and judging from reliable information it appears that the Canadian producers hesitate to contract for the delivery of large orders as prices are gradually upwards. Some years ago it was predicted that the Russian on account of its lower production costs would gradually replace the Canadian variety but it seems now pretty well established that the latter is far superior for the manufacture of certain articles than the Russian.

The production of Russian asbestos has steadily increased since 1889. From monograph of Asbestos, its occurrence, mining, milling and uses by Mr. Fritz Cirkel, as the following table will show:—

1889:—	1,850	poods
1893 —	64,654	poods
1899 —	164,430	poods
1906 —	494,680	poods
1908 —	9,500	tons (gross)
1912:—	1,007,679	poods=28,000 tons
1913 —	1,033,003	poods=28,700 tons

(1 pood=36 pounds)

GRANBY.

Granby directors have declared the regular quarterly dividend of $1.50 to be paid June 15 to stockholders on record May 29.

OIL DISCOVERED AT GREAT DEPTH IN ALBERTA

Calgary, Alta., May 16.—Calgary is in the throes of an oil fever. Speculation in oil leases and shares reached a tremendous pitch last night and the only topic of conversation continues to be on the oil strike. The scene at the well was one never to be forgotten. From early morning till after dusk a constant stream of automobiles kept arriving and leaving and it is estimated that over 5,000 people visited the scene of the discovery yesterday.

During the forenoon the well became an intermittent gusher. This was caused by the oil rising inside the bore to a certain height when it was expelled with great violence by gas pressure. The result was that spouts of the highest grade oil were thrown 50 to 60 feet in the air. The casing was capped for a time until a supply of barrels and tanks could be procured from Calgary. On removing the cap the oil again spouted about sixty feet, then subsided and the operators managed to suppress the spouting by constant baling. This, however, failed to reduce the level of oil below a certain height and there always was a depth of 1,760 feet standing in the eight inch casing.

The following analysis was made yesterday by the Kelso Laboratories, of this city: "The oil encountered is 65 degrees baume. Evidently exceptionally high gasoline, containing lighter petroleum ethers, etc. paraffine base. Slightly lower gravity than first oil discovered, which was 62.5 degrees. This oil probably much the same, though there may be more petroleum there and also more kerosene. Oil contains large volume of dissolved gas while original contained very little."

Nearly all the prominent local business men and financiers were at the scene of the discovery throughout the afternoon and everyone expressed the greatest enthusiasm and confidence in the future of the field. W. S. Herron, pioneer of the Alberta oil fields, and owner of one-quarter of the entire section in the Calgary Petroleum Products Company, owners of "Discovery" well, was naturally elated when interviewed this evening. He was standing watching the operations. Oil was being brought up by the baler as quickly as machinery could be worked. Congratulations were being showered upon him that his assertion had been proved, and nature forced to yield up her liquid wealth.

"This is only the beginning," he said, "and I firmly believe that similar wells will be found along this anticline to the south for 20 miles, as I have found similar gas escapes there to that which I discovered on the right of this well. On the same anticline running northwest I have no doubt that oil will also be found for even as great a distance. The oil is remarkable for its high quality and this indicates that it is coming from an immense reservoir of the cruder or heavier oil further down the slopes of the anticline and at a greater depth. As a matter of fact, the drill has merely touched the oil producing sands and I think that if the sands were penetrated a few feet the production would be greatly increased."

"Discovery" well is located on the northwest quarter of section six, township twenty, range two, west of the fifth meridian. There are now eight drills in operation in close proximity to the well and further developments may reveal themselves at any moment —Journal of Commerce.

PROGRESS IN NOVA SCOTIA MINING INDUSTRY IN 1913

By F. H. Sexton.

The present time may occasion some anxiety as to the markets of the immediate future, but none can deny that the year that has passed was a most prosperous one. According to the report of the Provincial Department of Works and Mines, the number of long tons of coal produced in Nova Scotia reached the grand total of 7,200,000. This is the high water mark so far in the history of coal mining in this province. The production exceeded that of 1912 by 400,000 tons, equivalent to an increase of 6 per cent. The coal output in 1913 exceeds that of a decade ago by nearly 2,000,000 tons, equivalent to an increase of nearly 40 per cent.

There are two regretted features in the mining industry of the province during the year that has passed. I refer to the recession in the gold production, and to the increase in the number of fatalities in the coal mines. The value of the gold won last year has dropped to one third of what it was in the first year, for which we have official returns, viz.,—1862. The reasons for this condition are not as clear as might be wished. We have an enormous area of gold bearing measures, nearly five thousand square miles. Much of this ground is virgin at the present time. From the beginning of gold mining in Nova Scotia in 1862, to the present time, over 2,000,000 tons of rock has been crushed, yielding over 915,000 ounces of the precious metal, an average of about $9.00 per ton in value. Many large mines in the world have a long and profitable history where the amount of gold per ton extracted is less than a third of the average value of our ore. Our prospectors and miners are noted for their hardiness, intelligence, and ability, and have been placed in responsible and lucrative positions wherever they may have wandered away from their native province. The gold is easily extracted from our ores by the simple process of amalgamation. Our gold bearing districts, except in few instances, have never been prospected with even a small portion of the thoroughness of great areas of barren country in Ontario. It is common knowledge among our prospectors, that many trails of golden boulders in the glacial drift have never been followed to the rich leads from which the ore was torn.

A great portion of our prospectors and gold miners have followed the lure of distant fields, and are now in Cobalt, Porcupine, or other great silver and gold camps. One great successful mine attracts capital as honey draws flies, and we must admit that we have never had a gold mine whose name has become world-famous. Our gold veins are usually comparatively narrow where valuable ore shoots occur. The shoots themselves, although persisting in some cases to a depth of 1,000 ft., are often short along the strike of the vein. All the diagnosticians of the present depression in gold mining are not unanimous in their conclusions, nor do all propose the same remedies. Some say that a new era of prosperity will dawn with the advent of cheap power, some assert that drastic changes must be forthcoming in legislation concerning mineral leases, some maintain that provincial subsidies for development are essential, others declare that efficient management, and the application of the newer developments in mining machinery and metallurgical processes will solve the problem. It would seem that the whole question was in a state where it could profit by the intelligent study of a competent commission.

The case is not hopeless, and the future is not altogether gloomy. There is a general conviction among our gold miners that the most profitable form of exploitation of our gold deposits will be on a modest scale with a small company. The idea of treating vast low grade deposits in Nova Scotia on a huge scale has almost disappeared. There is a belief that there are many opportunities for handsome profits for the small company which will find the ore shoots and stick to them, if it is economically and efficiently managed. There is a much larger number of such enterprises entering upon extensive operations at the present time than there was a few months ago. The Halifax and Eastern Railway will improve the transportation facilities in a large gold-bearing district which it penetrates. A number of mine managers and miners have returned to the province from other mining camps, convinced that the possibilities in gold mining at home are quite as good as in many other places of much more general repute. Altogether, the outlook for a sane development of our potentialities in this branch of industry, is distinctly encouraging.

Of the increase in fatalities in our coal mines, I will have little to say, because a number of gentlemen, more competent to discuss this, will take up the matter fully in papers which they have prepared on this subject. Most of the accidents were individual cases, i.e., there was no explosion of gas or other serious calamity which involved the death of more than one person. It is perhaps noteworthy that nearly one half of the fatalities occurred to men who were not of Anglo-Saxon extraction. There was a larger percentage of deaths in the mine among those of Latin origin in comparison with the number employed, than among natives and British-born.

I wish to call attention to the fact that our vast riches in non-metallic deposits, such as gypsum, clays, barytes, limestone, and silica, are receiving more attention than has heretofore been the case. We have exported most of these products in the crude state, but with each succeeding year progress is made in erecting plants to convert these materials into various manufactured articles. Our rich heritage in deposits of limestones, gypsum, barytes, etc., will some day form the basis of an immense, staple and profitable industry. Speed the day when this consummation is manifest.

Last summer we were favored by a visit from many distinguished foreigners, who came to Nova Scotia on an excursion of the International Geological Congress. The arrangements of the trip to the Maritime Provinces had been exhaustively planned by the Canadian Geological Survey, so that everything slipped along to the casual observer like a smooth-working automatic machine responding to the plans of its inventor. We were delighted to entertain the visitors, and trust that their memories of this excursion be only half as pleasant as our own. We wish to commend Mr. Brock and his assistants for the truly admirable manner in which the whole affair was conducted, and especially for the wealth and utility of information of the guide books applying to this part of the country, which should be of great value for a long time to come.

Extracts from presidential address, Nova Scotia Mining Society, April 15, 1914.

We all welcome the recent humanitarian invasion of industry. Of course, the economical phase of a "safety first" movement is evident to any on-looker. But I am glad to believe that the root of this spirit is humanitarian and Christian rather than financial. No man, not even the driver or the trapper, would exchange his life for 150,000 tons of coal, which is about the toll that was taken last year. Absentee directors and stockholders are becoming, or have become, convinced that superintendents and managers of coal mines should not be submitted to such pressure for high production and low cost, as to neglect any safeguard which will preserve the safety and well-being of those who toil below ground. There is a fine spirit abroad, that even those who have only a financial interest in the mining industry are the trustees of the human welfare of those who assist with labor in profitably exploiting our mineral deposits. The great expansion in various efforts of mining corporations in safety devices, improved hygiene, profit-sharing, hospitals, wash houses, libraries, mine rescue apparatus first aid instruction, benefit associations, pensions, improved housing, education, and recreation facilities, are manifestations of the fundamental spirit of christian civilization expressed in the phrase "I am my brother's keeper."

I cannot let this occasion pass without making some slight reference to the gallant conduct of inspectors, mine officials, and miners in several trying underground fires during the past year.

The golden age of heroism and chivalry is not gone. The world is just as rich in courage as ever it was. The fine spirit remains, only the manner and conditions under which it blossoms are transformed. This was exemplified several times last year, when our men were called upon to fight fires underground. Here amidst huge volumes of smoke and poisonous gases, burning coal, and red hot rocks encased in oxygen helmets, and cooled by streams of water from a rear guard in similar helmets, ever in danger of an insidious unseen foe which might blow them to perdition at any moment they fought day and night to save the property of their company, to safeguard their means of livelihood, and to preserve one of the heritages of our people. We cannot accord such valor too high an honor.

SLOCAN.

From the time work was resumed at the Rambler-Cariboo mine and concentrating mill late in April until the middle of May, there have been shipped to the smelting works at Trail two cars of silver-lead crude ore and two cars of concentrate. One car of zinc concentrate is at the mill ready for shipment to Bartlesville, Oklahoma. About 45 men are employed at mine and mill; it is expected that shortly more men may be employed to advantage.

Repairs and improvements to the wagon road from near Cody to Sandon have been commenced in preparation for ore-hauling by teams. Ore from the Surprise Mine is being sent down by aerial tramway to the wagon road, whence four-horse teams will take it to the railway terminus at Sandon. Beside the silver-lead ore, which is shipped to Trail for reduction, there is zinc ore in both the Surprise and Noble Five group mines, near Cody. Nearer Sandon are the Slocan Star, Ruth-Hope group, and Richmond-Eureka group, all of which will ship ore. Now that the roads down to the railway are clear of snow, hauling from the Star and Hope can be resumed. The Richmond-Eureka has aerial tramway connection between mine and railway. Developments in the long low-level tunnel in the Payne property are reported to be encouraging, for while the ore lately found at considerable depth is as yet only in very small quantity, it has a high value in silver.

OIL DRILLERS BUSY.

Calgary, May 22.—In addition to "Discovery" well, which is located on section 6, township 20, range 2, west of the fifth meridian, where the oil strike was made last Thursday night, there are no less than eight wells drilling in the same locality.

The great rush of people eager to purchase shares in these companies at prices ranging from par to 500 above, has furnished the necessary capital in astonishing rapidity and drilling will be conducted with feverish activity from now on. Other wells have been located and within three months the whole strip of land will be dotted with derricks. For the information of those interested in oil developments the following will prove of interest.

Depth of Wells Now Drilling.

West of the Fifth Meridian.

Company.	Depth.
Calgary Petroleum (Discovery)	2,718 ft.
McDougall Segur Exploration	2,402 ft.
Black Diamond Oil Fields	1,575 ft.
United Oils, Ltd.	1,282 ft.
British Alberta	1,000 ft.
Western Pacific	300 ft.
Southern Alberta	800 ft.
West of the Fourth Meridian.	
Federal Oil & Gas, Corporation	482 ft.
Monarch Oil Company, west of Olds	200 ft.

THE ANGLO-FRENCH EXPLORATION CO.

The Anglo-French Exploration Company, Limited, capitalized at £15,000,000 and possessing assets of £1,028,660 in the form of holdings of stocks, shares and debentures, has issued its report for the year 1913. Of the thirty-three principal companies in which interests are held, twenty-seven paid or declared dividends during the year. Railway and mining company stocks, shares and debentures are the principal holdings.

In Canada the company's chief asset is 20,000 shares of Hollinger Gold Mines, Limited.

The directors of the Anglo-French Exploration Company are F. A. Robinson, Wm. Frechville, Ernest G. Mocatta, Louis Ochs, Edward Wagg, Wm. Henderson Clark, and W. Dalrymple.

Geo. R. Airth is manager in London, J. A. P. Gibb is advisory engineer in South Africa.

In Canada the company is represented by J. B. Tyrrell, Toronto.

BRAZEAU COLLIERIES.

Martin Nordegg, vice-president of the Brazeau collieries, in the foothills of the Rockies, west of Edmonton, announces that the company has control of some 20,000 acres of coal lands, 200 men at work in the mines and that the output of the Nordegg field will eventually reach 2,000 tons a day. A town will be established by the company and houses are to be built for the miners and their families. The Canadian Northern Railway Company is building a line to the Brazeau coal country from its Vegreville-Calgary line, via Red Deer.—Financial Times.

RELATION OF GEOLOGY TO MINING

By F. H. Hatch.

The delivery of the presidential address to the Institution of Mining and Metallurgy affords an opportunity which is in some respects unique. For, not only is the choice of subject unfettered, but the occasion is privileged in so far as it is exempt from discussion; and the calling of a temporary halt in the consideration of topics of more immediate interest provides an interval for taking stock in some one of the numerous provinces of our many-sided profession, for reviewing its recent progress, appreciating its present position, and forecasting its future development.

This being conceded, the incoming president will naturally choose his subject from the department with which his work has been more particularly connected. Since in my career as a mining engineer a knowledge of geology has stood me in good stead, I cannot do better than choose as the subject of my address the Relation of Geology to Mining.

Geology was founded to a large extent on the observations of the miner.—The primary geological conceptions, such as outcrop, strike, dip, hanging wall and foot wall, together with a wealth of mineralogical and petrological detail, were furnished by the work of the early metal miner; while the close study of the bedding relations of the coal seams which their profitable extraction demanded, formed the basis of modern stratigraphy. The earlier geologists acknowledged their debt to mining. But to-day the positions are reversed; mining is in debt to geology. Thus, by the application of geological principles, valuable seams and lodes, even when disturbed by igneous intrusions or dislocated by faulting, are traced far beyond their first known outcrops, and facts bearing on their downward extension are scientifically interpreted; while detailed geological surveys of mining districts are of the greatest service to prospectors, and sometimes lead to entirely new discoveries. To-day, on the great iron and copper mines of the United States, not only are geologists retained to study the deposits, but the exploratory work is often committed to their care. By means of a system of routine work, successfully organized on some of these mines, veins and ore shoots are correlated from level to level; raises, crosscuts and pump stations are located in the positions most suitable to geological conditions; and ore bodies lost in faulted country are recovered, the fault-displacement being determined quantitatively and allowed for in subsequent development work on lower levels.

Specific instances of the successful application of geological knowledge to mining work can, of course, be given in abundance; but a few must suffice for the present purpose.

In this country the proving of the underground extension of the coal fields beneath the younger rocks surrounding them is of paramount importance to its industrial welfare. One of the first pieces of work in this direction resulted from the admirable mapping of the Midland coal field by Beete Jukes, a distinguished member of the Geological Survey of England and Wales. The entire correctness of his theories was demonstrated by Henry Johnson in a deep sinking at Sandwell Park when the first definite proof was furnished of the prolongation of the South Staffordshire coal field to the east under the fringe of overlying red rocks.

Similarly the discovery of a buried coal field in the south-east of England was the direct result of a piece of pure scientific deduction. Godwin-Austen argued that the tectonic folds in the Palaeozoic floor, by which the existence of coal basins are determined, would be traceable even when covered by a great thickness of newer rocks, because a line of disturbance, whether of faulting or folding, when once established, tends to be the locus of subsequent movement and thus to set its mark on the newer strata. The correctness of this tectonic principle was demonstrated by the successful borings carried out in the neighborhood of Dover, first by Sir Edward Watkin and later by the Burr companies under the scientific advice of Prof. W. Boyd Dawkins and other geologists. These borings showed that deeply-buried under Mesozoic and Tertiary strata is a coal field, situated on the line connecting the seams worked in Northern France and Belgium with those of South Wales and Bristol; and it appears not improbable that other coal areas might be found, if the underground geology of this line of country were systematically explored. A satisfactory feature of the discovery of buried coal fields in England is the large addition thereby made to our coal resources, as to which previous estimates had been rather pessimistic.

Another striking instance of the successful application of geology to mining is furnished by the tracing eastward and southward of the sub-outcrop or apex of the Rand banket formation under a cover of up to 1,200 ft. of later unconformable beds. The investigations that led to this result were based on a geological survey of the country between Boksburg, the Springs and Heidelberg, the first results of which made it probable to me that the Van Ryn conglomerate, which disappears near the Springs beneath the Karroo coal measures, and the Nigel conglomerate, emerging therefrom near Heidelberg, were geologically identical, although separated by a large area in which dolomite and coal measures from the surface. As my work progressed, the supposition that the two outcrops with their opposed dips were respectively the northern and southern lips of a large but shallow synclinal basin became almost a certainty, and deep borings made in the intervening country confirmed in the end the correctness of the theory in the most satisfactory manner.

