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Editor

REGINALD E. HORE

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NANAIMO COAL MINERS' STRIKE

The coal mining industry of Vancouver Island has for several months been in very bad condition. Recently grave disorders have occurred and damage has been done to life and property.

It is stated that strikers have set fires underground and burned mine buildings and dwellings. Men trying to put out the fires and save property have been attacked and brutally assaulted. Desperate characters, who were not in the employ of the companies when the trouble started last September, are now present in large numbers. There seems to be reason to believe that such men have been brought in solely to bring about the present conditions at Nanaimo. If this be true, the organization responsible for bringing them into Canada cannot be too strongly condemned.

The trouble started at the Canadian Collieries, where the miners went out on strike last September. Since May 24 the other collieries have also been idle, the men not going back to work after the holiday. A series of riots has occurred.

As the local authorities were quite unable to enforce the law and prevent disorders, the militia were called in. Several of the leaders of the United Mine Workers, the organization which is endeavouring to gain a foothold in Nanaimo, have been imprisoned and order restored.

For the present the most important duty of the Government is to teach the disorderly element that the laws of the country must be obeyed, that violence will not be tolerated, and that prompt punishment will be meted out to offenders. Until this lesson has been taught no lasting settlement of disputes between operators and strikers is likely to be arrived at.

THE RUSH TO SHUSHANNA

During the past few months there has been a rush of prospectors to the Shushanna district, Alaska. The reports state that Mr. James, the original discoverer, took out \$300 per day from the creek bottoms. Others have not been so fortunate; but a large area has been staked. Dr. D. D. Cairnes, of the Geological Survey of Canada, who is familiar with the district, has issued a warning to stamperders, stating that it will be inadvisable to go in without a good outfit. It will be necessary to spend the winter there. Already a large number of prospectors are on the ground and the most promising ground was staked some time ago. There

is, however, a large area which may prove to be mineral-bearing, and much prospecting will doubtless be done far from the original discovery.

MINING IN BRITISH COLUMBIA

Canada's Pacific province has long been one of the most productive of mineral wealth. The industry is in a flourishing condition, and the value of the output for 1912 was much greater than that of any previous year. 1911 was an off year, owing chiefly to prolonged labour troubles in the East Kootenay coalfield, and it is therefore pleasing to record the marked change for the better.

KOOTENAY MINING MEN WANT A COMMISSION

For several years the Nelson mining district in British Columbia has been known to contain large deposits of zinc and lead ores. A few mines have been profitably operated; but a large number of the deposits are under present conditions not workable. Efforts have been made to secure Government aid, so that a large industry may be built up. It is the belief of several of those interested that with some assistance the district can become a very important producer of zinc. It is desired that the ores should be smelted in Canada; but it is thought that to do this the smelter men will need to have some aid from the Government until the industry is well established.

The Department of Mines has undertaken the investigation of methods of treatment of the ores, and promises to render considerable assistance this way.

On the occasion of the visit of Hon. Louis Coderre, Minister of Mines, to Nelson on August 21, business and mining men presented their case to him and urged that a commission be appointed to investigate its merits. It is likely that this will be done.

Mr. Coderre, who is accompanying the C2 excursion of the Geological Congress, is showing a keen desire to become acquainted with the wants of the mining men of the west.

DISORDER CONTINUES IN MICHIGAN COPPER DISTRICT

There are as yet no indications of a settlement being reached between union strikers and the mine operators of the Copper Country. A number of the mines are in operation, the miners being carefully guarded. Workers are frequently assaulted by strikers, and it is still considered unsafe to withdraw the militia. At a meeting of strikers in Laurium a resolution was made to appeal to the U. S. Senate for an investigation of the conditions. It is reported from Washington that Frank Morrison, secretary of the American Federation of Labor, has, at the request of President Moyer, issued

an appeal for funds to help the strikers. The union officials complain that the operators will not recognize the union. The operators say they are willing to talk with their employees as such; but not with representatives of the union.

It is reported from Houghton that the mine output is steadily increasing. Calumet and Hecla mine is operating twelve shafts, Isle Royal one, Champion two, Timountain one, Quincy two and Superior one. The Mining Gazette reports the output last week to be at the rate of about 5,000 tons of ore per day.

Strikers complain that they have not received the benefits promised them by the agitators. Some are resigning from the union and others leaving the country. Some continue to believe the agitators.

FOURTH EDITION OF COBALT REPORT

The Ontario Bureau of Mines has published a new and revised edition of the report on the Cobalt district, prepared by Dr. W. G. Miller, C. W. Knight, A. G. Burrows and others of the staff. The third edition, published in 1908, has been out of print for some time.

The mining operations during the past few years have disclosed many interesting structural features, and the revised report contains a number of sections illustrating these. Accompanying the report there are a number of new photographs and maps, which aid in giving the reader a better knowledge of the character of the ore bodies and the rocks in which they occur.

In addition to description of the Cobalt area proper, there are short descriptions of surrounding areas, including South Lorrain, Casey and Harris, Lake Wendigo, Bay Lake, Montreal River, Temagami Forest Reserve, Gowganda, Shining Tree, Florence Lake, Langmuir Township and Otter Township.

A chapter is devoted to the Lake Superior and other Canadian and foreign deposits of Cobalt deposits and the metallurgy of Cobalt. Mr. E. T. Corkill contributes a description of mining and concentration methods at Cobalt.

The newer features of the geological descriptions are contained in the paper by Dr. Miller, prepared for the Geological Congress, and now running in the Journal.

AN INDEX TO THE PUBLICATIONS OF THE CANADIAN MINING INSTITUTE

Mining men will be pleased to learn that the general index to volume I. to X. of the Mining Institute Transactions is nearly ready. In addition to the index the book contains very useful summaries of the papers. The labor and expense involved in compiling the book has been very considerable, and it is hoped that members will support the effort by subscribing at an early date. The edition is a limited one.

MOB VIOLENCE AT VANCOUVER ISLAND COAL MINES

Mob rule prevailed for two or three days about the middle of August in Nanaimo coal mining district, Vancouver Island, British Columbia, but the prompt action of the Provincial Government in despatching the militia forces in sufficiently large numbers to enforce the law and keep order, resulted in a speedy termination to the violence and excesses of the brief period during which the local and special police were powerless to prevent the outrages that occurred.

The history of the trouble goes back to the declaration of a strike of the miners then employed at the several coal mines at the Comox (Cumberland) and Extension collieries of the Canadian Collieries (Dunsmuir) Limited, owning and operating the mines acquired about two years ago from the Dunsmuir interests. After the strike was carried out, the company was unable for more than six months to operate its Extension colliery mines, which are situated a dozen or fifteen miles south-west of Nanaimo, and which have their shipping bunkers near Ladysmith, the residence town of most of the Extension miners. Efforts were concentrated during those months on the operation of the Cumberland mines, and gradually a non-union force was obtained, until latterly the mines were being worked at about three-fourths their normal productive capacity, and coal was being sent out accordingly. Having got things going at Cumberland, the company two or three months ago turned its attention to Extension mines, where, despite the boast of local strikers that work would not be resumed until after an agreement with them, it became apparent that the working force there also was gradually being increased and production of coal resumed. Meanwhile efforts had been made, but without success, to induce the men employed at the Western Fuel Company's mines, in the immediate vicinity of Nanaimo, to join in a sympathetic strike. Incidentally, it may be mentioned, that the agreement between the Western Fuel Company and its miners had still several months to run—until September—it has been stated in district newspapers. Other collieries being operated near Nanaimo were those of the Pacific Coast Coal Mines, Ltd., and the Vancouver-Nanaimo Coal Mining Company Ltd., but both these were producing on a much smaller scale than the two larger companies previously mentioned.

At the end of last April a man named Farrington, of Seattle, Washington, prominent in the activities in the North-west of the United Mine Workers of America, instructed the president of the local union at Nanaimo to call a strike at all coal mines on Vancouver Island. Notwithstanding that the U. M. W. of A. did not at that time have on its membership list one-tenth of the men concerned—*island newspapers published the statement that its local membership was then only about 200—nearly 2,000 miners and other coal mine employees ceased work, many of them acknowledging that while they wished to keep faith with the company and carry out their agreement, they could not afford to be branded as "scabs," as the U. M. W. of A. was reported to have announced its determination to brand them in Canada, the United States, and Great Britain if they continued at work. A vote was ordered as to whether or not they would return to work, but heeding the warning of the U. M. W. of A. not to vote, approximately three-fourths of those affected abstained from voting. The great majority of those who did*

vote, however, were favourable to keeping their agreement and working until it should expire. No united action was taken, though, so the production of coal was not resumed.

A short time ago an effort was made by the Western Fuel Company and its two neighbouring companies to start work with a few men, and it was generally understood that a beginning had actually been made. This seems to have so exasperated the strikers that many of them became very violent, ordering non-union workers to leave the district, and even threatening them with death if they did not go. Finding that the law was being broken, and that the few local police were powerless to prevent disorder, the Provincial Government had a number of men sworn in as special constables and sent to Nanaimo, which action so angered the lawless strikers that they hustled the specials back on the train and steamer, and bade them depart or pay the penalty of staying with their lives. Then the gathering mob abandoned all restraint, and a reign of terror was quickly inaugurated. At Nanaimo mines little damage was done by the mob, but at the Pacific Coast Coal Mines Company's South Wellington colliery, five miles away, non-union men were violently assaulted, their lives threatened, buildings were wrecked, and even the police sent from Nanaimo were assaulted and turned back. Then the mob proceeded to Extension, where the working miners were fired on, and compelled to take refuge in the mine entry, their women and children so terrified that they fled into the surrounding bush without clothing other than what they wore, and without food, and some of them had to remain there for 36 hours. When they did return they found their homes torn down or burned, all their belongings either stolen or destroyed, and mine buildings and plant effaced by fire. In the town of Ladysmith, eight or ten miles away, police were of no avail, and strikers were so threatening in their attitude that many residents, whites as well as Chinese, got away by train as soon as possible, and left their homes and belongings to the will of the unruly crowd.

Not long, though, did mob rule prevail, for before the law-breakers knew that the Provincial Government intended sending troops, there were hundreds of militia-men in Nanaimo, having been sent up at night by steamer from Victoria, and more followed from Victoria and Vancouver during the next two days. Now disorder has been effectually checked, and the ringleaders of the mob are trying to evade arrest. Col. Hall, in charge of the militia, and police officials having obtained the names of more than a hundred of those stated to have been active in citing the mob and in taking part in its excesses. There will, doubtless, be stern measures taken to punish the leaders of the mob and all others known to have been largely responsible for the disorder and crime of the few days when the mob ran amuck.

One fatality occurred—a man was shot at the Extension mines, but whether by a striker or a non-union miner has not yet been determined, for he was in the line of fire between the attacked miners and their assailants. A particularly dastardly outrage is charged against strikers at Ladysmith, who are stated to have thrown dynamite, with a short-lighted fuse attached, into a room where several children were in

bed. The story told is that the father of the children, realizing their imminent danger, seized the dynamite, but before he could throw it out of the house it exploded in his hand, shattering one of his arms and so

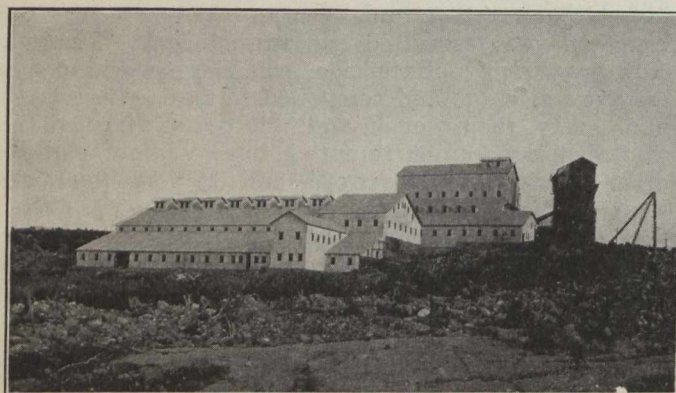
injuring the lower part of his body that recovery is regarded as most unlikely. Other cases of brutality on the part of the strikers are alleged, but as yet investigation of them has not been made.

AMALGAMATION AND CYANIDATION OF COBALT SILVER ORES

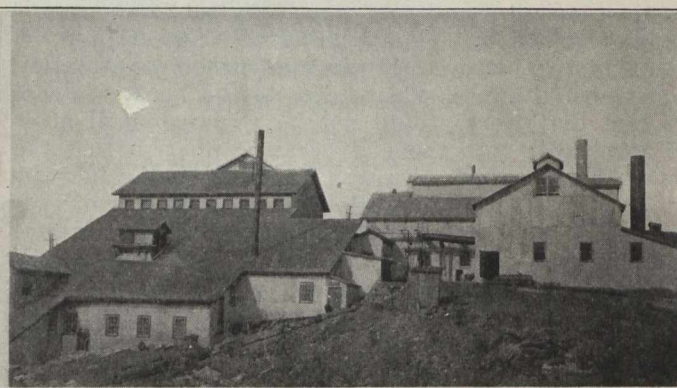
By Reginald E. Hore.

Both high grade and low grade ores are now being treated by amalgamation in some plants at Cobalt, and low grade ore is being cyanided. At the Nipissing the process for treating the high grade has proven quite successful, and a similar plant has been built at the Buffalo. Amalgamation of concentrates from low grade ore is used at the Nova Scotia mill. Cyaniding is extensively used at the O'Brien and Nova Scotia plants. At the Buffalo, slimes are cyanided, and at the Nipissing high grade mill, tails from amalgamation treatment are cyanided and the Nipissing has recently put into operation a large cyanide plant for the treatment of low grade ore.

been extracted from the ore, which in the form of pulp, then passes to a settler, where the amalgam is separated by gravity. Thence it goes to a clean-up pan and drainers. These last are canvas bags for removing any excess of mercury. Meanwhile the pulp and solution, deprived of amalgam, passes to a vat and is fed to a Butters filter, the clarified solution going to boxes in which the dissolved silver is precipitated by zinc shaving. This shaving is in the form of a coarse wire, necessary on account of the strength of the cyanide solution. The residue, left on the filter, is stored, being valuable for its arsenic, nickel and cobalt. As yet no method has been devised for eliminating the arsenic



Nipissing low-grade plant.



Nipissing high-grade plant.

High Grade Plants.

To treat high grade ore on the property without smelting it, the Nipissing management has a very satisfactory process which was worked out by Charles Butters and his assistant, G. H. Clevenger. The crushed ore is ground with mercury in a tube mill. The amalgam sponge is melted in a reverberatory furnace and refined. The tails from the tube mill are cyanided. The precipitates are melted in a tilting furnace and refined in the reverberatory.

The Nipissing high grade mill has been described by Mr. T. A. Rickard in the June, 1912, number of the Mining Magazine, and I quote here his description and comments:

"The ore after being crushed to 70 mesh at the sampler is delivered to the plant with an average content of 2,600 oz. silver per ton. It is fed to a Krupp tube-mill 20 feet long by 4 feet diameter. The charge consists of 3½ tons of ore, 4½ tons of mercury, and a 5% cyanide solution. The tube-mill is closed at both ends. Air, to accelerate chemical action, is introduced through a pipe. There is also an ingenious device whereby the excess of air is subsequently expelled. After nine hours in the tube-mill, 98% of the silver has

in this residue with a view to marketing the nickel and cobalt.

"Meanwhile the amalgam, containing 80% mercury and 20% silver, is placed in retorts, each of which holds 450 lbs. After the mercury has been distilled, the silver, still containing 1% mercury, is taken to a reverberatory furnace. Here it is melted in a charge of 25,000 ounces. After 15 hours' exposure to a hot oxidizing atmosphere, without addition of any flux, the molten metal is cast in ingots, each weighing 1,100 oz. silver, which is 999 fine. Two oil-burners furnish the necessary heat. The flue from the furnace is provided with a water-jet condenser, whereby 1,000 to 2,000 lbs. mercury is arrested monthly. The gases escape at 100 degrees F. While I was collecting these data a melt was about to be finished, and I was able to see the bath of molten metal before it was tapped into the rows of ingots. During February 550,000 ounces of silver were melted in this small plant.

"The richness of the mine product under treatment and the completeness of the metallurgical operations left a vivid impression. Within a small building it was possible to watch the successive stages by which a complex ore of a refractory type yielded its precious

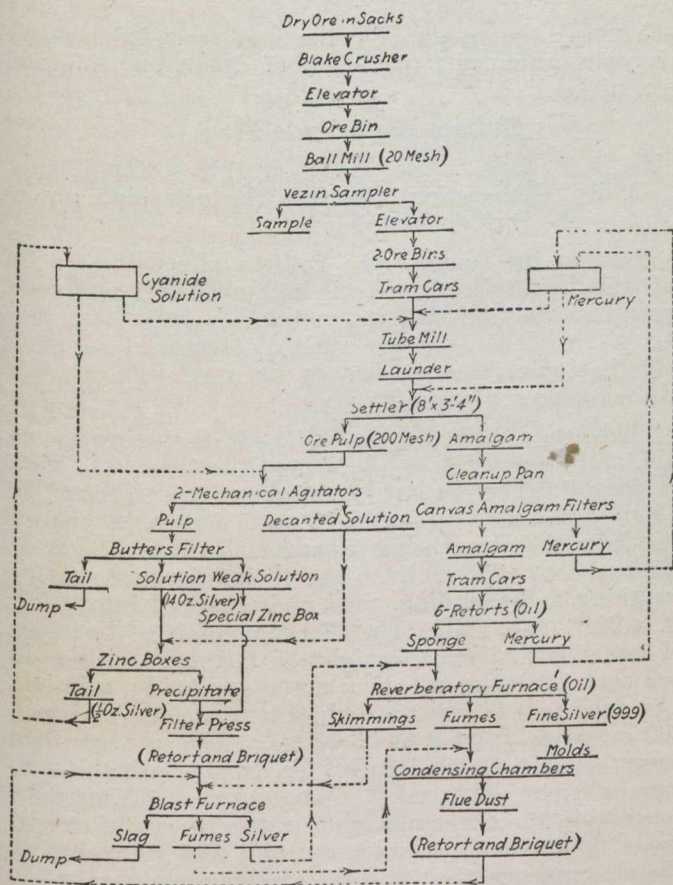
content in metal of such purity as to be ready for the mint. The entire process is so expeditious that the silver is delivered at New York within a week of the day when the ore is received at the mill and a cheque for the yield is received concurrently with the shipment. No less than 20 tons of mercury is in use at a given time. The cyanide has a cleansing effect upon it; indeed, the use of mercury would be impracticable without the cyanide, for the mercury would become 'sick' or fouled so as to hinder amalgamation with the silver in the finely ground arsenical ore. The yoking of amalgamation and cyanidation constitutes another remarkable feature. To the practical man, however, the most memorable note is the fact that a consignment of ore is turned into negotiable paper within seven days."

mesh material is being ground in a tube mill. The mill used is a Krupp mill 3 feet 11 inches in diameter and 19 feet 8 inches long, fitted with silex liners and run at 37 r.p.m. The weight of ore per charge depends somewhat on the silver content, but with 2,500-oz. ore the ordinary tube-mill charge is 6,500 lb. of ore; 8,500 lb. of mercury; 3,800 lb. of cyanide solution, and six tons of pebbles.

"The materials are charged through a manhole on the top of the mill, and after the cover has been replaced the mill is revolved for 9½ hr., when 99 per cent. of the pulp will pass a 200-mesh screen. This fine grinding is necessary to liberate the fine particles of silver and permit of complete amalgamation. A screen analysis of the final tailing shows that the coarser particles are much richer than the slime; this is also shown by the accompanying screen tests on ore crushed through a 10-mesh screen.

"It was found advantageous to have a certain quantity of silver go into solution in the cyanide, and to this end more air had to be supplied to the charge.

"Each gudgeon of the mill is fitted with a stuffing box through which passes a heavy cast-iron pipe, four inches outside diameter, with a 1½-inch hole through the centre. The casting is held stationary by bolts to the concrete foundation, and the mill revolves about



Flow sheet, Nipissing high-grade plant.

