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## ECONOMIC MINERALS AND MINING INDUSTRIES OF CANADA

The Mines Branch of the Department of Mines has recently published a very useful pamphlet presenting interesting information on minerals and mining in Canada. This has been compiled under the direction of Mr. J. McLeish, Chief of the Division of Mineral Resources and Statistics, who has had the co-operation of several officers of the Mines Branch staff; more particularly Messrs. C. T. Cartwright, L. H. Cole, H. Frechette, H. S. de Schmid and A. W. G. Wilson. The publication is remarkable for its concise, clear statements. Seldom has so much information on such subjects been given in so few pages.

### QUEBEC IN 1912

Mr. Denis' report on Mining Operations in Quebec during 1912 shows an output valued at \$11,187,110. In the previous year the value of the product of mines and quarries was \$8,679,786. The increase is a very satisfactory one. The chief products are asbestos, cement, limestone, brick, copper and sulphur ore, lime, granite and marble.

The volume contains in addition to the resumé for 1912, a report by J. Austen Bancroft on the Geology and Natural Resources of the drainage basins of the Harricanaw and Nottaway river, to the north of the Transcontinental Railway, in northwestern Quebec.

Mr. Denis is to be congratulated on the early appearance of the volume.

### MICHIGAN COPPER MINERS' STRIKE

The strike called by the Western Federation of Miners in Michigan on July 23 has not yet been settled. Many of the mines have resumed operation. Some have a large percentage of their former employees again at work, but others are still idle and none are producing at a normal rate.

The financial loss to operators and miners continues very large. Aside from the loss to all merchants and others who depend on the mines and miners for their business, there is a large expense to the counties and to the state in providing soldiers and deputies to enforce the laws.

The strikers are being reduced to pitiable circumstances. Many already are dependent for their daily bread on the funds supplied by the union. A few dollars a week is given to those who prove to the satisfaction of the union officers that they are in urgent need. Others get nothing. Appeals are being made in several mining districts for contributions to the union treasury.



It is a notable feature of the strike that the men who quit work have, according to the mine managers, never made any request for change in working conditions or wages. It is generally reported that the men want an eight-hour day and a minimum wage; but they have not yet asked for it.

The reason for the remarkable condition of affairs is that the men are on strike at the order of officers of the Western Federation. These officers asked that the mine managers recognize them as representatives of the miners. The mine managers refused to do so, giving as reasons the past record of the Federation and the fact that the officers of the Federation do not properly represent the miners; but only such miners as they have induced to join the union. The officers claim that a large percentage of the employees are members of the union. The operators claim that a large majority are not members, and have no desire to be considered such or to be represented by the union officers.

Believing this to be the case, the managers have reopened the mines and taken back such employees as wish to work. There has as yet been no attempt to bring in large numbers of new men, though a few are now at work.

As is usual, the men going to work have been subjected to much abuse from the strikers. For weeks attempts were made every morning to prevent the miners from going to work. Encounters were frequent and serious riots were prevented only by the activity of the soldiers and deputies. On September 20 the companies applied for and were granted an injunction intended to stop such practices.

In order to settle the strike, investigations are being carried on by both State and Federal Governments. Numerous plans have been proposed; but none yet found acceptable. The union men state that what they want is recognition as representatives of the employees. The mine managers say that they will never recognize them as such. Hence they say that proposals of arbitration are not to be considered, for there is nothing to arbitrate.

In order to break the deadlock, if possible, the Copper Country Commercial Club, an organization of business men of the district, has appointed a committee of three members to offer its services to both employer and employee with a view toward the resumption of work at all of the mines.

At present it seems unlikely that there will be any settlement of the dispute between the Western Federation and the mine managers. It is possible, however, that the strikers and their former employers may come to terms if they can be brought together.

### CANADIAN NICKEL CORPORATION'S SMELTER

It is understood that the nickel company organized by Dr. F. S. Pearson and associates has taken over the property of the Dominion Nickel Company in the Sudbury district. For some time the work at these properties was carried on vigorously by the former

owners; but lately there has been less activity. A smelting plant has been designed, but it is not yet erected. The financial stringency is supposedly the reason for the postponement.

In Mr. Gray's article, part of which appears in this issue, he quotes from a memorandum prepared by the promoters, in which the smelting plant is spoken of as though already in existence. There were no signs of it two weeks ago, and we doubt whether it has been erected since that time.

### CONDITIONS IN BRITISH COLUMBIA

As the third quarter of the year draws to a close, the condition of the metal mining industry of the province continues generally satisfactory. While few, if any, new mines have this year added substantially to the total of ore production, there has not been a decrease in output of the mining districts from which the chief supplies of ore are obtained. In a general way this is true of all parts of the province that have in recent years contributed to the total quantity of ore produced. Several individual instances of a reduction of output are known, but these do not include mines that have made a large production; on the other hand, there are other cases where there has already been an increase or where ore will shortly be mined to an amount that will more than offset decreases. With lode mining generally productive, and placer mining giving promise of larger results than were obtained during any of the last three or four years, there appears to exist good reason for satisfaction. Indeed, it is hoped that metal mining will show a sufficiently large increase to, in considerable measure, compensate for the loss in total production that labour troubles at coal mines have caused.

### ASBESTOS MINING IN QUEBEC

The world's chief source of asbestos is the district known as the Eastern Townships in the Province of Quebec. This district shipped in 1912 111,175 tons of asbestos, valued at \$3,059,084, an average of \$27.52 per ton. There was mined during the year 1,870,608 tons of rock. Wages amounting to \$1,377,444 were paid to the 2,910 men employed.

During 1912 the shipments exceeded the production of the mills, and the stock on hand was reduced from 33,751 to 24,176 tons. During the present year business has been very good, and the industry is generally reported to be in better condition than it has been for some time. A few years ago the industry received a setback as the result of overcapitalization and questionable dealings in stock. The mines and mills were pushed and a large production made at a time when the market would not absorb the mineral. Soon the buyers become aware that stocks were accumulating. The price fell, and many of the mines and mills were forced to close. Conditions have now happily changed for the better. Elsewhere in this issue will be found the report of Theo. Denis, Superintendent of mines of Quebec, on Asbestos in 1912.



# ORE DEPOSITS OF THE KIRKLAND LAKE DISTRICT

By Charles Spearman.

That part of Teck and Lebel Townships, in the neighbourhood of Kirkland and Gull Lakes, is usually spoken of as the Kirkland Lake district. The centre of the district is about five miles east of Swastika Station, which is at mileage 164 on the Timiskaming and Northern Ontario Railway.

The history of the district has been more or less fully covered by papers published at various times, and therefore no space need now be devoted to it.\*

The rocks of the district are for the most part sedimentaries, which have been correlated with the Timiskaming series of the Algonkian. Intrusive into the sedimentaries are lamprophyres and porphyries. Outside of the immediate neighbourhood of the district are some patches of Keewatin, upon which the above sedimentaries lie unconformably.