The successful outcome of these investigations added to the Witwatersrand gold field an enormous area of mining ground in which the banket is not too deep for exploitation, should its average gold-content prove high enough to enable it to be profitably extracted—a consummation, of course, devoutly to be wished, but only demonstrable by shaft-sinking and development, since the assay results of bore-hole cores are no guide to average values. The deepest bore-hole of the series under my immediate supervision, namely, that put down on the boundary of the farms Grootvlei and Daggafontein, was practically on the axis of the syncline, and cut the "main reef" at a depth of 5,540 ft. (or corrected for deviation, 4,880 ft.). It passed through 1,140 ft. of dolomite before entering the Witwatersrand formation, but gave a most instructive section of the latter, intersecting the Kimberley, Bird, Modderfontein and Van Ryn or Main Reef series of conglomerates as well as their associated quartzites,

Extracts from presidential address, Institution of Mining and Metallurgy, London, Feb. 19, 1914.

slates and sheets of amygdaloidal diabase. At the time of the sinking the whole of the core, about a mile in length, was carefully labelled and preserved on the property in a specially constructed core house.

The limited time at my disposal will not allow me to recapitulate more than a few of the important services rendered in recent years to mining by geologists. But mention must be made of E. J. Dunn's and T. A. Rickard's work on the Bendigo gold fields and their exposition of the true nature of the remarkable saddle-reefs, whose tectonic structure has determined a type of mine development quite peculiar to that field.

Again, S. F. Emmons' monograph on the structure and genesis of the Leadville silver-lead ores has been of enormous value to the Colorado miners, not a few of whom owe their success on that field to the predictions of the distinguished economic geologist whose recent demise we must all deplore. On the other hand, the theory favored by Emmons that the ores were derived from metals leached from the overlying porphyries and the consequent conclusion that the lower limestone would on the whole be unproductive, have probably somewhat retarded the deeper development of the district. These lower horizons, however, have latterly proved to be very productive as will be shown in the new edition of the Leadville Monograph now in course of preparation. Emmons' researches on the deposits of silver-lead ore in limestone at Leadville incidentally led him to develop the theory of metasomatism, or replacement, as a prime factor in the genesis of ore deposits. Of this more anon.

Another worker in the same field, and, moreover, a friend of Emmons and long a colleague on the United States Geological Survey, is George F. Becker, whose classical studies on the famous Comstock lode and its high-temperature thermal springs have done so much to demonstrate the close genetic connection between ore deposition and vulcanicity. Becker's monograph on the geology of the Comstock lode was issued in 1882, and in one of the opening chapters he pays a remarkable tribute to Baron Ferdinand von Richthofen, who examined the Comstock in 1865 for the Sutro Tunnel Co., at that time engaged in driving a deep level adit to the lode at a depth over 1,000 ft. vertical below the then existing workings. The German geologist had a keen insight into structure, and although the mines were, when Becker wrote, about six times as deep as they were at the date of von Richthofen's report, the later investigator states that the opinions and predictions of his predecessor as to the behavior of the lode in depth had been verified in a very remarkable manner.

The United States not only is rich in great natural repositories of mineral wealth, but is fortunate in its economic geologists, whose keen observation and powers of deductive reasoning are admirably adapted to the study of their structure and genesis. That this is no idle saying witness the splendid series of monographs and professional papers issued by the United States Geological Survey. I have referred to the work of Emmons and Becker; there are many others. To mention a few only: R. D. Irving, who wrote on the Copper-bearing Rocks of Lake Superior; Lindgren, on the Copper Deposits of the Clifton Morenci District, Arizona; Weed, on the Geology and Ore Deposits of the Butte District, Montana; Lindgren and Ransome, on the Geology and Gold Deposits of the Cripple Creek District, Colorado; Van Hise and Leith, on the Iron Ore Deposits of Lake Superior.

Willet G. Miller's work in the Cobalt silver district also deserves mention. His description of the characteristic features of the silver veins right at the beginning of the mining operations of that camp was of first importance; and his early recognition of the bearing of the Keewatin series, which underlies the Cobalt conglomerates, on the life of the mines exercised a salutary chastening influence.

The laborious nature of the task of collecting and collating the material for memoirs such as these is well illustrated by the introductory remarks to Mr. Weed's Butte paper. The complexity of the geological structure of the Butte district necessitating very detailed observations; "in every mine, maps of each level were transferred to notebooks, and with these in hand the writer and his assistants carefully examined the drifts and crosscuts and plotted on the maps the occurrences of each slip, vein or fault, noting the dips, strikes and other important features. Stopes and raises were noted in the same way and sketches made of particular features of vein structure and ore occurrence." Over a hundred miles of underground workings were examined in this manner.

Hitherto I have confined my remarks to lode mining; but in the field of alluvial mining the economic geologist has also something to say. The fascinating task of tracing out, first by boring and then by drifting, the auriferous gravels of an ancient river system, deeply buried under a pile of more recent accumulations, which sometimes even include thick sheets of basaltic lava as in the Loddon valley at Ballarat, must have called for considerable geological acumen. I am unaware to whom the credit for the first discoveries of this nature in Australia and California is mainly due, but mention must be made of the work of Reginald A. F. Murray in Victoria and of R. L. Dunn and Ross E. Browne in California. I should also like to direct attention to Lindgren's remarkable reconstruction of the ancient (Tertiary) topography in the vicinity of Nevada City and Grass Valley in California.

The assistance rendered by geologists in prospecting for petroleum is well known to you. The earliest investigations of petroleum fields, dating back to the middle of last century, led to the conclusion that great natural reservoirs of oil and gas tend to form along the axes of anticlinal folds or at the top of domes; it was also observed that the best conditions for oil accumulation were those of gentle folding, sufficient indeed to give a gradient along which the oil and gas could travel in the porous bed, but not intense enough to cause fissuring in the impermeable cover. It must be conceded that the general correctness of this theory has been confirmed by the work of subsequent observers, and it will also be noted that the "anticlinal theory" is not quite as novel a conception as some of our friends would have us believe.

There can be no doubt that the search for these natural products is essentially a geological problem, and, to my mind, the fundamental qualifications for what is euphemistically termed "the oil expert" are sound geology and common sense.

I shall refer later on to the important bearing on mining—especially on the mining of copper—of the researches of mining geologists on the origin of ore deposits, and notably in regard to the phenomenon of secondary enrichment.

Enough has been said to indicate the dependence of mining on geology; but that this dependence is not universally admitted is evidenced by the prejudice against both the mining geologist and the scientifically

trained engineer occasionally found among mining employers by whom they are sometimes unfavorably compared with the so-called "practical miner." Rule of thumb methods, however, in either mine valuation or exploratory and development work can never command success; indeed, the unschooled miner often enough realizes the value of geology and sets about acquiring such a working knowledge of its principles as will enable him to tackle the more prominent tectonic troubles met with in sinking or drifting. But men of this stamp are the exception rather than the rule, and it is clear that, ceteris paribus, the trained man, who brings to mining problems a sound knowledge of the principles underlying their engineering and geological aspects, not only starts with a pronounced advantage, but is enabled to assimilate practical details with far greater rapidity and certainty when once his mining career has commenced.

The feeling amounting even to suspicion with which geology is in some quarters regarded, is, perhaps, attributable to the following causes: First, there are the nonsensical reports on mines and mining prospects —such as most of us can recall—made by charlatans who, by the use of an obscure geological phraseology, seek to impose their trite conclusions on the credulity of their employers; then there are the wearisome lucubrations of the irresponsible faddist who uses the columns of the local press to ventilate his absurd geological theories. However, geology is not the only science to suffer from the ignoramus and the bore. A more serious disability perhaps lies in the employment in mining work of the academic geologist who has had no previous experience of mines and is unacquainted with mining conditions and economics. Imagine such a one—in his own province possibly a distinguished scientist—taken underground for the first time, groping his way in a murky atmosphere but dimly illumined by the miner's lamp or the glimmer of a candle, amid unfamiliar, and occasionally unpleasant, surroundings; imagine under such conditions his being asked to unravel the intricacies of a fault or to prognosticate the downward extension of an ore body. In fact, the lavish natural indications, which at the surface attract the attention of the geologist, tend at first to elude him when he penetrates beneath it; since there the exposures are few in number, and, such as they are, small; moreover, they are, as a rule, covered with dust, begrimed with soot or buried in mud. Even to overcome initial difficulties, such as these, is not enough; to achieve a real success the work of the miner must be followed step by step, since in his progress he effaces the facts almost as soon as they are disclosed.

Mining geology.—It must be abundantly clear that mining geology is a branch of the profession distinct from pure geology, and that proficiency in this specialized department cannot be attained without a proper training underground.

In the United States there is a growing tendency to differentiate the functions of the mining man; thus we find there an increasing use of the term "mining geologist" to designate a mining engineer strong on the geological side, or, what in practice amounts to the same thing, a geologist who has specialized in mining work. On the other hand, the term "mining engineer" is occasionally used rather in the restricted sense of a mechanical engineer who has specialized in mining machinery. Thus, Professor Munroe of the Columbia University, in contributing to the discussion of a paper read before this institution, said the mining engineer was called upon to design machinery for mining purposes and to superintend its construction and operation. He "should be able," he continued, "to test, among other things, the efficiency of boilers, steam and gas engines, air, hydraulic and other motors, pumps and compressors, electric lighting and power plants, telephone and telegraph systems, crushing, concentrating and amalgamating machinery and metallurgical plant, and to determine in each case whether the motive power, coal, gas, water, air or electric current, is economically used and the machines and mechanical devices are working to the best advantage. Or if this is not the case, he should be able to diagnose the trouble and indicate the remedy, and determine the conditions of maximum efficiency and economy." Surely in writing this Professor Munroe must have had in mind the application of mechanical engineering to mining, neglecting for the moment its exploratory side, for it is clear that mining consists of two distinct parts: (1) The exploration and development of the ore body; and (2) the extraction and bringing to the surface of the ore, the first being essentially a problem in which geological principles are dominant, while in the second, mechanical engineering plays the chief part.

It is evident that the examination of a supposed mining field, or of a lode or ore-body on which nothing but prospecting work has been done, is essentially the work of the mining geologist; and it may also be conceded that, provided he has served the requisite apprenticeship underground, understands the art of sampling, and can gauge with some approximation to accuracy the costs of mining and treatment, the inspection of a partially developed or "young" mine may also be properly entrusted to the mining geologist.

In the case of a fully developed mine, in which the whole, or practically the whole, of the available ore is blocked out for stoping, or at any rate is developed by drifts extending from end-line to end-line at the lowest levels permitted by the dip boundary of the property, the requirements are somewhat different. Here what is wanted is not so much the drawing of inferences from the geological environment of the ore, but a correct appraisement of the net profit obtainable by its extraction with due regard to the economic conditions prevailing. In this case, apart from the estimation of ore reserves, a consideration of the most suitable methods of extraction and treatment and questions of finance are of paramount importance. An actual apprenticeship in mine management, supplemented by a long experience of mine examination under the most varied conditions, are here the prime requisites for a successful valuation.

ALBERTA OIL COMPANIES.

Forty Alberta oil companies, incorporated since the discovery of oil in the Dingman well last week, have a total capitalization of $35,820,000.

The Board of Trade of Grand Forks, B.C., is urging the Provincial Government to repair the wagon road and bridges between the end of the railway at Lynch creek and Gloster camp, some 30 miles or more, a contract for hauling 1,000 tons of ore from the Union mine to the railway terminus having been let.

IRON ORE WASHING PLANTS

The occurrence in various parts of the United States and Canada of large bodies of iron ore too low in iron content to be smelted direct in the blast furnace at a profit, is of great economic importance to these countries. Undoubtedly from these sources the future supply of this most important commodity will be drawn when the great bodies of high grade ore now furnishing the bulk of the raw material to the blast furnace are insufficient for the demand.

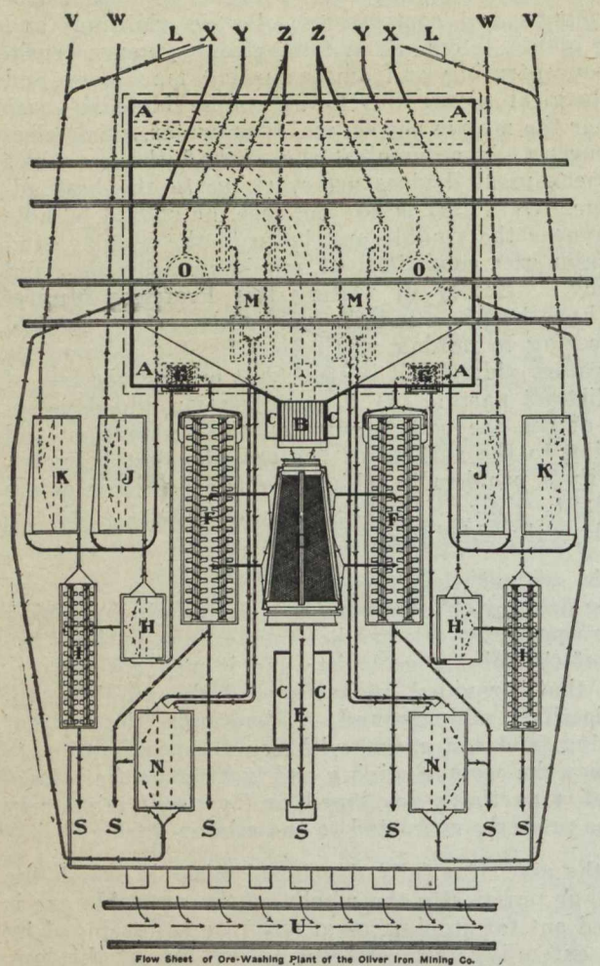


Fig. 1. Flowsheet of Iron Ore Washing Plant.

A—500-ton crude ore receiving bin; **B**—71in. grizzly bars; **C**—Rock pocket; **D**—20 ft. 2 in. perforated conical screen; **E**—3 ft. picking belt; **F**—25 ft. log washer; **G**—36 in. x 4 ft. perforated chip trommel; **H**—5 ft. x 8 ft. settling tank; **I**—18 ft. turbo washer; **J-K**—6 x 14 ft. settling tank; **L**—Overstrom tables; **M**—10 x 54 in. Frenier pumps; **N**—7 ft. x 12 ft. dewaterer; **O**—5 ft. x 6 ft. clear water tank; **S**—Shipping bin; **T**—Tail race; **U**—Shipping track; **V**—To first 5 Overstrom tables; **W**—To last 5 Overstrom tables; **X**—Overflow to waste; **Y**—Wash water; **Z**—Concentrates lifted by Frenier pumps to dewatering tanks.

The interest of the public in the conservation of natural resources and the interest of owners of such low grade ores is stimulated by the success of two milling plants installed on the Mesabi range in Minnesota for raising the grade of hitherto unprofitable ores. These mills are those of the Oliver Iron Mining Company near Coleraine, Minn. on the shore of Trout Lake, and of the Wisconsin Steel Company near Nashwauk, Minn. and a short distance from the shore of O'Brien Lake. The ores treated in both mills consist of a mechanical mixture of soft hematite and sand, with boulders of ore and paint rock and some clay, all loosely held together, and breaking up in handling.

The following description of the plant is from a bulletin issued by the Allis-Chalmers Co.:

The plant of the Oliver Company which treats upwards of 1000 tons per hour, is an example of conservative construction, a plant designed for long life with a consequently low depreciation and maintenance charge, for low operating costs, and for reliability. The accompanying flow-sheet, Fig. 1, shows the passage of the ore through a single unit of the mill, there being five similar units. The ore comes from several of the company's mines in the immediate neighborhood, and is hauled in trains of dump cars and discharged into the five-hundred ton receiving bin, Fig. 3, within the mill building. Leaving the ore bin "A" the ore flows over the grizzly "B", where a partial sorting takes place, waste being rejected into the pockets "C" and coarse ore being broken by hand to pass through the grizzly. The ore with the water used in sluicing it to the grizzly is fed into the revolving conical trommels "D", four feet in diameter at the feed end and tapering to a diameter of eight feet in a total length of twenty feet. These trommels, Fig. 2, are especially designed for iron washing service, very substantial in construction, carried on rollers so that there is an unobstructed opening through the trommel for the passage of the ore. It has few wearing parts and those capable of easy replacement, the screening surface is of perforated metal, which in this case has perforations two inches in diameter. After being washed by a

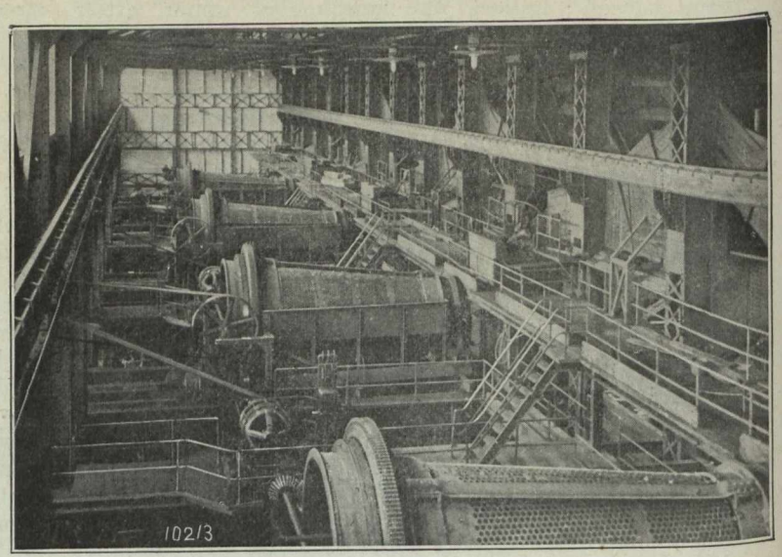
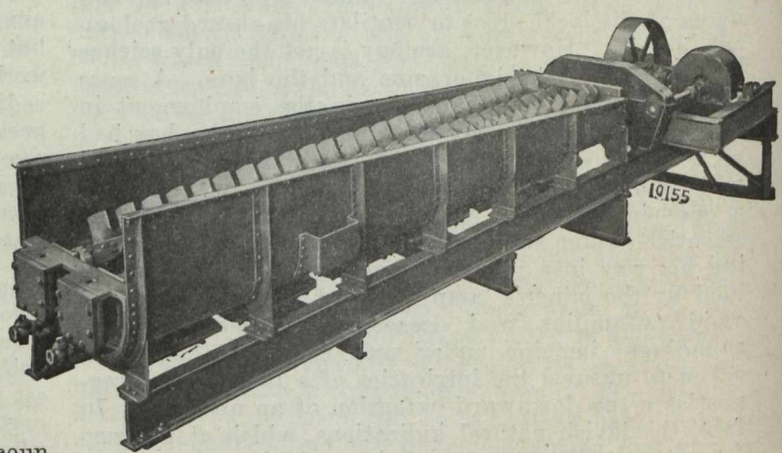


Fig. 2. Trommels, Oliver Plant.