Grading Analysis of Nipissing Ore Crushed Through 10-Mesh.

| Mesh. | Percentage by weight. | Silver oz. per ton. |
|-------|-----------------------|---------------------|
| + 20 | 12.7 | 6837 |
| + 40 | 26.2 | 3375 |
| + 60 | 11.6 | 2330 |
| + 80 | 6.3 | 1954 |
| + 100 | 6.3 | 1654 |
| + 120 | 2.7 | 1348 |
| + 150 | 1.3 | 1182 |
| + 200 | 3.8 | 1202 |
| - 200 | 29.1 | 706 |

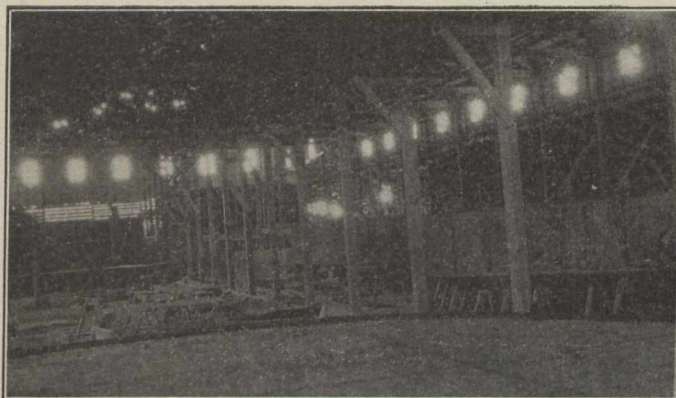
the pipe. Compressed air under 25 lb. pressure is introduced through one of the hollow castings. At the outlet end there is a right-angle turn in the hollow casting just inside the mill and the upper end reaches to within ½ inch of the lining. The heavy cast-iron elbow, therefore, remains stationary, the inside leg stands vertical, and the upper end remains above the level of the charge at all times, allowing the compressed air to escape while the mill is in motion. The casting is heavy enough to withstand the battering of the pebbles falling against it. This arrangement allows the mill to be filled well above the centre with a consequent decrease in the power used, but it is found that the best results are obtained by filling the mill to a point two inches above the centre.

"At the end of the grinding period the three manhole covers are replaced by coarse screens and the mill is turned over; the charge falls into a sheet-iron hopper which delivers it into an all-iron settler, eight feet in diameter, fitted with wooden shoes. The tube mill is then washed out twice by revolving it with a ton of solution and 1,500 lb. of mercury. These washes are added to the charge and the settler filled with solution; the charge is kept in agitation by the muller while the amalgam is drawn off into an iron cleanup pan, and from there into canvas amalgam filters, of which there are 24, each holding 400 lb. of amalgam. The pulp is gradually run out of the settler by drawing the top plug, the balance of the charge being washed twice with solution.

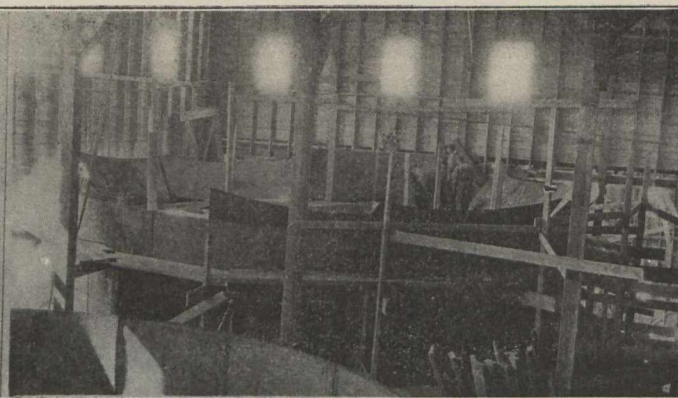
A more recent article by Mr. R. B. Watson, general manager, Nipissing Mining Co., in December, 1912, issue of the Engineering and Mining Journal, gives further information. Mr. Watson says:

"The high-grade ore from the picking tables is delivered to the sampling plant at the top of the mill where it is put through a 9 x 15-inch Blake crusher and elevated to steel receiving bin. From this it is fed automatically into a No. 3 6-foot Krupp ball mill carrying 1,000 pounds of steel balls and fitted with 20-mesh screens. The metallics or silver nuggets which will not pass the screen are removed periodically by taking off a screen, and are melted down in the refinery. From the ball mill the pulp is delivered by a spiral feed to a Vezin sampler and elevated to two 60-ton steel storage tanks, from which it is drawn as needed for treatment in the mill.

"The main operation consists of amalgamating the silver in a 5 per cent. cyanide solution while the 20-



General view in Nipissing low-grade plant, during construction.



Building one of the huge tanks.

When the flow of amalgam has ceased, the mercury, as it drains out of the canvas filters, is pumped back to the settler to wash out any remaining amalgam. The bottom plug is finally drawn and the balance of the pulp discharged. It requires two hours to dump the charge and get the amalgam into the filters.

"It was soon found that the amalgam must be kept exceedingly thin, otherwise it would stick in the tube mill and cake under the muller of the settler; hence the mercury used is 15 times the weight of the silver in the ore. After draining in the sacks, the amalgam still carries 78 per cent. mercury. The remarkable part about the whole process is that 97 per cent. to 80 per cent. of the total silver in the ore yields to amalgamation in the tube mill. An ore assaying 2,500 oz. per ton is reduced to 50 to 75 oz. per ton when it leaves the settler.

"The cyanide treatment of the pulp which follows is comparatively unimportant as it deals only with six or seven tons of 50-oz. ore daily. There are four 16 x 7-foot wooden tanks for the collection and treatment of the pulp, and the necessary tanks for storage of solution and water. A charge for agitation is made up of four tube-mill charges or 13 tons of dry pulp. Five pounds of lime per dry ton of pulp are added and the charge is agitated for 36 hr.; the tanks are fitted with mechanical agitators, and the pulp is circulated through a pump as well. The cyanide strength is 0.75 per cent.

"After settling, the solution is decanted, and the pulp, having a specific gravity of 2, is run to a Butters filter of 10 leaves. The specific gravity of the ore is 6, and to avoid the settling of the pulp in the bottom of the filter box while the cake is forming, the charge is kept in circulation by an air lift drawing out of the bottom of the box and delivering at the top. The cake is washed 2½ hr. with weak solution and then discharged. The arsenides of cobalt and nickel go through the process practically

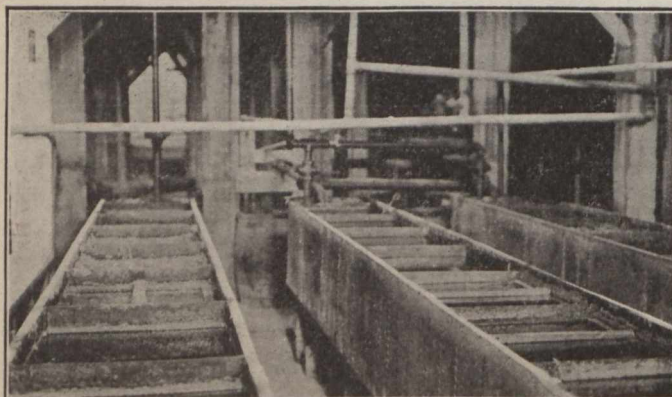
unchanged; the residue for the first seven months of this year contained 9 per cent. of cobalt and 4.5 per cent. nickel."

Buffalo High Grade Plant.

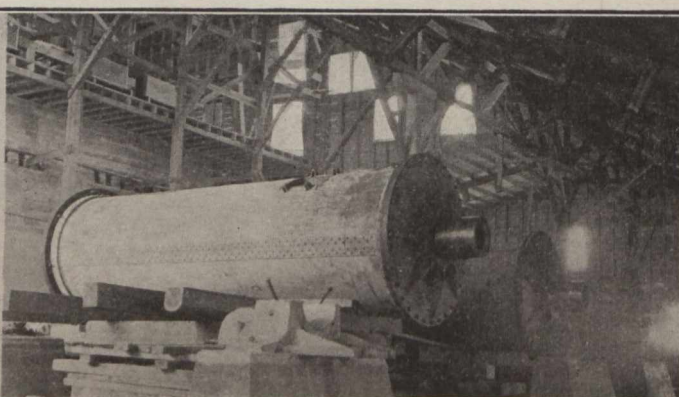
Mr. A. A. Cole, in his report for 1912 to the T. and N. O. Ry. Commission, describes the new high grade plant at the Buffalo as follows:

"During the summer the Buffalo mines erected a mill for the treatment of their high grade ore and concentrates, and the mill commenced operations at the end of November. The method of treatment adopted is very similar to that already in operation at the Nipissing high grade mill.

"The ore is hoisted up an incline from the low grade mill, and discharged into bins near the top of the high grade mill. The ore is first dried and then ground in a Krupp ball mill through a 30 mesh screen, the metallics from the same being separated during the grinding and sent separately to the tilting furnace. After weighing and sampling, the ore is charged into a 5½ ft. x 20 ft. tube mill. The charge consists of five tons of ore, with an equal weight of mercury, with a 40 per cent. moisture of a 5 per cent. cyanide solution. The tube mill is run until the entire charge will pass 200 mesh, or from 9 to 10 hours. The charge then passes to an 8 ft. all iron settler, from which the mercury is drawn off to a 4 ft. clean-up pan. The mercury containing the silver amalgam is strained in 18 canvas bags, the mercury passing through and returning to the mercury reservoir and the amalgam being taken to the refinery. The ore pulp from the settler, along with the overflow from the clean-up pan is passed into a secondary settler for further recovery of the floored mercury. The overflow from this last settler is run to an elevator and elevated to agitation tanks. These are



Zinc boxes, Buffalo cyanide plant.

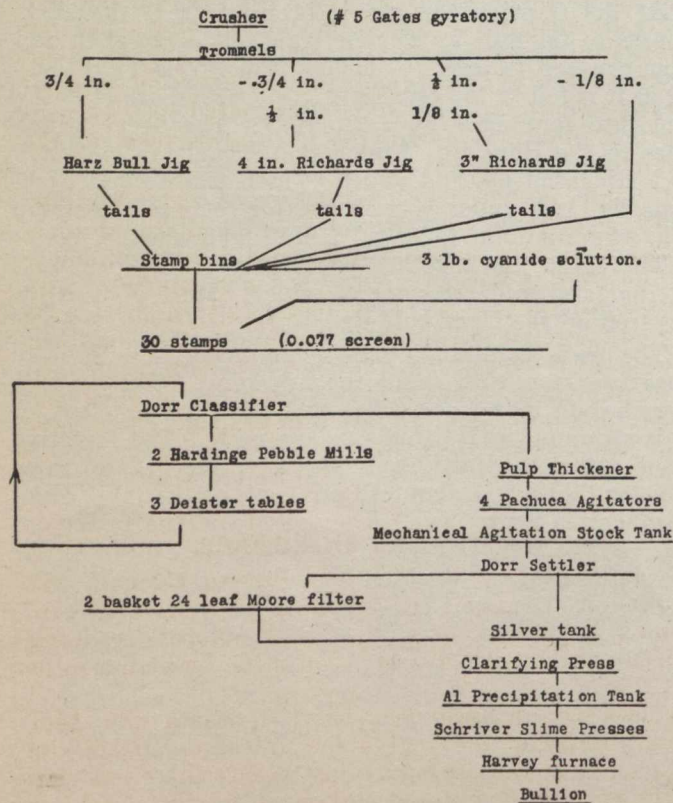


Tube mills, Nipissing low-grade plant.

precipitation is commonly under 950 fine. The precipitate is melted without any flux in a Harvey furnace and the resulting bullion is shipped to London. The chief impurity is said to be copper.

Regarding the use of aluminium as a precipitant, Mr. S. F. Kirkpatrick, in the June issue of the Engineering and Mining Journal, says in part: Up to the present, excluding the Nipissing bullion, over 14,000,000 ounces of silver have been precipitated by aluminium from cyanide solutions. Most of this has been recovered by the Deloro Mining and Reduction Company, through the cyanidation of Cobalt high grade ores or speiss produced from these ores, and a minor portion by the O'Brien mill, treating low grade Cobalt ores. Describing the process of precipitation, Mr. Kirkpatrick says: "An amount of aluminium dust, slightly greater than one-eighth of the weight of silver present, is added (to the solution to be precipitated), with about one-half the weight of caustic soda." There is a discrepancy between the theoretical amounts required for the supposed reaction and the amounts actually employed. Mr. Kirkpatrick suggests that this might be accounted for by a partial precipitation according to reactions suggested by Mr. Hamilton in an article describing the use of aluminium at the Nipissing plant, or by loss due to the action of soda and water on the aluminium, or by incomplete solution of the aluminium due to fine particles being coated with silver. The amount of soda required varies with the acidity of the ore treated. Mr. Kirkpatrick gives the cost of chemicals for precipitating 1,000 ounces of silver as follows: 35.6 lb. soda, at 2 cents per lb., \$712, and 9.1 lb. aluminium, at 32 cents per lb., \$2.91; total, \$3,622.

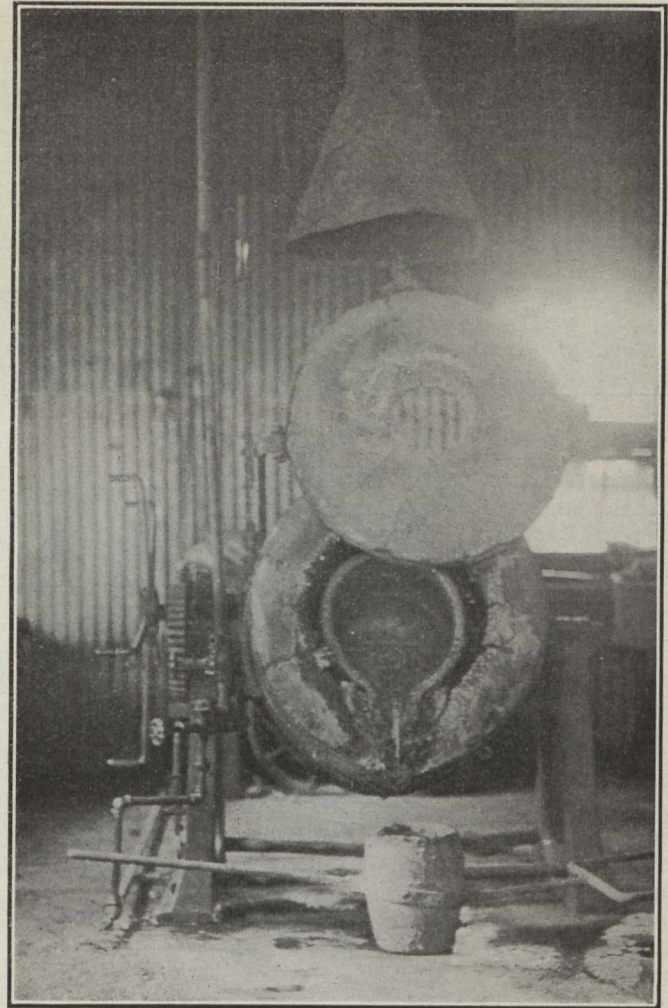
The process at the O'Brien is shown in outline by the accompanying flow sheet.



Flow sheet, O'Brien cyanide plant, Cobalt.

Advisability of Using Cyanide Process.

As to the advisability of cyaniding Cobalt ores there is much difference of opinion among the metallurgists who have worked on the problem. The good results obtained by straight concentration, and the unsatisfac-



Harvey melting furnace, O'Brien cyanide plant.

tory results of some experiments in cyaniding, lead several mill men to conclude that results obtained by present methods do not warrant the building of cyanide plants. Other metallurgists, who believe that straight concentration should be the main process, are in favour of cyanide treatment of the slime tails from the concentrating tables. Still others consider the cyanide process so satisfactory that they have devised plants in which the chief recovery from low grade ore is by cyanide.

There are differences in the ore from the several mines. Some produce ore containing a greater percentage of cyanicides than do others. The ore in diabase, for instance, is comparatively clean and easy to treat. Of the ore in conglomerate, some contains considerable ruby silver, while ore from other mines or other parts of the same mine is comparatively free of such compounds. Dyscrasite, which occurs in a few rich veins, destroys large quantities of cyanide. It is stated that copper is present in some ore in sufficient quantity to be an important cyanicide; but other ore is almost free from copper compounds. The character of the ore, therefore, is responsible for some of the differences of opinion among the millmen. Variations in the results obtained in straight concentration plants are also responsible.

The new plant built for the Nipissing Mining Company provides for extensive use of cyanide, and it is therefore apparent, that while most of the millmen prefer straight concentration, there are others, who, after much experience with the ores, believe in the cyanide treatment.

THE MOOSE MOUNTAIN IRON RANGE*

By A. P. Coleman.

At Moose Mountain about 7 miles beyond the northern side of the nickel basin, and 33 miles from Sudbury by the Canadian Northern Railway, one of the largest iron ore deposits in Canada has been found. The iron formation here is separated from the northern nickel range by a band of Laurentian consisting of granite, banded gneiss, greenstone and green schist, all more or less cut by pegmatite dikes. These rocks are far older than the nickel eruptive and underlie the deposits of the northern nickel range as country rock. The Sudbury series is lacking on this side of the nickel basin, so far as known, and nothing suggesting the Grenville series has been found, so that the geology to the north differs greatly from that to the south.

Moose Mountain, rising 280 feet above the plain and the railway, though one of the most important examples of the iron formation in the Keewatin of Ontario, presents less than the usual variety in the accompanying rocks, and the structural relations are more obscure than in some other regions, such as the Helen Iron Range.

In most cases the iron formation of Ontario consists of some form of silica interbanded with iron ore, either jasper with hematite or cherty or quartzitic silica with magnetite. At Moose Mountain the latter material is found. Commonly the iron formation occurs as synclinal belts enclosed in green Keewatin schist; but a definite relation of this sort has not yet been proved at Moose Mountain, perhaps because the regularity has been disturbed by intrusions of greenstone and granite. The accompanying rock is a banded schist alternately light and dark gray. The iron formation here has the usual steeply tilted attitude. Often the banding is fairly straight and uniform for considerable distances, but in many cases there has been crumpling and sometimes crushing and faulting on a small scale. The ordinary banded ore contains 36 per cent. of iron, and from the results of stripping and diamond drilling, the manager of the mine, Mr. F. A. Jordan, estimates that there are 100,000,000 tons of ore of this grade. There are also 6,000,000 tons of higher grade magnetite in which there is much less silica and where the banding is less marked. Here some green hornblende is interbedded with the magnetite.

Laurentian-looking gneiss occurs just south of the iron formation, but its relations to the ore bodies are not very certain; though dikes of granite and less often pegmatite cutting some of the outcrops of ore have probably come from it.

The richer parts of the ore have been greatly fissured and are penetrated in all directions by yellowish green bands or veins of epidote, evidently the last mineral formed. Beside these bands the magnetite is sometimes changed to hornblende which gradually passes into the usual ore within a few inches. The main ore body worked has been provisionally classified by Prof. Leith as belonging to the Pegmatitic type (*Jour. Can. Min. Inst.*, Vol. XI., 1908, p. 93). He defines the type as including "ores which are carried to or near the surface in magmas and are extended from them in the manner of pegmatite dikes, after the remainder of the magma has been partially cooled and crystallized. They are deposited from essentially aqueous solutions mixed

in varying proportions with solutions of quartz and the silicates." He has evidently in mind the usual theory of the formation of the Kiruna and other magnetite deposits in northern Sweden. In his special reference to the Moose Mountain deposit, he mentions that the ore shows "such intimate relations with greenstones as to suggest a direct derivation from them."

It should be stated, however, that some of this richer ore is interbanded with belts of the poorer silicious type making up the majority of the whole series of deposits, and it is possible that the downward percolation of hot waters may have produced the enrichment. The latest effect of circulating fluids, the formation of epidote, is generally accompanied by an enrichment of the ore near the small veins of that mineral.

Moose Mountain has been the first iron mine in Canada to concentrate its ores magnetically on a commercial scale. The higher grade ore is crushed to about inch size and separated from the intermixed epidote and hornblende by magnetic means, raising its iron contents to a merchantable grade containing 55.50 per cent. of metallic iron. The plant in use, though small and experimental, has provided 155,000 tons of ore for shipment.

This method is not effective for the 36 per cent. ore in which the magnetite is intimately mixed with silica, and within the past two years a new concentrating mill, much larger and more elaborate, has been erected. Here the ore is crushed to 100 mesh and separated magnetically by the Grondal method. The finely divided magnetite is then compressed to drive off most of the water, briquetted and finally treated in a furnace which sinters it slightly and transforms most of the magnetite into hematite.

Though not so large as the great magnetite deposits at Kiruna and elsewhere in northern Sweden, Moose Mountain promises to become a great producer of ore. The Keewatin iron deposits of Ontario, with the exception of the Helen and Magpie Iron Mines near Lake Superior, are usually similar to the one just described at Moose Mountain. There is a good deal of dispute as to their origin, though the original materials of the iron ranges are admitted by all to have been sediments of some kind.