The relative ages of the above rocks are clearly shown at different exposures in the district, for instance, on the McKane claim, near Kirkland Lake, lamprophyre dikes cut the sedimentary series, which are in turn cut by porphyry dikes.

The conglomerate is in places rather coarse, the boulders being from two feet to three feet in diameter, but on the whole it cannot be called coarse, for the

average pebble is not much larger than egg size. Practically all of the conglomerate shows evidence of great strain, for most of the pebbles are highly fractured. Thin sections also show this fragmental nature, together with abundant decomposition products, such as kaolin, chlorite, serpentine, epidote and sericite. The greywacke also shows much of the same secondary minerals of decomposition as the conglomerate, under the microscope. There is every evidence of a great thickness of the sedimentaries.

The lamprophyre is very near the camptonite porphyry variety, the predominating feldspar being plagioclase and the phenocrysts being augite and hornblende. Some of these lamprophyre exposures are very large, covering several acres. From observation in the field, so far, there is no evidence that the lamprophyre played any important part in the introduction of the ore.

The porphyry, of which there are many different varieties, is probably the most widespread igneous rock of the district. The common variety is a reddish alkali porphyry, with predominating orthoclase phenocrysts. Some of these phenocrysts are over half an inch long, and display wonderful zonal structure, while still other gradations show a fine grained hypidiomorphic structure.

\* For description of some of the deposits see July 15 issue of this journal.

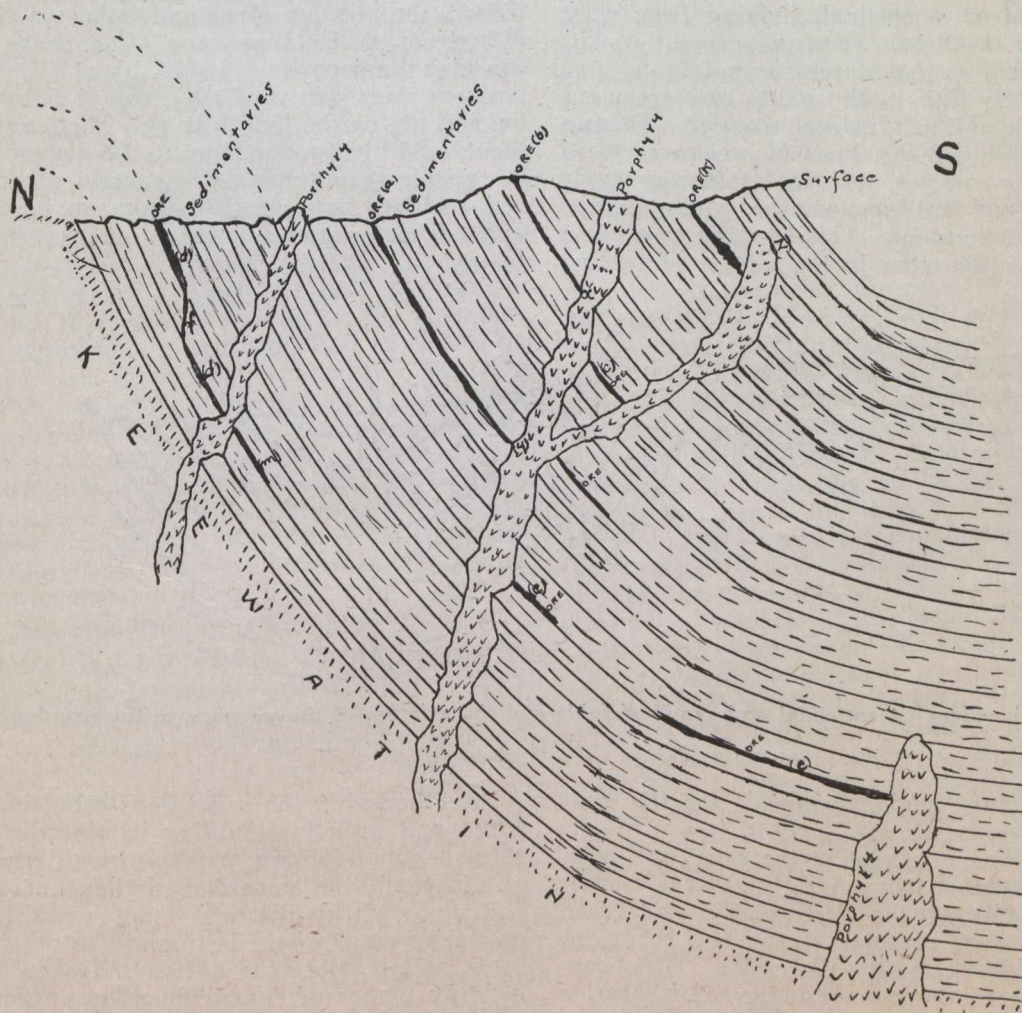


Fig. No. 1.—Showing the relation between the porphyry and the ore bodies in the sedimentaries.



Another variety shows the acid plagioclase albite as the predominating phenocryst, while still other varieties of the more basic type show amphibole and pyroxene phenocrysts. All the porphyries are much altered, the thin sections showing the common decomposition products.

From field observations and from exploration work already done in the district it is safe to conclude that the acid porphyries were instrumental in introducing the ore in the present deposits. The line of reasoning is as follows:

either side, viz., the gliding planes between the strata referred to above as "main channels." See Fig. 1.

The mineralized solutions from the porphyry following along these channels deposited minerals in every available void within the zone of its permeability. This mineralization may be seen in the "mashed" conglomerate pebbles and stringers along the channel. This method of mineralization, along such a uniformly crushed zone, accounts for the uniform value of the ore as well as its high content.

In general, under such conditions of mineralization

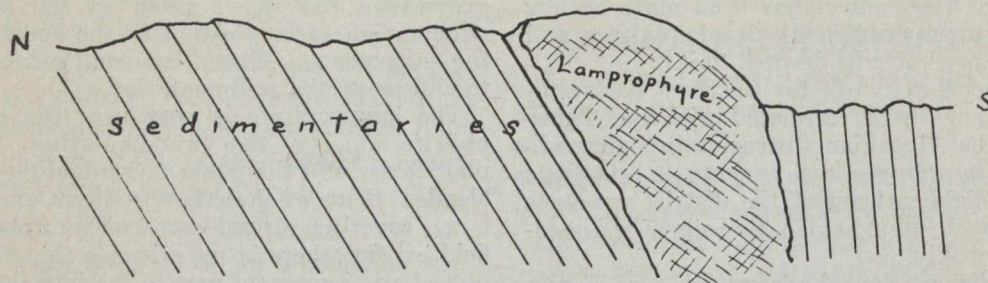


Fig. No. 2.—Showing vertical position of strata on north part of Burnside property, due to a large lamprophyre intrusion.