Log Washer

spray of water inside the trommel, the oversize is discharged onto a short belt conveyor, "E", from which the waste is sorted out and dropped into further waste bins "C", the coarse ore going over the end of the conveyor into the shipping bin "S". The undersize from the two inch holes of the trommel is divided between two twenty-five foot patented Turbo Log Washers, "F", the coarser and heavier particles which constitute the ore being pushed over the shallow end into the shipping bins, while the sand and clay together with the finer particles of ore are carried by the high velocity of the water over the overflow at the deep end and pass through a chip screen "G" and a settling or sloughing-tank "H", chips and water being eliminated. From the sloughing-off tank, the fine ore flows through the spigots to an eighteen foot Log Washer, "I", where the ore is again washed, concentrates being discharged over the shallow end into the shipping bin, and the overflow, which contains the finer sand and finer ore, goes to a settling tank. The overflow from the sloughing-off tank goes to a similar settling tank, the overflow from both settling tanks "J" and "K" going to waste. The slowly settled slimes in these tanks is discharged through bottom spigots and fed onto Overstrom Tables Fig F, of which there are twenty per unit, on which the final concentration is done, the tailings going to waste. The fine concentrates from these tables are elevated by Frenier sand pumps "M" to settling tanks "N", from which the concentrates as settled are drawn off into the shipping bins without excess water. The overflow from this tank is led to the tank "O" supplying the wash water for the dressing on the tables and thus is prevented from leaving the mill carrying any mineral of value. This small wash water supply tank has its level maintained automatically, fresh water from the supply lines being introduced for this purpose, constant head being thus maintained at the tables.

The ore coming from the mines runs from 35 per cent. to 50 per cent. iron, and is raised to an iron content of from 58 per cent. to 62 per cent. by the treatment in this mill, the final grade depending partly on the furnace requirements. For each unit there is installed a motor equipment totaling 135 horsepower, as follows: For the revolving trommel "D", the two 25 ft. Log Washers "F", the two 18 ft. Log Washers "I", and the Picking Belt "E", there is provided a 100 horsepower induction motor; for the twenty tables and the Chip Screens, a 15 horsepower induction motor; and for the eight Frenier sand pumps, a 20 horsepower motor. The water supply is pumped through a 30 in. main from Trout Lake, 1 1-4 miles distant, into an elevated storage tank of 100,000 gallons capacity, from which each unit receives its supply at 70 pounds pressure through a 14 in. main. There is provided for each unit a pumping capacity of 1700 gal. per minute when the complete plant is in operation.

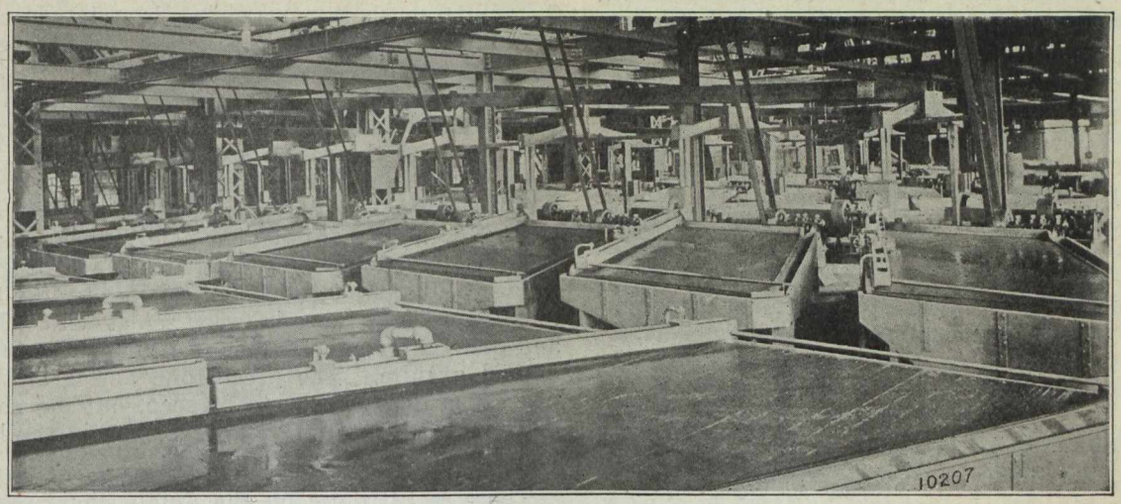


Fig. 3. Overstrom Tables, Oliver Plant.

This mill was built from plans of the Oliver Iron Milling Company and put into operation early in 1910 and is the result of experimenting dating from 1907 under the direction of John Uno Sebenius, chief mining engineer.

The success of this plant pointed the way for other mining companies having similar problems, and during the winter of 1911-12 there was constructed the plant of the Wisconsin Steel Company, built along the lines of the former plant, but with features of its own. It is built at an elevation of some 112 feet above O'Brien Lake, which will allow of a settling basin for the sands rejected by the plant and prevent them flowing into the lake.

Plant of the Wisconsin Steel Co.

This plant consists of a single unit at the present time, but provision is made for increasing the number of units when it becomes desirable. The ore coming from the company's open pit mines, where it is loaded by the steam shovels, is discharged from the cars into a steel bin of some 250 tons capacity. From this bin the ore is fed onto a long inclined conveyor, on which it is carried into the building and discharged onto a short grizzly, the grizzly openings being 9 3-4 in. centers. The oversize from the grizzly is rejected into the rock chute if waste, or broken to pass the grizzly if ore. All material passing the grizzly falls along a chute to the small end of a revolving conical trommel where it undergoes washing as well as screening. The oversize from the trommel falls onto a picking belt, from which the waste rock is sorted out, the ore being discharged by the conveyor into ore bin. The undersize from the trommels is divided between two 25 ft. Log Washers.

The mill machinery is driven by a 100 horsepower motor, this including one screen, two 25 foot washers and two 18-foot washers, and the picking belt. A 30-horsepower motor is used to drive the main conveyor,

which is 36 in. wide and 151 ft. long; a 20 horsepower slip-ring motor is used to operate the feeders under the ore bins.

The pumping unit in the power plant has a capacity of 2500 gal. per minute against a head of 250 ft., and is carried to the mill through a 16 in. main where it discharges into a storage tank having a capacity of 25,000 gal. This water is distributed within the mill at 40 lb. pressure.

The principal machinery in both of these plants and in the power plant as well, is the product of Allis-Chalmers Manufacturing Company. In the case of the Oliver Company, the generating unit is an engine driven alternator of 1200 K. W. capacity, supplying power in the mill at 3-phase, 60-cycles, 440-volts. In the case of the Wisconsin Steel Company, the power unit is a steam turbine driven alternator with a capacity of 500 K. W. at 80 per cent. power factor, running at 3600 R. P. M. generating a 3-phase, 60-cycle, 2300-volt current, which is transformed down to 440 volts at the mill.

THE MASSEY COPPER MINE AREA*

By A. P. Coleman.

Copper ores have been found in many parts of Northern Ontario, partly in association with nickel, and partly as independent deposits; but at present the only copper mined in the Province comes from the nickel-copper deposits of Sudbury, in which nickel is the more important metal. Of mines opened for copper alone within recent years the Massey and Hermina mines in Salter Township are those on which most work has been done.

The Massey mine, or Massey Station mine, has been known for about thirteen years, and the history of its development may be found in several reports of the Bureau of Mines from 1901 to 1907.

As stated by the Inspector of Mines, Mr. C. De Kalb, in 1900, the copper-bearing deposits were first traced on the surface by test pits for a mile east and west a little south of the contact of granite with green schist, and a shaft was sunk 80 ft. on the main deposit. In later years the shaft was deepened to 550 ft. and on seven levels more or less stoping was carried on, furnishing some thousands of tons of ore. Part of this was shipped to Copper Cliff and to Victoria mines for use in connection with the smelting of the nickel ores, but apparently was not entirely suitable as a fluxing mixture. A plant was then erected in 1904 for treating the ore by the Elmore oil concentrating process, but this proved unsuccessful, and in 1907 the mine was closed down.

The Hermina mine was opened in 1903, and a shaft was sunk to a depth of 500 ft. In 1908 a smelter was constructed at Thessalon, partly to treat the Hermina ores and partly for custom work, but both mine and smelter have been closed down for some years. Both the Massey and the Hermina mines are connected by short railways with the Sault branch of the Canadian Pacific, the Massey mine branch ending at the station of the same name 3 miles southeast, and the Hermina branch 4½ miles long, ending a little east of Walford, the next station beyond Massey.

Massey Copper Mine.

A railway three miles long connects Massey on the Sault branch with the Massey mine, running first north and then bending toward the northwest, the workings of the mine being in the southwestern quarter of section No. 15. The railway runs over old lake deposits except for half a mile of mica schist, where the line bends northwest. Beyond this no solid rock shows itself until the mine itself is reached, where a low mound rises above the drift for 180 yards, consisting of quartzite toward the southeast and green schist to the northwest, both more or less brecciated and crossed by quartz veins. The bedding of the quartzite has a strike of 60 degrees east of north. The rock dump consists mainly of green schist with a good deal of reddish-gray quartzite and some massive vein quartz. A hundred yards to the east there is another patch of quartzite and crush conglomerate, but otherwise the surface in all directions is drift-covered. Say 200 or 300 yards northwest at the outlet of a pond which was dammed for a water supply, a glaciated surface of greenstone shows itself; and a quarter of a mile through the woods to the northeast there is green schist with a little slate and quartzite on the flanks of a hill whose top consists of red granite. The greenstone and granite are the nearest eruptive rocks to be seen, but the covering of drift may hide granite or greenstone in the immediate vicinity of the mine.

There is little ore on the dump, chalcopyrite being the only visible copper-bearing mineral, and it seems to be associated with the green schist rather than the quartzite.

The rockhouse is connected by tramway with the concentrating plant a short distance to the west, but at the time of my visit the caretaker was away, and the buildings were locked up.

Reports of the Mine Inspectors during the years when the mine was in operation give brief accounts of the results of mining. The ore was reported to run from 3½ to 6 per cent. of copper with traces of gold in 1901, when the mine was first opened; but in 1902, when the shaft had been sunk to 230 feet, 3,000 tons of ore are said to average 3½ per cent.; and in 1906, a year or two after the Elmore plant had been installed, it had fallen to 2.7 per cent. In 1904, the shaft is reported to have reached a depth of 550 feet with drifts from seven levels. It had an inclination of 87 degrees to the north, and the ore bodies are said to be overlapping lenses in slate.

Stripping is said to have shown the vein to extend for a mile; but only one of the other workings appears to have been of much importance. Half a mile west of the main shaft and 230 paces west of the line between sections 15 and 16, some stripping was done about 200 paces north of the road to Hermina mine. The rocks exposed on successive east and west ridges are alternating slate and quartzite with a nearly vertical dip. The stripping, which is extensive, shows from 4 to 6 ft. of ore, containing small quantities of chalcopyrite. Two hundred or 300 paces north, after an interruption of drift, the east and west range of granite hills rise much as was described near the main shaft.

A quarter of a mile west of this stripping, where the Hermina road touches a hill of rock to the north, a large amount of work was done, including the driving of a tunnel 120 ft. into the hill side. The hill consists mainly of quartzite, but with interbanded green schist, and quartzite extends north for 250 paces, beyond which there is drift. The rock dump at the tunnel shows mainly green schist with vein quartz enclosing some chalcopyrite.

*From Extracts 22nd Annual Report of the Bureau, 1913.

Hermina Copper Mine.

A large amount of work has been done at the Hermina mine where several shafts were sunk along a distance of more than a mile, running from southeast to northwest. The nearest workings to the Massey mine are on a hill about two miles to the west, where shaft No. 1 was sunk to a depth of 400 ft., according to Mr. John Thomann, who was in charge of the property as caretaker. The shaft is in green chloritic schist, but a belt of coarse quartzite runs for 200 paces north 70 degrees east, with a vertical dip a little to the southwest. The green schist is cut by veins of quartz with some chalcopyrite.

Shaft No. 2 is a little northeast of the road on quartz veins in coarse granite, and is said to be about 25 ft. deep. Two other small openings in granite with some greenstone occur a little southeast.

No. 3 shaft, the most important of the Hermina workings, is said by the caretaker to be 500 ft. deep, and a large amount of drifting has been done at different levels. The shaft is in a valley between hills of granite, including masses and bands of green schist. No quartzite was observed here. The granite is partly fine grained and partly coarse and pegmatitic. It has entirely the appearance of the Laurentian; and from the low hill tops one can see the pinkish granite and gneiss extending for a long distance to the north. The rock dump shows much green schist and quartz.

A fifth of a mile northwest of shaft No. 3, there is another small shaft on a large quartz vein in granite, with strips of green schist. Granite and greenstone extend for a mile southwest from No. 3 shaft along the railway to Walford, and the whole surroundings of the mine suggest Laurentian and Keenwatin rocks, except for a small patch of quartzite on the road between No. 3 and No. 2 shafts. The presence of this quartzite and of the strip near No. 1 shaft make it probable that both granite and greenstone are later than the Sudbury series.

From the descriptions just given it will be seen that the Massey and Hermina copper deposits follow roughly the contact of the granite with the sedimentary series but that the ore is mainly found in green schist. They are not contact deposits in the strict sense, however, but may occur a quarter of a mile north or south of the actual contact either in the sedimentary series or in the mass of eruptives. There has been a considerable amount of faulting and fracturing of the rocks along this line, as shown by crush breccias and the numerous quartz veins, though the ore itself is more apt to accompany the schist than the quartz.

SURF INLET GOLD MINE, PRINCESS ROYAL ISLAND, B.C.

The Vancouver, B. C. "Daily Province" lately published some particulars of the taking up, under option of purchase, by the Tonopah Belmont Development Co., of a gold mining property on Princess Royal island, British Columbia. The following gives the greater part of the article that was printed in the "Daily Province," and, as well an official account of the property, printed last year:

"For the past four years a Vancouver company has been carrying on development work on a gold prospect at Surf inlet, on the west coast of Princess Royal island. The Surf Inlet Mines, Limited, the owners of the property, have just closed a deal with the Tonopah Belmont Development Co., concerning which the following is the first authentic information available.

"The terms of the deal are that the Tonopah company proceeds immediately with further development work, and while no amount is stipulated to be spent on such work, it is estimated it will require an expenditure of about $150,000. If, at the end of a year, the results are satisfactory to the Tonopah company, it will pay to the Surf Inlet Mines, Limited, the sum of $150,000 in cash, take over the property, and will organize a company to operate it. The Surf Inlet Mines, Limited, will have a one-fifth interest in the new company, for which it will be allotted that proportion in shares in that company.

"The Tonopah company has appointed Mr. F. W. Holler to take charge of the work, and he has arrived in Vancouver for the purpose. He is placing orders for machinery, which will include air compressors and drills, and is sending up 25 men with supplies to erect the necessary buildings preliminary to engaging the mine staff. The work will be superintended by Mr. Holler himself for the present. Steam power will be used to operate the compressor.

"In the event of the mine being taken over by the Tonopah company a hydro-electric plant, and a mill capable of treating 500 tons a day, will be installed. The latter will include stamp batteries, tube mills and cyanide plant, and will constitute the largest gold mining plant in British Columbia.

"The property was examined during the winter by Mr. Humphries, consulting engineer for the Tonopah Belmont Development Co., and other members of their engineering staff; Mr. Heller, president of the company, has several times visited Vancouver in connection with the deal. The reports stated that the development work done by the Surf Inlet Mines, Limited, had made available about 150,000 tons of ore, of an average value of $6.60 a ton making total value of about $1,000,000. This comes very close to the estimate made by Mr. C. S. Verrill, M.E., of Vancouver, who was called in by the company about a year ago to make a report on the property. The development work was carried out under direction of Mr. F. M. Wells, superintendent of the Surf Inlet Mine, Limited.

"The Tonopah Belmont Development Co. has its head office at 501 Bullitt Building, Philadelphia, Pa.; it is one of the strongest mining companies operating in Nevada. It operates at Tonopah two mills, each of a capacity of 500 tons a day, and has ore developed of a net value of $15,000,000. The ore averages about $20 a ton, mostly in silver. The officers of the company are: President, Clyde A. Heller; vice-president, W. M. Potts; secretary-treasurer, K. Kitte; assistant secretary-treasurer, R. G. Wilson.

"The Surf Inlet Mines, Limited, is capitalized at $1,000,000, of which shares to about $800,000 have been allotted. The directors are: President, Captain Duff Stuart; vice-president, E. A. Cleveland; treasurer, A. H. Wallbridge; Jonathan Rogers, A. B. Clabon, Dr. Burnett and A. H. MacNeill, all of Vancouver. B. G. Hawkins, of the office of Messrs. Cleveland & Cameron, civil engineers, Vancouver, is secretary.

"The deal was arranged by T. M. Verrill, who has been at work on it for some time, his personal knowledge of the property and recommendation of it as an investment carrying much weight with the Nevada men with whom he was personally acquainted.

"The Surf Inlet mine is well situated for the development of cheap hydro-electric power, so that, in the

event of the proposed plant being installed, it will be operated with the utmost economy. There is abundance of good mine and building timber, and the climate is excellent, with the exception of a few weeks in winter. The property was first brought to the notice of Vancouver investors by Messrs. A. B. Clabon and F. M. Wells. It is probable that the capitalization of the company, which it is proposed to eventually organize to operate the mine and mill, will be about $2,000,000, in which case the Surf Inlet Mines, Limited, would be allotted 400,000 shares in addition to the $150,000 cash for distribution among its shareholders.