HALF YEAR IN COPPER.

According to the Boston News Bureau, the half year to June 30 witnessed the breaking of all records concerning copper exports, the total clearances being 193,936 tons, against 172,441 tons in the first six months of 1912.

Prices have ranged between 17 $\frac{3}{4}$ cents and 14 $\frac{3}{8}$ cents. Early in the year a few sales of electrolytic were made at the top figure just before the break, and in the ensuing downward movement the metal sold as low as 14 $\frac{1}{2}$ cents a pound.

A recovery then took place about the middle of March, during which electrolytic sold up to 15.96 cents a pound, following which another quiet spell brought cheap sellers into the market, and their offerings resulted in sales down to 14 $\frac{3}{8}$ cents, cash, New York.

*Extracts from Guide Book No. 7, published by Geological Survey of Canada for Twelfth International Geological Congress.

THE COBALT AREA

By Willet G. Miller.

(Continued from August 15th issue.)

The Cobalt Silver Veins.

The cobalt-silver veins occupy narrow, practically vertical fissures or joint-like cracks in rocks of three ages, viz.: Cobalt series, Keewatin series and Nipissing diabase. The relations of the veins to each of these three groups of rocks are shown in the accompanying generalized cross-section of the Cobalt area and in the larger scale, coloured cross-section (plate IV.), published by the Ontario Bureau of Mines. The veins are much more numerous in the rocks of the Cobalt series than in the Keewatin or Nipissing diabase.

It was estimated that up to July 1st, 1911, the yield from the Nipissing diabase had been approximately 7.55 million ounces from 12 veins, or 629,000 per vein, or 7 per cent. of the total production. The Keewatin, with 13 veins, had produced 11.7 million ounces, or nearly one million per vein, or 10.85 per cent. of the total. From 86 veins in the Cobalt series there had been obtained 88.55 million ounces, or a little over one million ounces per vein, representing 82 per cent. of the total production. It is difficult to determine the exact number of productive veins owing to the fact that, being very narrow, parts of one vein may be mistaken for two or more distinct veins. At the present time there are 115 or more productive veins, and the relative productivity of those in the three series of rocks is about the same as it was in 1911.

Origin of the Veins.

After the intrusion of the Nipissing diabase sill, which, on the whole, dips at a low angle from the horizontal, and penetrates both the Cobalt series and the Keewatin, disturbance, probably due chiefly to the contraction of the sill on cooling, caused fissures and joint-like cracks to be formed. These openings were made in the rocks of the hanging wall of the sill, in those of the foot-wall, and in the sill itself.

Ore-bearing waters working through or along the zone of weakness produced by the sill deposited their burden in the fissures and cracks. The minerals first to be deposited were essentially cobalt-nickel arsenides, and related compounds, and dolomite or pink spar. The fissures and cracks were ultimately filled with these minerals. Then there was a slight disturbance of the veins, reopening the ore-filled fissures and cracks, or fracturing the material deposited in them.

In the interval, between the filling of the fissures and cracks with cobalt-nickel ores and the fracturing of the veins thus formed by a secondary disturbance, the character of the material carried by the circulating waters had changed. Silver was then the characteristic metal in solution, and it was deposited, along with calcite, in the cracks and openings in the fractured veins. There may have been some silver deposited in the earlier period of vein filling, and doubtless cobalt-nickel minerals were deposited after the secondary disturbance, but the latter minerals belong characteristically to the first generation and the silver minerals to the second.

Certain writers on the Cobalt ores have expressed the opinion that the silver represents "secondary enrichment," meaning that it has come from the decomposi-

tion of compounds of the metal in the veins that were deposited at approximately the same time as the cobalt-nickel minerals. The present writer believes that at least by far the greater part of the native silver is of primary origin. The recent interesting experiments of Messrs. Chase Palmer and Edson S. Bastin,* on the precipitation of silver from solutions by cobalt-nickel minerals, appear to confirm the opinion that the native silver is a primary deposit, and did not come from the decomposition of silver compounds in the veins. The work of these gentlemen shows that where silver solutions come in contact with cobalt-nickel minerals the silver is deposited rapidly and essentially as native silver. Since there is much calcite in the veins with the native silver, it would appear that the metal was carried in solution as a carbonate, or double carbonate. Under ordinary conditions of temperature and pressure, silver carbonate is slightly soluble in water. For example, sufficient of the carbonate can be dissolved in an ordinary beaker of water to make a distinct precipitate of metallic silver when cobalt-nickel minerals are placed in the beaker.

It has been proved, by the experience gained in mining at Cobalt, that the presence of rich silver ore is dependent on proximity to the diabase sill. Over much of the productive area, not only the upper wall of the sill, but the sill itself, and more or less of its foot-wall have been removed by erosive agencies. Owing to little of the upper or hanging wall remaining in the productive area, most of the ore has come from the foot-wall of the sill, or from what was the foot-wall before the erosion took place. In these veins, in the foot-wall of the sill, it is the exception to find rich silver ore extending more than two or three hundred feet below the surface. Most veins are productive to a lesser depth. After rich silver ore disappears, with increase in depth, cobalt-nickel ore frequently continues downward in the veins. This seems to be due chiefly to the strong precipitating effects that the cobalt-nickel minerals had on the silver in the waters that worked downward beneath or along the sill. The silver was deposited before it reached a great depth. In certain cases, where veins with cobalt-nickel minerals contain no rich silver ore, or in which the silver extends to a comparatively shallow depth, the absence of the precious metal is to be accounted for by the fact that such veins, or parts of veins, escaped fracturing during the secondary disturbance, thus not affording openings for deposition from the silver-bearing solutions.

Frequently, below the rich silver-bearing parts of veins well crystallized argentite and hair silver are found in vugs. These minerals may represent secondary deposition of a little of the silver that has been dissolved from the upper part of the veins and carried downward.

Former Vertical Extension of Veins.

Certain writers have expressed the opinion that veins of the Cobalt area, that outcrop at the surface or occur immediately below the drift covering, represent the narrower, lower parts of wider veins that extended to or towards the original surface. There is no justifica-

*Ec. Geology, March, 1913.

tion for the holding of such an opinion. The few veins that have been worked to a depth of a few hundred feet in rock of one series give no indication of becoming narrower below, although, when the veins are in the foot-wall of the sill, the ore tends to become less rich as the vertical distance below the sill or the eroded part of it becomes greater. Moreover, "blind" veins, or those which do not reach the present surface of the rock, have been found. These veins have the same character, as regards width and mineral content, as those which are exposed at the surface.

Briefly, it appears that after the intrusion of the diabase, fissures and cracks were formed in the rocks of the hanging wall and in those of its foot-wall, and in the sill itself. The openings in the upper wall probably extended a considerable distance upward beyond the sill, but there is no evidence that they reached the surface or that they were wider in the parts that have been eroded.

Some of these fissures in the upper wall extended downward into the sill itself, e.g., veins on the Timiskaming, Beaver and Nova Scotia. The veins on these properties, worked at the surface in the Keewatin hanging wall, and in the diabase sill below, are the deepest mines in the area. No foot-wall vein has been found to be productive to such a depth.

Then there are veins, e.g., that on the Cobalt Central property, which have been worked at the surface in the diabase and followed downward into conglomerate and greywacke, which at times lie beneath the sill.

Again, blind veins are found in the Cobalt series and in the Keewatin where the sill has been eroded.

There are also blind veins, e.g., one that was worked two or three years ago under Peterson Lake and one on the Silver Leaf property, that lie in Keewatin beneath the sill. These veins run upwards to the lower face of the sill, but not into it.

The types of veins mentioned in the preceding paragraphs are shown in the accompanying, generalized cross-section of the area.

Relation of Wall Rock to Ore.

The productive veins, as the maps and cross-sections show, are found in three series of rocks, viz., the conglomerate and other sediments of the Cobalt series, the Nipissing diabase sill, and the Keewatin complex. But 80 per cent. or more of the ore has come from the Cobalt series. The chief reason for this greater productiveness is due to the fact that these rocks fractured more readily than did the diabase or the Keewatin. There appears to have been no difference in the precipitation of ores due to physical-chemical influences of the country rocks. Precipitation seems to have taken place as readily in rocks of any one of the three series mentioned in the preceding paragraph as in the others.

Judging from the way in which silver is found in the minutest cracks in granite boulders of some of the conglomerate near the veins, this ore, at least, was precipitated no less readily in acidic rocks than in basic ones. With the exception of these boulders, there are few opportunities afforded of observing the relations of the ore to granite. But in the Timiskaming mine, a few hundred feet below the surface, narrow dikes of Lorrain granite intrude the Keewatin and are cut across by a vein. The surface of the granite is plated with native silver.

The occurrence of rich silver ore depends on the character of the openings in the rocks now occupied by the veins, on whether the veins have been affected by secondary disturbances, and on the proximity of the openings to the diabase sill. Naturally, it would be

expected that solutions would work upward through the openings in the hanging wall above the sill more readily than downward into the foot-wall. Unfortunately, owing to the excessive erosions to which the district has been subjected, there is little of the hanging wall of the sill left in the productive area at Cobalt. But of the veins thus far worked the two or three that occur in the hanging wall are productive to the greatest depth reached in the area.

In the foot-wall of the sill, or what was the foot-wall before erosion took place, the rich or merchantable ore is limited as to the depth to which it extends. This depth below the sill is variable, depending on the character and strength of the fissures, and other factors already mentioned. Rich ore descends to a less depth in narrow, more irregular fissures than in wide ones.

As has been said previously, much the greater part of the ore has come from veins in the fragmental rocks of the Cobalt series in the foot-wall of the sill. These veins, on reaching the contact of the Cobalt series with the underlying Keewatin, either end at the contact, or split into stringers, or continue down into the Keewatin. In many cases the rich ore disappears when the veins penetrate the Keewatin. On the other hand, a few veins in stronger fissures have been found to be productive in the Keewatin that, before erosion, lay beneath the sill.

In the veins both in the diabase and Keewatin rocks, ore is found to occur more irregularly distributed than in those of the Cobalt series. In other words, it tends to occur in bunches.

The best veins that have been worked in the diabase are one on the Kerr Lake property and one on the O'Brien. Of those in the foot-wall of the sill, the best vein in the Keewatin has been No. 26 on the Nipissing.

Ores and Minerals.

The more important ores in the veins under consideration are native silver—associated with which is usually some dyscrasite, argentite, pyrrargyrite and other compounds of the metal—smaltite, niccolite and related minerals. Many of the minerals occur mixed in the ores, and for this reason some of them have not been clearly identified. Another character of the minerals, which renders their identification difficult, is the fact that most of them occur in the massive form. Crystals when present are small, being frequently almost microscopic in size. The following minerals have been identified and can be conveniently classed under the headings:

- 1.—Native Elements:
Native silver, native bismuth, graphite.
- 2.—Arsenides:
Niccolite, or arsenide of nickel, NiAs; chloanthite, or diarsenide of nickel, NiAs₂; smaltite, or diarsenide of cobalt, CoAs₂.
- 3.—Arsenates:
Erythrite, or cobalt bloom, Co₃As₂O₈+8H₂O; and annabergite, or nickel bloom, Ni₃As₂O₈+8H₂O; scorodite, FeAsO₄+2H₂O.
- 4.—Sulphides:
Argentite, or silver sulphide, Ag₂S; millerite, or nickel sulphide, NiS; argyropyrite? stromeyerite? (Ag, Cu)₂S; bornite, Cu₅FeS₄; chalcopyrite, CuFeS₂; sphalerite, ZnS; galena, PbS; pyrite, FeS₂.
- 5.—Sulpharsenides:
Mispickel, or sulph-arsenide of iron, FeAsS; Cobaltite, or sulph-arsenide of cobalt, CoAsS.
- 6.—Sulpharsenites:
Proustite, or light red silver ore, Ag₃AsS₃; xanthoconite? Ag₃AsS₄.

- 7.—Antimonides:
Dyscrasite, or silver antimonide, Ag_6Sb ;
breithauptite, $NiSb$.
- 8.—Sulphantimonites:
Pyrargyrite, or dark red silver ore, Ag_3SbS_3 ;
stephanite, Ag_5SbS_4 ; polybaisite? Ag_3SbS_6 ;
tetrahedrite, or sulph-antimonite of copper,
 $Cu_3Sb_2S_7$; freibergite? (silver-bearing tetra-
hedrite).
- 9.—Sulphobismuthites:
Matildite, $AgBiS_2$; emplectite, $CuBiS_2$.
- 10.—Mercury:
Amalgam?
- 11.—Phosphate:
Apatite.
- 12.—Oxides:
Asbolite; heubachite?; heterogenite?; arsen-
olite; roselite?
- 13.—Veinstones:
Calcite, dolomite, aragonite, quartz, barite,
fluorite.

The table contains a few minerals that have been found in only one or two veins and cannot be considered characteristic. Millerite, for instance, is of rare occurrence, and emplectite has been found only in the Floyd mine, near Sharp lake, in the western part of the Cobalt area. Bornite, chalcopyrite, zinc blende, galena and pyrite are not characteristic of most of the ore, these minerals occurring more frequently in the wall rock or in non-silver bearing ore of the Keewatin, but one or two mines have produced copper with cobalt-silver ore. Apatite in recognizable crystals has been found in the ore of only one mine. Mercury appears to occur in the ore of all the mines that contain high values in silver, but whether it occurs only as amalgam or in other forms has not been determined. Among the veinstones, aragonite is found but rarely, at least in easily recognizable form, while barite and fluorite have not been observed in the veins at Cobalt proper.

A question mark has been placed after the names of several minerals in the table which have been reported to occur in the veins, but the identification of which has not been made complete by chemical analyses or crystallographic measurements.

Gold in small quantity has been found in a number

of veins, especially in those in which cobaltite or mispickel are characteristic minerals.

A characteristic of the group is the subordinate part which sulphur plays in comparison with arsenic. Antimony, which is not abundant, is found in some compounds where one would expect to find arsenic, since the latter is so much more abundant. For instance, while both native silver and arsenides occur in abundance, the compounds of arsenic and silver are found only in small quantity. Then one would also expect to find more compounds of bismuth since this metal occurs in the free state in considerable quantities in some parts of the deposits. It might also be expected that native arsenic would occur at times.

Nearly all the chemical groups of minerals found in the celebrated Joachimsthal deposits of Bohemia are present in the Timiskaming ores. The most important exception is uraninite or pitchblende, which came into prominence a few years ago on account of its being the chief source of the element radium.

Order of Deposition of Minerals.

The following table shows, in descending order from the youngest to the oldest, the general succession in the order of deposition of the principal minerals of the Cobalt area proper. There appear to be, however, minor exceptions to this order.

III. Decomposition products, e.g., erythrite or cobalt bloom, annabergite and asbolite.

II. Rich silver ores and calcite.

1. Smaltite, niccolite and dolomite or pink spar.

After the minerals of group I. were deposited the veins were subjected to a slight movement. In the cracks thus formed the minerals of group II. were deposited. A few veins that escaped the disturbance do not contain silver in economic quantity.

This order of deposition appears to be the same as that of the minerals in the Annaberg deposits of Germany and in those of Joachimsthal, Austria. At Annaberg the uranium ore or pitchblende is said to have been deposited earlier than the rich silver ores and later than the cobalt-nickel minerals, while barite, fluorite and quartz were deposited prior to the latter. At Annaberg there are thus considered to have been broadly five periods of deposition, while at Cobalt there have been but three, minerals representing the first and third periods being absent.

MINING AND THE CANADIAN NORTHERN RAILWAY

(Continued from July 1st issue.)

Marble Quarries at Bronson, Ontario.

The Ontario Marble Quarries, Limited, is quarrying marble at Bronson, on the Central Ontario Railway, two miles south of Bancroft, in the County of Hastings.

These quarries are producing material which in colour beauty and variety of marking, and size of slabs, compare favourably with any other marble on the market. Among the buildings in which it has been used for interior decoration, are the New Standard Bank Building, King street west, Toronto; the C.P.R. building in Montreal, and buildings in Winnipeg and Vancouver. Their plant is about one-half mile above the station at Bronson. A siding is being built into quarry No. 3, close to the railway, and it will be extended to the plant and connect the three quarries, the farthest of which is about one-half mile from the railway.

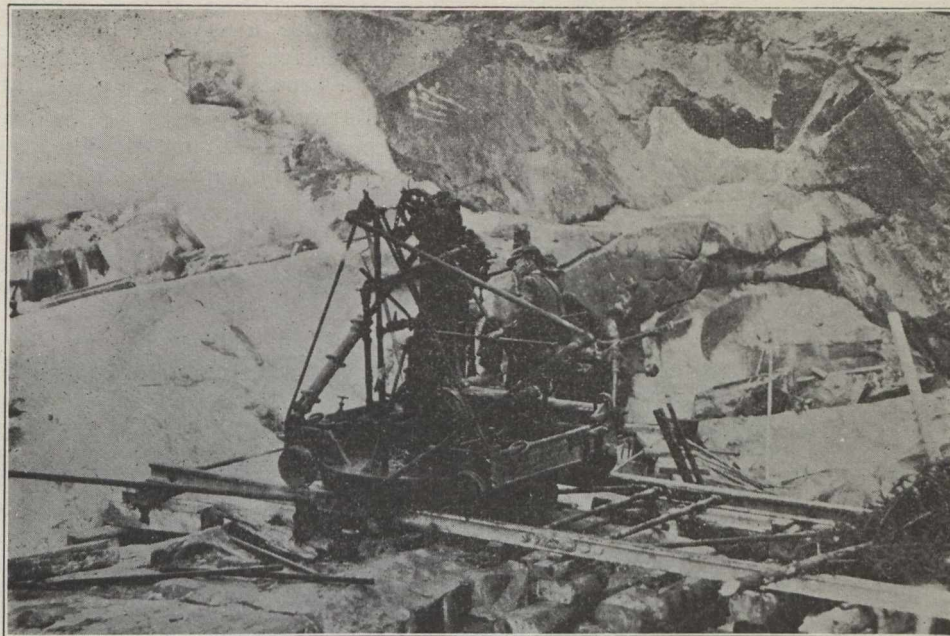
No. 1 quarry, on lots 28-29, 10th concession, Dunganon, has an excavation about 100 ft. long, 60 ft. wide and 25 ft. deep. The rock is cut in blocks by a channeling machine, which is driven by steam. The

blocks vary in size, but they average 6 x 5 x 5 feet, and weigh about 20 tons. The blocks are picked up by a 20-ton derrick placed on a small tram car and taken direct to the mill, run under the saw, and cut into slabs without being removed from the car.

The colour of the marble in this quarry varies. Much of it is a variegated green and white, some of it is white with green veining. East of No. 1 quarry, a little work has been done to show up a fine face of green marble of very beautiful colour and fine grain, which will prove most valuable for interior work.

Dr. W. A. Parks, in his report on Building and Ornamental Stones of Canada, says of the marble at No. 1 Quarry:—

“The general strike of the belt is N. 70 deg., in which direction the continuity of the deposit has been proved by test pits for at least 1,000 feet. The width is stated by Mr. Morrison to be 1,000 feet, but owing to the overburden, it is not easily ascertained.



Cutting marble at quarry near Bronson, Ont. Marble Quarries, Ltd.

“Different types of marble are arranged in bands parallel to the strike. From the north to the south the following varieties are recognized:—

- (1) A laminated green variety.
- (2) A green variety with broad bands and clouds of white and pink.
- (3) A light green marble with bands of white.
- (4) A light cream ground with green bands and cloudings.
- (5) A pink ground with green, blue and white foliated bands.
- (6) A blue variety with very fine white veins.