After the sedimentaries were laid down and prior to the advent of the intrusives, there appears to have been great crustal movement, which folded the sedimentaries, such that the axis of the fold was about N. 75° E., and the dip about east 75° S. This fold may have been synclinal or monoclinical, judging from what evidence is left in the field. (For the present it will be called monoclinical, as the writer has not found any evidence of northerly dips in the strata to correspond to the opposite leg of the synclinal trough.) During this process of folding many lines of weakness were created in the sedimentaries, such as fracturing across the bedding planes and faulting along the bedding planes, as shown by the slickensides. This faulting or gliding of one stratum over the other in the process of folding

as above, many peculiarities may arise. Glacial erosion removed the higher part of the fold, exposing some of the ore deposits as at (a) and (b), striking N. 45° E., still others may exist as at (c), yet not exposed. Conditions might also exist as at (d), where the deposit follows the bedding plane and follows a fracture as at (f), across the bedding plane. Conditions being equal, consider the deposits (a) and (b), at (b) the ore shoot is much shorter than at (a), for at (b) the length is  $bx$ , and at (a) the length is  $ay$ . The length of the ore shoot would be proportional to the distance north from the porphyry outcrop. Then again other ore bodies, such as (k), may emanate from an intrusive as (z), which is not exposed; ore as at (m) might also be found.

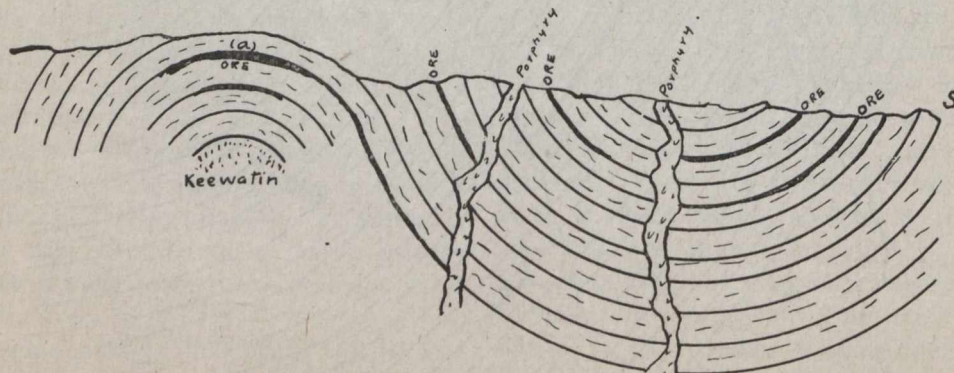


Fig. No. 3.—Showing anticlinal and synclinal folds and the relation of the porphyry to the ore deposits.

probably afforded the "main channels" for the mineralization solutions.

After these lines of weakness in the crust had been formed by some tectonic movement, the intrusives began to find their way to the surface through these fractures. For reasons outlined above, the porphyry only will be considered in this discussion. This porphyry crossing the bedding planes of the sedimentaries imported minerals to the lines of weakness on

Next consider the conditions resulting from synclinal and anticlinal folding in this district, instead of monoclinical folding. In the immediate district the results would be somewhat similar but to the north and south of this district, if not already removed by glacial erosion, would be found the other legs of the folds, and possibly the outcropping ore bodies of the bedding planes of the sedimentaries, providing there exists the porphyry intrusives to introduce the ore.



See Fig. 3. Conditions beneath the eroded surface resembling saddle reefs (a) might also occur.

In prospecting the area it is a good rule to first locate the alkali porphyry, then run the trenches north from it. This is evident from the ideal section, Fig. 1.

This type of deposit is very irregular as to width, from the fact that the width is governed by the different degrees of permeability of the sedimentaries through whose slickensided bedding plane channels the mineralized solutions flowed.

In places the strata do not preserve their regular average dip, but stand quite steeply. This may be regarded as strictly local and effecting but a small area. An example of almost vertical strata is seen in the Burnside shafts, but this may be accounted for as follows: About 200 feet north of the shaft is a great lamprophyre intrusion, which by squeezing in between the strata, turned up in almost vertical position all strata to the south of it. See Fig. 2.

The ore deposits, i.e., the economic deposits of the camp to date are not true veins, but impregnations of the sedimentaries introduced by mineralized solutions along the slickensided bedding planes. This is quite evident from the nature of the ore on either side of the slickensided surface, which preserves its lithological character throughout, many places showing the conglomerate pebbles in the very midst of the ore. This impregnation extends back into the formation for several feet on either side of the "main channels," and at times much further by following small fractures across the bedding plane. The mineralization consists of quartz, molybdenite, graphite, pyrite, gold and tellurides of lead, silver and gold. The quartz for the most part fills small fractures along the channels, and is dark coloured, having many wavy bands of dark metallic-looking mineral running through it. As a rule a small percentage of the gold content is found in the quartz. For the most part the gold and tellurides are associated with the "impregnated" portion of the country near the slickensides. The gold content here is very high, ranging about 50 ounces per ton. The molybdenite and a small quantity of graphite give the ore a bluish black lustre, and this in conjunction with the millions of minute pyrite crystals give the ore a very rich appearance. Much free gold is disseminated throughout this mass, as well as are the tellurides. The common telluride is altaite, and to a much less degree the silver and silver-gold tellurides. There is every evidence that after the deposition of the ore the whole was subjected to slight movements at various times, which shattered the deposit. These cracks, which are very numerous and some large, but as a rule nearly microscopic are filled with secondary quartz and sometimes with calcite. At times this calcite filling encloses the pieces of native gold, which happened to be located on the fracture plane.

#### Deposits Within the Porphyry.

Another class of deposit is the deposit within the porphyry itself. Of this class there are two types so far seen in the field. Firstly a fissure caused by movement of the solidified porphyry and filled with quartz and brecciated porphyry. This type seldom exceeds 8 inches, and is usually two or three inches wide. The other type suggests the flow structure, while the porphyry magma was in semi-plastic state, where the strain of the flow is almost sufficiently severe to shear, thus leaving a weakened drawn out zone, which was subsequently filled with quartz emanating from the porphyry itself, thus mineralizing the weak zone. This type is often over 18 inches wide, with much quartz filling throughout, alternated by long drawn out bands of porphyry. Again, where certain flow strains with-

in the porphyry have not been so severe as to suggest flow structure, but nevertheless to cause lines of weakness, quartz again derived from the flow is deposited with mineralization in the strained zone. These deposits resemble very much differentiations from the porphyry, as they have no definite delineation, grading apparently insensibly into the porphyry. Deposits of this kind are usually narrow and short. Both types often carry spectacular gold.

The outcropping ore deposit in the sedimentaries is usually covered by more or less of a gossan, due to oxidation of the sulphides in the impregnated outcrop, and this often helps to locate the ore body, especially in trenching operations. The outcrop in the trench may be but a fraction of an inch in width, yet the rusty gossan will serve to locate it. Work may then be continued on the deposit along the strike or dip.

From Fig. 1, which is of course an ideal section, the conditions are such that it is not at all improbable that the mineralization extends also into the underlying Archean in the neighbourhood of the porphyry intrusives.

As development work progresses in the district, no doubt many new conditions will arise which will throw more light on the nature of the different deposits. This article is based practically on surface observations and is merely a summary of such observations.