Report by the Provincial Assayer.

The following report on the property made to the Provincial Department of Mines by Mr. Herbert Carmichael, who was then Provincial Assayer and Assistant Provincial Mineralogist, was printed in the "Annual Report of the Minister of Mines, 1912":

"Princess Royal island lies on the coast of British Columbia, 180 miles north of Vancouver island. The island is of considerable size, being 60 miles long by 20 miles wide. It is very mountainous, but is intersected by lakes and numerous channels which afford good waterways. One of the fiords, called Surf inlet, runs 12 miles in from the Pacific ocean, forming a safe channel for sea-going vessels; at the head of the inlet Cougar lake empties, with a fall of 30 ft. into the sea. Cougar lake is one of a chain of lakes which, with short portages, gives easy access to a large portion of the island.

"The mining claims visited were the D. L. S. group and the Princess Royal group. These claims are on either side of a small stream flowing out of Paradise lake, and are reached by a short portage from Surf inlet to Cougar lake, a row of two miles along the lake, then a portage of a mile from Cougar lake to Bear lake, then a row of three miles up Bear lake to Paradise creek.

"The main tunnel of the D. L. S. group is situated on the northwest side of the creek about a mile and a quarter from Bear lake, and at an altitude of approximately 800 ft. above the lake or 850 ft. above sea-level. There is a good trail from the lake to the mine. The property is held by the Surf Inlet Gold Mines, Limited, Vancouver, B.C. The company owns nine claims located in the strike of a quartz vein occurring in granite country-rock and running diagonally into a mountain-ridge.

"Bluff Claim.—The principal work has been done on the Bluff claim. A small creek on the side-hill cuts through and exposes a quartz vein dipping southwest into the mountain at an angle of 32 deg. The vein has been followed by a tunnel in a northerly direction for a distance of 500 ft. At 20 ft. in, a short crosscut was run to the right, cutting through the foot-wall, which is well-defined with gangue-matter; the tunnel then swings slightly to the left, following the vein, but turning again to the right, so that the general direction is about N. 30 deg. W. At 135 ft. in, the tunnel cuts through a diabase dyke 7 ft. thick, which, however, does not displace the vein; 25 ft. farther in a crosscut was driven 12 ft. to the hanging wall, and a winze was sunk 18 ft. on the dip of the vein. Up to this point the vein-filling is quartz, with iron-pyrites scattered through it, and also a little arsenical pyrites. For the next 50 ft. the tunnel is entirely in vein matter, showing a fair amount of ore on both sides in a short crosscut of 5 ft. run to the right to the foot-wall. At 235 ft. in, the vein pinches, but again makes, and a good oreshoot was struck at 300 ft. From this point a long crosscut is being driven to the left at a deflection angle of 40 deg. to cut a vein lying to the west of the main vein, and on which some work has been done. This crosscut had been driven 243 ft. all in a granitoid rock, but at the face the ground was becoming brecciated and it seemed likely that the zone of disturbance, carrying the "west vein," was being entered.

"The main tunnel has been continued from where the crosscut branches off in the same northwesterly direction; for 50 ft. it follows the footwall, where a fair grade of ore was taken out; at this point a drift of 12 ft. was made to the left and is all in a fair grade of ore. The hanging wall is there followed for a further 50 ft., when a drift was run to the left for 20 ft.; this drift to the face is all in ore. The tunnel keeps the same general direction for another 50 ft., but the ground is more broken and the foot-wall is not well defined, what appears to be a horse coming in. At the time the property was visited the face of the main tunnel was in 500 ft.; at this point, while the ore was showing, it was more broken and the vein seemed to swing more to the right; later information would confirm this, as the tunnel has been driven farther to the right and is reported to be in solid ore. From the face a short drift has been run to the left, but, except for a few stringers, was in country-rock.

"A trail goes along the hillside to the north, rising above the tunnel; this leads to a gulch where a strong outcrop of a quartz vein is seen dipping into the hill and having the same general strike as the vein in the tunnel, so that there is every reason to suppose it is the same vein. At 280 ft. north of the tunnel-mouth and 171 ft. above it, an inclined shaft had been sunk on the outcrop of vein, having a dip of 32 deg. to the northwest; the shaft was reported to be down 50 ft., with ore at the bottom, and a raise run to the hanging-wall, which it cut through, giving the vein a width of 18 ft.; but this could not be examined as there was several feet of water in it. This vein is well defined and has the same dip and general character as seen in main vein in the tunnel. It is the intention of the management to run an upraise from the main tunnel to connect with this shaft.

"What is known as the "west vein" outcrops in the creek 300 ft. to the northwest of the portal of the main tunnel and 143 ft. above it. A drift from the gulch was run in on the vein for 30 ft., showing good ore, from which high value was obtained. As working was difficult from the adit on the gulch, a short drift was run through a shoulder of rock to the hillside, and this is the working entrance. At 25 ft. in from the gulch a drift was run to the left for 300 ft.; this is for the most part in a quartz-breccia with good ore showing in the face. From the intersection of the right drift the tunnel has been driven in a northerly direction for 40 ft., mostly in country-rock with a little quartz. The tunnel then swings to the left, running nearly northeast for 30 ft.; at 7 ft. from the turn a stringer of iron-pyrites 10 to 18 in. wide was cut; this yielded fairly high assays in gold, otherwise the tunnel is in country-rock. At 30 ft. from the turn to the left, the tunnel cut into a well-defined quartz vein dipping at 40 deg. to the northwest. A drift at right angles follows the foot-wall of the vein northeasterly for 30 ft., for which distance the vein is well defined and the face in ore, the samples taken giving good value. The mineralization consists of iron-pyrites, with a little arsenical pyrites, in quartz gangue. This is the vein that the long crosscut-tunnel from the main vein is expected to intersect.

"Summary.—The property contains two or more well-defined quartz veins which have been proved by underground work for considerable distances. It is fairly easy of access, and the treatment of the ore presents no serious difficulty. The value of the property depends then on the average assay of the ore, and this has not yet been determined with any degree of accuracy."

MINING INVESTMENTS

Report of Committee, American Mining Congress, Philadelphia, Octo. 20-24.

We find a unanimity of opinion among mine owners, prospectors and investors for such laws and regulations as will tend to drive from the field that class of promotions that are not founded upon merit, fair dealing, or justice.

We fully realize that no other occupation offers more opportunities for success and large profits. Ever since the creation of man has the search for metal been carried on; ancient history from the time of Tubalcain, the first worker of metals, records human activities in the search for and the manufacture of minerals and metals that have been so useful and necessary to mankind.

There are two great fundamental industries on which civilization is based and our very existence depends; mining and agriculture. These two industries must necessarily be carried on hand in hand, each working with and through the other. One cannot exist or be of value without the other. These two make up all the essentials, comforts, conveniences and necessities of life.

The science of agriculture can, and, indeed has, become a purely mathematical problem; its hazards are so limited as to admit of the smallest possible profits, with a reasonable degree of certainty; all that pertains to agriculture can be seen and comprehended. It is far different with the mining industry. In dealing with this branch of our existence no well-defined law of nature can be followed; no satisfactory rule of man can be depended upon. It is true that the study of mineralogy, geology and chemistry has, and will enable the human eye, to a degree, to see further than the surface of the earth; but at best, all deductions made are more or less speculative. To formulate any set rule for the discovery of ore, or estimating the value of minerals not seen or uncovered, is impossible; therefore, as the uncertainties increase so should the profits.

The mining industry requires the genius of man, the brains of the world; perseverance, unlimited hope, and a great amount of capital. As a rule, mineral is not found in places of easy access.

The Prospector.—The millionaire, or man of moderate means, is content to leave the unexplored fields to that intrepid, dauntless, fearless,, and courageous body of men known as prospectors, buoyed by hope, with unbounded enthusiasm and encouraged in the belief that they will discover mineral. This army of argonauts is found wherever traces of mineral exist, toiling without certainty of reward, suffering hardships and enduring privations; but few realizing their dreams. Throughout all mining regions rest the dust in unmarked graves of the prospectors who have passed from life without reward. As we enjoy the implements of modern civilization, little do we realize the blasted hopes, the disappointed lives, the unpaid labour of the prospectors that have been imprinted upon the tablets of progress and time before the results of their labour could be put to commercial use. Not only every miner and mine owner, but civilization itself should encourage and assist the prospectors; to that end laws should be framed for their protection, as well as the protection of the investor. Our endeavour should be to put the investor in touch with the prospector, and the prospector in reach of capital. One is as necessary in the development of the industry as the other; one is the pioneer, the other the builder. Thousands of prospectors, who will never be able to accomplish anything in their lifetimes, could develop properties of great worth and value if they only had the necessary funds.

Millions of acres contain hidden treasure that cannot be reached by the prospector's pick, yet by surface indications he knows full well of the mineral existence. Large cities will yet be built; billions of wealth will be poured into the world's treasury from ore deposits yet undiscovered.

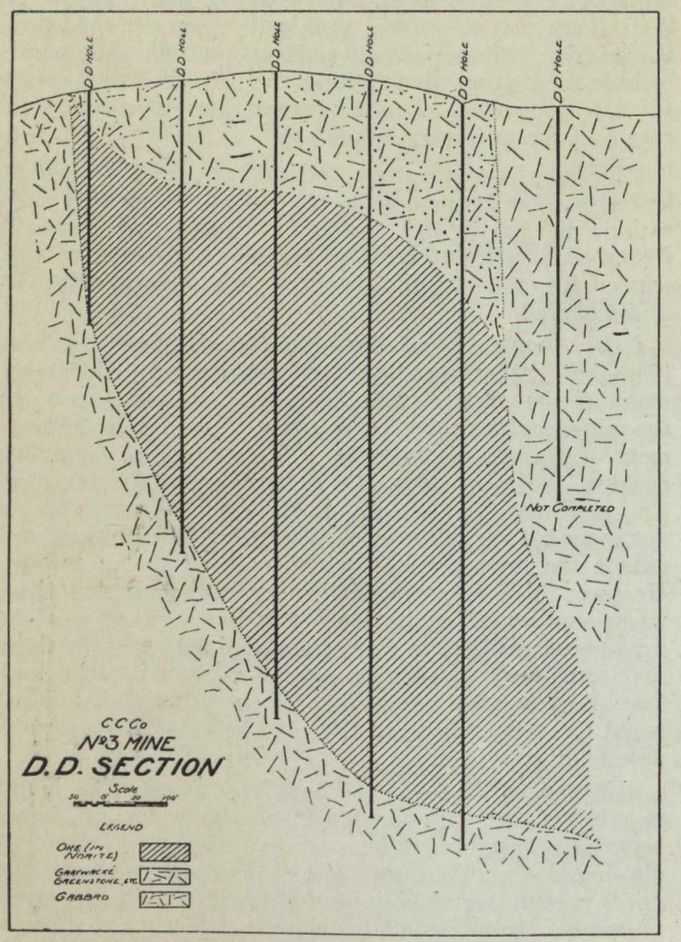
Laws Should Assist.—We should not, by laws, harrass; but rather assist and encourage in the development of the mineral resources; lend encouragement to the prospector, protect and assist him in the development of the mining industry. There are three necessary factors; the prospector, the promoter and the investor. The legitimate, honest promoter who, after careful investigation finds a prospect worthy of development and enlists the necessary capital, is entitled to his reward. He is entitled to some of the credit that is due those whose endeavours go to make this industry great. The investor is entitled to more than ordinary returns upon his investment; he has no absolute assurance; he may lose all or he may receive enormous returns. He is entitled to every safeguard that can be reasonably thrown around him.

Mines and Prospects.—There are many who invest in mining propositions who do not know the difference between a mining prospect and a developed mine. A developed mine is a commercial proposition, operating upon a commercial basis and returning certain annual premiums. In mines of this class the element of speculation is past, also the element of chance for large returns. The investor in the developed or developing mine is in the class that may hope for large returns; but there must always be associated an element of chance. If, after proper investment of the funds and careful and competent management, the project fails to develop, there should be no complaint on the part of the investors, for they would have willingly and gladly accepted any returns no matter how large.

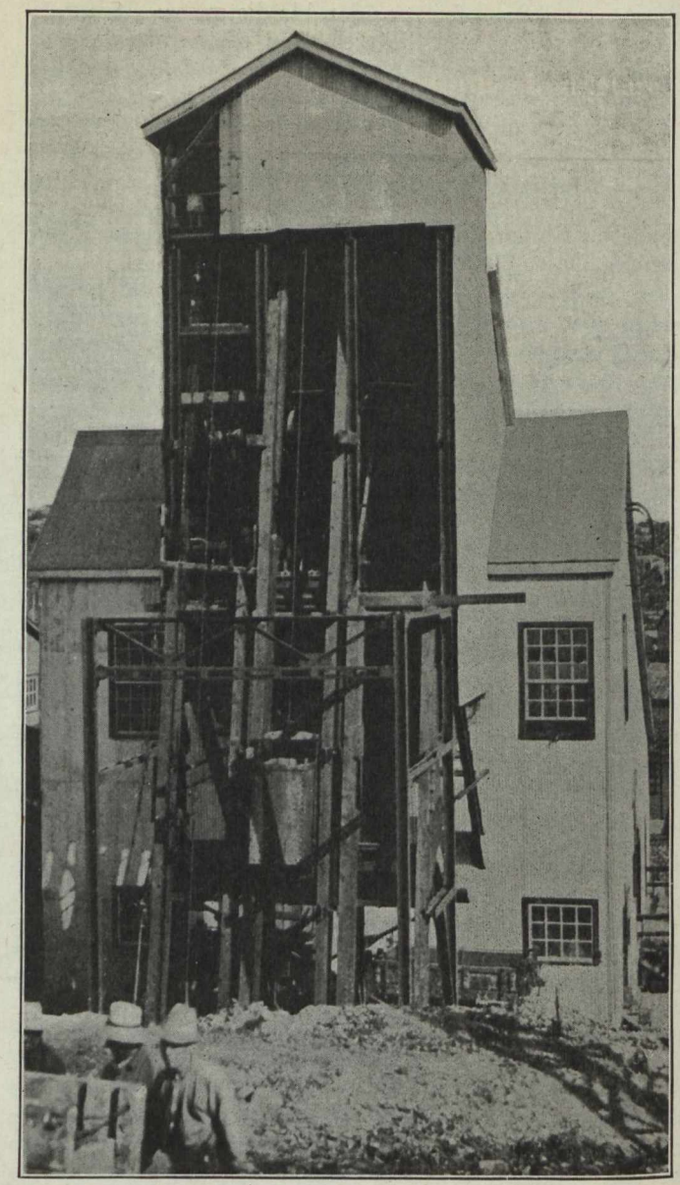
Losses in Mining Investments.—If the money lost from mercantile business failures, as reported by the commercial agencies, could be compared with the money lost through legitimate mine development, and this comparison be compared with the profits on each line pro rated with the investment, I am of the opinion that the balance would be on the mining side. I am of the opinion that the percentage of failures would be smaller in the mineral column. The great question before us is how to prevent unscrupulous and conscienceless promoters from entering the field and fleecing the public, thereby doing the mining industry and legitimate mine promoter and prospector irreparable injury. Any field of endeavour that promises large returns will always attract the criminal and dangerous class of promoters that prey upon the unsophisticated and gullible public.

Eliminate the 'Wildcat.'—It is my desire and it is the desire of every delegate in this Congress to eliminate the wildcatter and the promoter of worthless mining propositions. The growth and development of the industry can be retarded, however, by enacting such laws as will make it prohibitive for the small mine owner

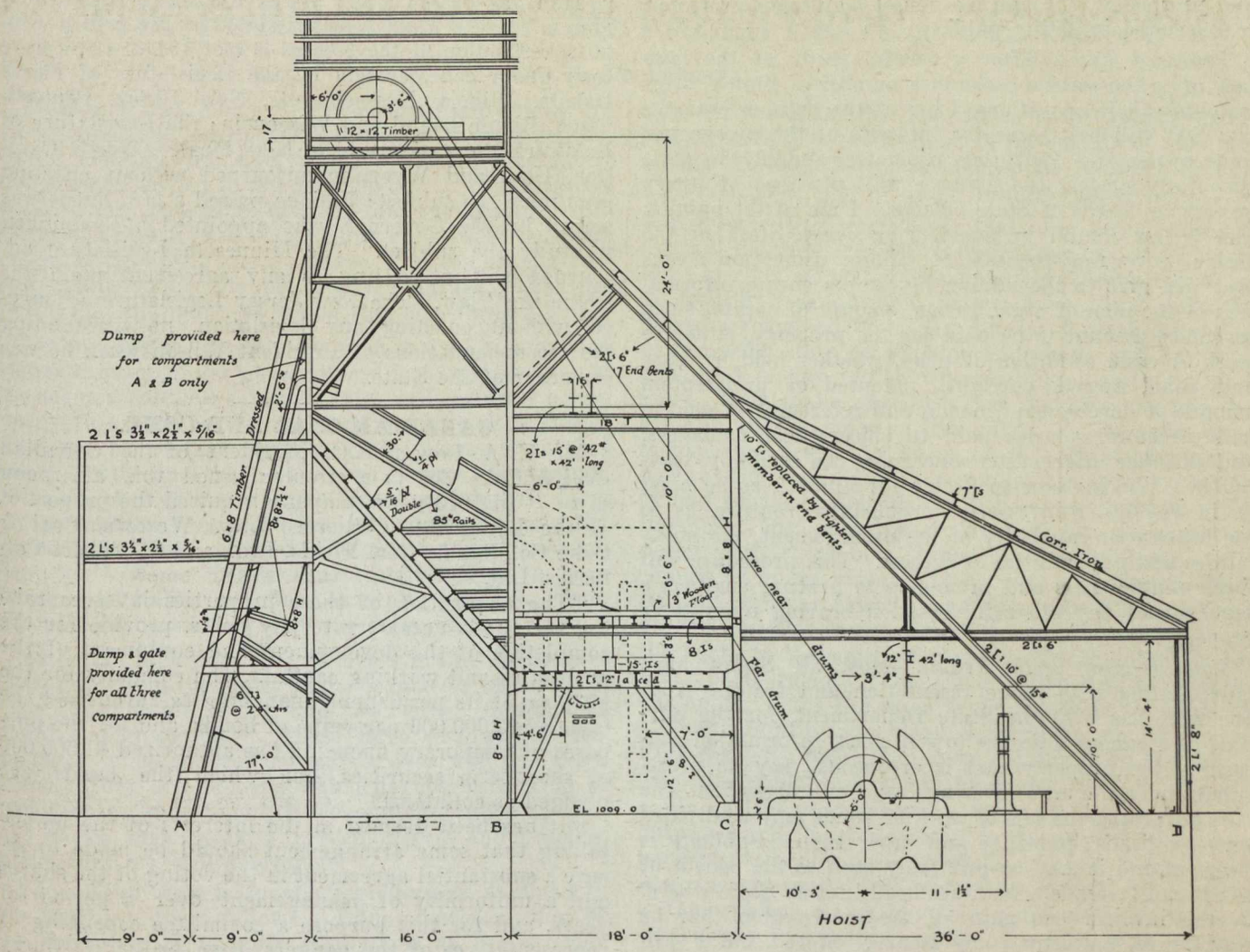
ROCK-HOUSE AT NO. 3 MINE CANADIAN COPPER COMPANY