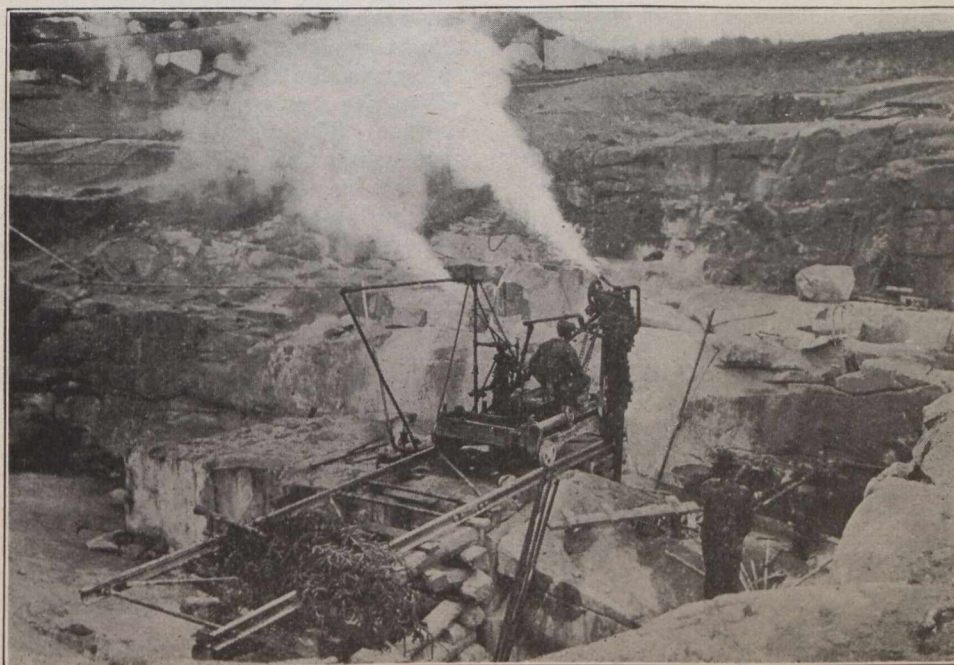
“The deposit, as exposed on the hills near the mill, is remarkably free from surface cracking and weathering, which argues well for the durability of the stone. The surface alteration is so insignificant that large

blocks with the adhering earth, go directly to the mill and result in an entirely satisfactory product.

“Clean vertical joints striking S 20 deg. E. cut the deposit at an average distance apart of 20 feet. There is very little minor jointing. Blocks 25 feet square could be obtained and several 4 x 5 x 10 have already been quarried. Horizontal partings (floors) occur at intervals of 10 or 12 feet.”

No. 2 quarry on lot 41 West Hastings Road, is about a quarter of a mile west of No. 1. The marble of this quarry is found in a variety of colours, pink, white with a greenish cast, mottled and brecciated, and very dark green. Some shows a blending of mauve and grey, and some a mixture of red and black.

Dr. W. A. Parks says of the rock on lots 41 and 42, Hastings Road:—



Channeler in operation near Bronson, Ont. Marble Quarries, Ltd.

"The most beautiful and delicate marbles of this property, are exposed along the brow of a considerable hill running north and south towards the eastern border of the lots. The upper 50 feet of the bluff consists of the marbles about to be described, but whether these extend to greater depths or whether they overlie the Rose fantasia, I am unable at the present time to say.

"The general strike of these deposits is 5 deg. S. of E. and the dip 80 deg. to the north. Beginning at

this point for a considerable distance, but another opening 750 feet from the southern limit shows a large body of a brown and red veined variety."

No. 3 quarry is close to the railway. Here is found a very large deposit of white marble which will have a great commercial value. There are two deposits of this white marble, one 70 feet and the other about 100 feet wide. They are both about 700 feet long, according to the development work done upon them now. None of this has been marketed yet, and will not be



Blocks of marble at Ontario Marble Quarries, near Bronson, Ont.

the south, the first belt is about 100 feet wide and consists of a beautiful fine grained semi-translucent base with brown and green bands and contorted stripes.

"Towards the north this band is less prominently marked and presents the same base with much fainter cloudings. Then follows a narrow dyke of basic eruptive, north of which the Rose fantasia rises to a higher level and is succeeded by 150 feet of beautiful brecciated varieties.

"This brecciated zone is followed by about 200 feet of a fine grained, delicate pink variety with black bands and clouds.

"A brown veined partly brecciated variety follows.

"The continuity of the exposure is interrupted at

until the railway spur has been completed, when the blocks already taken out will be shipped direct to Toronto to be finished.

The plant consists of a 90 H.P. boiler, one engine and four gang saws, each of these saws contains about 40 to 45 blades. The blades can be placed to saw any thickness, but the average is about one inch. The cutting is done by feeding sand and water to the saw. When the sawing is finished, it leaves a smooth, soft surface. The marble in this form is shipped to Toronto, where it is polished and cut to size, according to the requirements of the trade. These quarries at present employ about 50 men. Mr. T. Morrison, one of the owners, acts as the manager.

THE WITWATERS RAND GOLD INDUSTRY IN 1912*

By W. L. Honnold.

In the light of the data now available for the past year it is clear that, taken as a whole, the mines of the Rand have made noticeable advancement. This is true in respect of both operation and intrinsic soundness, as well as of the financial position generally.

A total of 25,486,361 tons were milled by an average of about sixty producing companies, as against 23,888,258 tons during the previous year. The yield in

gold amounted to \$181,080,211, equivalent to \$7.06 per ton, which was \$0.26 per ton better than the yield for 1911. The gold won was therefore 10.8 per cent. greater, although the scale of operations increased by only 6.7 per cent. Explanation lies partly in the fact that for the year before the unit recovery was abnormally reduced because several companies mined an unnecessary proportion of unpayable ore. Compari-

*The Michigan College of Mines Alumnus, July, 1913.

son is further complicated by the fact that in both years several companies, for good reasons, worked somewhat above the grade called for by their ore reserves.

The average working cost advanced from \$4.38 to \$4.54. This apparent advance should not be taken too literally, since, to some extent, it arises out of the fact that the figure for 1911 was unduly low because of the mistaken policy of mining unpayable ore referred to in the preceding paragraph. On the other hand there were certain factors which undoubtedly affected costs unfavourably. Chief amongst these may be mentioned the continued tendency to higher cost of native recruiting and wages, a tendency fortunately now checked by the formation of the Native Labour Corporation, which will deal with the matter co-operatively and correct in some measure the past disadvantages of competition. Costs were also adversely influenced by the greater inefficiency of white labour, the incidence of the eight hour law, increasingly exacting Government regulations, and the expenditure called for in consequence of legislation for the compensation of miners suffering from phthisis. The latter charge is in the way of being largely eliminated by concerted maintenance of a moist atmosphere throughout the mines by liberal spraying. In considering working costs it has also to be borne in mind that in 1912, as in the preceding year, there was a disposition in many instances to charge directly to working accounts extraordinary items which, if money could have been raised as freely in the past, would have been dealt with as capital expenditure.

Working profits totalled \$61,742,322, as compared with \$55,595,243 for 1911, a gain of slightly over 11 per cent. The per-ton figures for the two years were \$2.44 and \$2.33 respectively.

In the matter of dividends the showing is outwardly not so satisfactory. There was an increase of \$924,851 in the aggregate distribution, making the total for the year \$38,731,080, but the per-ton declarations averaged only \$1.52 as against \$1.58 for the previous year. The explanation lies chiefly in that the money markets were unfavourable to the provision of additional working capital. As in the year before, large amounts had to be appropriated to cover extraordinary expenditures, in connection with additions and alterations, both underground and at the surface, which have had to be undertaken at this stage, more particularly in connection with the recently merged properties. Under more propitious monetary circumstances these appropriations would have been charged to capital account. This point will perhaps be clearer if the following per-ton figures are considered:

1910—Working profit, \$2.56; distributed, \$1.97; undistributed \$0.59.

1911—Working profit, \$2.33; distributed, \$1.58; undistributed, \$0.75.

1912—Working profit, \$2.44; distributed, \$1.52; undistributed, \$0.92.

The tendency shown by this comparison would be cause for uneasiness were it not that the special improvements to which it is due are either completed or nearing completion. It has, however, to be borne in mind that, arising out of the hopeful feeling which prevailed in 1910, certain mines over-reached themselves and made a better showing than their intrinsic position warrants. Figures for that year consequently cannot be taken as an absolute basis of comparison, although in the aggregate they were not far out and may be again realized. One is forced to the conclusion, therefore, that the relatively poor showing of the

last two years in the matter of dividends is not due to intrinsic deterioration but to an enforced change in financial policy, temporarily inconvenient, no doubt, but in the long run of advantage to shareholders.

Whether and to what extent it may be possible and advisable to bring about a closer relationship between working profit and dividend than that shown above, is a question open to difference of opinion, but not so simple as has been suggested. If we take working cost as covering all head office, maintenance and operating expenses, including the development called for by the equipment provided, then the remaining supercharges against working profit fall chiefly under the headings Interest and Redemption of Loans, Profits, Tax, and Capital Expenditure. It would, of course, be possible to add to the published monthly and quarterly costs a fixed charge per ton under each of these three headings, or any others that might be called for. These fixed charges would be based on experience and probability and would be fairly reliable as to loans and profits tax, although in the latter case, owing to its determination being a matter of complex calculation by Government officials at the close of the year, only an approximate figure could be used.

The matter of capital expenditure, however, would present far more difficulty. As commonly interpreted it embraces all the various and varying items of extraordinary expenditure called for in order to conform to engineering progress, meet the demands of expansion, and deal with both incidental and accidental exigencies of major importance, items, obviously that cannot be charged directly to working costs without perversion of the comparative value of the latter and the consequent confusion of the shareholders. It is not surprising that directors and engineers hesitate to forecast expenditure under so problematical a heading. If a true approximation were attempted, those responsible would probably find themselves either trammelled by underestimates or criticized for misleading overestimates. In practice, the latter chance would probably be taken as the lesser of two evils and generous provision would be taken against contingencies, a course hardly favourable to economy.

It may be urged that any resulting surplus could be carried forward or credited to general revenue and expenditure. But this is equivalent to abandonment of the advantage aimed at; for the surplus might equal the margin of uncertainty under the present policy.

Even if it were possible to forecast the expenditure with approximate accuracy, and this forecast were embodied in the monthly and quarterly reports, the showing would still be open to misconstruction owing to uncertainty as to the financial policy that might be called for at the close of the year, more particularly as to the matter of balance forward. Furthermore, the financial policy of a company is open to modification in accordance with market conditions, or other circumstances, and there are a number of companies which at a favourable moment may, by new share issues or otherwise, materially alter their position and thus make available for distribution amounts that have now to be apportioned to capital expenditure. Enough has been said to show that the question is not so simple as has been implied by some critics. The prevailing custom admittedly results in interim reports which do not directly reflect the dividend position. Such perfection, however, is not aimed at—it might be realized by some of the companies some of the time, but not by all the companies all the time, a consideration of special bearing where uniformity is

so important as on the Rand. All that is claimed for the monthly and quarterly reports as now published is that they provide confirmation or modification of certain comparative data, the dividend significance of which has been previously foreshadowed by precedent and prophecy with as much certainty as would probably result from a more ambitious attempt. Taken in this light, much can be said in their favour. It should, perhaps, be added that some critics have advocated going to the other extreme and publishing no interim reports whatever, their argument being that, apart from the fact that at best such publications may prove misleading in some degree, there is the practical consideration that they may lead to a somewhat costly struggle for regularity in matters essentially irregular.

With regard to the industry as a whole, it is doubtful if, taken from the standpoint of actual demonstration, it has ever shown greater soundness, i.e., a more satisfactory correlation between salient factors. The financial position of the companies generally is unusually strong. Plants are in good condition and have been enlarged whenever necessary to meet the demands of expansion. Necessary underground haulage ways and mechanical features have been provided to meet the requirements of increasing tonnage and greater

tramping distance. Development is well in advance and there is apparently no material change in tenor. The native labour situation is probably more satisfactory than ever before and is in the way of further improvement, partly through the better organization recently effected, and partly through the wider use of machine drills. In the latter connection it is interesting to note that the number in use has increased by about 57 per cent. within the last two years, a total of 5,634 drills now being employed. Unfortunately, the white labour position is not so satisfactory, this country like most others having now to contend against both shortage and inefficiency. This difficulty will probably disappear when it is recognized, as it inevitably must be sooner or later, that the existing prejudice against the employment of natives of superior capacity on certain so-called skilled labour is unreasonable and inadvisable under the circumstances. The prospect in this connection, however, is too vague to be reckoned on at present. Generally speaking, the mines are neither unduly pressed as to tonnage and grade, nor over-strained as to dividends. In fact, there is a reserve of strength in the working position that promises to find expression in a materially improved showing for the current year.

SILVER LEAD AND ZINC DEPOSITS OF SLOCAN, B.C.*

By O. E. Leroy.

Although the lead deposits in the vicinity of Ainsworth on Kootenay Lake were being worked in the later 80's, it was not until 1891 that the richer and more important ore deposits were staked inland from Kootenay Lake and further to the west. In the early years the transportation difficulties were great, so that it was not until 1895 that important shipments were made. The total production from 1895 to the end of 1911 in round numbers amounts to 795,000 tons of ore, containing 30,875,000 ounces of silver, 2,890 ounces of gold, 269,460,000 pounds of lead with a total value of nearly \$29,000,000. The zinc returns from 1907 to 1911 are valued at nearly \$1,000,000.

General Geology.—The deposits occur in the granitic works of the Nelson batholith, but particularly in the sedimentary rocks of the Slocan series (Carboniferous?). The granitic rocks range from true granite to quartz diorite. They are almost prevailing of a light grey colour and the texture ranges from medium to coarse grain. Outside of the main area of the batholith the rocks appear in the sedimentaries as dikes, stocks and irregular masses.

The Slocan series consists of interbedded argillaceous quartzites and limestones, and slates or argillites which are more or less carbonaceous. They form an undoubtedly thick series, but the folding, faulting and lithological similarity prevent any section being made that would give even an approximation of the actual thickness. The series is extensively diked by quartz porphyry and lamprophyres which are older than the fissure system containing the ore bodies.

Veins.—The veins are nearly all of the fissure type and are much more numerous in the Slocan series. There they almost invariably cut across the strike of the formation, if they coincide in strike they cut across the dip and terminate usually by either turning suddenly and following a bedding plane or by feathering out in the broader bands of the softer slates. The

veins vary in length from a few hundred feet to over 4,000 feet and in thickness from a few inches to over 50 feet. In exceptional cases the vein may attain a thickness of 150 feet.

The widest portions of the veins are generally filled with crushed and broken country rock with but relatively small amounts of the gangue minerals. In certain definite areas the fissures form a widely paralalled system; the dips range from 40 to 80 degrees and as a rule are well over 50 degrees.

Ore Shoots.—The ore shoots are composite in character and consist of widely parallel bands, lenses and masses of galena and zinc blende alternating with siderite and to a less extent with quartz and calcite. As a rule the high grade ore favours the hanging wall side of the vein, though this is not invariably so. The shoots also favour the carbonaceous slates rather than the quartzites, porphyry stocks or dikes, but the reverse again holds in a few instances. Another favourable factor in the formation of shoots is the cross fissures which pass across the vein from either the foot or hanging wall side. These appear to have formed accessible channels for the metal bearing solutions. The shoots vary in length from 15 or 20 feet to 400 feet or over, and in width from a few inches to 40 feet.

The vertical component varies from 10 feet or so to 500 and 600 feet in the larger bodies. In many cases with, however, numerous exceptions, the shoot bears a relation to the topography of the country and pitches out of the hill. With depth the ore gets poorer and passes into slightly mineralized gangue and crushed rock.

Mineral composition.—The chief metallic minerals are galena and zinc blende. With freibergite as the important silver bearing ore, ruby and native silver and argentite are found in many of the deposits developed along fractures in the more massive ore.

*Extracts from Guide Book, No. 9, prepared by the Geological Congress, August, 1913.

Chalcopyrite and pyrite are almost invariably present, the former in small amount, the latter in increasing quantity as the lead content diminishes. The zone of weathering is very shallow, but originally contained carbonates of lead, zinc and copper and in one instance linarite, a sulphate of lead and copper.

The gangue is composed of siderite, calcite and quartz in varying proportions, the quartz content usually increasing with depth.

At present the metallic contents of the ores mined range from 7 per cent. of lead and 20 ounces of silver to the ton to one carrying from 50 to 75 per cent. of lead and from 80 to 175 ounces of silver to the ton. In some mines there is a little gold which ranges in value from \$1.00 to \$7.00 to the ton.

Origin.—No definite law holds with regard to the order of the formation of the several minerals. In many instances, however, siderite was formed first, followed by zinc blende which replaced a portion of the siderite. Galena succeeded the blende, and freibergite followed, filling in fractures in the galena and to a certain extent in the blende.

The ore appears in great part to be primary and to have been introduced by ascending solutions which deposited their mineral content in the wider portions of the veins at favourable horizons, where the action was aided by decrease of pressure, lower temperature and by the reducing action of the carbon in the crushed rock which forms an important percentage of the vein filling.

The ore was probably derived from some horizon of the granitic rocks of the batholith which underlies the whole area and is perhaps closely connected with the basic lamprophyric dikes. In several instances it was noted that veins followed the same fissures as the dikes, in which cases the ore lay on and along the dike.

Many of the ore shoots so far stoped have been comparatively shallow, but more recent development work has shown ore at greater depths, in one case 1,270 feet (387 m.) below the outcrop. The development of the last two years has encouraged the belief that the ore shoots are not merely surface deposits, but that they will be found to have a much greater vertical range than was formerly believed.

THE KOOTENAY ZINC PROBLEM

On August 21st at Nelson, B. C., Hon. Louis Coderre, Secretary of State and Minister of Mines of Canada, met a number of members of the Nelson Board of Trade and local mining men, to discuss the zinc problem. The following account of the meeting, published in the Nelson Daily News, contains statements made by several of those present:—

After listening to the statements by members of the Board of Trade and mining men of the district, in which the necessity for the continuation by the Dominion Government of experiments in the treatment of complex zinc ores and for the appointment of a royal commission to make a thorough investigation into the requirements of the mining industry was urged, Hon. Louis Coderre, Secretary of State and Minister of Mines, yesterday morning announced that he had just despatched to Dr. Eugene Haanel, Director of the Federal Department of Mines, instructions to authorize E. Didolph, who is now in Nelson, to proceed at once with the work at the zinc plant in Fairview. Expenses of the work will be covered, he explained, by \$30,000, which remains of the grant of \$50,000 originally made for the purpose of experiments in methods of treating zinc ores. He inspected the plant yesterday morning.

Evidently deeply interested in the proposal that the Government should name a royal commission on mining, in order that it might be placed in possession of complete information regarding the industry, Mr. Coderre said that he really believed something could be done on that line and promised that he would place the matter before the cabinet next month, and would endeavour to bring about action which would be satisfactory.

Himself bringing up the question of the desire for the creation of a separate portfolio of mines in order that the industry might have the benefit of the complete attention of a minister, Mr. Coderre promised to lay the wishes of the board and the mining men before Premier Borden and the other members of the Cabinet.

Mr. Coderre Shows Keen Interest in Subject.—Throughout the speeches of the Board of Trade members and the mining men the ministers displayed the

deepest interest, asking frequent questions in order to clear up points about which he was in doubt.

When he heard that he was expected to visit the West with the members of the International Geological Congress, he had felt pleased because he had realized that the trip would give him an opportunity to see those interested in mining, hear what they had to say, and gain a thorough understanding of the requirements of the industry through personal contact, said Mr. Coderre, in making his reply. Having accepted the portfolio of Minister of Mines, he was most anxious to understand the industry's needs, and learn of the remedies which might be brought to bear.

Speaking of R. F. Green, M.P., the Minister said that he would meet him in Victoria, as the member for Kootenay had taken a great interest in the various mining questions last session. Many times Mr. Green was in the speaker's office pressing on his attention the needs of the industry.

In conclusion, after thanking the Nelson board and the mining men for the entertainment given in Nelson to himself and the geologists, Mr. Coderre said that he believed that the proposed commission could collect all the facts necessary for the Government to make a decision regarding aid to the lead mining industry, the question of zinc ore treatment and other matters of importance.

Kootenay-Boundary Output Large.—In introducing the speaker to Mr. Coderre, W. F. Roberts, President of the Board of Trade, recalled that the Nelson board had been instrumental in bringing to the attention of the Government many matters of importance to the mining industry. In 1912, the mineral output of Kootenay and Boundary was about \$20,000,000, which was approximately two-thirds of the output of British Columbia, which was one-sixteenth of the total production of Canada. While gold, silver and coal took a prominent place in the total output of Kootenay and Boundary, this district was especially interested in lead and zinc mining, as it produced about 90 per cent. of the total lead output of the Dominion, and practically all the zinc. He concluded by expressing the thanks in which other speakers joined, to the minister

and the Government for the extension of the lead bounty and the work at the zinc smelter, and referred to the need for a royal commission to secure evidence as to the best means of placing the lead and zinc mining industries on a stable basis.

Mr. F. A. Starkey.—Mining was possibly the most important industry in Kootenay to-day, declared Fred A. Starkey, President of the Associated Boards of Trade of Eastern British Columbia, who related the history of the lead bounty and stated that it had done a great deal of good. The position as to the zinc industry, was that the ore could not be treated in this country and had to be shipped, if sufficiently high grade to stand freight and smelting expense, to the United States. He remarked that he considered it wrong in principle for such a condition of affairs to exist on the ground that an American industry was being built up out of a Canadian natural resource. The suggested royal commission could go into the whole question of assistance to the lead industry, whether by bounty or by duty or by other means, he said.