#### ASIATICS IN VANCOUVER ISLAND COAL MINES.

Our British Columbia correspondent writes: Reference has frequently been made, especially by those advocating the cause of the coal miners who stopped work and declared a strike at coal mines on Vancouver Island, British Columbia, to the number of Asiatics employed at those mines, and there have been attempts made to give the impression that very many of the non-union miners who have worked at the mines of the Canadian Collieries (Dunsmuir), Limited, are Asiatics. If reference be made to the "Annual Report of the Minister of Mines for British Columbia," 1912, p. K. 246, there will be found a table showing the "number of hands employed" at the Coast collieries for the year, namely, 4,720, of which 4,090 were employed at Vancouver Island coal mines, including: Japanese—miners 55, labourers, 62, total 117; Chinese—miners 85, labourers 537, total 622; total Orientals or Asiatics, 739, as compared with 3,351 whites, the latter including all white employees of the coal mining companies. It should be noted that 416 of the Orientals were employed above ground and but 323 underground, and of the latter number 183 were labourers. Prior to the strike, white (union) miners employed Oriental labourers underground. Five years ago—in 1908—there were employed at Vancouver Island collieries 864 Orientals out of a total of 3,460 hands; ten years ago—in 1903—there were 865 Orientals out of a total of 2,993 employed; twenty years ago—in 1893—there were 442 hands employed at the Comox (now Cumberland) coal mines, and of them 150 were Orientals. It will be seen, then, that the employment of Orientals at Vancouver Island coal mines is by no means a new departure. It is true that there are now both Chinese and Japanese certificated miners (there were shown to be 140 in 1912), but there is no law in British Columbia, nor has there been, debarring Orientals from mining coal underground after they have passed the examination prescribed by law. No official figures are available for the current year, but I have unequivocal assurance that the number of Oriental miners—that is those who do work that only certificated men may do—is this year not much, if any, larger proportionately than in 1912.



## A VISIT TO MINES OF ALBERTA AND BRITISH COLUMBIA

By Reginald E. Hore.

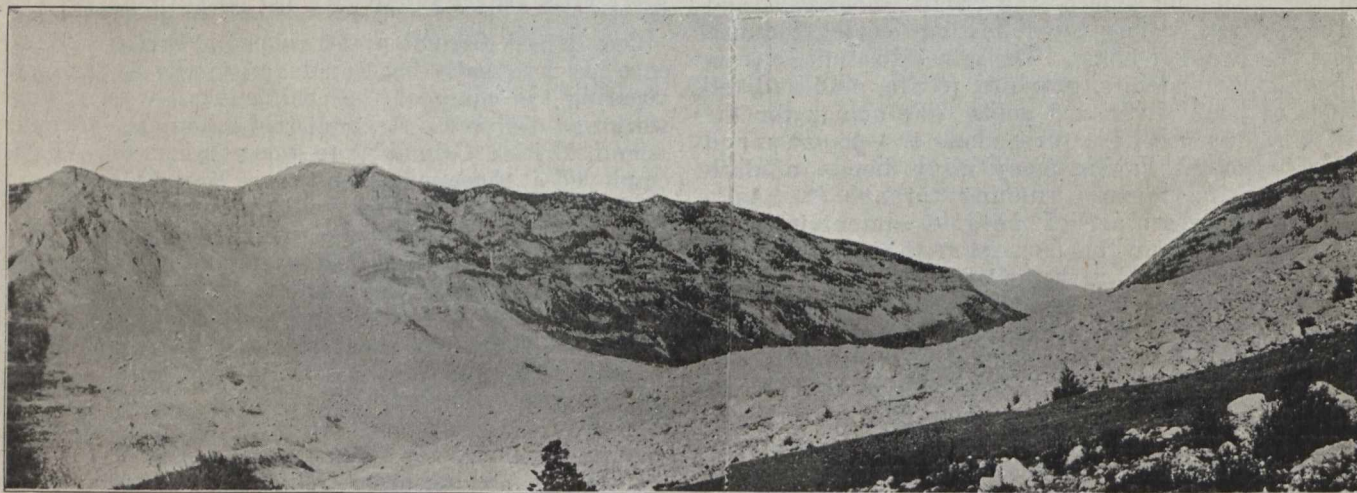
The C2 transcontinental excursion of the Twelfth International Geological Congress left Toronto by special train on Thursday, August 14th, a few hours after the conclusion of the session in Toronto. Hon. Louis Coderre, Secretary of State and Minister of Mines, accompanied the party, which was in charge of R. W. Brock, director of the Geological Survey, and J. McEvoy, mining engineer and geologist. H. E. T. Haultain, professor of mining at Toronto University, was secretary, and H. Frechette of the Department of Mines, Ottawa, assistant secretary. At several points along the route geologists and mining men joined the party and guided the members in the areas which they have studied.

The excursion afforded an excellent opportunity to visit western mines, especially the coal mines of Alberta and the coal, gold and copper mines of British Columbia. The large smelting plants at Grand Forks, Greenwood and Trail were also visited. On the return trip the gold mines at Porcupine and the silver mines at Cobalt gave the visitors some idea of the possibilities of Northern Ontario.

transportation facilities and the activity in improving and extending them, the magnificence of the mountains with their glaciers and beautiful lakes, the great rivers and their power-producing possibilities, the forests, the salmon-producing streams, the fruit ranches in the mountain valleys, have made lasting impressions. Not the least highly treasured memento of the trip is the remembrance of the kindly hospitality of the western people.

### At Winnipeg, Stony Mountain and the Stampede.

The first scheduled stop was at the capital city of Manitoba. Arriving here at noon, the party was received by a number of municipal officials and taken out on electric cars to the City Park, on the Assiniboine River. Luncheon was served in the pavilion and an address of welcome was given by Mayor Deacon. Several members of the party replied on behalf of the countries which they represent. After the luncheon a trip was made to Stony Mountain to examine the exposure of fossiliferous rocks there. Many of the party went out to the Exhibition Grounds to see the "Stampede," the great exhibition of cowboy sports, which had been run-



The Landslide at Frank, Alberta.

The excellent arrangement of the excursion gave a remarkable opportunity for study of the western mountains. The Rockies were crossed at all three passes, in going west on the Canadian Pacific Crow's Nest Pass branch, east on the Canadian Pacific main line through Kicking Horse Pass and west and east again on the recently constructed Grand Trunk Pacific line through the Yellowhead Pass. The several trips to the mines in the mountains and the steamer trips on the long lakes gave several sections across and along the ranges. In all the places visited the geologists received warm receptions from the citizens. The large cities and the small camps in the mountains in every instance extended hearty welcome to the visitors. The members have learned much of the geological structure and the mineral resources of the districts visited, and on these counts alone feel well repaid for the time and expense which the excursion demanded, but all, I am sure, will value highly also the general information gained en route. The vast extent of the grain-producing prairies, the evidence of remarkable growth of the centres of population, the splendid

ning all week and which the excursionists fortunately visited on the closing afternoon, when the finals for the championships were being run off. The remarkable ability of the cowboys and cowgirls held the attention of the spectators for several hours and proved especially interesting to those unfamiliar with the romantic features of life on the plains. The roping of steers, riding wild horses and the exhibitions of fancy roping proved more attractive than the possibility of finding fossils in Stony Mountain. It is reported, however, that some of the party, not realizing the attractive nature of the "Stampede," did actually spend the afternoon in a very industrious attack on the fossiliferous limestones.