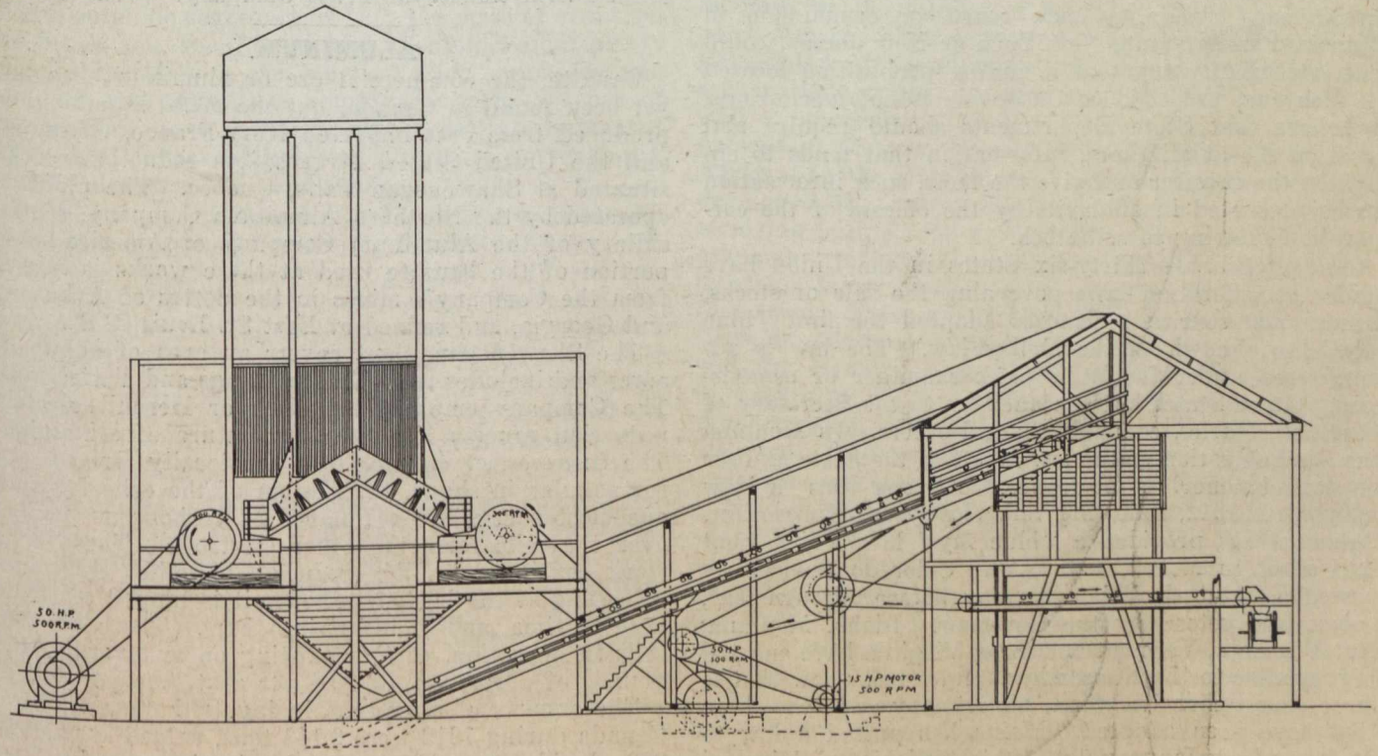


Geological Section of No. 3 Ore Body.
After A. P. Coleman.



No. 1 Shaft, No. 3 Mine, Canadian Copper Company.





Rock-house at No. 1 Shaft, No. 3 Mine, Canadian Copper Company.

and prospector, through his honest legitimate promoter, to reach the investing public.

Proposed Law.—After a careful study of the laws now upon the statute books in a number of States; after watching their operations, I am of the opinion that the law that will best serve the interests of the prospector, mine owner and legitimate promoter, and at the same time fully protect the investor, will place no arbitrary powers in boards of State officials. I am of the opinion that a law should be enacted by every State in the Union, governing the sale of mining promotion stocks that will give to the mining investor accurate information of the plan of organization, amount of capital stock or bonds, amount to be paid for the property, either in stock or cash, condition of titles, whether held by lease and bond, owned outright, patented or unpatented, amount of development, names and references of officers and directors, salaries paid to officers and managers, and all other information concerning the company, leaving it to the investor to decide for himself, as he must do in any other investment or business venture, as to the honesty or capability of the management, the possibilities and probabilities of success. This procedure will force mine owners and promoters to procure engineer's reports and any other information bearing upon their property.

Laws Dealing with Fraud.—Most all States have laws dealing with misrepresentation and fraud. Anyone who files with the State Department, for the purpose of securing a license to sell stock, information concerning the property that is erroneous, may be prosecuted under the laws covering fraud and deception. The laws governing the sale of stock or bonds may be divided into two heads; publicity and supervision. Publicity is essential and it may be profitably used to the benefit of all; it can be made a fountain head in each State whereby the investor can gain all the information that he may desire, concerning any security offered, but I seriously doubt if it would be advisable to place the power with the State officer or board to pass upon the question as to whether or not the security offered is a good investment. Again, a man, board, or commission in Illinois, Pennsylvania, New York or New Jersey, could not intelligently say that a mining proposition located in Montana, Colorado or California is not meritorious. I believe that State Departments should require and have on file at all times, information that tends to enlighten the investor and give the facts, such information to be presented in affidavits by the officers of the corporation desiring to sell stock.

Sale of Stock.—Thirty-six States in the Union have under consideration laws governing the sale of stocks, bonds and securities. Kansas adopted the first "blue sky" law, known as the Dolley law. The law is administered under the State bank examiner or commission. Other States left the question to the Secretary of State, secretaries, commissions and others. In Montana the administration of the law is left to the State auditor or commissioner of insurance. Arizona has a law adopted in 1912, following very closely the Kansas law. Arkansas has provided a "blue sky" law, which went into effect in March, 1913. The Colorado Legislature passed a "blue sky" law the day before adjournment, but it was vetoed by the Governor. Idaho, Montana, North Dakota, Vermont and West Virginia have enacted laws similar to the Kansas law. Iowa has a law that is more comprehensive than almost any of the laws that have been adopted. Maine has passed a law to go into effect January 1st, 1914. Michigan, Missouri and Ohio have adopted laws that are now in effect. Oregon has passed a law which becomes effective next March. South Dakota has adopted a law which contains restriction of the Kansas law of 1911. Laws have been under consideration by the Legislature of North Dakota, Illinois, Massachusetts, New Jersey, Pennsylvania, Rhode Island and Wisconsin; the Legislature of Delaware, New Hampshire, New Mexico, North Carolina, Utah and Wyoming adjourned without enacting laws upon the subject; Indiana passed a law, but it was vetoed by the Governor, who appointed a commission to study the subject. The Minnesota Legislature adjourned without getting to any agreement upon the "blue sky" law. The New Jersey Legislature adjourned without enacting any legislation, notwithstanding the recommendations of President Wilson when he was Governor of the State.

CANADIAN COAL AND COKE.

Mr. H. A. Lovett, K.C., president of the Canadian Coal & Coke Co., in a circular issued this afternoon says: "In 1913 your company acquired the properties of the Lethbridge Collieries, Ltd., Western Coal & Coke Co., Pacific Coal Fields, Ltd., and St. Albert Collieries, Ltd.

"The acquisition of these properties involves raising the funds necessary to pay debts, provide for the completion of the development and equipment of the properties and working capital. The company for the purpose of its permanent financing has authorized the issue of $3,000,000 par value of bonds, and for the purposes of temporary financing has authorized $1,500,000 of short-term securities, for which the bonds are pledged as collateral.

"It has been deemed in the interests of the undertaking that some arrangement should be made to secure a substantial agreement in the voting of the shares and a uniformity of management over a period of years, and for this purpose a committee consisting of representatives of the bankers, Hon. Nathaniel Curry and Gordon W. McDowell, K.C., has been formed to vote the stock and a stock deposit agreement has been lodged with the Royal Trust Company."—The Globe.

ALUMINUM.

Bauxite, the commercial ore or aluminum, has not yet been found in Canada, but the metal aluminum is produced from ores imported from France, Germany, and the United States, in extensive reduction works situated at Shawenegan Falls, Quebec. The plant is operated by the Northern Aluminum Company, a subsidiary of the Aluminum Company of America. A portion of the bauxite used at these works is mined from the Company's mines in the States of Arkansas and Georgia, and refined at East St. Louis, U.S.A.

The Shawenegan plant covers an area of about 10 acres and includes reduction buildings and a wire mill. The Company employs the Hall, or Heroult electric reduction process for the manufacture of aluminum. The furnaces, or cells as they are locally termed, are rectangular in shape, the bottom of the cells forming one electrode, while a number of carbons suspended over the cells form the other electrode. These cells work continuously, the reduced metallic aluminum collecting at the bottom, whence it is tapped off from time to time, and moulded into bars. There are 340 cells in operation, each producing on an average 150 pounds of aluminum, of 99.4 per cent. fine per day.

The exports of aluminum in ingots, bars, etc., from Canada during 1912 were 9,143 tons, valued at $2,002,363, besides manufactures of aluminum valued at $10,898.

THE FORMATION OF METALLIFEROUS DEPOSITS*

By M. De Launay.

Modern works, many of which have been written by Norwegians and Americans, accentuate the relation between metallic ores and eruptive rocks. This interdependence has led to the classification of metalliferous deposits into several groups. If the fundamental hypothesis of relation between ores and eruptives from their origin be accepted, we are induced to establish a corresponding connection between the nature of the deposits and the depth at which they are formed.

Let us consider an eruptive rock that is in course of crystallization under cover of sedimentary strata. If the magma contains minerals they will manifest a tendency to ascend in the guise of metallic exhalations. Analyses prove that eruptive rocks possess traces of many metals, and that in the case of iron they include as much as 7 or 8 per cent. These metals first form an unimportant aggregation of small disseminated grains that have received the name of "inclusion deposits." Some metals thus distributed have been found exploitable, as, for example, platinum, iron, chrome and nickel, and even the diamond.

After the inclusions, the elements group themselves more densely in the midst of the eruptive rock and still at a considerable depth, and we have "deposits of metallic segregation." These have a practical importance, since mineralized masses over 150 feet thick occur. They are deposits which have been formed at great depths, and can only be encountered in very primitive rocks, such as exist in Scandinavia and Canada, where they are well developed.

Succeeding these magmatic segregations, confined to the eruptives, there follows a different process, that of the deposition of metallic exhalations on the exterior of eruptive rocks. This is commenced by the appearance of sulphide ores massed at the contact of the eruptive with other rocks. They are designated as "peripheral sulphide segregations." In the mass of eruptives are found only small quantities of sulphides but plenty of oxides, whilst at the junction rocks sulphides concentrate and crystallize abundantly. These types of segregation, up to now very rare, constitute important deposits of copper, nickel, etc., which are, for example, successfully exploited in Canada.

Still at a considerable depth, deposits have been produced that appear in the form of lenticular bodies with transverse veins. This type, termed "diffused impregnations," is of great consequence. There are certain regions with veins enclosing sometimes copper and often gold; they are troublesome to work, since they are very irregular and prone to peter out suddenly. Notwithstanding, they are considerably exploited on account of concentrations, due to earth movements, and give rise to alluvial deposits through disintegration.

We now reach the true fissure type of mineral deposition, at first those which are directly connected with eruptive crystallized at great depth, then with more superficial deposits associated with microgranites, and, lastly, microlithic. With granites exhibiting white mica, tin and its group is developed, sometimes accompanied by copper; then follows copper associated with lead and zinc, and, still higher, mercury—all in the true fissure group.

At surface little ore is formed directly from the rocks; these are only the results of mineral concentration derived from the denudation of previously existing deposits. The predominating proportion of minerals appear to have been crystallized at immense depths under varying conditions of heat, pressure, etc.

We have just remarked that the occurrence of mineral deposits may be classed as inclusions, segregations, peripheral segregations, impregnations, and veins of fracture. A question arises, have these different deposits remained from the time they were deposited in the same state as we now find them, and are they produced in any region where similar conditions prevail? It is to be observed that deposits are not the same in all regions; and if a miner, for example, were transported from the basin of the Mediterranean to Norway, he would fail to recognize the types to which he had been accustomed, and if he endeavored to apply brusquely the empirical results of his previous experience to these new types, he would have every chance of going wrong. Each region possesses, then, its own peculiar aspect, generally very different from others, and this is especially the case in passing from the north to the south of Europe. On the other hand, some parts remote from each other display certain analogies. Thus the same types obtain in the Central plateau, Bohemia, or Saxony, and the geologists of Freiberg have noticed in Asia, especially in the Altai, deposits similar to those in their own district.

We can, therefore, arrange deposits in metallogenic provinces which are adjusted to the age of the corresponding tectonic zones, and that have successively permanently crystallized under the influence of regional metamorphism, which have since suffered only vertical movements and have usually remained without any further mineralizing action. In Europe there can be distinguished from north to south a Huronian zone, a Caledonian zone, a Hercynian zone, and a zone influenced by the folding of the Alps; their equivalents exist also in other continents. In the Huronian and Caledonian of Scandinavia, the types of inclusions, segregations and impregnations are exceeding well represented, and their equivalents are present in Canada, Brazil, India, Siberia and Central Africa. In the Hercynian of Central Europe has been developed the petrographic type of porphyries harmonizing with a semi-profoundity characterized by the occurrence of veins containing blende, galena and pyrites. More to the south are the folded Tertiary formations, accentuated by numerous volcanic intrusions, in which are found auro-argentiferous minerals and also mercury, a metal that is able to deposit itself in proximity to the surface. If we examine a particular region, outside the deeply-seated igneous masses, we shall find metalliferous aureoles showing an analogous succession—first tin, followed by copper, zinc and lead, and finally mercury. It should be observed that for each of the types we are led to class the metals by groups which overlap each other, the natural sequence, however, persisting. It must not be imagined that each metal occurs as an isolated deposit, but as forming part of a whole, so that it would be a blunder to have a concession for a single mineral.

We now pass to another question. As deposits are not independent of their position in space, neither are they so in their place in time. Since formation metalliferous deposits have undergone modifications and

*Extracts from a lecture delivered to the Societe de l'Industrie Minerale, published in the Mining Journal, London.

but as forming part of a whole, so that it would be a blunder to have a concession for a single mineral.

We now pass to another question. As deposits are not independent of their position in space, neither are they so in their place in time. Since formation metalliferous deposits have undergone modifications and have not been able to remain in the state in which they were crystallized out in remote ages. These changes have been determined by their approximation towards the surface, and the effects of superficial action must be conceded to extend to a depth of several hundred yards. Fissure veins have a limit both in depth and in height, and if we find them cropping out at surface, it is because denudation has removed more or less of the crust and exposed them to-day. This exposure has induced reactions in the upper parts of lodes which have gradually transposed minerals to continually deeper portions of the veins.

There is everywhere a point beneath the surface where water is reached and below this horizon aqueous actions and movements are decelerated. The nature of the region above this hydrostatic level is entirely different, and throughout this space the surface waters, charged with oxygen, carbonic acid, etc., percolate, reacting on rocks and minerals, and issuing from the surface as springs. It is interesting to note the alterations which are produced in this upper portion, and to a certain distance also under the hydrostatic level, by the incessant circulation of superficial waters. The present was preceded by a higher surface, the vein extending up the interspace, and in which certain ores were placed in solution—for example, copper; this dissolved copper was partly washed away by the rains, but a portion was also precipitated in the vein at some distance beneath. This action continued to the gradual enrichment of the lower zone by cementation. At a varying depth under this zone the unaltered vein becomes, more or less, suddenly poorer. Gold lodes are affected in a similar manner, the lode above the unaltered zone assuming an abnormal productiveness, and the same for silver lodes. These phenomena entail important consequences, of which numerous instances could be cited; a prominent case will be sufficient. When ores are enclosed in calcareous strata these reactions attain a maximum of intensity; thus one is able to refer the development of calamine deposits to the phenomenon of cementation. They are the result of the transformation of blendes, and are not formed in depth. Similar action changes spathic iron to iron oxide, which is shown in iron cappings and in the extensive masses of hematite worked at Bilbao and other places. In the mines of Leadville galena has been converted into cerrusite, but this action is less frequent than for zinc and iron, since the compounds of lead are less soluble.

To sum up, in the presence of metalliferous deposits it is essential to attribute considerable significance to this vadose action; if the country is accidented and if the water level is at a great depth, as in the Andes and Mexico, such alterations may reach a depth of 900 to 1,200 feet. The study of these transformations is interesting from a theoretical point of view, as it affords an explanation of facts inadequately interpreted by the theory of lateral secretion. It is possible thus to construe the presence in these enrichments, formed at an epoch almost contemporaneous, of bones of modern animals which have been enclosed in them. The alterations of minerals much more ancient is confirmed by similar crystallizations of sulphides and oxides often produced in old and abandoned mines. When we are prospecting a new country, we are enabled to grasp some knowledge of its general tectonic character, and to form an opinion on the nature of the enclosed ores, and to determine in what direction operations should be undertaken.