Speaking of the experiments in the reduction of complex zinc ores, Mr. Starkey suggested that, even if the work did not result in entire success, such results as were attained should be given over to anyone who would build a plant with the idea of improving it. Such a plant should, he suggested, be financially aided by the Government. There were tremendous quantities of zinc ore in the mountains of this district and all that was required was a method of treating it, he said.

Aids All Other Industries.—Asking the minister to use his influence toward the appointment of the royal commission, Mr. Starkey declared that the prosperity of the mining industry meant the prosperity of every other industry in the surrounding district.

Speaking of the ore testing laboratory at Ottawa, which has been recently established, Mr. Starkey suggested that it would prove of still greater advantage to prospectors and small mine owners if samples of ore of from 25 to 50 pounds could be sent, instead of from 200 to 500 pounds, as provided under the regulations of the Department. Such a comparatively large amount of ore cost a considerable sum in freight charges, he explained.

Mr. S. S. Fowler.—S. S. Fowler remarked that while Mr. Coderre was the fourth Minister of Mines in the present Government, he was the first who had paid a visit to Kootenay in that capacity. The visit of the minister was appreciated very much, said Mr. Fowler, as personal contact was essential to the proper understanding of the conditions and the requirements of the industry. Standing second to agriculture in value of total output in the Dominion, the mining industry should be encouraged and fostered in every possible way.

While British Columbia's total mineral output bore an important ratio to the total production of the Dominion, and while practically all the lead and zinc of Canada was produced within a comparatively few miles from where the minister was sitting, this district was the farthest from the point of production of the things which the industry consumed and the farthest from the point of consumption of its product than any other mining district in Canada, he declared, the industry here having an additional handicap in the high cost of labour and materials, the latter resulting from the distance which goods had to be transported. Another handicap, which applied to the lead mining

industry, was that there were no official quotations of the metal in Canada, and the lower London prices consequently had to be accepted.

What the lead and zinc mining industry most needed in order to encourage the investment of capital here, was permanency of conditions as far as it was possible to obtain them. To illustrate his point, Mr. Fowler quoted the lead bounty, which assures the producer £18 per ton, even when the market price is below that figure. The bounty is paid whenever the price falls below £18 and until it drops to £14, thus enabling the mine owner to figure with reasonable certainty upon his returns, explained Mr. Fowler.

Bounty Keeps Bluebell Busy.—Were it not for the lead bounty the Bluebell Mine, of which he is manager, and which employs about 100 men, would not now be in operation, he declared. There were, he continued, several of the largest producers of lead which could not exist without the bounty.

Referring to zinc and to the enormous loss suffered by zinc mine owners through the lack of a method of treatment, Mr. Fowler estimated that in the mines of the country there was probably 50 per cent. more zinc than lead, which meant that every pound of lead was accompanied by one and one-half pounds of zinc, which was now being thrown away. If this wasted zinc could be treated, it would, at present prices, return more to the mine owner than the lead.

After congratulating the Government upon what he described as the practical manner in which it was proceeding in its efforts to solve the zinc problem. Mr. Fowler remarked that all these matters could be brought before a royal commission, if such were appointed.

Should Look to Future.—While the lead bounty during the years that it had been in operation, had been of very considerable benefit, and the mine owners were grateful to the Government for the extension granted at the last session, the mining industry was one which was not developed in a day, and it was necessary that steps should be taken toward providing for the assistance of the industry in future years, said Ernest Levy, manager of the Van Roi Mine at Silverton, and the Le Roi No. 2 at Rossland, who, in making a plea for the appointment of a commission, emphasized the fact that such a body could gather the information upon which the Government could act when the necessity would arise in about four years, when the lead bounty extension expires.

As a mining district, Kootenay and Boundary, already of considerable importance, would be of very much greater importance, declared Mr. Levy, who said that he regarded the lead bounty more as a temporary expedient than as a permanent form of aid to the industry. What form the aid to be granted should take would be a matter to be decided by the Government on the recommendations of the proposed commission, which could also go into the zinc question, the speaker agreeing with Mr. Fowler that the latter was of as much, if not of greater moment than the lead question.

Charges Eat Up Zinc Values.—To illustrate the difficulty of mining zinc at a profit, Mr. Levy stated that on a ton of ore or concentrates which assayed 45 per cent. zinc, the freight and duty when sent to an American smelter, was equivalent to the value of a ton of such ore at a price of \$5 per 100 pounds, St. Louis. Therefore, it was only when such a zinc ore contained silver that it could be shipped out at a profit, the zinc values being eaten up by the charges. If the ore could

be treated in Canada, much of freight and all duty would be saved. Reports of the progress made on the zinc experiments by the Government would be valuable to mine owners, he suggested.

Speaking of the process for the treatment of refractory zinc ores invented by A. Gordon French, J. O. Patenaude declared that he was able to announce that the Consolidated Mining & Smelting Company would next month be producing zinc by this method on a fairly large scale at its plant at Trail. In Nelson Mr. French had experimented with the process until he had it nearly perfect, so that it would save all but 2 per cent. of the zinc in a complex ore, together with a larger percentage of silver and lead than was secured by ordinary smelting methods, he said. In addition, Mr. French's method saved manganese, which was worth about \$75 per ton, said Mr. Patenaude. Pure

zinc could be produced by the French method for half a cent per pound, he continued.

Questioned regarding the statement made by Mr. Patenaude, R. H. Stewart, general manager of the Consolidated Mining & Smelting Company, stated that the company had not any such announcement to make.

A vote of thanks to the minister for attending the meeting was passed on a motion by Ald. James Johnstone, seconded by W. G. Foster.

Those present were: W. F. Roberts, Fred A. Starky, J. O. Patenaude, J. E. Annable, Hugh W. Robertson, E. Didolph, W. G. Foster, T. A. Robley, S. S. Fowler, Ernest Levy, A. B. Netherby, L. K. Larson, J. H. D. Benson, W. J. Meagher, Ald. James Johnstone, W. F. Cochrane, E. K. Beeston, Edward Peters, A. T. Eyton, R. Smillie, W. H. Jones and Harry Amas.

MICHIGAN COPPER MINE MANAGERS STATE TERMS ON WHICH THEY WILL RE-EMPLOY MEN

The following is the text of the statement made by the mine managers of the copper country to Governor Ferris, through Judge Murphy:

"At the recent meeting with you of the mine managers of Houghton and Keweenaw counties, the operations of whose mines is affected by the existing 'strike' conditions, you submitted to us the following question:

"Eliminating any recognition now or hereafter of the Western Federation of Miners, what terms and conditions of labour will you authorize me, as the representative of the governor, to present to anyone interested, as the basis for the re-employment of your men?"

"You are authorized as representative of the governor to state that the men will be re-employed on the same terms and conditions of labour as existed at the several properties prior to the inception of the strike. That in such re-employment the fact that a former employee has been a member of, or otherwise affiliated with the Western Federation of Miners, will not of itself be considered as a bar to his re-entering our employ. But we reserve the right to use our individual discretion as to the re-employment of any who may be known to have engaged in acts of agitation, lawlessness, violence or intimidation, or inciting thereto, after such employment and the cessation of strike conditions. Any alleged grievances, affecting the entire body of the employees at any mining property, or affecting individuals, brought to the attention of anyone of us through his own employees, will be given full consideration, with the desire as in the past, of each of us severally, to correct any wrongs that we may find to exist, either in individual instances or in general conditions.

"The foregoing answer to your question is the basis for the re-employment of our men. The great differences in working conditions existing at the various mines have made it impossible to formulate a statement of the terms and conditions of labour which could be made uniformly applicable to the several mines with justice to their respective employees or with fairness to the several mining companies. But you are further authorized, assuming such re-employment ensues, to state with respect to matters mentioned by you at our conference.

"As to wages, let us say that the adoption of a uniform minimum wage is impracticable owing to the great differences in conditions at the several properties. But to you, as the representative of the governor, we will, when the

work is resumed, and for a reasonable period thereafter, submit our payrolls and all material data, and if, after being informed as to attendant conditions and circumstances, you find any iniquities in specific individual instances, they will be remedied in accordance with your recommendations. If, taking into full consideration the living and working conditions, the advantages and privileges furnished to or for the employees, the costs of mining and production and all material circumstances, you find at any of our mines that the general rates of wages as to any class or all classes of employees are inadequate, unfair or inequitable, we will severally give full and fair consideration to your recommendations in that regard.

"As to the working hours we have each had for some time under consideration a change in this respect with the intention, if and so far as found practicable, to bring about as near an approach as conditions may warrant to an eight-hour day for our underground employees, a portion of whom have heretofore been in close approximation to that condition. The present situation does not alter our intentions. Any change of this character involves to a great extent a reorganization of the operations, and for that reason must be a gradual one. The time within which it can be brought about cannot now be stated. We can now state only the fact that it has been and is under favourable consideration.

"As to the one-man drill, we can only state that with respect to this, as to all our operations, our efforts, in advance of all other considerations, are exerted toward securing the safety of our employees. The conditions of competition, the low-grade of our rock as compared with other districts, the increasing expense with debts and other conditions have made the use of the one-man drill imperative for the continuation of operations.

"The request for nonemployment of boys under 18 is clearly a matter for the legislature. The foregoing involves as a condition the early cessation of strike conditions, the elimination of any recognition now or hereafter of the Western Federation of Miners and the withdrawal from that organization of those of its members who may be re-employed. This is not imposed to a condition of an arbitrary nature, nor is it stated through illwill, but must be recognized that in view of the nature of the teachings and utterances of such leaders in their addresses to their members and to the public with respect to ourselves, our officials, our employees and our

companies, there cannot be a restoration of harmony, good feeling and mutual respect between employers and employees, between bosses and men, or among the men themselves in any other way. To act otherwise on our part, to fail to bring about such restoration, most essential to the welfare of our men and of the community and the state, would be to invite an early renewal of strife.

"James MacNaughton, general manager of the Calumet and Hecla Mining Company, Ahmeek Mining Company, Allouez Mining Company, North Kearsarge mine, South Kearsarge mine, Tamarack Mining Company, Osceola Consolidated Mining Company, Laurium Mining Company, LaSalle Copper Company, Isle Royale Copper Company, Superior Copper Company, St. Louis Copper Company and Centennial Copper Mining Company.

"F. W. Denton, general manager of the Baltic Mining Company, Champion Copper Company and Tri-mountaine Mining Company.

"Charles L. Lawton, general manager Quincy Mining Company.

"Theodore Dengler, agent of the Wolverine Copper Mining Company and Mohawk Mining Company.

"R. M. Edwards, president and general manager of the Franklin Mining Company, Indiana Mining Company, North Lake Mining Company, Algomah Mining Company, and general manager of South Lake Mining Company.

"J. L. Harris, general manager of the Hancock Consolidated Mining Company.

"R. R. Seeber, superintendent of the Winona Mining Company and Houghton Copper Company."

OPPORTUNITIES IN MINING*

By James G. Ross.

The development of the mineral resources of Canada has been so rapid that mining is now the second greatest industry of the country. The value of the products of the mine is surpassed only by that of the farm. Only a very small proportion of the vast extent of the Dominion, much of which is favourable to the occurrence of mineral, has been prospected. The construction of railroads through regions hitherto difficult of access is opening up districts whose development gives promise of disclosing valuable deposits of mineral.

Of the vast number of men who took to the trail in the early Cobalt days many have become seasoned prospectors trained by hard experience. From these men, acquainted with the northern country, one expects news of new strikes. As districts become more readily accessible they have more time for actual rock knocking in the season and their chances of locating a vein are increased.

The knowledge gained in the north is being used to advantage in every new rush. Promiscuous claim staking is done only in time of excitement in order to hold ground for time to look it over. In cruising a new territory the prospector bides his time, but he finds a showing that holds promise of being worth developing. Many a prospector from experience gained in the newer camps recalls rocks or formations seen in former wanderings and takes the back trail to prospect the Maritime Provinces, Old Ontario, the Rainy River Country, or even British Columbia.

The good work done by the various Geological Surveys in mapping the country is of immense value in showing rock formations and routes. It would be even more valuable were the reports to state a little more definitely the parts of each district mapped most likely to repay careful prospecting.

The individual prospector has not yet been replaced by parties sent out by companies, as too much time is used in transporting supplies to keep a large party. The small syndicate formed to finance the prospector in opening up his property stands to make a good profit, as the market for promising claims partly developed is increasing. Organizations which in a systematic manner examine, buy and operate new properties, have grown out of successful ventures in the more recent camps. These afford to the prospector a ready market and to the small syndicate an opportunity of turning over partly developed claims.

Even in mining regions once thought to have been carefully prospected and in districts fairly well settled discoveries are being made. Tungsten is being shipped from a part of Nova Scotia formerly the scene of gold mining activity. China clay is being mined within 100 miles of Montreal in a country farmed for many years. Oil shale areas are being tested in the neighbourhood of the Alberta Mine, N.B., from which no shipments have been made in a decade.

There are many new districts of promise for the prospector and in which opportunities may yet come for profits such as the deposits of Sudbury and Cobalt have given.

The coal and gypsum deposits of the Maritime Provinces are rather beyond the scope of the prospector, but afford a field for syndicates and mining companies to open up those areas as still unworked which are favorably situated. The old gold fields of Nova Scotia, probably still contain deposits, which, if properly worked, would yield satisfactory returns.

Iron and manganese deposits in New Brunswick may still be found, and if in suitable locations will receive the attention of capitalists. Molybdenite, tungsten and even tin are reported in Northern New Brunswick. The Transcontinental Railway opens a district from the St. Lawrence River to Moncton, part of which have heretofore been difficult of access.

In Quebec the iron sands of the Lower St. Lawrence are being investigated by the Department of Mines and may yet be the scene of large industrial development.

The Asbestos industry seems to be emerging from its dark days and a new deposit in this area would not be difficult to dispose of. Renewed interest in the copper district of the Eastern Townships is being shown, with the erection of a custom smelter many of the deposits worked in the 60's would be again reopened and a search for new ones actively pursued.

From the extensive country north of the St. Lawrence to Hudson Strait about all that has come out so far are stories of gold samples in the hands of Indians. The Transcontinental Railway and the North Railway will enable many an adventurous party to work contiguous territory more thoroughly now that the larger part of their time will not be required in transporting supplies.

The Hurricanaw, Bell River, Kewagami and Keene-wesik countries have furnished alluring samples of gold

*From Journal of Commerce, Aug. 30, 1913.

and molybdenite and are favourably mentioned by the Geological Survey men.

Although trips have been made to Ungava for many years and during the last two years large parties have visited the country and long traverses made but little detailed prospecting has been done. What is required to investigate that territory is a well organized party, adequately financed, led by trained explorers, and composed of men prepared to remain several seasons on the ground to carry out a programme which has been definitely planned after a season's reconnaissance.

In Eastern Ontario iron, gold, mica, graphite, galena, feldspar, talc and zinc are all being profitably mined and thorough prospecting in a district readily accessible should reveal more paying deposits.

In Northern Ontario railway construction discovered two unique camps, Sudbury and Cobalt. In the vast area between the Quebec and Manitoba boundaries and northward to the Bay, including the new district of Patricia is a promising field with room for many such areas as Cobalt and Porcupine. The Transcontinental, Canadian Northern and Algoma Central railways now enable much of this country to be easily reached. Though canoe routes through this country have been used by the Hudson's Bay Company ever since its formation, there are still unexplored areas within a few miles of the rivers.

In Northern Manitoba the railways to the Bay are opening a district in which the area of rock exposure predominates and, with supplies in easy reach, the prospector should soon be in here.

In Northern Alberta attention is being directed to occurrences of coal, gas, oil and tar sands.

British Columbia will for long be the happy hunting ground for the prospector. The unknown coal areas of the Crow's Nest Pass, Brazeau, Peace River, and other districts are continually being increased by the work of the indefatigable prospector and men of the Geological Survey.

For the last eight years the country adjacent to the Grand Trunk Pacific Railway from the foothills to the coast has been the scene of many promising finds by prospectors working the country ahead of the construction gangs to be ready to ship when the rails reached them. Many claims have been staked for coal, copper and silver-lead. As progress is slow with pack trains much of the time has been spent in packing in supplies at high rates. With the completion of the railway the prospectors will be able to go farther back to districts yet untouched.

There still remains a great part of British Columbia and the Yukon Territory, the only parts which have been prospected being the routes traversed in Cariboo days, and those only for placer gold. The Sushanna Placer deposits on the White Horse, Yukon, is the latest discovery reported.

As minerals afford so large a proportion of the country's wealth the prospector is worthy of every encouragement, both by the Government and by the railways, a goodly proportion of whose freight is furnished by the mine. The Northern Pacific Railway recognizes this fact to the extent of granting free transportation to the prospector and his outfit in their mountain division. The T. & N. O., Canadian Northern and Algoma Central railways employ their own mining engineers, while the C. P. R. has done much to bring mining to its present high state of production in British Columbia.

The mining industry is well worthy of the serious attention of investors. All the good properties have not

been discovered and worked out. The investor, however, should examine a mineral proposition as carefully as any other and insist on capable men having charge of the expenditure of his money and developments of his property.

It seems to be a peculiar feature of investing in mining companies that the ordinary investor makes no effort to secure reliable information on a company in which he contemplates investing. It is quite useless to reiterate the advice so often given that a mining proposition should be as carefully investigated as any other business venture. Not only the probability of the ore yielding a profit as shown by the report of a reliable and competent engineer but also all other conditions such as capitalization, and personnel of directors and management. By regarding a mine as a legitimate industry and not as an adjunct to the stock market the chance of a profitable investment are probably greater than in any other line of industry.

GRANBY.

The Boston News Bureau says:

The smart advance in Granby Consolidated to 77¼, a rise of 26¼ points from the year's low point (it sold as low as 33 last year) reflects the expectation that within a very few months the company will be in position to show earnings at the rate of between \$15 and \$20 per share.

If present anticipations are realized, the company on January 1 should begin to produce from its new Hidden Creek property at the rate of 20,000,000 pounds per annum, thus practically doubling the mine's production. Against this new output the only capital charge is \$1,500,000 6 per cent. convertible bonds, exchangeable into stock at par, \$100. The balance of the sums necessary to make possible this big increase in production has come from earnings.

At the present time Granby has outstanding only 152,000 shares, and for the year ended June 30 showed profits of practically \$8 per share, or \$1,207,661. This was on a copper market which averaged the company not far from 16½ cents.

The new Hidden Creek mine on a 17-cent copper market, when given time to warm up to its best efficiency, should produce annual earnings of \$1,500,000, or \$10 per share.

It requires no stretch of the imagination therefore to figure prospective Granby earnings of \$20 per share.

In the newly acquired property Granby has blocked out between 8,000,000 and 9,000,000 tons of ore, or sufficient to last between 10 and 15 years, with the smelter treating 2,000 tons per day.

Granby has "come back" in no uncertain fashion. To make good the sudden discovery of declining ore reserves at its Grand Forks (British Columbia) mine, it started at once to secure another mine, and in acquiring the Hidden Creek it has secured a property far more valuable than the original property.

LABOUR DISPUTES.

According to the record maintained by the Department of Labour industrial conditions showed an improvement in regard to labour disputes during July. There were 24 in existence, as compared with 27 during the previous month. A still greater improvement is seen when the comparison is made between the present month and the corresponding period of last year when there were 46 strikes and lockouts existing in the Dominion. During July, 1913, about 152 firms and 8,000 employees

were involved in strikes and lockouts as compared with 450 firms and 11,957 employees affected by trade disputes during the previous month. There was a slight increase in the loss of time to employees, about 188,000 working days being lost, as compared with approximately 181,000 during June. It may be mentioned that during July, 1912, upwards of 270,000 working days were lost

from this cause. Two disputes of importance occurred during July, while of those that were in existence previous to this month, the most important as affecting industrial conditions, were those of coal miners on Vancouver Island and sawmill hands at St. John, N.B. These two disputes, together, accounted for a loss of upwards of 130,000 working days.

THE COAL DEPOSITS AT NANAIMO, VANCOUVER ISLAND, B.C.*

By Charles H. Clapp.