### Medicine Hat Gas Field.

From Winnipeg the party travelled westward through the great grain fields to Medicine Hat, Alberta. Here a stop was made to visit the gas wells and the manufacturing plants which have recently grown up as the result of the use of cheap fuel furnished by the city. Near Medicine Hat there are two important producing



wells, from which gas is piped 178 miles to Calgary. The city has within its limits a large area of gas-producing horizons and has drilled several wells. To manufacturing industries gas is supplied free for five years and after that period is supplied at a low figure—about five cents per thousand.

#### The Great Landslide at Frank, Alberta.

From Medicine Hat the Crow's Nest Pass route was followed. At Hillcrest the party left the train to view the results of the disastrous landslide which occurred at Frank in 1903, and which is believed to be one of the greatest which has ever occurred. As a result of the openings made in the process of mining coal the whole side of Turtle Mountain broke away on extensive joint planes and piled up a mass of rock at a great distance away and high up the opposite side of the valley. It seems almost a physical impossibility that the sliding of rock down the mountain side would of itself produce enough energy to send the material so far and so high. It is nevertheless believed by Mr. Brock and others who made special study of the phenomenon soon after its occurrence that such was the case. Mr. Brock, in point-

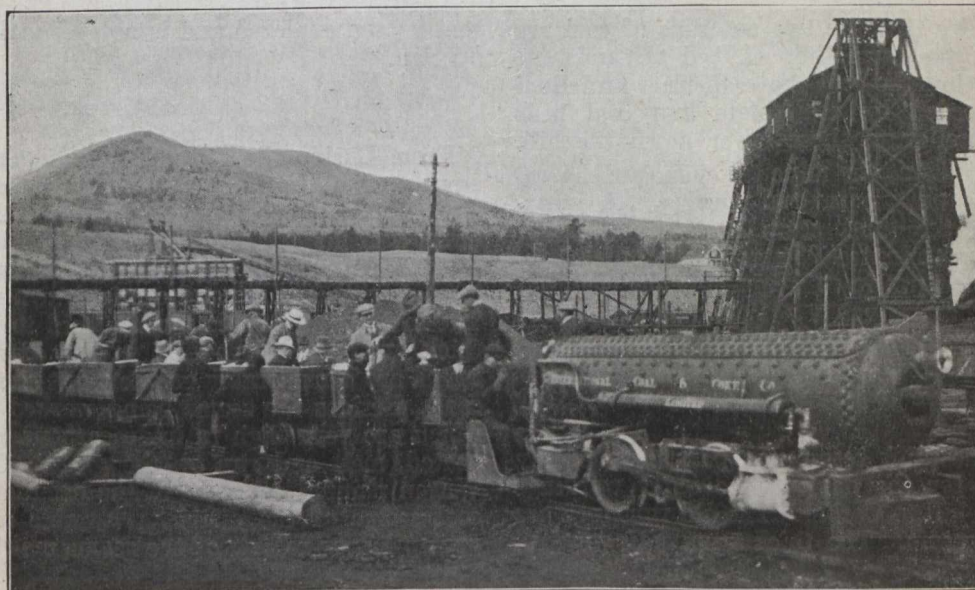
ment to examine and report on the condition of the mountain. The most dangerous period of the year is when freezing and melting of water is occurring in the joint planes. The action of frost is liable to set off the trigger, as Mr. Brock puts it.

#### Coal Mines at Hillcrest, Frank and Blairmore.

After examining the Frank landslide several coal mines and structural sections were visited. At Blairmore the party were taken into the International Mine, where a very extensive bed of coal is being mined. The tunnel level runs for nearly three miles into the mountain, and from it rooms have been driven several hundred feet to the surface.

#### The Corbin Coal Seams.

To visit the Corbin mine the excursion train was taken sixteen miles south from McGillivray on the Eastern British Columbia Railway, which follows the south fork of Michel creek. At Corbin the mining company had made excellent arrangements for taking the visitors up to the great exposures of coal over 1,000 feet above the town and 6,100 feet above sea level. A standard gauge railway has been recently constructed up the hill and,



Air locomotive and train load of geologists ready to enter International coal mine at Blairmore.

ing out features of the extraordinary slide stated that eye witnesses saw the great mass rebound as it struck the bottom of the valley and actually leap up the opposite slope. This account is borne out by the fact that there is actually a decided valley in the debris, such as might have been thus formed. It has been utilized in rebuilding the railroad across the area covered by fallen rock, and is a marked depression which greatly facilitated construction.

The actual position of the fallen rock suggests what might have been expected if a gigantic blast had been fired along the joint plane. Sudden relief of horizontal tension may have been partly responsible for the extraordinary distribution of the broken rock.

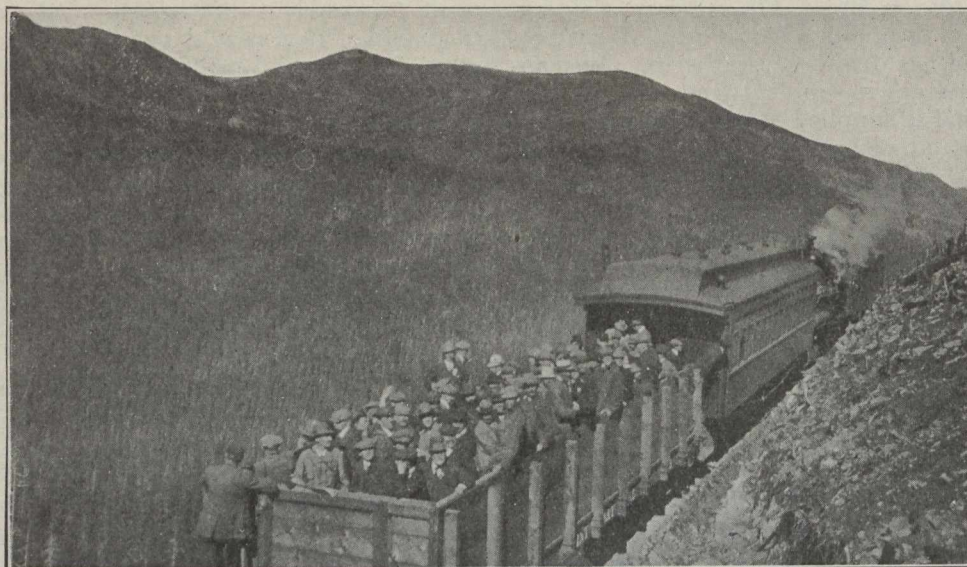
There are numerous large open joints parallel to the face along which the slide took place and another large portion of the mountain is believed by Mr. Brock to be in a very precarious condition and liable to slide. A danger zone has been established and warning given to the public by a commission appointed by the Govern-

for the convenience of the geologists, a gondola was fitted up as an observation car and pushed ahead of the locomotive up the grade. General Manager Roberts and Superintendent Graham accompanied the party.