ROSSLAND ORE DEPOSITS*

By O. E. LeRoy.

Rossland is situated about six miles west of Columbia River and five miles north of the International Boundary. The main avenue of the city is 3.410 feet above sea level. The city lies on the slopes of Red and Monte Christo mountains towards the head of Trail Creek. The immediate surrounding country is characterized by mountains with rounded peaks and gentle, flowing slopes. The city commands a view of Trail Creek Gulch, the Columbia Valley 2.000 feet below, the Selkirk Mountains to the east and the ranges in Northern Idaho and Washington to the south.

The first discovery near Rossland was made on the Dewdney trail in 1887, when the Lily May claim was staked. In 1890 the LeRoi, Centre Star, War Eagle, and other mines were staked on Red Mountain, and a small lot of ore was packed out in 1891 and shipped to an American smelter.

The total production from 1894 to 1912, inclusive, according to the Provincial Bureau of Mines, amounts to 4,105,358 tons, containing 1.995,589 ounces of gold, 3,381,421 ounces of silver and 86,608,170 pounds of copper. The gross value is placed at $55,100,259.

The principal mines at present are the LeRoi, War-Eagle, Centre Star group, owned and operated by the Consolidated Mining and Smelting Company, and the LeRoi No. 2 Company. The greatest depth reached is 2,200 feet below the surface outcrops, and all ore mined is shipped to Trail for treatment.

Ore Deposits.—There are two mineralized belts in the Rossland camp, known as the North and South belts, respectively. The North belt is by far the most important. All the rocks, except perhaps the later dikes, are more or less mineralized, but the larger ore bodies are confined mainly to the Carboniferous augite porphyrites and the monozonite, and lie along the northwest border of the large area of monzonite, and near or on the contact of the porphyrites and Mount Roberts formation with the monzonite, granodiorite or granite porphyry. The South belt is underlain mainly by the porphyrites and sediments of Carboniferous age.

In the North belt, the ore deposits occur (a) in fissure veins with or without replacement of the country rock; (b) as lodes in zones of fissuring or shearing, the ore minerals forming a network of veinlets impregnating or replacing in whole or in part the intervening masses of country rock; (c) in irregular impregnations in the country rock. The most important ore bodies found so far have occurred as indicated under (a) and (b). On the basis of mineral contents, the ores may be classified as follows:—

1. Massive pyrrhotite and chalcopyrite ores with some pyrite, occasionally a little arsenopyrite and more rarely magnetite and molybdenite. Galena and blende have been found in a couple of instances. Free gold occurs, but is rarely visible though the proportion runs from 10 to 50 per cent. of the total gold content.

2. Massive coarse grained pyrrhotite with but little copper and gold.

3. Pyrite and marcasite with arsenopyrite in veins with possibly some galena and blende. This type is

*Extracts from Guide Book, No. 9, prepared by the Geological Survey of Canada, for Twelfth Session International Geological Congress, August, 1913.

more characteristic of the South belt, and silver may form an important part of the values.

4. Arsenopyrite, pyrrhotite, pyrite, molybdenite, a little chalcopyrite, bismuthinite, and free gold, as impregnations particularly in and around pegmatitic and aplitic dikes of alkali syenite.

5. Gold bearing quartz veins.

Gangue.—The gangue is chiefly more or less altered country rock with some quartz and locally a little calcite. The country rock may be altered to quartz associated with secondary biotite in bands. Hornblende and chlorite are extensively developed in places. Muscovite, tourmaline, garnet, wollastonite and epidote also occur, and zeolites, chiefly anthophyllite and chabazite, are frequently found.

Ore.—The typical ore consists of more or less altered rock matter with reticulating veins and irregular masses of pyrrhotite, and varying amounts of chalcopyrite with perhaps a little quartz, the sulphides forming from 50 to 65 per cent. of the mass. There are all transitions from the solid sulphides forming massive shoots of ore on the one hand to rock matter or gangue on the other, with little apparent mineralization. In cases, however, lightly mineralized gangue may carry high gold values.

The values are largely gold with some copper and a little silver. The gold values do not appear to be dependent on the presence of any one mineral, though in many cases ore rich in chalcopyrite is rich in gold. The pyrrhotite, though gold bearing in some instances, is as a rule very low grade. An average analysis of the ore from the large producers gives—gold 0.5 oz. per ton, silver 0.3 oz. per ton, copper 0.9 per cent., iron 22 per cent., silica 37 per cent, sulphur 10.8 per cent., lime 4.2 per cent., aluminum 14.9 per cent. The ore from near the surface yielded the higher values, but the proportion of free gold does not appear to decrease with depth and high-grade ore bodies are still encountered at the lowest developed levels.

Oxidation extends downwards only a few feet from the surface. Secondary enrichment is a minor feature, but is found at several points well below the zone of weathering.

Lodes.—The chief lodes or veins have a general easterly trend and northerly dip with an associated fault system trending north and south. The LeRoi-Centre Star main and south lodes and the Josie lode strike about N. 60° E. The LeRoi north vein, the War Eagle vein, and the Centre Star north veins strike N. 70° W., and appear to be off-shoots of the main lodes. The dips are to the north ranging from 60° to 70° with local flattenings.

The main LeRoi-Centre Star lode is at least 4,000 feet long, with a thickness varying from a mere crack to over 130 feet. The maximum thickness cannot in many instances be determined owing to the lack of sharply defined walls. Between ore shoots it is sometimes very difficult to trace the lode, particularly where the continuity is broken by faults and dikes.

Ore Shoots.—The ore shoots vary greatly in size and shape, lenticular bodies being the more common. Some are very irregular at one termination, especially when forming against a dike or fault. In such cases the shoot either develops an enormously increased thickness or an L-shaped body is formed by the ore turning sharply and following the plane of the fault or dike. The pitch varies from vertical to a pronounced easterly or westerly direction dependent upon purely local conditions. In size the shoots vary from a foot to 130 feet in thickness and from 50 to 500 feet in length. One of the largest shoots was stoped for 590 feet vertically and averaged 50 feet in length and 56 feet in thickness.

The higher grades of ore are often confined to certain bands in the shoot parallel to the trend of the lode. They either occur in the body of the shoot or on the hanging or foot wall sides. These bands may also change their relative positions suddenly and follow other though parallel planes in the shoots.

The pay ore is sometimes bounded by a fissure or fault plane. More often, however, there is no sharply defined wall, but a transition, usually rapid, from commercial ore to "waste" or nearly barren rock.

The positions of shoots are usually along contacts between the lode and fault planes with impervious walls or dikes. In the case of the dikes, the shoots usually form on the under side. When the mashing or shearing of the rock is such that the metal bearing solutions are restricted within zones of reasonable width, other things being equal, the conditions are favourable for the formation of productive ore shoots. The importance of the shoot is oftimes accentuated by the development of a system of cross fractures emanating from the wall rock.

In the LeRoi, shoots have been found along the contact of the augite porphyrite series and the coarse monzonite and diorite porphyry.

Origin.—Ore deposition began subsequent to the extensive intrusions of alkali syenite and continued up to the period of injection of the last system of dikes. It is thought probable that the deposits are closely related to the alkali syenite.

The deposits were formed through the agency of ascending aqueous mineral-bearing solutions of high temperature which gradually replaced the primary minerals of the country rocks, particularly the feldspar.

Certain minerals in small quantities, such as garnet, wollastonite, epidote, amphibole, pyroxene and magnetite suggest an approach to the conditions under which contact metamorphic deposits are formed. Other minerals are characteristic of hydrothermal action such as tourmaline, muscovite, chlorite and zeolites. The paragenesis of the minerals has not been worked out, but pyrrhotite is cut by veinlets of chalcopyrite though in many cases the two minerals appear to have been contemporaneous.

The values so far have not greatly decreased with depth, though this is not apparent in the production since more lower grade ore can now be mined than formerly, because of reduced smelting charges. The evidence though not conclusive, is strongly in favour of almost the entire deposition being due to ascending solutions, though possibly at two or more periods. In the first period, the diking and faulting phenomenon accompanying the formation of the lodes formed barriers which afforded favourable conditions for the precipitation of copper and gold. A favourable area for deposition appears to be the underside of dikes. In the second period, ascending solutions of different composition may have deposited new minerals in the ores or concentrated at successively higher levels, the values of the ore minerals formerly deposited.

If a zone of true secondary enrichment ever existed, it was swept away during the heavy erosion accomplished by the Cordilleran ice sheets.

The success that has attended the vigorous development policy of the operating companies, gives no indication that the productivity of the lodes is near the end, nor even on the wane, but on the other hand, gives every encouragement to the view that ore bodies will be found at much greater depths than the levels now being exploited.

MINING COSTS*

By J. B. L. Hornblower.
Comptroller Pittsburg Coal Company.

It is with some misgivings that I undertake, at the request of the officers of this convention, to lead in the presentation of the subject "Mining Costs." This is not because the subject is one unworthy of your time and attention, nor that my study of it has been meagre or superficial, although doubtless a more experienced and capable leader might easily have been chosen for the service, but because the matter of the proper construction of mining cost accounts and the use of the same by those vitally interested does not usually receive the attention and consideration which it deserves. Perhaps this fact influenced your officers in introducing a paper on the subject and inviting your attention to its consideration and discussion. However this may be, I believe that the subject is one of great importance and I therefore have consented to discuss it, more in the hope of emphasizing some things which we all know more or less, but sometimes forget, than of presenting any new or startling views upon it.

First. Who are interested in mining costs? The foremen, superintendents, general managers, executive officers, boards of directors and stockholders—the viewpoints of these respective classes are different, but all are, or should be, greatly concerned to secure the truth, the whole truth and nothing but the truth. Carelessness and indifference as to statements made are, in the last analysis, of the same texture as wilfulness and misrepresentation and frequently lead to the same disastrous results.

Second. How may these statements be made to most accurately and clearly set forth the information concerning actual conditions, which is so necessary to those whose capital and reputations are at stake?

The limit of time you will fix for the consideration of this subject, among the many other important matters which are to engage your attention, makes it necessary for me to avoid details as much as possible—to outline rather than elaborate.

Interest.—Interest on capital invested in lands, mining rights, plants and equipments, and discount on bonds issued against such investments, should not be charged to mining cost. Interest on bonds sold for the purpose of constructing specific plants is commonly charged to such construction cost up to the time when the plants are ready for operation, but this practice easily runs into an abuse and a misrepresentation to bondholders, stockholders and the public. An operating company will not err but rather commend itself to all concerned by holding to an absolute rule not to capitalize interest under any circumstances. Many companies in the past, which sold bonds for less than face value, charged such discount to property or construction account. This practice is now less common and will doubtless gradually disappear in companies which wish to be credited with conservative management and frankness in reports to stockholders and the public.

Taxes.—Taxes in an operating company should be charged to operations, never to property. The amount of tax chargeable to the operation of a given mine ought to be, as nearly as may be, the tax upon the land which will ultimately be operated through that mine. The tax for a given year should be apportioned in equal amounts over the divisions of the year for which cost statements are made.

Royalty or Property Depletion.—The value of coal or mineral rights, at cost, should be extinguished at a charge to operations in a fixed amount per ton or per acre as the property is exhausted. Some companies have revalued lands on their books and so created a surplus. This, in probably almost every case, was not a wise thing to do. Assuming that the transaction was thoroughly honest in intent, properly shown on the books of the company as a surplus not derived from operations, and properly followed up by increased charges to future operations for exhaustion, it will appear in the last analysis to be simply reaching into the future. I would say, therefore, that while such revaluation in some cases may seem to be justified, in most cases it is a thing which ought not to be done. If the lands are really worth more from year to year than their first cost, the fact will be reflected in increased selling value of the product. The difference of value, believed or hoped to exist, ought not to be put into surplus account in advance of actual sales of product, thereby increasing in a fictitious way in corresponding amount the mining cost of the future—in other words, it may be said to be always wiser and more conservative to book earnings as they are actually realized, not as anticipated or hoped for.

Depreciation of Plant and Equipment.—There is, perhaps, no single phase of accounting, whether of mining or manufacturing companies, more complex or troublesome than this matter of plant and equipment depreciation; hence nothing in which there are more differences of opinion and method of procedure among operating companies; I might add nothing in which managements and accountants may more easily and with the best intentions deceive themselves and each other. The views, plans and methods herein set forth are, therefore, not necessarily standard—they are more or less the result of my personal study and experience.

Up to the time when a mine is placed on an operating basis, that is when it is ready to produce the daily tonnage for which its development, plant and equipment were planned (regardless of what it actually does produce at that time, determined perhaps by the law of supply and demand, labour or weather conditions or car supply) all expenditures for development, plant and equipment should be charged to construction account with credit to that account for product sold in the full sum realized for the same. After the projected development has been completed and the mine placed on an operating basis, all expenditures made during the whole course of its life, whether for development, air shafts, road extensions, mine cars, mining machines, motors, power houses, power equipment or lines, or anything that may be installed, should be charged to operations, unless such expenditures result in positive increase of capacity, in which case they may be charged to capital investment with a proper regard to the question of the length of time that such additions may reasonably be expected to serve.

Further charges should be made to mining cost monthly in fixed uniform amounts, with credit to a fund account generally known as plant and equipment depreciation fund, for the replacement of capital originally invested in such development, plant and equipment, or for the replacement of units which wear out or become obsolete. The extent to which this fund

*Address to the 16th Annual Convention of the American Mining Congress, Philadelphia, Oct. 20-24, 1913.

may be used for replacements or renewal in kind must be determined by the rate at which the fund is accumulated. If the rate is low and a long period, perhaps the entire life of the mine, is consumed in charging operations with the full amount of the original investment (less salvage) obviously no replacements or renewals should be charged against or paid out of the fund—all must be charged to operations. If the rate be made high enough so that a much shorter period is consumed in getting into the fund the full value of the original investment through charges to operations, certain replacements, renewals, or improvements may be charged against the fund.

The company with which I am connected now follows the uniform rule of charging operations with depreciation of plant and equipment at the rate of 6 per cent. per annum or net (or reducing) values, with credit to depreciation fund. This will cover into the fund about 70 per cent. of the original value in twenty years; it is contemplated that salvage values, that is, the values of all equipment scrapped or removed for use at other points during that period, together with the remainder value, credited to the fund will make up the 30 per cent. or balance of original value not charged to operations in the fixed monthly charges.

We, therefore, do not charge any renewals or replacements against our depreciation fund accumulation, but charge them all to operations. When the charges are so large as to seriously impair monthly comparisons of cost they are spread over the operations of a few months.

Labour.—In the Pittsburgh Coal Mining District labour costs fall into two general divisions, first, that which is paid on a unit basis of work performed, such as the scale rate for pick mining, machine mining subdivided into cutting and loading, and dead work, such as yardage, room turning, break throughs, clay veins, etc., and, second, that which is paid on a per diem basis, such as motormen, drivers, general inside labour, tipple labour, general outside labour, electricians, etc. It would hardly be profitable to follow the subdivisions of labour in this paper—they differ, of course, with changing conditions and according to the viewpoint of the respective operators.

Supplies.—All expenditures for live stock and supplies, after the initial installation at a new mine, should be charged to operations as made, although for purposes of checking and accuracy in monthly comparisons of cost inventories should be taken at the close of each month and entries made debiting inventory account, with credit to operations, for unused supplies at cost and for live stock in the service at a fair valuation.

Fuel.—The mining cost statement at a mine depending upon its own power plant, which does not include a charge for coal consumed in the same is incomplete and apt to be misleading in comparisons with mines purchasing power from central stations. For this reason it is proper to charge the fuel at a representative value to operations, with credit to coal sales account, notwithstanding that operations have already been charged with all the items entering into the cost of the product so consumed. This treatment of the individual power plant fuel of course, must not be lost sight of in the general summary of business done.

Insurance—Fire, tornado, boiler and employer's liability insurance premiums are increasingly important as items to be taken into account in mining costs whether these hazards are covered by insurance companies or assumed by the operator. In the latter case a fund or funds should be created and maintained at a charge to operations in sufficient amount to pay all losses, and, conservatism suggests, to accumulate a reasonable surplus.

General Office Expenses and Other General Expense.—General office expenses and other general expense should be incorporated in mining cost statements in order to get a total outside amount of cost upon which to base selling values; they should, however, be shown separately under appropriate headings, not being included in any of the subdivisions of "Cost at Mine." In a company conducted exclusively as a mining company it is, perhaps, better not to differentiate nicely between that portion of general office expense which is chargeable direct to mining, such as the operating and engineering departments, and the expenses of departments of sales, transportation, finance, accounts, etc. In a broad sense, the base of all the company's business is the production of its mines, hence all of its general office expense may properly be included as a part of its total mining cost.

RELATION OF BIG BUSINESS TO INDUSTRIAL PROSPERITY*

The Sherman Anti-Trust Act was responsible for the tremendous waste in mining through permitting unrestrained competition. When the Sherman Act was passed, immediately the wheels, so far as co-operation was concerned, were turned back to the conditions of the Middle Ages. An interstate trade commission and state trade commissions, which shall have substantially the same power to regulate co-operation in industry that the Interstate Commerce Commissions have in regard to public utilities, should be established. It seems to me that the Interstate and State Commerce Commissions and the administrative bodies for the pure food laws point the way for the next constructive step in the development of the laws. It would, perhaps, be chimerical, with public opinion as at present, to propose the repeal of the Sherman law, but the situation may be met by amendments to this law. The Sherman Act can be left to apply, as defined by the Supreme Court, to monopoly. Unreasonable restraint of trade may be defined as monopolistic restraint of trade, and it is rather generally agreed that monopoly should be prohibited. To make the matter perfectly clear another amendment should allow reasonable co-operation, but such co-operation should be under the watchful eyes of administrative commissions in order to protect the public.