There are at present three productive coal seams in the Nanaimo district lying in the following succession from the bottom upwards: the Wellington, the Newcastle, sometimes called the lower Douglas; and the Douglas. The lowest seam, the Wellington, occurs about 700 feet above the base of the Nanaimo series, overlying 600 feet of marine sandy shale, the Haslam formation. The Newcastle and Douglas seams, are only from 25 to 100 feet apart, and overlie the Wellington seam by about 1,000 feet, separated from it chiefly by a thick bedded conglomerate, the Extension formation. A fourth and small seam, called the little Wellington, locally overlies the Wellington at a distance of 20 to 50 feet. It has been mined in a small way.

The coals of the various seams are as a whole much alike, and furnish a bituminous coal of fair grade. The amount of fixed carbon in the best quality ranges from 45 to 60 per cent., and the ash from 5 to 10 per cent.

The most striking feature of the seams is their great variability in thickness and quality. The thickness varies from nothing to over 30 feet, sometimes within a lateral distance of less than 100 feet. This variation is caused by irregularities in either the roof or floor, and occasionally in both. In quality the seams vary from where they are entirely composed of clean, bright coal, with about 5 per cent. ash, to where they are entirely composed of a dirty slickensided coal, locally called "rash," with over 50 per cent. ash. The following is a proximate analysis of the rash from the Wellington seam.

Proximate Analysis by Fast Coking.

| | |
|------------------------|--------|
| Water. | 1.59 |
| Vol. combust | 24.15 |
| Fixed carbon | 19.29 |
| Ash. | 54.97 |
| Sulphur. | undet. |

100.

The Wellington Seam rests on a firm sandstone floor, which is fairly regular although a few sharp rolls do occur in it. The roof, however, varies greatly in character from sandy shale to conglomerate, with many irregularities, especially in the sandy shale. The average thickness of the seam is from 4 to 7 feet, but it occasionally pinches to virtually nothing, and then suddenly thickens to 10 or 12 feet. The floor may be nearly smooth, but the roof in passing from the thin to the thick portion of the seam rolls upward sharply and often irregularly. Occasionally the roof is overturned forming in one instance an overlap in the seam of at least 25 feet. These sharp rolls are locally called "faults." Invariably at the thin places or "pinches"

the coal is dirty and slickensided, while in the thick places or "swells" it is clean, black in colour with a sub-brilliant lustre, and broken only by a few irregular joints. Rash is usually found near the top and bottom of the swells and rarely in thin partings near the centre. Even in the swells some bone is present as small lenses seldom more than a quarter of an inch thick. In some instances the coal is clean and unfractured against the upturned roof, but more commonly it is somewhat slickensided and even contorted. The roof at the rolls is always contorted and slickensided.

The strike of the rolls corresponds with the strike of the measures, that is, northwest to west, and the pinches occur in the northeast and north side of the rolls with the corresponding swells on the opposite side. Where the seam is overlapped, the overlap is to the northeast or north.

It appears from the evidence given above as if the variation was due in large part to a folding which affected the coal seams when the clean coal was in a fairly plastic condition. This conclusion is especially well substantiated in another part of the Wellington seam, where it is composed of several sub-seams separated by dirty slickensided coal or rash. During the deposition of the seam, conditions in which fairly clean carbonaceous matter was deposited must have alternated with those during which the carbonaceous matter was deposited with a large amount of silt. When the seam was folded, the clean coal was apparently forced away from the tight bends, where the folding caused an increase in the vertical pressure, and left the seam at these places composed almost entirely of rash. The clean coal flowed to where there was a corresponding relief of vertical pressure forming a swell where the seam, except for the rash at the top and bottom, consists chiefly of clean bright coal.

Besides the barren places or wants due to folding subsequent to the deposition of the same, there are large wants due solely to silting, for in some instances the silting must have persisted throughout the period of coal formation. Also large and persistent partings of shale occur between the sub-seams.

The Douglas Seam.—Both types of variation occur in the Douglas seam. The seam varies from nothing to 30 feet in thickness, and averages about five feet, although over large areas the average thickness of the mineable coal is between three and four feet. The floor of the Douglas seam is usually a rather weak sandy shale, and the roof, although stronger, is very variable, ranging from a sandy shale to a fine grained conglomerate, the principal type being a shaly sandstone with sandstone layers and lenses of fine grained

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

conglomerate. Unlike the conditions in the Wellington seam the pinches and swells are caused chiefly by irregularities in the floor, the roof being fairly smooth. At the pinches the seam is composed almost entirely of rash, like that of the Wellington seam, although as a rule it is harder. The coal occurring in the swell has a compact texture, but rather dull lustre. It is irregularly broken into large blocks. Near the pinches some of the coal is slickensided and contorted, but where these features are shown the coal contains a higher percentage of ash. The coal seam is displaced also by small faults, although an actual break seldom occurs, the coal having been forced along the plane or zone of dislocation. Rarely the entire seam folds or wrinkles without any appreciable variation in thickness.

The Newcastle seam is more regular than the Wellington or Douglas seams, but is thinner, varying, as far as known, from 20 to 45 inches where mined, and contains more numerous and more regular partings. It is also less extensive in area than the other two seams.

Production.—The coal has been the source of a flourishing industry for over 50 years. The Wellington seam has been mined at Wellington, Northfield, East Wellington, Harewood Plains, and Extension, and is at present mined by the Vancouver-Nanaimo Coal Mining Company at East Wellington and by the Canadian Collieries (Dunsmuir) Company near Extension. The Newcastle and Douglas seams, which are usually worked together, have been mined extensively in the vicinity of Nanaimo. The mines here are operated by the Western Fuel Company. There has also been a large production from the Douglas seam south of Nanaimo, notably at Chase River, Southfield, and South Wellington. In these localities the Newcastle seam, although readily located, is of doubtful value. There is only one mine producing at present in this district, the South Wellington mine, operated by the Pacific Coast Coal Mines. Both the Western Fuel Company and the Pacific Coast Coal Mines are sinking new shafts along the lower part of the Nanaimo river to open up the Douglas seam in depth. The present coal production is over 1,000,000 tons per year, and the importance of the Nanaimo district in the coal industry may be more readily comprehended when it is realized that it produces over one third of the entire coal output of British Columbia.

HEDLEY GOLD MINING CO.'S PRODUCTION.

The Hedley Gazette states that there seems to be a persistent misconception on the outside as to the output of the Nickel Plate mine, in Camp Hedley, Similkameen district, British Columbia. In particular it complains that the Daily News of Nelson, B.C., placed the value of the output to the end of 1911 at \$2,500,000 to \$2,700,000, as compared with figures given in some detail by the Gazette, which total, to 1911, inclusive, \$3,810,910; further, that an official guide book compiled in Ottawa for the use of members of the International Geological Congress shows a value to the beginning of 1913 of \$3,250,000, while the Gazette claims a total to that time of \$4,599,625. Adding the value of the production for seven months, to August 1, 1913, an aggregate value of \$5,104,373 to that date is claimed by the Gazette. Now, while the detailed figures printed by the Gazette are higher for each of three years—1910, 1911 and 1912—than those published by the Hedley Gold Mining Co. as the value of the precious metal recovered in those

years (the company's figures for other years are not at the time of writing available to the present writer), there is no doubt that the Gazette has good grounds for its protest against the persistent publication of misinformation concerning the value of the output of the Nickel Plate group of gold mines. There is just a possibility that the Nelson newspaper mentioned will now admit its error, made in an account of the Hedley Gold Mining Company's property published in the Daily News of July 15, 1913, but it is probably too late for a change to be made in the official publication which the Gazette states was prepared for the International Geological Congress. No information is given as to who was responsible for the mistake to which the Gazette has taken exception, but since Mr. Chas. Camsell gave, in his Memoir on the Hedley Mining District, the recovered value of 153,000 tons mined and treated from 1904 to the end of 1908 as approximately \$2,142,000, there surely should not have been any difficulty in ascertaining the value recovered during the four years, 1909-1912. It would appear that the official statement, if as quoted by the Gazette, was about \$1,250,000, or more than 25 per cent. short of the amount actually produced. Such serious inaccuracy in a supposedly reliable publication is much to be deplored.

The detailed statement printed on August 28 by the Hedley Gazette is as follows:

| | |
|---|----------------|
| Value of production to end of 1907..... | \$1,617,229 49 |
| “ for 1908, 44,068 tons at \$13.35 per ton. | 588,507 80 |
| “ for 1909, 31,100 tons at \$11.58 per ton. | 360,138 00 |
| “ for 1910, 44,828 tons at \$12.31 per ton. | 551,832 68 |
| “ for 1911, 57,815 tons at \$11.99 per ton. | 693,201 85 |
| “ for 1912, 70,455 tons as per statement.. | 788,715 05 |
| “ for seven months of 1913, to July 31.. | 504,748 00 |
| | \$5,104,372 87 |

An excerpt from the Hedley Gazette's review of the Hedley Gold Mining Co.'s progress in the year 1912 may prove of interest at this time. In the course of its comments on the year's work the Gazette observed: "As might be expected from the fact that the dividends have been greater during the year last past than in any previous year, 1912 has been a year of breaking records and all former achievements have had to take second place. The quantity of ore mined and milled has been greater; the bullion produced has been greater; the mill has accomplished a higher duty per stamp; the extraction has been higher, and, more important than all of them, the development done during the year has shown up foot for foot a vastly greater amount of ore than ever before with the result that the ore reserves have reached a point which puts the whole enterprise on 'easy street' for years to come, so far as the necessity for looking for new ore bodies is concerned. No wonder the ore reserves have increased so enormously, when it is known that every bit of the development done in the Nickel Plate during the year has been all in ore."

In the published report for 1912 of the Hedley Gold Mining Co., the following statement is made by the general superintendent: "We have no hesitation in stating that the minimum quantity of reserve ore, as shown by development and diamond drill, in the Nickel Plate and Iron Duke claims, is 413,000 tons, and that this ore will average at least \$11.35 a ton."

The president of the company reported: "We acquired, in 1912, the adjoining claims, known as the Windfall group, lying to the northwest of our property. Our exploration work demonstrated that the ores pass into this acquired territory, which promises well for a long life to our mines."

SHUSHANNA GOLD FIELD, ALASKA

When in Vancouver, British Columbia, at the end of August, Dr. D. D. Cairnes, of the Geological Survey of Canada, gave a meeting of business men of that city his impressions of the Shushanna district, Alaska, from which he had just returned. Dr. Cairnes has done much geological investigation work in the North country, chiefly in Yukon Territory, latterly in studying and mapping the geology along part of the 141st meridian (the Yukon-Alaska boundary), in accordance with an understanding arrived at between the United States and Canadian Geological Survey workers engaged in delimiting the International Boundary between Alaska and the Canadian Yukon. A published report of what Dr. Cairnes said in Vancouver, states that he spoke in a very cautious manner, and did not give the impression that the Shushanna is an exceptional field. He was careful to lay stress on the fact that the area in which gold had been found in that part of Alaska is small, and that all the ground had already been taken up. He was quoted as follows:

"It would be very foolish to go in there without a good outfit and prepared to spend the winter. It is absolute foolhardiness to stampede in there with the idea of getting out quickly. By this time there must be between one and two thousand men on the ground, and all the good ground was staked by the first 200 to get in.

"As to the strike itself—Mr. James told men that he first found gold on May 3. There is a story current that an Indian showed James where he could get gold, but I believe James found it himself. On July 4 they started sluicing and took out \$300 a day per man. The diggings are shallow and gravel is not frozen. The creek bottoms are typical prospectors' diggings, and with a shovel and pan it is easy to establish the nature of the ground in an hour or two.

With the exception of that recovered by James, no great amount of gold has been taken out by any one as far as I am aware. The ground is staked for ten square miles, and this includes mountain tops. Practically everything between Johnson and Wilson Creeks has been taken up. Men going in after August 1 will find everything taken up around the strike, but there is a large country left to prospect. There are not many benches and the creeks are narrow. There is very little gravel on the benches, with the exception of the old channel of the Bonanza Creek."

Describing the geological conditions, Dr. Cairnes said that similar bedrock conditions prevail 25 miles away, on the Canadian side of the International Boundary, and it is quite probable gold will also be found in the Canadian Yukon part of the district. He adds:

"The stampede has been greatly overdone. Undoubtedly it is the greatest stampede since that to the Klondike, but kindly note that I do not say it is the greatest strike since the Klondike. The trails are bad, with wet ground and a great amount of "niggerhead," but new trails are being constructed along the higher ground. We met many men who had very little idea of their position; one man was 15 miles from where he thought he was. Several parties were overdue when I left."

Dr. Cairnes states that the ground is at a high elevation and the creeks are practically all above timber line, but one gets the impression that it is low flat country, despite the fact that the average elevation is above 5,000 ft.

There are five routes into Shushanna—two from Alaska and three from the Canadian Yukon. The first Alaska trail is from McCarthy, but this is available only for eight to ten weeks in summer and is dangerous for pack animals. The other Alaskan route is from Fairbanks up Tanana River, and it is possible to get to the mouth of Johnson Creek by water, but it is very dangerous. Rivermen think that light-draft steamers can get to within 50 miles of Johnson creek.

Of the Canadian routes, there is one from Skagway to White Horse 110 miles, thence by wagon road to Kluane Lake 145 miles, then trail to Canyon City 130 miles; from that point to where Beaver Creek crosses the line and then into the diggings. Another route is by way of White Horse to Coffee Creek and thence to Canyon City or by way of Snag Creek. The latter is the shorter route and a new trail is being constructed, while road houses are being built at suitable places. Freight rate from Dawson City, Yukon, is \$50 a ton, which Dr. Cairnes says is very reasonable.

Dr. R. W. Brock, director of the Geological Survey of Canada, who happened to be in Vancouver at the time, on his way to Dawson with an International Geological Congress excursion party, said that the whole country around Shushanna is favourable for prospecting, and added that he will not be surprised if some important discoveries are made in Yukon Territory and northern British Columbia within the next year or two. He also made reference to the proposed railway through Alaska, and stated that one of the few available routes is by way of Kluane Lake, White River and Tanana River.

A press despatch from Dawson is to the effect that the Canadian Customs Department has waived the restrictions on American goods crossing the Canadian Yukon to the diggings. Such goods in transit will be allowed to pass without the usual deposit, and where supervision shall be necessary to see that the goods are taken into United States territory the expense of conveyance will be borne by the Canadian Customs. This arrangement has been made by the Canadian Government on the recommendation of Yukon Commissioner Black and Dr. Alfred Thompson, member for Yukon in the Dominion House of Commons. No customs duty is being charged on Canadian goods being taken across the boundary line to the diggings.

GRANBY CONSOLIDATED M. S. AND P. CO.

Mr. Geo. L. Walker included the following information concerning the Granby Consolidated Mining, Smelting and Power Co., Ltd., operating in British Columbia, in his "Weekly Copper Letter," published in the Boston Commercial last month:

"Granby completed, on June 30, a most successful fiscal year. Figures at hand indicate that it produced approximately 27,000,000 pounds of copper at a cost of 10½ to 10¾ cents a pound. If it was sold at an average of 15½ cents a pound the company must have earned between \$7.50 and \$8 a share on its outstanding 150,000 shares.

"The ores of Granby's original mines at Phoenix, B.C., from which all its production now comes, yield an average of only 17 to 18 pounds of copper and about 90 cents of gold and silver per ton. On a 15 cent metal market, therefore, these ores have a gross recoverable value of only \$3.50 to \$3.60 a ton. Economical and highly efficient management make it possible for Granby to treat this very low grade ore profitably.

It is a direct smelting, self-fluxing ore, and the total values recovered from a ton of it do not greatly exceed the single cost of smelting a ton of ore in some other districts. Granby mines its ore, pays 25 cents a ton freight on it to the smelter, smelts it, ships the copper to the Atlantic seaboard, pays for refining and selling, and the cost of the whole operation is only about \$2.70 per ton of ore handled during the year.

“It is the same management that is developing for the Granby Company its new mine the Hidden Creek, and building the smelter at Granby Bay, B.C. This mine and smelter are located together at tidewater, eliminating the 25 cent freight charge and some other expenses; but more important is the fact that Hidden Creek ore will yield approximately \$6 a ton, or \$2.50 in excess of that now being handled with good profit at Phoenix. The Hidden Creek property, therefore, promises to yield very large profits.”

MINERAL PRODUCTION OF ONTARIO.

Returns made to the Ontario Bureau of Mines show that the production of the metalliferous mines and works of the province for the first six months of 1913 was as follows.

| | Quantity. | Value. |
|-------------------------------------|------------|----------------|
| Gold, ounces | 106,091 | \$2,171,147.00 |
| Silver, ounces | 13,890,692 | 7,693,713.00 |
| Copper, tons | 5,873 | 832,645.00 |
| Nickel, tons | 12,104 | 2,514,414.00 |
| Iron ore, tons | 62,627 | 141,324.00 |
| Pig iron, tons | 369,450 | 5,051,840.00 |
| Cobalt ore, tons | 79 | 7,374.00 |
| Cobalt oxide and Nickel oxide. | 404,060 | 186,347.00 |

Compared with the first six months of 1912 these figures show the following increases:

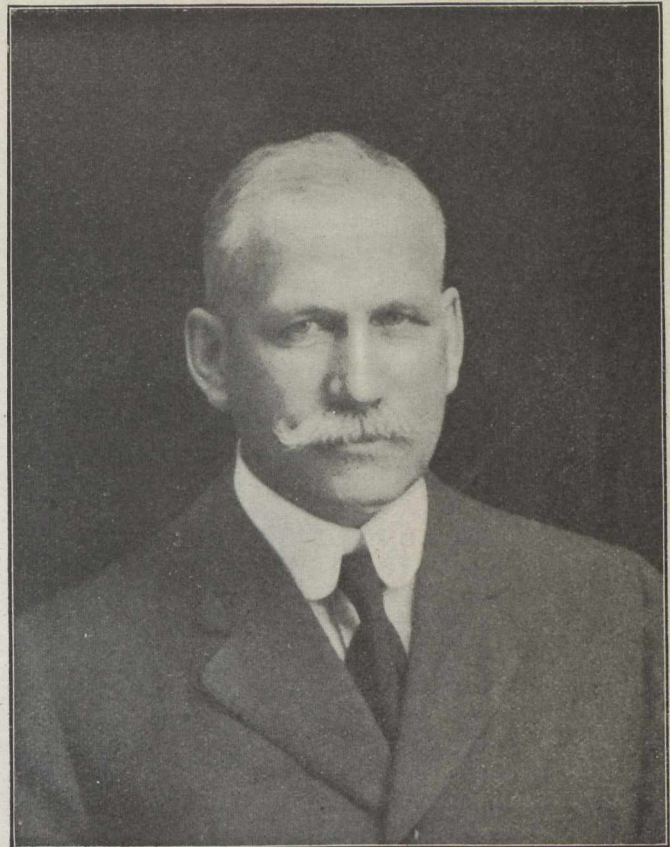
| | |
|----------------|-------------|
| Gold. | \$1,935,949 |
| Copper. | 96,176 |
| Nickel. | 347,519 |
| Iron ore | 108,264 |
| Pig iron | 1,109,202 |

and the following decreases:

| | |
|--------------------------------|------------|
| Silver. | \$ 242,887 |
| Cobalt and nickel oxides | 5,726 |

Gold.—Most of the gold came from Porcupine, the chief producers being the Hollinger and Dome mines, both of which have been steadily at work. Porcupine Crown and McIntyre Porcupine also contributed. The other gold camps yielded about \$150,000, including Swastika and Lucky Cross at Swastika, Cordova in Hastings County, Canadian Exploration at Long Lake, Northern Gold Reefs at Sturgeon Lake, Goldfields, Limited, at Larder Lake, and Tough-Oakes at Kirkland Lake. The narrow veins in the last named camp are proving to contain rich ore.

Silver.—The most productive mines for the half year were the Nipissing, Coniagas, La Rose, Kerr Lake, McKinley-Darragh-Savage, Buffalo and Crown Reserve, all mines which have held a leading place for years.



THOS. W. GIBSON
Deputy Minister of Mines, Ontario

Cobalt Townsite, Casey-Cobalt and Seneca Superior are coming into prominence as producers, while some properties, formerly in the first rank, are falling off in their yield. Shipments of ore were 3,216 tons, of concentrates 8,253 tons and of bullion produced at the mines 2,792,311 ounces. The corresponding figures for the first six months of 1912 were: Ore, 6,860 tons; concentrates, 4,806 tons, and bullion, 2,448,689 ounces, showing the progress being made towards complete treatment of the ore on the spot. Three mines in Gowganda and South Lorrain yielded 407,103 ounces.