Part of the ascent is made directly and is intended to be later used as a section of the railroad which will be continued south up the valley. The upper part is made by a series of switchbacks.

The outcrop of coal is a very remarkable one. The seam is usually thick and forms the surface rock for a large area on the slope of the hill. Bore holes driven to determine the thickness show that there is a large area which carries from 50 to 100 feet in thickness. Below this there is a slate bed 10 to 20 feet in thickness, and then a second bed of coal about as thick as the slate. At the mine the coal seam dips at a gentle angle to the west. Further down the slope the beds flatten and then turn up, the shale coming to surface. Higher up the hill there are outcrops of the beds which underlie the coal seam and then another thick bed of coal. The structure





Geologists on way to Corbin coal mine, B.C.

of the rocks indicates that the two outcrops of coal are in reality parts of the same bed. A bed of sandstone stratigraphically below the coal shows distinct anticlinal structure, is succeeded by coal, slate and coal beds which are quite similar to those lower down the hill.

While the party was at the mine the manager showed them an operation unique in coal mining. A steam shovel working in the thick seam loaded a standard freight car in a few minutes. It would be possible to make an enormous output in this way at a low cost, but without selection the product is not of good grade, and it is not thought that the steam shovel will be in regular operation, though it may be used on occasion. In any case it will be possible to mine a large quantity very cheaply.

After viewing the thick seams, the party was led by Mr. Clapp, guide for the day, to the older workings and then down the hill to Corbin. The old workings are on much thinner seams. The thick seam has only re-

cently been explored and is not yet making a large production.

#### Coal Creek.

From Corbin the C2 special was taken down Michel creek to the Crow's Nest line, and then on to Fernie. From Fernie a special local train took the visitors to the mines and plant at Coal creek. There are several seams lying rather flat and cut by the valley. The tippie is located in the valley and ore is drawn from either side. The main seam at this mine is said to be about 30 feet thick and one of the best in the district. The other seams are considerably smaller, but some are very good coal. Besides the seams being worked there are others which are very high in hydrocarbons and which, when heated, melt and run on the grate. General Manager Wilson pointed out some of the peculiar features of the coal seams of the district. Notable ones are unusual crumpling or rolling of the seams making it difficult to



Mining coal with steam shovel. Corbin mine, B.C.



keep the openings straight and the great quantity of gas encountered in crushed portions of the beds.

After visiting the plant and watching the methods of handling the coal, the party returned to Fernie. In the evening a smoker was given by the city. The Mayor welcomed the members of the Congress and called upon Mr. Brock to preside and ask the visitors to do the talking. Mr. Schofield gave a very instructive talk on the structure of the Cordilleras. This was much appreciated, as the following day included a section across the ranges. The members then entertained one another by several impromptu speeches, songs and dances contributed by men of various nationalities. Local singers also contributed, and after luncheon had been served the party became a very merry one. Mr. Ashworth of Manchester and Piper Ferguson and the Scotch dancers,

and the German chorus contributed largely to the success of the smoker.

**Reception at Frank.**

After visiting the coal mines at Blairmore and Coleman, the train was run back to Frank, where the members were entertained at a supper in the Sanitorium Hotel. The members were welcomed by the citizens, and several replied in kindred spirit and thanked the people for their hospitality. Among those who spoke on behalf of the visitors were Hon. Louis Coderre, Minister of Mines; Mr. Bedford McNeill, president of the Institution of Mining and Metallurgy; Mr. Dahlblom, Inspector of Mines, Sweden; Mr. Boggild of Denmark, Mr. Kukuk of Germany and Director R. W. Brock of the Geological Survey of Canada.

(To be Continued.)

## CROW'S NEST PASS COAL FIELDS\*

By W. W. Leach.

The territory lying between Burmis, Alberta and Elko, British Columbia, includes all the coal fields, containing high-grade bituminous coal of Kootenay age in the Crow's Nest Pass, which are traversed by the Crowsnest branch of the Canadian Pacific Railway.

These fields may be broadly divided into two groups, the most easterly lying in the Province of Alberta and separated from the westerly or British Columbia group by the main range of the Rocky Mountains. Each of these groups consists of a number of separate areas of coal-bearing beds.

On the Alberta side of the mountains the various coal areas are divided by a series of great faults, following closely the strike of the strata, while the in-

216 feet of coal contained in seams of over 1 foot in thickness. Similarly the Fernie shales, of Jurassic age, underlying the Kootenay are very much thinner in Alberta than in British Columbia, in the former having a thickness of about 650 feet, while near Fernie, B.C., they attain a thickness of over 3,000 feet.

The coals throughout this district are all of a very similar nature, with the exception of a number of small seams found near Fernie, overlying the main coal measures, which contain coal of a semi-cannel character.

Nearly everywhere the coal cokes readily and is utilized to a large extent in the manufacture of that product; it is generally rather friable, and often con-

Locality.	Moisture.	Vol. Comb.	Fixed Carbon.	Ash.	Remarks.
(1) Bellevue—No. 1 seam.....	0.2	27.5	56.8	15.5	Run of mine coal.
(2) Coleman—No. 4 seam .....	0.6	23.8	59.5	16.1	do. do.
(3) Michel—No. 8 seam .....	1.1	23.8	65.0	10.1	Coal, screened and picked at mine.
(4) Hosmer—No. 8 seam .....	1.3	27.6	63.7	7.4	Coal hand-picked at testing palnt.
(5) Coal Creek—No. 2 seam .....	1.3	26.0	63.8	8.9	Coal screened and picked at mine.
(6) Marten Creek .....	2.10	57.71	30.33	9.86	Camel coal, surface sample.

dividual areas have been subjected to severe folding and some minor faulting. On the other hand, the British Columbia group is composed of a number of more or less regular basins, the most important of which has a length of some 35 miles with a maximum width of 11 miles.

The coal is contained in rocks of Kootenay age (Lower Cretaceous) consisting of hard, grey sandstones, grey black, and carbonaceous shales with, towards the top, some hard siliceous conglomerate holding many chert pebbles. In the Alberta group the Kootenay rocks have a total thickness of not more than 700 feet containing from 5 to 6 seams of coal with an aggregate thickness of about 50 feet, while a section measured near Morrissey, on the British Columbia side of the Pass, showed 3,200 feet of Kootenay rocks with

tains a somewhat large amount of ash, but it has been found to be eminently adapted for steam raising purposes and is in much demand by the railways for locomotive use. The following proximate analyses, from air-dried samples, give a general idea of the quality of the coal:—

In the year 1910, a total of 3,137,138 tons (2,000 lbs.) of coal was produced in the district, of which amount Alberta contributed 1,608,205 tons, and British Columbia 1,528,933 tons, from which 121,578 tons of coke were made in the former Province, and 241,579 in the latter. In 1911, the output was very much less, due to the fact that for eight months nearly all the mines were idle on account of a miners' strike.