There can be no question that the competitive system, when unrestrained, is positively opposed to the policy of conservation. This is true alike for minerals and timber. The minerals of the earth require the building of the earth for their making. Mineral deposits are doubtless in the process of manufacture at the present time; but even if so, this is at so low a rate as to be negligible. From the point of view of mankind, the stores of minerals in the earth are deposits of definite magnitude upon which we may draw but once and which by no possibility can be increased. In this connection it should be recognized that modern civilization would not be possible without the mineral resources of the earth—no iron ships, no tools except those of stone, no fuel but wood. Without

*Extracts from address before American Mining Congress, Philadelphia, Oct. 2, 1913.

the sub-surface products of the earth we would at once return to the material conditions of the stone age. It is, therefore, incontrovertible that from the point of view of the human race, economic systems or laws which result in unnecessarily rapid use of the mineral stores of the earth are indefensible; but such are the economic theories and laws now dominant in the United tates.

The wastefulness of the competitive system may be proved with regard to every product which is taken from the earth. Lead and zinc in Wisconsin and Missouri are mined on a small scale under an extreme competitive system. The losses of these metals in their mining and metallurgy are nothing short of appalling. In southeastern Missouri, according to the late Dr. Bulkley, not less than 15 per cent. of the metal is left underground; the losses in concentration approach 15 per cent.; the loss in smelting and concentration frequently amount to 15 or 20 per cent.; thus making a total loss of from 45 to 50 per cent. These great losses are due to the system of numerous small holdings, combined with the competitive system. High royalties on the part of the small feeholder are demanded of the operator. The operators desire to get large returns at the earliest practical moment upon this small investment. In consequence, ore is left in the ground that should be mined; unnecessary losses take place in concentration, also unnecessary losses occur in smelting.

But the most disastrous losses in mining as far as the future of the human race is concerned are in connection with coal. Director Holmes of the United States Bureau of Mines, in a paper upon mineral wastes, presents the facts in regard to the ruinous wastes of the unrestrained competitive system in connection with coal. He says that in the early days of mining when there was much sub-division of ownership; that not more than 30 to 40 per cent. of the anthracite coal in the beds mined was brought to the surface, leaving from 60 to 70 per cent. in the ground. He states that even at the present time that not more than 50 per cent. of the anthracite reaches the surface. The situation is similar for bituminous coal, but until recently the losses for such coal was substantially half. This loss has been somewhat reduced, but it continues to be appalling. Holmes estimates that since the beginning of mining in the United States, "two billion tons of anthracite and three billion tons of bituminous coal have been left underground in such condition as to make its future recovery doubtful or impossible." The principles which from the point of view of conservation should apply to the mining of coal are well known. So far as practicable the mines should be so worked as to make one superimposed vein after the other available. Coal slack should be reduced in amount and utilized. No considerable percentage of coal should be left in the ground as pillars. If these reforms were introduced, the losses could be reduced to half the present amounts and possibly to one fourth.

But to ask that any such proposals should be put into operation is purely chimerical. Under the Sherman law there is no opportunity to limit output, divide territory, or regulate prices. Five thousand bituminous operators could produce two hundred millions of tons of coal per annum beyond present demands. If the operators could agree upon limitations of output, and division of market so as to reduce freights, and could arrange for reasonable prices, which would give them no more than their present profits, they would then be able to follow these principles in mining their coal; for they themselves would be gainers in prolonging the life of their mines, and far more important many future generations would be the immeasurable gainers in that they would have an adequate coal supply.

Under the competitive system, we are recklessly skimming the cream of the natural resources of a virgin continent with no regard for the rights of our children or our children's children. They will have a heavy score against us if we continue to ignore the future and to apply the unrestrained competitive system in total disregard of their rights.

My proposal to remedy these conditions is neither regulated competition, nor regulated monopoly, but retention of competition, prohibition of monopoly, permission for co-operation, and regulation of the latter. At the present time there are state and notional movements to still further extend the advantages of co-operation to the farmers. Since it is unquestionable that the sense of justice of the citizens of the United States will support the courts in prohibiting class legislation, we shall therefore, I believe, ultimately permit co-operation in all lines of business alike. If we, however, retain freedom of competition, permit concentration sufficient to give efficiency, allow reasonable co-operation, and prevent monopoly, this will require regulation just as it has been necessary to regulate the railroads. This done, the Sherman law will be forgotten. Has there been any prosecution of the railroads for violation of the Sherman law because of collusion in fixing rates? And yet, everyone knows that they are just as flagrant violators of the Sherman Act as any other class of corporations in the United States. Are the freight rates the same for different roads between any two points? Are the passenger rates between Philadelphia and Chicago identical on all roads? Can you do better in price by travelling over the Pennsylvania, than over any other road? The rate is the same providing the speed is the same. How does it happen that the roads all got together? Just by Providence, I suppose. It was doubtless by a providential act that these rates were fixed identically upon all the roads, under the same conditions, all over the country.

Why is it that nobody proposes to indict the railroads for collusion? Simply for the reason that the rates which they can charge are controlled by commissions, national and state. Nobody any longer wishes to make them further trouble, because the public is protected by its commissions. The railroads are just as amenable to attack under the Sherman Act as any other combination in the United States. but when the railroads are giving reasonable rates, and are competing in giving reasonable service, even if the law is on the statute book and is the hallowed thing that has been described—the sense of official justice is such that they are not attacked in the courts. Will the Attorney-General of the United States or the Attorney-General of this or any other state, bring suit against the railroads for conspiracy in fixing rates when the public is properly protected? I have not heard the proposal made anywhere.

Minnesota and Wisconsin men have arranged to purchase the Second Relief gold mine and 10 stamp mill in Erie camp, Nelson mining division, B.C., and have commenced to clean up around the mine preparatory to working it. Mr. Edward T. Seaman, from Wisconsin, is in charge of the work being done.

PERSONAL AND GENERAL

Mr. H. S. Lavery who recently returned from South America is now at the Porcupine Pet Mine, South Porcupine.

Mr. D. A. Thomas who has been negotiating important railway and mineral land projects in the west, has returned to England.

Mr. Ambrose Monell and Mr. W. W. Mein are in Northern Ontario visiting the properties of the Canadian Copper Company and the Dome Mines Company.

The 40th annual commencement of the Colorado School of Mines was held on Friday, May 22nd.

Canadian Allis-Chalmers, Limited, has issued a bulletin on turbine pumps.

Dr. Joseph Struthers has accepted the office of second vice president of the Johnson Electric Smelting, Inc., controlling the American rights of the Johnson electrothermic process for the treatment of zinc ores and zinciferous lead and copper ores, with offices at 18 East 41st Street, New York, N. Y.

Mr. A. J. Tonge, the Mining Engineer of the Dominion Coal Company, left Halifax for England on the 2nd May, and will be away for about six weeks. During his visit Mr. Tonge hopes to visit several new developments in mining practice in England and on the Continent, on behalf of his Company.

H. W. Johns-Manville Co. has issued a bulletin on paints suitable for use in and about mines.

Mr. Fritz Cirkel has made an examination of the asbestos and chrome properties of the Black Lake Asbestos and Chrome Co., at Black Lake, P. Q.

Mr. Geo. H. Aylard, general manager for the Standard Silver-Lead Mining Co., has been at Sol Duc Mineral Springs, in the Olympic Mountains, in the State of Washington.

Dr. A. E. Barlow has returned East from a visit to Nelson, Trail, and Victoria, in British Columbia, and Banff, Alberta.

Mr. H. C. Bellinger is at Spokane, Washington, having returned to the United States after resigning the position of general manager for The Great Cobar Mining Company, operating mines and concentrating and smelting works in New South Wales, Australia. Mr. Bellinger was in that country about five years.

Mr. Thos. Graham, chief inspector of mines for British Columbia, has arranged to attend the annual convention of The Mine Inspectors Institute of the United States of America, to be held shortly at Pittsburgh, Pennsylvania. He has been requested to allow himself to be placed in nomination for election as a vice-president of the institute.

Mr. J. Cleveland Haas, for years resident in Spokane, Washington, has removed to the Bozeman district of Montana, where he has charge of a placer-gold mining enterprise.

Capt. Harry Johns, who for two or three years had been superintendent of the British Columbia Copper Mining Co.'s mining operations in Nelson and Slocan Lake districts, recently returned to Nelson after having been about four months in California recuperating following convalescence from a serious illness with pneumonia.

Mr. Woolsey McA. Johnson, of Hartford, Connecticut, was recently at Nelson and Trail, British Columbia, looking into the prospects for establishing in West Kootenay district, a small electric zinc-smelting plant to demonstrate the commercial value of a reduction process he has patented.

Mr. Chester F. Lee, of Seattle, Washington, recently again visited the Tulameen district of British Columbia. It is stated that he will direct placer mining operations for gold and platinum on ground on Tulameen River below the junction of Rock Creek with the larger stream.

Mr. Dudley Michel, of South Wellington, Vancouver Island, formerly of the Crows Nest district, in Southeast Kootenay, has been appointed instructor in "first aid to the injured" for the British Columbia Department of Mines, and in that capacity will visit both metal and coal mines and give demonstrations of and instruction in first aid work, following the course of the St. John Ambulance Association. At the suggestion of the secretary of the Western Branch of The Canadian Mining Institute, the Chief Inspector of Mines arranged that Mr. Michel should give his first public address at the meeting of the branch called for May 28th, in Nelson, B. C.

Mr. L. B. Reynolds has returned to Nelson, B. C., after having spent several months in Ontario.

Dr. Joseph Struthers, of New York, recently accompanied Mr. Byron E. Eldred, president of the Johnson Electric Smelting, Incorporated, on a business visit to British Columbia.

OBITUARY

Mr. W. J. Sutton, of Victoria, B. C., who died suddenly on the morning of May 9 at Ucluelet, on the west coast of Vancouver Island, was a well-known geologist and mineralogist. He was born at Kincardine, Bruce County, Ontario, on January 19, 1859. After having attended the public schools for a number of years, he took courses in mining and geology at Trinity College, Cornell; Columbia School of Mines, New York; and the Michigan College of Mines, Houghton, Michigan, at which last mentioned institution he has been for some time an instructor in geology. His residence in Victoria, B. C., dates back to 1877. In the late eighties he was Provincial Government Assayer, and in connection with that office examined and listed many minerals occurring in the province. The Annual Report for 1888 of the Minister of Mines for British Columbia includes a comprehensive report by Mr. Sutton on several of the then known mining districts, and a list of minerals that had come under his notice in the performance of the duties of his office. On leaving the public service he joined the staff of the Dunsmuirs, then largely interested in coal-mining on Vancouver Island and owning an extensive area of land on the island acquired in connection with the construction of the Esquimalt & Nanaimo Railway. Much work was done by Mr. Sutton ascertaining the geological features of the E. & N. railway belt, so that he became particularly well informed concerning the geology of Vancouver Island and as the years passed placed on record much valuable information relative to the topography, geology, and mineral resources of various parts of the island. His work in this connection included the preparation of a large map of the island, which, however, was primarily for the information and use of the Dunsmuir interests, though now and then Mr. Sutton showed it when

addressing audiences, as he did occasionally, on the geology and mineral resources of the island. Fortunately, for five or six years immediately prior to 1913 the Geological Survey of Canada had either topographical or geological parties in the field on the island, and as Mr. Sutton gave to those in charge freely of his knowledge of local features and conditions, there was made available for the benefit of the public much information that might not otherwise have been readily accessible.

Apart from his geological work, Mr. Sutton made a hobby of collecting specimens of mineral and succeeded in getting together what is probably the finest and most valuable collection in the Northwest. He took great pleasure in showing his mineral treasures to those well enough informed on the subject to appreciate their worth. At times he would give his fellow members of the Natural History Society of Victoria the benefit of a talk on minerals and show them many specimens of interest and value. He was a member of the American Institute of Mining Engineers, a vice-president of the Canadian Mining Institute, and belonged also to other societies.

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA

Much interest has been taken in the district about Nelson in the visit during the early part of May of leading officials of the Johnson Electric Smelting Co., who were invited by the Nelson Board of Trade to investigate the situation in Kootenay with a view to establishing an electric smelting works in the district to treat lead-zinc ores. Particulars of the negotiations that were carried on will be given on other pages of the Canadian Mining Journal.

The 1914 mining season in districts where there is a heavy snowfall in the winter is now fairly entered on, and information has been received from various camps telling of renewed activity, together with good prospects for the year. In the placer-mining districts, too, much preparatory work has been taken in hand, and generally there is confidence that the year will see production to a similar extent that characterized operations in 1912 and 1913, in each of which years the total value of the mineral produced exceeded that of any year prior to 1912.

Standard Silver-Lead Mining Co.—A statement showing the receipts and expenditures of the Standard Silver-Lead Mining Co. for the month of March has been issued to stockholders. The company operates the Standard Silver-Lead-Zinc mine situated about two miles from Silverton, Slocan Lake. Net receipts for ore shipped totalled $107,253, and from the boarding house there was received $4,511. Operating expenses were $23,539, and expenditures on capital account $7,467. The net profit for the month was, therefore, $80,758. The monthly dividend No. 25, of $50,000—was paid, which left $30,758 to be added to the company's credit balance, bringing the latter up to $324,090 as at March 31.

A statement recently sent to stockholders in the Standard Silver-Lead Mining Co., shows that during the calendar year 1913 receipts from all sources totaled $1,071,692, as follows: From ore shipped (13,959.54 tons) $949,245; final settlements and umpires, $180; lead bounty (paid by Government of Canada), $15,764; zinc concentrates, $65,890; boarding house, $38,168; interest, $2,445. Expenditures totaled $340,467, of which $253,457 was on operating and $87,010 on capital account. The net profit for the year was $731,225, of which amount $650,000 was distributed as dividends. Adding the remainder—$81,225—to the balance at credit on January 1, 1913—of $165,123—the current year opened with a credit balance of $246,348. Shipments of silver-lead ore and concentrate in 1913 totaled 13,960 tons, the average metal contents of which were 77.5 oz. per ton (total, 1,081,849 oz.) and lead 64.4 per cent., (total, 17,988,805 lb.). There was also shipped 4,375 tons of silver-zinc concentrate which averaged 24.3 oz. of silver to the ton and 41.92 per cent. zinc. Total shipments by the company from the time it commenced production operations on December 1, 1911, to December 31, 1913, a period of 25 months, were as follows: Of silver-lead products, 24,536 tons, averaging 77.1 oz. silver to the ton (total, 1,893,673 oz.) and 64.1 per cent. lead (total, 31,486,065 lb.). Of silver-zinc concentrate, 8,046 tons averaging 23.4 oz. of silver to the ton (total, 188,744 oz.) and 41.6 per cent. zinc (total, 6,696,691 lb.).

Comparing the average metal value of the silver-lead products in 1912 with that in 1913, there is little difference, for in the former year it was 76.2 oz. silver to the ton and 63.8 per cent. lead, while in the latter it was 77.5 oz. of silver and 64.4 per cent. lead. There was also a small increase in the average metal contents of the silver-zinc concentrate—silver 24.3 oz. to the ton and zinc 41.92 per cent. for 1913, as compared with silver 23.4 oz. to the ton and zinc 41.6 per cent. for the whole period of production.

Boundary.

Granby—During the first week of May there was treated at the Granby smelting works at Grand Forks 22,756 tons of ore, of which 22,362 tons was from the company's mines at Phoenix and 394 tons was of custom ore. The week's shipments of blister copper to the refinery totaled 174,000 lbs., making the total for the year 7,074,652 lb.

Published figures for four months, January-April, of this year show that the total quantity of ore treated at the Granby works during this period was 401,246 tons, of which 393,249 tons was from the company's own mines in Boundary district and 7,997 tons was of custom ores. No particulars are available as to the sources of the latter, though it is known that mines in Republic Camp, Washington, ship to the Granby smeltery. Blister copper shipments from the works to an eastern refinery during the four-month period have totaled 6,900,652 lb. The figures for this year show a small decrease as compared with those for the corresponding period of last year, when they were as follows: Ore from Granby Co's mines treated, 410,631 tons; customs ores, 3,679 tons; total, 414,310 tons, The blister copper shipped to May 1, 1913 totaled 7,394,697 lb.

Similkameen.

Hedley—The dam across Similkameen River in connection with the Hedley Gold Mining Co.'s new hydro-electric power system, for which the directors some time ago made an appropriation of $200,000, is now nearly completed. The erection of this dam was commenced late last autumn, and now all that remains to be done is a small portion of the upstream aprons, which work must be deferred until the spring freshets in the river shall have passed. The ditch and flume

line are now having attention and the work on these is well advanced, both in clearing and grading the line and in preparing timbers for the flume. Meanwhile production of ore at the mine and its reduction in the company's 40-stamp mill are being continued as usual.

Placer mining for gold and platinum on parts of the Similkameen and Tulameen Rivers is to be actively engaged in this year, to a larger extent than for several recent years. One enterprise is in charge of Mr. Chester F. Lee, of Seattle, Washington, who has arranged to give it much of his time. The ground to be worked is on the Tulameen, below Granite Creek. Mr. R. A. Lambert will continue his work on Granite Creek, just above the junction of the north fork with the main creek, where he and his associates have put in a dam and sluice-flume.

Tulameen.

A Spokane, Washington, syndicate is persevering in developing its property on Treasure Mountain, Summit Camp, near the headwaters of Tulameen River. There being no wagon-road connection nearer than 16 or 17 miles from the camp—only a trail the grade of which is steep in places—work is being done under difficulties, but a low-level crosscut adit is being driven with the object of proving whether or not the well-defined and ore-bearing vein that can be traced for a long distance on the surface continues down to the depth at which the adit is being driven. Some silver-lead ore has been found, but it is believed the vein sought for is farther ahead. In an upper tunnel, driven about two years ago, there was opened a vein in which galena occurs in places, ranging in width up to 14 inches, with concentrating ore between and about the shoots of clean ore. The Treasure Mountain syndicate claims to have expended about $20,000 in connection with the development of its group of mineral claims, while other Spokane men have spent smaller sums in the camp, notably on the Indiana claim, in which an adit has also been driven, with silver-lead ore occurring in places along its length of 300 ft. or more. Mr. Patrick Clark, of Spokane, last year bonded a number of claims in the camp, but as yet he has done but little development work on them.