Nickel and Copper.—The mines of the Sudbury District continue to increase their output, and the outlook is for still further production. The Canadian Copper Company and the Mond Company remain the sole producers of matte. Recent drilling operations have proven the existence of very large ore reserves. The Alexo mine, on the Porcupine branch of the T. and N. O. Railway is interesting, as being separated about 140 miles in a direct line from the Sudbury mines, and so proving the existence of ore quite outside the older field. The shipments are made to the Mond Company's new smelting plant at Coniston, which came into operation during the half year.

Pig Iron.—The production of pig iron in Ontario is growing rapidly. In 1902 it amounted to 112,687 tons; in 1907, 286,216 tons; in 1912 to 589,583 tons, and at the present rate of production, if maintained for the remainder of the present year, the output will be 738,900 tons. All the blast furnaces, except the one at Port Arthur, were in blast during the six months.

PERSONAL AND GENERAL

Mr. C. F. Caldwell, manager of the company operating the Utica Silver Lead mine, in Ainsworth mining division, has returned to his headquarters at Kaslo, B.C., after having spent several weeks in the United States.

Mr. Wm. Fleet Robertson, of Victoria, provincial mineralogist for British Columbia, accompanied the International Geological Congress excursionists to Prince Rupert last month.

Mr. W. M. Brewer, who at the time was traveling in Lillooet district, investigating mining conditions for the British Columbia Department of Mines, lost his horse, which slipped off a trail and fell down a steep mountain side, fully one thousand feet. Fortunately Mr. Brewer was not riding the horse when the accident happened.

Mr. Bruce White has returned to Nelson, B.C., from a prospecting trip down the Athabaska river to Lake Athabaska and thence east into northwestern Saskatchewan. He told the Daily News of asphaltum, lime, salt, and natural gas resources of parts of the country passed through, and that there are as well lode metals—gold, copper, lead and nickel.

Mr. Jas. Buchanan, superintendent of the Consolidated Mining and Smelting Co.'s smelting works, has returned to Trail, B.C., from a holiday trip to Scotland.

Mr. W. L. Coulson, of Victoria, B.C., general manager of the Canadian Collieries (Dunsmuir), Limited, operating collieries on Vancouver Island, has been in Toronto. The Canadian Collieries Company is a MacKenzie & Mann enterprise.

Dr. D. D. Cairnes, of the Geological Survey of Canada, came down to Vancouver, B.C., from Yukon Territory last month to meet a north-bound party of International Geological Congress excursionists and accompany them to Dawson. Mr. R. G. McConnell, also of the Survey, was down from Rainy Hollow, in the extreme northwestern part of British Columbia, to take charge, as leader of the excursion to Prince Rupert, Skenna River, Malaspina and Yukon.

Mr. C. H. Macnutt left London on August 29th to take charge of the Burma Mines, Ltd., at Nantu, Burma.

Mr. A. A. Hassan has completed a report on the Moose-Head Gold Mine in Halifax County, Nova Scotia.

Mr. H. H. Lavery has joined the staff of the Mond Nickel Company at Worthington Mine.

Prof. A. P. Coleman injured his ankle as the result of slipping on a stone on a mountain trail while with the geological excursion in British Columbia in August. He has gone on to Alaska, however, with another excursion.

Mr. Reginald E. Hore has returned to Toronto after visiting mining districts of Alberta and British Columbia with the C2 excursion of the Geological Congress.

Mr. Neil Cochrane, an old-time mine superintendent in Rossland camp, recently visited Rossland after an absence of ten years. He is now superintendent of the Jumper Californian Gold Mines, Tuloumne County, California.

Mr. H. Hyman Claudet, for years representative in British Columbia of the Elmore Oil Process interests, was in London lately, after having completed the installation of an Elmore plant in Switzerland.

Mr. J. D. Galloway has been appointed acting assistant to the Provincial Mineralogist of British Columbia, and will do field work for the British Columbia Department of Mines during the remainder of the present year's field season.

Mr. Thos. Graham, chief inspector of mines for British Columbia, last month had a narrow escape from serious accident. Accompanied by Mr. James McGregor, district inspector, he was returning to Nelson after having visited the Silver King Mine, on Toad Mountain, when their horse bolted down the wagon road. Both men jumped from the buggy; Mr. Graham was not hurt, but Mr. McGregor had one ankle badly sprained. Shortly afterward the buggy was smashed and one horse was so badly injured that he had to be destroyed.

Mr. J. H. Cunningham, superintendent of the Canadian Collieries Co.'s colliery at Extension, Vancouver Island, had a somewhat strenuous time last month, having taken to the woods to escape the wrath of the strikers, who were indulging in the diversion of shooting and burning in and about the Extension mining camp. Mr. Cunningham's house and contents were utterly destroyed by fire. After a rough experience he found a place of safety in Victoria.

Mr. W. W. Leach, of the Geological Survey of Canada, who was to have been one of the guides in Western Canada, of an International Geological Congress excursion party, was prevented from doing so by an attack of typhoid fever.

Mr. Horace G. Nichols, who was for some time manager of Ymir gold mine, in British Columbia, and since then has had his headquarters in London, England, was expected to leave that city in July on a business trip to the United-States and Canada. Lately he joined the firm of Bainbridge, Seymour & Co.

Mr. W. W. Mein, of New York, consulting engineer for the Canadian Mining and Exploration Company, was in Hedley camp, Similkameen, B.C., in the early part of August. He was accompanied by his assistant, Mr. Ralph S. G. Stokes, formerly mining editor of the Rand Daily Mail, Johannesburg, South Africa.

Dr. Heinrich Ries, professor of geology at Cornell University, Ithaca, New York, is in the West, continuing his investigations into the clay resources of Canada, which work he is doing for the Geological Survey of Canada.

Mr. Wm. Thomlinson, of New Denver, B.C., has been engaged for a couple of months in getting together specimens of the ores of Slocan district, for use in representative collections of the ores and minerals of British Columbia the Provincial Department of Mines is having prepared for permanent exhibition in suitable places.

Mr. E. E. Ward has retired from the office of superintendent of the Silver Hoard mine, in Ainsworth camp, B.C.

Mr. Ed. Dedolph, for some time engaged in the metallurgical laboratory at McGill University in connection with zinc ore reduction experiments, that have been conducted there under the direction of the Mines Branch of the Canada Department of Mines, is now in British Columbia, Dr. Haanel having arranged to continue the experiments at the electro-thermic works at Nelson, for some time operated experimentally by the Canada Zinc Company.

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA

Metal mining is being continued in the province with very little interruption. Hydraulic mining in the placer-gold districts has been practicable to a later date than is usual in ordinary seasons, so a proportionately large increase in the quantity of placer gold recovered this year is looked for. Generally speaking, lode mining is being carried on in the older mining camps. The only serious decrease in mineral production looked for is in connection with coal mining, and this on Vancouver Island, where labor troubles have occasioned much bitterness, and unfortunately with no present prospect of a settlement.

Ainsworth.—The following information concerning the Silver Hoard mine, in Ainsworth camp, has been given to the Kaslo Kootenaiian by Mr. W. S. Hawley, managing director of the company owning and operating that mine: "As a result of having found a larger and better orebody at the 100-ft. level than we had at the 50-foot, and the encouraging outlook generally, the company has decided to sink a double-compartment shaft on the Silver Hoard to a depth of 500 ft., which will be 400 ft. deeper than the lowest present level on the property. With this end in view surveys are being made and preliminary work is to be commenced at once. A compressor, to be driven by water from the north fork of Cedar Creek, is to be installed, and this will supply all the power that will be required for drilling and hoisting. This compressor, by the way, will be of a somewhat new design and principle; it was designed by Prof. Francis A. Thompson, head of the mining engineering department of the State College of Washington, Pullman, Washington.

Kaslo.—The Lardo correspondent of the "Kootenaiian" says: "The mining outlook along the Lardo branch is steadily improving and prospects have not been so encouraging for a long time. Prospectors and claim owners are active and the indications are that capital will soon be more readily available with which to develop the many promising locations."

Grading on the Kaslo & Slocan railway line, which is being changed from narrow to standard gauge, is likely to be completed by November 1, according to the contractor for the work. Most attention has been given during the summer to completion of the work from Whitewater, a few miles down toward Kaslo, for the altitude of that part being higher snow falls earlier than nearer Kaslo. It is hoped steel will be laid part of the way between Whitewater and South Fork before the snow shall commence to fall, for it will then be practicable to haul freight in and out between Three Forks and South Fork pending completion of the line through to Kaslo.

Sandon.—Several Slocan mines that had not shipped ore for a number of years lately commenced to send ore to Sandon for shipment by railway and steamer to the smelting works at Trail. The Last Chance aerial tramway having been put in running order, after a long period of non-use, is being utilized for conveyance of ore from the Surprise mine down to the lower terminal below Cody, whence hauling is done by teams. The outlet for the Surprise is now through one of the old Last Chance adits, connection having been made by a long extension of the adit and

then a raise of more than 800 feet. Ore is also being received at the Sandon railway depot from the Wonderful mine, at which years ago much galena was recovered by ground-slucing. Underground work has resulted in the vein on the Wonderful being found and now ore is being mined from it.

New Denver.—The Slocan Record states that the work of driving No. 8 adit on the Standard, near Silverton, Slocan Lake, has been commenced. This adit is on one of the old Emily Edith group of mineral claims, now owned by the Standard Silver-Lead Mining Co., No. 7 adit, on the same property will have to be driven about 400 feet more before it will be under the big orebody occurring on levels Nos. 6 and 5. Ore is being mined in a stope that has been opened from No. 5 level, which stope has been advanced about 50 feet, and still has 6 feet of shipping ore in the face. The ore contains about 80 per cent. lead, and some zinc, and averages 156 oz. silver to the ton. Other stopes, both above and below No. 5, are also yielding shipping ore.

Silverton.—The Van-Roi mine report for the month of July shows that little more was concentrated in that month, milling operations having been temporarily suspended on July 9. Only 143 tons of ore was milled; its average assay was 3.7 oz. silver per ton, 0.1 per cent. lead, and 3.5 per cent. zinc. The metals recovered were half a ton of lead concentrate and two tons of zinc concentrate; the former contained 117 oz. silver per ton, 54.6 per cent. lead, and 10.3 per cent. zinc; the latter contained 35.3 oz. silver per ton, 3.4 per cent. lead and 38.2 per cent. zinc. The west drifts on levels Nos. 7 and 9 were extended and the raise from level No. 9 was advanced 22 ft. Diamond drilling was continued from No. 9 level and holes from both 1,250 and 1,510 feet from portal reached the vein.

Rossland.—Le Roi No. 2, Ltd., has published the following report for July from its Josie mine: Shipped 1,570 tons of ore and 103 tons of concentrate. The receipts from the smelter were \$23,530, being payment for 1,695 tons of ore shipper, and \$1,138 for 145 tons of concentrate; total receipts, \$24,668. Estimated costs for corresponding period were: Development \$7,700, ore production \$8,300, milling \$1,500, total \$17,500. Summarized, the development work done was 173 ft. on the 500-ft. level, 40 ft. on the 700-ft. level, and 199 ft. on the 900-ft. level. The highest grade ore opened was that on the 700-ft. level where the average for a width of 16 in. along 30 ft. was 16 dwt. gold per ton, and 6.25 per cent. copper.

Arrangements have been made under which Mr. W. R. Foley, of Denver, Colorado, and associates will operate the Blue Bird mine, in the South Belt of Rossland camp. This mine was worked for some time by Mr. Lyman Carter, but under unfavourable conditions financially. Some 20 cars of ore was shipped to Trail. As depth was gained copper largely replaced silver and lead in the ore.

Boundary.—The Granby Consolidated Co., has declared a dividend of \$1.50 per share, payable on September 2.

The Ledger says there are 40 men working at the Jewel gold mine and stamp mill, and the production of ore is about 50 tons a day.

A commencement has been made to haul ore from the Union claim, in Franklin camp, North Fork of Kettle river, to the railway terminus at Lynch creek, where 12 tons of gold-silver ore was lately delivered. This is the first ore shipped in commercial quantity from Franklin camp.

The Granby Consolidated Co. is reported to have bonded the Big Copper property, situated about five miles west of Greenwood, and to intend to do some diamond drilling on it.

A. E. Watts, a well-known lumber mill man of East Kootenay, and F. N. Knight, both connected with the management of the Boundary Mining and Exploration Co., were recently charged with five infractions of the Coal Mines Regulation Act. For failing to report to the Department of Mines that a man had been burned by gas in the company's coal prospect workings near Midway. Watts was fined \$75 and Knight \$25, both with costs. Watts has appealed against the infliction of this penalty. On four other charges Watts was fined \$1 each, without costs. Similar charges against the others were withdrawn. Watts at first disregarded a summons to appear at Midway to answer the charges but after a bench warrant had been issued for his arrest thought it best to put in an appearance. A minority of the shareholders are much dissatisfied with the present condition of the company's affairs.

Advices from New York state that the preliminary report of the Granby Consolidated M. S. and P. Co., for the fiscal year ended June 30, 1913, shows that the profits from the company's Phoenix mines and Grand Forks smeltery amounted to \$1,207,661, of which the sum of \$449,955 was distributed among shareholders since dividend payments were resumed recently. These figures are subject to minor corrections by the final statement to be submitted at the annual meeting of shareholders to be held in New York on October 7, proximo. The earnings for July and August will show some shrinkage, due to low copper prices and somewhat small recoveries, but the total for the year will reach approximately \$1,250,000, it is believed, as compared with \$1,600,000 for the previous twelve month period.

In a circular letter to the shareholders, which will be mailed with the dividend cheques for the second quarterly disbursement on September 2, President W. D. Nichols has included the greater part of the engineer's reports on the company's Hidden Creek property, compiled recently, that shareholders may be kept in touch with the progress of the work there.

"Construction work is progressing with remarkable rapidity," says President Nichols. "Inspection from August 3 to August 10 shows that the ground for the buildings at Hidden Creek is all cleared; steel frame for main smeltery building erected; foundations for the flue chamber completed; the machine shop finished and being used; and smeltery warehouse being erected. The mine development is in advance of the demand and ore shipments can be begun at any time. Our engineers estimate that 7,000,000 tons of ore is now in sight within the developed area."

Vancouver.—Preparations are being made for as large a display of specimens of minerals as it shall be found practicable to get together. Many mining camps have sent in collections of ores, and the Provincial Department of Mines is making a comprehensive exhibit.

Mining is in progress on several properties in the mountains near Howe Sound, but only the Britannia

is making a production of ore of any importance, the work on other properties being either prospecting or development.

Nanaimo.—Owing to the destruction of property at the Extension coal mines of the Canadian Collieries (Dunsmuir) Limited, and the violence of striking miners and their sympathizers, the whole of the Nanaimo-Extension coal mining district has for two weeks been guarded by militia men, whose presence has been made necessary by the excesses of those who for several days committed many unlawful acts. About 150 men have been arrested and charged with various breaches of the law—assault, unlawful assembly, possession of stolen property, or other offences. It is probable the Extension mines will shortly be worked again, only surface buildings and plant having been destroyed by fire, and all danger of a repetition of the recent disorders having passed. The Western Fuel Company is flooding, from the sea, the southern and most important part of its No. 1 mine, at Nanaimo, to either extinguish underground fire that has gained much headway since the miners ceased work at the end of April, or seal off that large and hitherto productive section of the mine workings of that mine. Local newspapers state that serious effects of the strike will be felt by business men of both of the coal-mine towns, Nanaimo and Ladysmith, for a long while.

Granby Bay.—Much machinery, plant and material is being received for use in construction and equipment of the smelting works of the Granby Consolidated Mining, Smelting and Power Co., Ltd., is establishing at this place, and in providing for mining ore on a large scale, also for shipping accommodation. The company is hastening construction and equipment work as much as possible while the weather continues favourable, so as to get well forward toward completion before the winter shall set in, and outdoor work be done only under difficulty.

New Hazelton.—Smelter returns from 282 tons of ore shipped from the Silver Standard mine, situated a few miles from Hazelton, to the Consolidated Mining and Smelting Co.'s smelting works at Trail, B.C., give the following metal recoveries: Gold, 63.323 oz.; silver, 40.883.28 oz.; lead, 149,525 lbs. The net value of the whole was \$30,000.61, or \$106.42 a ton after payment of freight and treatment charges. Other properties are making small shipments of ore, but generally for test purposes. In most cases development work only is being done, facilities for transportation of ore from mines to railway not yet having been provided. By next year the present temporary freight tariff will have been replaced by a regular, and it is expected a lower tariff, after which production and shipment of ore will be undertaken by a number of mine-owners not yet ready to make an output.

PORCUPINE, WEST SHINING TREE AND SWASTIKA

Enlarging Dome Mill.—Work has been started on the excavations for the 40 stamp addition to the Dome mill. The new addition to the mill is being erected at the west end of the present building, where the forty stamps are now treating over 400 tons daily. The new building will be 130 feet by 75 feet. With the addition to the mill the practice will be slightly altered, so that it will approximate even closer to the Home-

stake. The new plant will consist of 40 stamps, Dorr classifiers, 3 Dorr thickeners, 4 sets of Merrill cones, 4 sets of plates, a couple of storage tanks, 3 pumps, 3 Merrill presses and 6 40 by 10 leaching tanks. The whole building will be of steel. The force of men has been increased. All the machinery has been ordered, as it is expected that the building will be roofed in before the snow flies. The addition should be in operation early in 1914.

The Kerr Lake Mining Company has examined the Hollinger Reserve property in Porcupine and thoroughly sampled the same. But no purchase or option has yet been negotiated, though it is quite possible that it may be.

Rea Mine.—So satisfactory was the mill run at the Rea mine that the directors of the Leasing and Exploration Company have decided to add another five stamps at once. During the 19 days in July that the five stamp mill was in operation treating dump ore, a return of \$3,000 was made, and for the experimental run the directors were quite pleased. The Leasing and Exploration Company has an option on a royalty basis, on the Rea.

West Shining Tree.—Largely owing to the systematic work on claims owned by Mr. R. J. Denison and his associates there is quite a rush into the West Shining Tree district. The best claims all lie round Wasabika Lake, and it is estimated that about 300 men are encamped on its shores or near it. There is not much free gold found on the claims worked by the Denison syndicate, but the assays from the devitrified quartz are very encouraging and quite uniform. The district was first staked in the months of July and August, 1911, largely by Gowganda prospectors. But that was before Porcupine had demonstrated the possibilities of gold in Northern Ontario, and the original stakers did little work and received very poor backing. Many claims were allowed to lapse and nothing or little was heard of the district for years. The prospectors now have to pack in their supplies from Ruel, on the Canadian Northern, but a wagon road is now being cut by the Government and should be available this winter. If the camp demonstrates its importance, it will be easy for the Canadian Northern to run a spur into the new gold camp.

Alexo Nickel Mine.—The shipments from the Alexo nickel mine for the month of August will be about 800 tons. This has all gone to the Mond Nickel Company at Coniston. The open cut is down 60 feet and is about 40 feet long. At the bottom of the working there is four feet of massive ore, which will run about 8 per cent. The disseminated ore on one side of the vein is as high as 3 per cent. for the width of the open cut. There is little or no nickel in the other wall.

Dixon Mine.—The Timmins, McMartin and Dunlop syndicate has commenced work in earnest on the Dixon property at Porcupine. The shaft is now 200 feet, and it will be carried to 500 feet without cross-cutting at intervening levels. The Hollinger Mining Company has been granted a contract for the work on the Dixon. The Dixon will be explored from the Hollinger. Wherever the Hollinger veins are found to continue into Dixon property they will be followed and developed.

Pearl Lake.—A shoot of high grade ore has been struck on the Pearl Lake twenty feet above the 400 foot level in a raise.

McEnaney.—Owing to the stoping of some remarkable ore at the 100 foot level, the little stamp mill at

the McEnaney mine produced about \$50,000 in the month of August. The ten stamp mill has therefore already produced \$165,000. The block of ground which enables the little mill to show such good returns in August was at the 100 foot level. For 23 feet in the drift the ore was taken out for a width of six and a half feet, and over this width it ran \$130 to the ton. This helped the general average of the mine very materially.

Kirkland Lake.—A good discovery has been made on the Bagshaw claims at Kirkland Lake. These claims lie between Mud and Gull Lakes. They are owned jointly by Robertson and T. Montgomery. The vein is about twelve inches wide and has been stripped for sixty feet.

Hollinger Mine.—At the 400 foot level ten feet of good ore has been cut at the Hollinger mine. The vein was cut from the winze sunk from the 300 foot level. The drift will be continued from the point where the ore body was struck, to a point under the main, and a rise put through to the 300 foot level. Then sinking operations will be resumed. By the end of the year it is expected to have the main vein at a depth of 550 feet.