The Davenport Coal Company has developed six coal seams, the several thicknesses of which are 3.4 feet, 5

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



feet, 4.6 feet, 5 feet, 6 feet, and 6 feet. The coal is mined by pillar and stall method and hauled to the tippie by endless rope; the steel tippie is equipped with Marcus screens, built at Newcastle-on-Tyne, and is capable of handling 120 tons per hour.

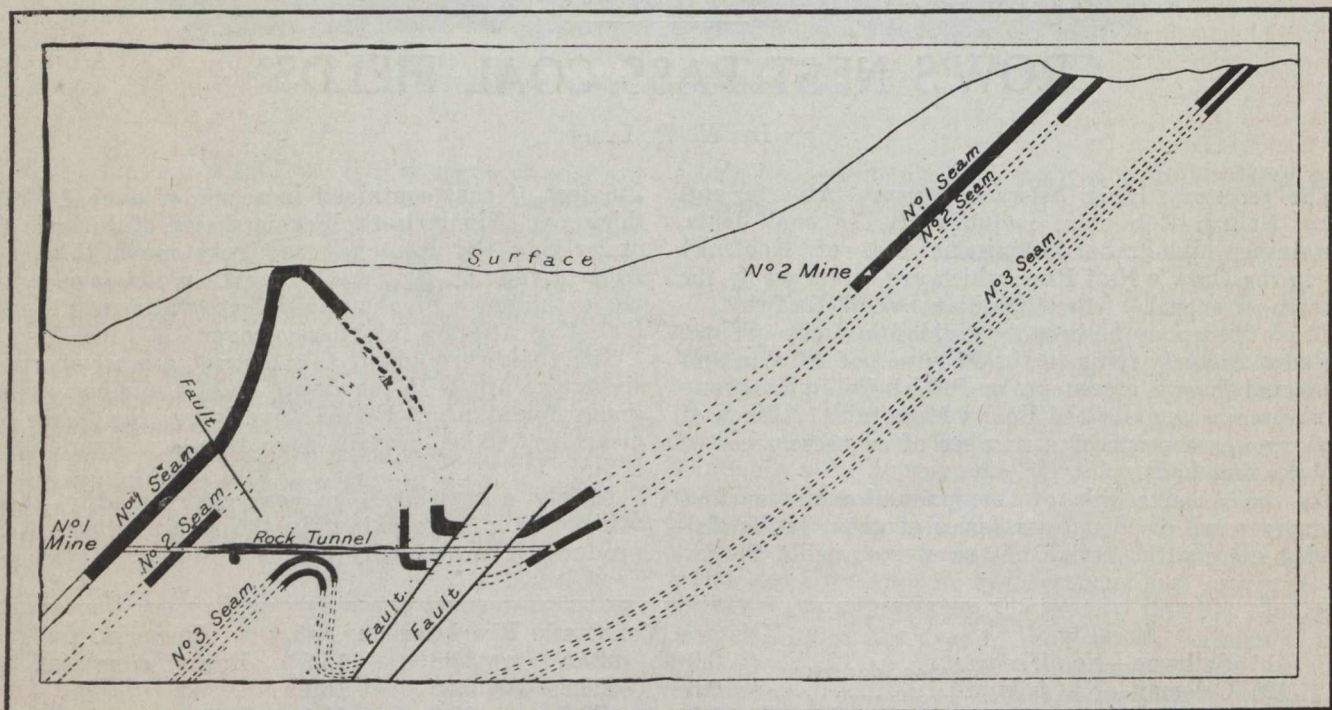
**Police Flat Siding.**—At Police Flat is situated one of the Leitch Collieries' plants. This point is on the axis of a sharp anticline and is underlaid by Dakota rocks, but about half a mile to the north, where the mine is situated, erosion has uncovered the underlying Kootenay beds. Here five seams of coal have been proven, 2 feet, 6 feet, 5 feet, 4 feet, and 10 feet, respectively, in thickness. The mine is worked by pillar and stall system, and on account of the steep dip ( $60^\circ$ ) the rooms are driven diagonally up the pitch. The coal is hauled in the main gangway and to the tippie by gasoline motor. The tippie is of the Phillips cross-over type and is equipped with shaking screens and

seam to intersect the lower seams from a point some two miles from the entry, a notable double fold was met with, No. 2 seam having been cut in three places while No. 1 and 3 seams were entirely missed; the accompanying sketch will make this clear.

About one-half mile to the east of Bellevue, the Maple Leaf mine is situated. The folding mentioned above is well seen here, the coal seams being repeated four times in a distance of about one-half mile.

**Hillcrest.**—At this station a short spur turns off to the south to Hillcrest town and mine. The mine is located on the western limb of a broad undulating syncline, on the eastern limb of which the Bellevue mine is situated. Three seams, 14 feet, 8 feet, and 9 feet in thickness, have been developed at this point.

**The Canadian Coal Consolidated** is operating two mines at Frank; the first is opened by a drift parallel to the face of Turtle Mountain and driven in a souther-



Geological Survey, Canada

Section in Bellevue Mine showing folding of coal seams



picking tables, and has a capacity of 1,000 tons in two shifts. From the tippie the slack coal is elevated to the washing plant, of Luhrig jig type, with a capacity of 500 tons washed coal in ten hours. After washing, the coal passes to bins holding 1,000 tons and thence by electric lorries to the coke ovens, 101 in number; these ovens are a modified bee-hive, rectangular in shape and are mechanically levelled and pushed. They take a charge of 10 tons of coal.

**Bellevue Siding.**—At Bellevue, the West Canadian Collieries, Ltd., are operating an important mine. Four seams intersected by a cross-cut tunnel are 9 feet, 17 feet,  $4\frac{3}{4}$  feet, and 15 feet, respectively, in width, in a total thickness of 450 feet of measures. Two other seams, one 4 feet, the other  $3\frac{1}{2}$  feet in thickness, are known to occur below these. The coal is worked by pillar and stall system, the rooms being driven directly up the pitch. In driving a crossecut from No. 1

ly direction. Three seams have been proved but one only, the highest, is being worked; this seam is from 12 to 15 feet thick. The coal is hauled along the main level and to the tippie by means of gasoline locomotives.

No. 2 mine is situated about one-half mile north of No. 1, and is being operated by means of a shaft 330 feet in depth. The main level, driven from the bottom of the shaft, runs in a northerly direction towards Bluff Mountain. From this mine the daily output is about 450 tons.