QUEBEC

At the asbestos and chrome properties of the Black Lake Asbestos and Chrome Co., in Black Lake, P. Q., five pits are in operation. There is employed a force of 225 men. About 700 tons of asbestos rock is raised daily. Only half of the mill is in operation now, but the other unit will be operated also as soon as the big ore bin, to hold several thousand tons of asbestos rock, is completed.

The graphite deposits at Elmsley, Ont., which were extensively operated several years ago, will be taken over by Pittsburgh people. The mill will be overhauled and its capacity, which is now 60 tons per day, increased to 100 tons. About six per cent. of graphite is extracted by the present machinery. This will be increased to eight per cent. by the installation of some new separation tables. These properties were intermittently operated for the last 20 years. Diamond drill borings have shown that the extent of the deposits is great.

PORCUPINE, SWASTIKA AND KIRKLAND LAKE

Dome—At first sight the Dome annual report is frankly disappointing to shareholders; but on fuller examination it presents many redeeming features. The fullest information is vouchsafed and the most inquisitive stockholder cannot say that he has not been taken into the confidence of the directorate.

Mr. W. W. Mein states his average grade of ore at $3.80 per ton and this is regarded as uncomfortably low unless the ore bodies are so enormous as to permit of handling very large tonnage so as to reduce costs to $2.50 or less a ton. Fortunately both developed and indicated ore as stated in the report tends to prove that the ore bodies will be large enough to permit of very economical handling.

The management believes that with the extension of the mill and the alteration in the process the costs per ton can be reduced to $2.50 or even lower, and if this intention can be realized the ore will yield a handsome profit.

Certainly it is the general opinion that if the Dome can make a good profit on $3.80 a ton it opens a field for the operation of low grade ore bodies in Northern Ontario, which should cause the investment of considerable capital in low grade deposits, which have so far been considered too low to treat at a profit.

During April the tonnage treated in the mill was lower, but the recovery was higher indicating that the grade ran better. It is extremely difficult to maintain the grade of the ore at anything like an even level as only the most careful examination will indicate even a relative value.

It is pointed out in the annual report of Mr. A. A. Cole, mining engineer of the Temiskaming and Northern Ontario Railway, that the gold production of the Porcupine camp in the year 1913 was an increase of 147 per cent. over the previous year. Porcupine according to official figures produced 95 per cent. of the Ontario gold and 29 per cent. of the amount taken out of the ground in the Dominion.

Jupiter—The McKinley Darragh Savage Mining Company has lost no time in getting to work upon the Jupiter. The directors of the Cobalt company visited the Porcupine mine last week and were satisfied with the progress made. According to their sampling there is on the 300 ft. level 300 ft. of ore which will run $15 for a width of 36 to 42 in. Drills are at work on both ends of this ore body. Above the 300 ft. level the ore bodies are short and irregular. The winze has been sunk to the 400 ft. level and a crosscut has been started to the north. A vein has been cut, which may or may not be the main vein. It is 5 ft. wide, but runs only about $6 to the ton. To the south the crosscut has just run into a narrow ore body which panned gold and appeared to be quite rich. At the time of writing exact assays had not been received. The company has leased the compressor plant of the Plenaurum, which will give sufficient power for the present and until such time as they desire to prosecute operations upon a larger scale.

Porcupine Crown—In the month of April the mill at the Porcupine Crown treated 3,500 tons of ore of a value of $18 per ton. Of this the mill recovered 97 per cent. with very creditable costs considering that only about 100 tons per day is being treated.

At the 500 ft. level the vein which has so far been drifted upon is by no means of as good a grade as on the upper levels. It will be remembered that the main

vein dipped out of the winze at a depth of 450 ft. and that the winze was carried on down vertically to the 500 ft. From the bottom of the winze a crosscut was carried across to the vein, which when cut was not of a grade as high or nearly as high as on the upper levels. But on the 450 ft. level the vein has already been developed in good ore for 100 ft. and drifting will be continued south to the fault. On the 400 ft. level the ore shoots developed amount to about 400 ft. The body is divided into two shoots by a lean patch of about 150 ft. It is the intention to sink a winze on ore from the 400 ft. level to the drift on the 450 ft. and thence down to 500 ft. with the intention of discovering exactly where the break in the vein occurs.

Dome—The production of the Dome Mines, Porcupine, during April was: Tonnage milled 14,770; value gold produced $97,454.

The total tonnage milled for the twelve months ending March 31, was 145,210 tons, and the total amount of gold recovered, $1,204,263.

In Munro Township prospectors have been stirred by the spectacular showing of the Dobie Leyson property. The vein is stated to have an approximate width of from 5 to 7 ft. There is much visible gold and also sulphides.

The owners of the Agate gold property, which is in the same section, have recently made a mill run of 30 tons of ore in the Detroit syndicate's small mill. The test is said to have been satisfactory and to have decided the company to proceed with development on a more extended scale.

Vipond—The first work the new company that has taken over the Vipond will undertake, will be the reconstruction of the mill. The crushing section of the mill will not be altered very extensively, but it is proposed to add equipment similar to that in use at the Porcupine Crown where the continuous decantation process has proved so successful. After the mill has been put in shape underground work will commence. It is understood that the control of the company will be held by the majority shareholders of the old company. Shares will be apportioned to old shareholders at a ratio of 3 new for 8 old. A block of stock has been sold to a Toronto brokerage firm, and it is estimated that the money so raised will provide the funds necessary to put the mine in good running condition. The Vipond mine has been closed down since the labor strike in September 1912. At that time there was trouble with the mill, the recovery on the plates not being at all satisfactory. When the strike was declared the mine was closed down and has been so closed ever since. Mr. C. H. Poirier, who had charge of the property before, is again manager of the property and will attend to the reconstruction of the mill.

Porphyry Hill—Last month the Porphyry Hill property shipped another car of ore taken from an open cut on one of the old Preston East Dome claims, which lapsed to its original owners. The shipment consisted of 51,700 lb.

Alexo—From the Alexo mine no less than 582 tons of ore left the mine during the month. It is learned that in the drift at the 80 ft. level the ore body has widened considerably. This will probably induce the owners to run a spur line into the property and open up the mine on a larger scale.

COBALT, GOWGANDA AND SOUTH LORRAIN

Keeley—Dr. J. Mackintosh Bell, the representative of the Huronian Belt company, the Canadian Corporation of Messrs. Ehrlich and Co., and allied interests, is reported to be quite pleased with the developments on the Keeley mine in South Lorrain. He has been spending some time at this property, which has recently been re-opened after being closed down for the whole of the winter.

The ore shipments for the month of April showed an advance of almost 300,000 pounds in comparison with the previous month of this year, although the record is still considerably short of the corresponding period last year. The Chambers Ferland appeared on the shipping list again after a lengthy absence. There were no less than 17 mines shipped ore in April.

The shipments for the month of April in pounds were:

Beaver Consolidated	62,435
Chambers-Ferland	58,690
Crown Reserve	40,000
City of Cobalt	75,740
Cobalt Townsite	356,940
Coniagas	301,750
Cobalt Lake	193,620
Dominion Reduction	518,360
Hudson Bay	154,610
La Rose	191,840
McKinley-Darragh	379,480
Nipissing	115,370
O'Brien	63,760
Penn-Canadian	63,760
Peterson Lake (Seneca Superior Lease)	68,210
Trethewey	95,860
Temiskaming	49,800
	2,811,045

Kerr Lake—Ore reserves at the Kerr Lake mine are being drawn upon only to the extent of keeping production high enough to enable the company to pay current dividends. It is the purpose of the present mine management to maintain development of unproven territory at least at an equal pace with the stoping of known ore reserves. The ore in the Fleming vein at the Kerr Lake mine proved to be profitable farther below the contact and in the Keewatin than any other mine in the camp. To the 325 ft. level, or approximately 100 ft. below the bottom of the conglomerate the ore is of excellent milling grade, but at the 325 it is lean. As a rule in most mines in the camp the veins carry little silver below the contact.

The big vein, known to exist at the 140 ft. level, but not exhibited on the surface until last year when the lake was drained, has not been touched yet. Ore from it will be pulled from time to time as it is required, but it is yet as intact as it was nine months ago.

The fact that the power company is overloaded prevents the running of more than one of the two pumps now being used to drain the lake. This pump is only running at nights and is now pumping mud only, the lake being almost entirely dewatered.

La Rose—All the old board of the La Rose was re-elected at the annual meeting in Montreal. In the annual report Mr. R. B. Watson, general manager, clearly indicates that more ore will soon have to be found to maintain the present position of the company. Milling ore on the dumps was scarcely touched during the year, the contract with the Northern Customs mill being filled with ore from development; but the high grade reserve was cut in two. Both the Lawson and the Princess are now contributing more to the production of the company than the old La Rose, where a very vigorous development campaign is being carried on near the Cobalt Lake fault. Results to date have been negative. A good feature of the report was the reduction in costs by 3.13 cents an oz., though the net gain was only 79c an oz., owing to the fall in the price of silver. Dividend requirements call for $931,000 during the year. The net surplus has been increased to the large total of $1,528,776, the company not finding any of the prospects examined sufficiently alluring.

Gould—The General Assets Limited of Toronto, of which Mr. Garnet Grant is president, has made first payment on the control of the stock of the Porcupine syndicate, and since the Porcupine syndicate has control of the Gould Consolidated stock, the General Assets is now in charge of the Gould lease, the Cart Lake, Several short shoots of high grade ore have recently been discovered on the Gould. The General Assets once had the control of the Dome Lake, at Porcupine, but sold out to the Hudson Bay. They still are running the Cochrane mine near the Temiskaming mine in south east Coleman.

The Seneca Superior Mine Co., Limited, has declared its regular quarterly dividend of 10 per cent. with two and a half per cent bonus. The bullion shipments from the Cobalt camp for the year now amount to more than two million dollars.

The Trethewey Cobalt Mining Company has taken an option on 120 acres in Harris township, about a mile south of the Casey Cobalt mine. The overburden is for the most part heavy and the only method of prosecuting is with the diamond drill. Two drills will be set up in various places and the formation will be tested, it being hoped also that veins may be encountered. The claims form part of a plateau between two ridges of rock rising out of the Clay Belt along the shore of Lake Temiskaming.

The whole of the acreage is in the conglomerate.

ALASKA SOLOMON DERBY DOG RACE.

The first of the dog races of the 1914 season—the Solomon Derby—over the snow trail from Nome to Solomon and return, was run on March 2. The competitors were Fred Ayer, who finished first; John Johnson, A. A. (Scotty) Allan, driving a team of malumets owned by himself, and Mrs. C. Darling, of Berkley, Fay Dalzene, winner of last year's All-Alaska Sweepstake, driving dogs owned jointly by himself and Russell Bowen, and Percy Blatchford.

The five teams started from Nome at 10 o'clock in the morning under a clear sky, but a wind and snowstorm that became almost a blizzard as the race proceeded made the going heavy, so that there was no chance of beating the best record of other years. Fred Ayer finished the course of 64 miles in 6 hours, 30 minutes and 4 seconds. John Johnson, winner of the 1913 Derby, was a close second with his team of Siberian wolves, finishing two minutes after Ayer. Johnson's time last year, which was the record of this course, was 5 hours, 47 minutes, 24 seconds.

The All-Alaska sweepstake, 412 miles, from Nome to Candle and return, will take place in April. The contestants in the long races must finish with the same dogs and equipment as at the start. If a dog is disabled, he must be carried on the sledge. Winners in either of the big derbies are honored for the remainder of their lives.

The introduction of the reindeer and the promise of railroads have not affected the place of the Eskimo dog as the chief transportation agent in northern Alaska. The sledge dog has as many points to be considered as a blooded horse, and when Stefansson brought dogs here last summer for his Arctic expedition he picked them as carefully as he had previously selected his men.

COBALT ORE SHIPMENTS.

The ore shipments for the week ending May 22 were about the same as they have been for the past six or seven weeks in spite of the fact that only six mines were on the shipping list. This is explained by the fact that the McKinley-Darragh shipped no less than five cars of ore during the week. One of these had been sent previously to Campbell & Deyell's to be sampled so that it had actually been produced some time before. It ran about 2,500 oz. for 33½ tons. The Cobalt Townsite shipped two cars and the Casey Cobalt and the Cobalt Lake, one each. The mine belonging to the Rose Van Cutsem group in London is reported locally to be in much better shape than the sudden drop of the stock in the London market would indicate.

The ore shipments from the Cobalt camp for the week ending May 22 were:

	High.	Low.	Total lb.
McKinley-Darragh	341,305	....	341,305
Cobalt Townsite	162,200	....	162,200
Nipissing	....	121,330	121,330
Dominion Red	....	86,160	86,160
Cobalt Lake	63,770	....	63,770
Casey Cobalt	....	63,700	63,700
	567,275	271,190	838,465

TOUGH-OAKES.

Cobalt, May 23.—The bush fire which destroyed some poles on the Charlton-Swastika Kirkland Lake transmission line did not materially alter the date of the turning on of power. At the Kirkland Lake end of the line everything is in readiness and has been now for some time. It is hoped that the power may be turned on next week, but there are always so many unexpected factors to consider that it is not certain.

The Tough-Oakes has shipped another car of ore of the usual value, viz., about $400 to the ton. Drifting on the main vein has started at the 300-ft. level.

As an indication of the interest that a group of mining men are taking in the Kirkland Lake field, it is known that a representative of the Central News Agency of London, England, made a special journey to Kirkland Lake and cabled some 300 or 400 words to England at the request of the firm by whom he was employed.—Cobalt Nugget.

MARKETS

STOCK QUOTATIONS.

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

May 26, 1914.

New York Curb.

	Bid.	Ask.
Alaska Gold	28.25	28.50
British Copper	1.50	2.00
Braden Copper	7.75	8.00
California Oil	308.00	311.00
Chino Copper	41.25	41.50
Giroux Copper	.50	1.00
Green Can.	31.00	33.00
Granby.	.....	.....
Miami Copper	21.75	22.25
Nevada Copper	14.50	14.75
Ohio Oil	185.00	186.00
Ray Cons. Copper	21.37	23.50
Standard Oil of N. Y.	219.50	221.00
Standard Oil of N. J.	407.00	409.00
Standard Oil (old)	1050.00	.....
Standard Oil (subs)	945.00	.....
Tonopah Mining	6.37	6.62
Tonopah Belmont	7.12	7.37
Tonopah Merger	.57	.59
Inspiration Copper	16.50	17.25
Goldfield Cons.	1.43	1.50
Yukon Gold	2.75	2.87

Porcupine Stocks.

	Bid.	Ask.
Apex.	.02¾	.03½
Dome Extension	.08	.09
Dome Lake	.41	.42
Dome Mines	10.20	10.40
Eldorado.	...	...
Foley O'Brien	.30	.32
Hollinger.	16.40	16.60
Jupiter.	.11	.12
McIntyre.	.27	.30
Moneta	.02	.04
North Dome	...	...
Northern Exploration	2.25	2.75
Pearl Lake	.03½	.04¼
Planaurum.	.50	.60
Porcupine Vipond	.28	.32
Imperial.	.01¾	.02
Porcupine Reserve	...	...
Preston East Dome	.01¾	.02
Rea.	.10	.20
Standard.	...	...
Swastika.	.01	.01¼
United.	...	...
West Dome	.06	.10
Porcupine Crown	.83	.87
Teck Hughes	.08	.10

Cobalt Stocks.

	Bid.	Ask.
Bailey.	.01¼	.01½
Beaver.	.28¾	.29
Buffalo.	1.15	1.20
Canadian.	.08	.10
Chambers-Ferland.	.19	.20
City of Cobalt	.46	.50
Cobalt Lake	.41	.50
Coniagas.	7.15	7.75
Crown Reserve	1.30	1.31
Foster.	.04	.06
Gifford.	.02½	.03
Gould.	.01¾	.02
Great Northern	.08	.09
Hargraves.	.01	.02
Hudson Bay	75.00	78.00
Kerr Lake	4.50	4.55
La Rose	1.38	1.40
McKinley.	.67	.75
Nipissing.	6.05	6.25
Peterson Lake	.38	.38½
Right of Way	.04	.05
Rochester.	.01	.02
Leaf.	.01	.02
Cochrane.	.35	.50
Silver Queen	.01¾	.02
Timiskaming.	.15	.16
Trethewey.	.18	.20
Wettlaufer.	.05	.05½
Seneca Superior	2.50	2.85

TORONTO MARKETS.

May 26.—(Quotations from Canada Metal Co., Toronto).
Spelter, 5¼ cents per lb.
Lead, 5¼ cents per lb.
Tin, 36 cents per lb.
Antimony, 8½ cents per lb.
Copper, casting, 15 cents per lb.
Electrolytic, 15 cents per lb.
Ingot brass, 10 to 15 cents per lb.

May 26.—Coal—(Quotations from Elias Rogers Co., Toronto).
Anthracite, $7.50 per ton.
Bituminous, lump, $5.25 per ton.

GENERAL MARKETS.

May 22.—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $1.80 to $1.90 per ton.
Foundry coke, prompt, $2.35 to $2.65 per ton.

May 22.—Tin, straits, 33.25 cents.
Copper, Prime Lake, 14.37½ to 14.50 cents.
Electrolytic copper, 14.10 to 14.20 cents.
Copper wire, 15.25 cents.
Lead, 3.90 cents.
Spelter, 5.10 to 5.20 cents.
Sheet zinc, (f.o.b. smelter), 7.00 cents.
Antimony, Cookson's, 7.25 to 7.35 cents.
Aluminum, 17.75 to 18.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, $43.00 to $44.00 per ounce.
Platinum, hard, 10%, $46.00 to $47.50 per ounce.
Platinum, hard, 20%, $49.00 to $51.50 per ounce.
Bismuth, $1.95 to $2.15 per pound.
Quicksilver, $38.00 per 75-lb. flask.

SILVER PRICES.

	New York cents	London pence.
May 9.	58⅞	27 1/16
" 11.	58¾	27
" 12.	58½	26⅞
" 13.	58⅝	26 15/16
" 14.	58⅝	26 15/16
" 15.	58⅝	26 15/16
" 16.	58½	26⅞
" 18.	58½	26⅞
" 19.	58	26⅝
" 20.	57⅝	26½
" 22.	57½	26 7/16