Burnside.—On the Burnside property at Kirkland Lake the vein dipped from the shaft at 50 feet. A cross-cut has been started at the 100 foot level to pick up the vein. It is estimated that from its dip it should be cut at not much more than fifteen feet. Camps are now being built for the winter campaign on the Burnside. Five thousand feet of surface work has been done this summer.

Two hundred feet north of the southern boundary a twelve inch vein has been cut which shows free gold.

COBALT, GOWGANDA, AND SOUTH LORRAIN

McKinley-Darragh-Savage.—Another of the regular Cobalt dividend payers has cut its regular rate of payment. After paying 176 per cent. the McKinley-Darragh-Savage has cut its bonus from 7 per cent. to 3 per cent. The company is still paying at the rate of 6 per cent., or 3 per cent. regular and 3 per cent. bonus. The McKinley-Darragh, with its October payment, has distributed \$4,097,832. There should be no great surprise among shareholders at the announcement. For the last two annual meetings the president of the company has given notice that unless some unexpected good fortune arrived the company would soon have to cut their high rate. The company has now merely arrived at a point where exploration will be higher in comparison with silver production, as it is fast becoming all over the camp. In making the announcement of the cut the treasurer said: "Owing to extensive explorations, which have resulted in the discovery of valuable deposits in the McKinley mine, and indications of a considerable addition to reserves in the Savage mine, and to the cost of a large addition to the concentrating plant, the accumulated surplus, as shown by the statement of January, 1913, has been considerably reduced, in order to maintain the standard of credit and efficiency of the company, the directors have decided to restore and maintain the usual substantial surplus, and therefore reduced the rate of bonus to be divided, as present conditions indicate a continuation of this rate of distribution for a considerable period." As a commentary upon this statement,

it is significant to state that the McKinley production jumped from 185,182 ounces in June to 224,628 ounces in July. Several good shoots of high grade ore were discovered and worked.

Buffalo.—As an offset to this cut in dividend rate the Buffalo mines have increased their bonus. The directors added 15 per cent. to the regular five per cent. due on October 1st, with 4 per cent. more added to the usual 3 per cent. dividend in November, making a total of 27 per cent. declared at one time. The Buffalo has been on a 32 per cent. per annum basis, but from time to time have added a bonus to the regular dividends. This year has surpassed all others, as the Buffalo had a remarkable surplus, and 57 per cent. has been added to the regular dividend. On January 1st an 18 per cent. bonus was added to the regular 5 per cent., giving a total dividend of 23 per cent. For the second quarter of the year a 15 per cent. bonus was added, making a 20 per cent. dividend, falling due on April 1st, with the 3 per cent. in May. The Buffalo's total for the year is brought to 89 per cent., or a total of \$890,913.

Nipissing.—During the month of August the Nipissing mined ore of an estimated net value of \$222,260 and shipped bullion of an estimated net value of \$330,526. During the month the high grade mill treated 171 tons of ore, and the refinery shipped 553,698 ounces of bullion. The low grade mill yielded 7,824 tons, an average of over 260 tons per day.

While no new veins were found either on the surface or underground, the development of known ore bodies continues to be quite satisfactory. Most of the month's production continued to come from shafts 73, 80 and 63. At all other places most of the work consisted of exploration. The hydraulic was working to the east of shafts 27 and 19. Several seams were uncovered, but these contained no ore at the surface. The diamond drill is working in the diabase on R. L. 408, near the Nova Scotia mine. One hole has a depth of 613 feet. Nothing favourable was encountered. The drill is now on the second hole endeavouring to cut a small vein assaying 150 ounces in silver, found on the surface several years ago by trenching.

Geological Congress Visitors.—The last of the geologists have seen the North and departed. There can be no doubt of the impression the silver camp made upon them. One German scientist, belonging to Party C6, said at the reception given in their honour, that the chief difference between Cobalt and Saxony was that Cobalt had the ore and Saxony the rock and the tenor of all the speeches of the Teutons was that Cobalt was yet in its infancy. They, too, they declared,

had had high grade ore, but it had been mined out generations ago.

The last party contained the Minister of Mines, the Hon. Louis Coderre. Mr. Coderre made a good impression upon all the mining men he met by his evident interest in all he saw, and his sincerity in intending to make the portfolio of Minister of Mines a more important one than it has been heretofore. He frankly admitted that he knew nothing whatever about mining; but was quite willing to learn.

Crown Reserve.—A new ore shoot has been discovered on the north vein of the Crown Reserve. It is two and a half to three inches of high grade ore, and it was developed at the 50 and 140 foot levels. On August 29th the big turbine pumps on the raft near the Kerr Lake No. 7 shaft began to work, and good progress has already been made with the big project of draining the lake.

Hudson Bay Mine.—The production of the Hudson Bay mine for the month of July was 36,484 ounces, practically the same as the preceding month. The greater part of this production came from the mill. The mill ran 24 days and treated 1,784 tons, the daily average being 74.30 tons. The heads ran 22.2 ounces and tails ran 2.9 ounces. The extraction was 87.30 per cent. The buildings to replace those destroyed by fire have been completed. At camp No. 2 the long drift connecting No. 1 and 2 shafts has broken through. This cross-cut is 780 feet in length and cuts the Cobalt Lake fault. It was started from the 100 foot level of the No. 1 shaft. The vein on the fault did not hold any very encouraging values.

Nipissing Bullion.—A bullion shipment, which is claimed as a world's record, was made last month by the Nipissing. It contained 212 bars of bullion, 257,425 ounces, \$152,524. On the same day the Buffalo also made a large consignment of bullion, the total for the two mines being 397,827 ounces, \$235,361.

O'Brien.—By adding another tube mill the O'Brien mill has raised its capacity from 100 to 150 tons. No change is being made in the treatment.

Earlton.—A calcite vein showing native silver has been made in Cain township, between Earlton, on the T. and N. O. main line and Elk Lake. The outcrop of rock above the clay is meagre. No work has been done on the narrow calcite vein, which shows native and cobalt bloom. Quite a number of claims have been staked wherever it was possible to find rock.

Elk Lake.—In the Elk Lake camp some fine high grade ore is being taken off the Curry claim. The Forest City Mining syndicate struck good high grade ore at a depth of 30 feet sinking on a strong niccolite vein.

STATISTICS AND RETURNS

B. C. ORE SHIPMENTS.

Shipments of ore from Kootenay and Boundary mines to Trail smelter for the week ending Aug. 30 totaled 6,454 tons, making a total for the year to date of 241,527 tons.

In the Slocan district the foremost shippers were the Standard, 74 tons; the Utica, 30 tons, and the Eastmount, 29 tons. The No. 1 at Ainsworth shipped 141

tons and the Silver Hoard in the same camp sent out a shipment of 48 tons. In the Nelson district the heaviest producer was the Yankee Girl at Ymir, which shipped 131 tons. Production in detail was:

Consolidated Co.'s Receipts, Trail.

| | | |
|-----------------|-----|-------|
| Knob Hill | 52 | 1,706 |
| Ben Hur | 429 | 8,820 |
| Bonanza | 47 | 94 |

| | | |
|-------------------------|--------------|----------------|
| Standard. | 74 | 9,151 |
| Eastmount. | 29 | 209 |
| Utica. | 30 | 209 |
| Silver Hoard | 48 | 606 |
| No. 1. | 141 | 2,131 |
| Yankee Girl | 131 | 3,445 |
| Emerald. | 34 | 786 |
| Centre Star | 2,895 | 97,425 |
| Le Roi. | 1,765 | 38,618 |
| Le Roi No. 2 | 376 | 14,392 |
| Inland Empire | 25 | 50 |
| Sullivan. | 378 | 23,601 |
| Other mines | ... | 40,116 |
| Ttal. | 6,454 | 241,527 |

Nelson.

| | | |
|--------------------------------|--------------|---------------|
| Yankee Girl | 131 | 3,445 |
| Emerald. | 34 | 786 |
| Queen, milled | 350 | 9,725 |
| Mother Lode, milled | 500 | 13,000 |
| Second Relief, milled. | 150 | 4,600 |
| Other mines. | 150 | 21,265 |
| Total. | 1,165 | 52,821 |

Lardeau.

| | | |
|-----------------------|-----|-----|
| Other mines | ... | 332 |
|-----------------------|-----|-----|

Rossland.

| | | |
|-------------------------|--------------|----------------|
| Centre Star. | 2,895 | 97,425 |
| Le Roi | 1,765 | 38,618 |
| Le Roi No. 2 | 376 | 14,392 |
| Inland Empire | 25 | 50 |
| Le Roi, mid | 325 | 11,298 |
| Other mines. | ... | 174 |
| Total. | 5,661 | 165,432 |

East Kootenay.

| | | |
|-----------------------|------------|---------------|
| Sullivan. | 378 | 23,601 |
| Other mines. | ... | 1,003 |
| Total. | 378 | 24,604 |

Slocan and Ainsworth.

| | | |
|-----------------------------------|--------------|----------------|
| Standard. | 74 | 9,151 |
| Eastmount. | 29 | 209 |
| Utica. | 30 | 377 |
| Silver Hoard. | 48 | 606 |
| No. 1. | 141 | 2,131 |
| Standard, milled. | 1,000 | 33,000 |
| Rambler-Cariboo, milled | 300 | 8,000 |
| Bluebell, milled. | 1,400 | 46,723 |
| Other mines. | ... | 30,145 |
| Total. | 3,022 | 131,142 |

COBALT ORE SHIPMENTS.

The ore shipments for the week ending Sept. 6, are:

| Mine. | High. | Low. | Pounds |
|------------------------|-------|------|---------|
| Coniagas. | 5 | .. | 431,365 |
| Trethewey. | 2 | .. | 95,430 |
| Cobalt Comet | 1 | .. | 86,080 |

The shipments from the Cobalt camp for the year to Sept. 6, are:

| Mine. | High. | Low. | Tons. |
|--------------------------------|------------|-----------|------------------|
| Bailey. | 5 | 1 | 158.15 |
| Beaver. | 8 | .. | 237.43 |
| Chambers-Ferland. | 3 | 4 | 223.77 |
| City of Cobalt | 4 | .. | 105.14 |
| Cobalt Townsite | 46 | .. | 1,637.34 |
| Cobalt Lake | 22 | .. | 736.66 |
| Buffalo. | 2 | .. | 66.13 |
| Coniagas. | 37 | .. | 1,368.23 |
| Crown Reserve | 15 | .. | 429.93 |
| Cobalt Comet | 15 | .. | 451.72 |
| Green-Meehan. | .. | 1 | 12.96 |
| Hudson Bay | 12 | .. | 441.27 |
| Kerr Lake | 16 | 1 | 509.11 |
| La Rose | 38 | 4 | 1,772.10 |
| McKinley-Darragh. | 50 | .. | 1,720.17 |
| Nipissing. | 2 | 41 | 1,259.78 |
| O'Brien. | 10 | .. | 371.18 |
| Seneca-Superior. | 6 | 3 | 310.51 |
| Silver Cliff (Orion) | 2 | .. | 48.05 |
| Trethewey. | 10 | 8 | 486.38 |
| Timiskaming. | 11 | 1 | 362.64 |
| Casey Cobalt | 5 | .. | 341.00 |
| Colonial. | 1 | .. | 21.56 |
| General Mines | .. | 1 | 8.80 |
| Silver Queen | .. | 2 | 169.89 |
| Wettlaufer. | .. | .. | 122.26 |
| Miller Lake O'Brien. | 2 | .. | 47.19 |
| Right of Way | 1 | 1 | 62.71 |
| Penn-Canadian. | 4 | .. | 126.13 |
| Silver Bar. | .. | 1 | 20.00 |
| Mann. | 1 | .. | 20.00 |
| York Ontario | 3 | .. | 65.72 |
| Miscellaneous. | 2 | .. | 83.08 |
| Total. | 333 | 69 | 18,641.76 |

The bullion shipments for the week are:

| | Bars. | Ounces. | Value. |
|-----------------------|------------|-------------------|---------------------|
| Buffalo. | 65 | 66,694.00 | 40,000.00 |
| Nipissing. | 112 | 135,127.67 | \$80,400.96 |
| Total. | 177 | 201,821.67 | \$120,400.96 |

The bullion shipments for the year to Sept. 6 are:

| Mine. | Ounces. | Value. |
|--------------------------|---------------------|-----------------------|
| Nipissing. | 4,038,734.63 | \$2,333,808.31 |
| Penn-Can. | 14,141.60 | 8,456.90 |
| Buffalo. | 1,125,261.90 | 701,801.57 |
| C. Reserve | 315,266.00 | 193,609.25 |
| Dom. Reduc. | 352,183.40 | 203,277.15 |
| Townsite. | 10,909.00 | 6,647.00 |
| Miscellaneous. | 3,920.00 | 1,623.00 |
| Timiskaming. | 25,561.70 | 14,948.04 |
| O'Brien. | 118,309.77 | 61,998.66 |
| Wettlaufer. | 4,715.00 | 2,925.00 |
| Miller Lake | 3,710.20 | 2,053.01 |
| Colonial. | 635.00 | 374.00 |
| Trethewey. | 13,529.83 | 8,282.04 |
| Casey Cobalt | 2,394.00 | 1,520.00 |
| Kerr Lake | 24,226.79 | 14,936.84 |
| Bailey. | 1,839.00 | 1,103.40 |
| Cobalt Lake | 1,717.80 | 996.36 |
| Wettlaufer. | 4,391.00 | 2,634.60 |
| City of Cobalt | 1,755.45 | 1,053.00 |
| Preston E. D. | 3,452.60 | 2,002.50 |
| Cobalt Comet | 2,432.65 | 1,426.13 |
| Totals. | 6,079,077.32 | \$3,575,526.76 |

STOCK MARKETS.

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

Toronto, Ont., Sept. 8, 1913.

| New York Curb. | Bid. | Ask. |
|--------------------------|-------------|-------------|
| American Marconi | 5.12½ | 5.50 |
| Alaska Gold | 18.75 | 19.00 |
| British Copper | 2.25 | 2.50 |
| Braden Copper | 6.75 | 7.00 |
| California Oil | 182.00 | 185.00 |
| Chino Copper | 44.75 | 45.00 |
| Giroux Copper | 1.25 | 1.50 |
| Green Can. | 6.75 | 7.00 |
| Granby Copper | 75.25 | 75.75 |
| Miani Copper | 23.37½ | 23.50 |
| Nevada Copper | 17.87½ | 18.00 |
| Ohio Oil | 275.00 | 280.00 |
| Ray Cons. Copper | 20.50 | 20.62½ |
| Standard Oil of N. Y. | 152.00 | 154.00 |
| Standard Oil of N. J. | 369.00 | 371.00 |
| Standard Oil (old) | 1100.00 | |
| Standard Oil (subs.) | 725.00 | |
| Tonopah Mining | 4.87½ | 4.93¾ |
| Tonopah Belmont | 7.00 | 7.12½ |
| Tonopah Merger | .73 | .74 |
| United Cigars, com. | 93.75 | 94.00 |
| United Cigars, pfd. | 110.00 | 120.00 |
| Inspiration Copper | 15.75 | 15.87½ |
| Goldfield Cons. | 1.87½ | 1.93¾ |
| Yukon Gold | 2.00 | 2.12½ |
| Porcupine Stocks. | Bid. | Ask. |
| Apex | .00½ | .01 |
| Crown Chartered | .00¾ | .00½ |
| Dome Extension | .05½ | .06 |
| Dome Lake | .22 | .24 |
| Dome Mines | 12.00 | 14.00 |
| Eldorado | ... | ... |
| Foley O'Brien | .20 | .24 |
| Hollinger | 15.75 | 16.25 |
| Jupiter | .17 | .19 |
| McIntyre | 2.25 | 2.60 |
| Moneta | .03 | .04 |
| North Dome | ... | .40 |
| Northern Exploration | .50 | .75 |
| Pearl Lake | .33¼ | .34 |
| Plenaurium | .50 | .90 |
| Porcupine Gold | .09 | .10 |
| Imperial | .01¼ | .02 |
| Porcupine Reserve | ... | .14 |
| Preston East Dome | .01½ | .02 |
| Rea | .15 | .25 |
| Standard | ... | ... |
| Swastika | .03¾ | .04 |
| United | ... | ... |
| West Dome | .10 | .15 |
| Cobalt Stocks. | Bid. | Ask. |
| Bailey | .05½ | .06 |
| Beaver | .32 | .34 |
| Buffalo | 2.45 | 2.60 |
| Canadian | .20 | .22 |
| Chambers Ferland | .15 | .17 |
| City of Cobalt | .45 | .50 |
| Cobalt Lake | .45 | .50 |
| Coniagas | 6.90 | 7.05 |
| Crown Reserve | 1.70 | 1.75 |
| Foster | .03 | .05 |
| Gifford | .03 | .04 |
| Gould | .02¾ | .03 |
| Great Northern | .09 | .10 |
| Hargraves | .03 | .04 |
| Hudson Bay | 70.00 | 80.00 |

| | | |
|-----------------|------|------|
| Kerr Lake | 3.45 | 3.60 |
| La Rose | 2.25 | 2.30 |
| McKinley | 1.48 | 1.50 |
| Nipissing | 8.95 | 9.10 |
| Peterson Lake | .21¼ | .22 |
| Right of Way | .03½ | .05 |
| Rochester | .03 | .04 |
| Leaf | ... | .03 |
| Cochrane | .25 | .50 |
| Silver Queen | .03 | .04 |
| Timiskaming | .24½ | .25 |
| Trethewey | .24 | .28 |
| Wettlaufer | .15 | .17 |
| Seneca Superior | 2.20 | 2.50 |
| Porcupine Crown | 1.20 | 1.60 |

TORONTO MARKETS.

Sept. 9.—(Quotations from Canada Metal Co., Toronto).

Spelter 5 cents per pound.

Lead, 5.75 cents per pound.

Tin, 45½ cents per pound.

Antimony, 9½ cents per pound.

Copper, casting, 17 cents per pound.

Electrolytic, 15¾ cents per pound.

Ingot brass, 11 to 15 cents per pound.

Sept. 9—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto).

Summerlee No. 1, \$26.00 (f.o.b. Toronto).

Summerlee No. 2, \$25.00 (f.o.b. Toronto).

Midland No. 1, \$19.20 (f.o.b. Toronto).

Midland No. 2, \$19.00 (f.o.b. Toronto).

Sept. 9—(Quotations from Elias Rogers Co., Ltd., Toronto).

Coal, anthracite, \$7.50 per ton.

Coal, bituminous, lump, \$5.00 per ton.

GENERAL MARKETS.

Sept. 5—Connellsville Coke (f.o.b. ovens).

Furnace coke, prompt, \$2.50 per ton.

Foundry coke, prompt, \$3.00 per ton.

Sept. 5—Tin, straits, 43.25 cents.

Copper, Prime Lake, 16.62½ to 16.75 cents.

Electrolytic Copper, 16.37½ to 16.50 cents.

Copper wire, 17.50 to 17.75 cents.

Lead, 4.80 cents.

Spelter, 5.90 cents.

Sheet zinc, (f.o.b. smelter), 8.00 cents.

Antimony, Cookson's, 8.30 cents.

Aluminum, 21.50 to 22.50 cents.

Nickel, 40.00 to 45.00 cents.

Platinum, ordinary, \$44.50 to \$45.00 per ounce.

Platinum, hard, \$50.00 to \$51.00 per ounce.

Bismuth, \$1.95 to \$2.15 per pound.

Quicksilver, \$39.00 per 75-lb. flask.

SILVER PRICES.

| | New York. | London. |
|---------|-----------|---------|
| | cents. | pence. |
| Aug. 23 | 59½ | 27 7/8 |
| " 25 | 59¾ | 27 7/8 |
| " 26 | 59½ | 27 7/8 |
| " 27 | 59½ | 27 7/8 |
| " 28 | 58 5/8 | 27 1/2 |
| " 29 | 59 5/8 | 27 1/2 |
| " 30 | 59½ | 27 1/2 |
| Sept. 1 | holiday | 27 1/2 |
| " 2 | 59 5/8 | 27 7/8 |
| " 3 | 59 5/8 | 27 7/8 |
| " 4 | 59 5/8 | 27 7/8 |
| " 6 | 59½ | 27 1/2 |
| " 8 | 59 5/8 | 27 7/8 |
| " 9 | 59 5/8 | 27 7/8 |
| " 10 | 59¾ | 27 5/8 |