**Lille Coal Mine.**—From Frank, the Frank and Grassy Mountain Railway branches off to the north and follows the valley of Gold Creek for about 7 miles. About 5 miles up this line the town of Lille is situated, where the West Canadian Collieries are operating their Lille mine. A coal seam 4 to 5 feet in thickness has been worked here quite extensively. The mine is



operated on the pillar and stall system with compressed air haulage on the main levels, the tippie capacity being about 1,200 tons in two shifts. The company has a coking plant at this point consisting of a washery for treating the slack coal and a battery of 50 Belgian ovens of the Bernard type.

**Blairmore.**—At this point the West Canadian Collieries are operating a mine on the south side of the railway, with an output from 700 to 1,000 tons a day. The coal seams have also been prospected for some distance north of the track.

**Coleman.**—At Coleman two companies are operating coal mines, one on each side of the valley. The plant and mines of the International Coal and Coke Company (Dennison Colliery), are situated to the south of the railway where five coal seams have been proved, of which No. 2, 15 feet, and No. 4, 6 feet are at present being worked. Both seams are opened by means of levels driven on the strike, the coal being won by pillar and stall method, and the rooms driven up the pitch, which is here about 32 degrees.

The capacity of the mine and plant is about 3,000 tons daily.

The coke plant consists of a Bradford breaker and 216 beehive ovens, the coal being delivered to the ovens by electric lorry.

The McGillivray Creek Coal and Coke Company's mine is situated on the north side of the valley, about one-half mile from the railway. One seam, from 10 to 12 feet in thickness, the No. 2 of the series, has been developed by means of a slope with levels driven from its foot, the coal being worked by pillar and stall system. From the top of the slope the mine cars are hauled by electric motor along a surface tram to the tippie, a distance of one and one-half miles. The tippie, of steel construction, is equipped with screens and picking belts, and is capable of handling about 2,000 tons in two shifts daily.

**Corbin.**—At Corbin a similar outlying remnant of the coal-measures is being exploited by the Corbin Coal and Coke Company. This company is operating two mines; No. 1 being opened near the valley level by means of a tunnel along the strike of the seam, while No. 2 mine is situated nearly 1,000 feet above the floor of the valley. The geological relationship of these two openings has not as yet been worked out, and it is possible that the same seam is represented at both places. At No. 1 mine the seam is nearly vertical and varies greatly in size, from a minimum thickness of 10 feet to a maximum of nearly 250 feet; this great difference may be due to compressed monoclinical folding. At the upper mine the coal has been stripped near the top of the hill, and shows the coal in a synclinal basin about 370 feet in width; the thickness of the coal near the centre of the syncline having been proved by drilling to be over 100 feet.

The upper mine is reached from the valley by means of a switch-back railway and the coal is worked in open cuts with a steam shovel. The output in 1910 from No. 1 mine alone amounted to about 142,000 tons.

**McGillivray.**—McGillivray station is situated near the eastern edge of the main Crowsnest coal basin, the rocks having general westerly dips. From the station to the junction of the North Fork with the main Michel Creek, where the coal measures proper are entered, the railway follows closely the strike of the Fernie shales.

The Crowsnest basin has a total length along its major axis of about 35 miles, with a maximum width of 11 miles, and is estimated to cover an area of about

230 square miles. In a section measured near Morrissey, 22 coal seams, of one foot and over in thickness, were noted, containing in the aggregate 216 feet of coal in a total thickness of measures of about 3,200 feet. The greater part of the coal, however, consisting of 198 feet, occurs in a thickness of strata of 1,847 feet. Assuming the extent of the basin to be 230 square miles, and the average thickness of workable coal at 100 feet, the total available supply of coal would be about 23,000,000,000 tons.

The coal measures are overlain by a great series of conglomerates, sandstones and shales containing, towards the base, thin seams of coal of a semi-cannel nature and reaching a maximum thickness of from 4,000 to 5,000 feet. It is over comparatively limited areas only, however, that such great thicknesses of the overlying beds are to be found, denudation having removed them to a large extent over the greater part of the basin.

Where crossed by the railway in the valley of Michel Creek, the basin has narrowed to about four miles in width and the beds overlying the coal measures have been entirely removed by erosion.

**Michel.**—At Michel, near the centre of the trough, the Crowsnest Pass Coal Company is operating an extensive colliery and coke-making plant. The company has developed seven seams in all, four on the south side of the valley and three on the north side; of the former the seams designated upper No. 3, No. 3, No. 4 and No. 5, have the following respective widths: 10 to 12 feet, 4½ to 5½ feet, 6 to 8 feet, and 6 to 8 feet, while on the north side, No. 7 seam is about 11½ feet thick with a 2½ foot parting; No. 8 is from 8 to 14 and No. 9 is about 10 feet thick. No. 9 seam has not been worked for some years. All the mines at Michel, with the exception of No. 3, are worked by the pillar and stall method: in No. 3 the longwall system is in use. A total of 486 beehive coke ovens have been built at Michel.

**Hosmer.**—At Hosmer the colliery of the Department of Natural Resources of the Canadian Pacific Railway is situated. A rock tunnel, across the measures, has been driven at a point 600 feet above the railway for a distance of 4,931 feet, which has cut ten coal seams of the following dimensions:—

No. 1 seam,	18 feet (5.4 m.).
No. 2 “	12 feet (3.6 m.).
No. 3 “	22 feet (6.7 m.).
No. 4 “	4 feet (1.2 m.).
	5 feet coal, (1.5 m.).
No. 5 “	10 inch parting, (25.4 cm.).
	13 feet coal, (3.9 m.).
No. 6 “	8 feet 8 ins. (2.6 m.).
No. 7 “	4 feet (1.2 m.).
No. 8 “	5 feet (1.5 m.).
No. 9 “	8 feet (2.4 m.).
No. 10 “	large seam.

Of these seams Nos. 2, 9 and 10 are at present being worked, and it is probable that Nos. 9 and 10 correspond to seams Nos. 2 and 1, respectively, of the Coal Creek Colliery. The lowest seams, first cut in the tunnel, have easterly dips of 63 degrees, the dip flattening from three on the minimum of about 25 degrees. In addition to the tunnel seams, the company is operating a mine on the outcrop of the coal, where No. 2 seam is being worked by means of a slope; this point being several hundred feet higher than the tunnel entry.



From the tunnel the coal is lowered to the tippie level by a steam-actuated, double-track incline, and thence hauled to the tippie by air locomotives. The tippie, of steel construction, is equipped with screens and picking belts, and has storage bins with a capacity of 2,600 tons of coal and 2,400 tons of slack. The slack coal is treated in a Robinson washer of 400 tons daily capacity, the washed product being utilized in the manufacture of coke in a battery of 240 beehive ovens.

**Fernie.**—Altitude 3,302 feet (1,006.4 m.). Fernie, a town of about 5,000 population, is the British Columbia headquarters of the Crowsnest Pass Coal Company; from here the Morrissey, Fernie and Michel railway branches off and follows the valley of Coal Creek up for a distance of five miles (8 km.) to the Coal Creek colliery.

**Coal Creek** is a tributary of the Elk River from the east, which occupies a comparatively deep valley cut through the Cretaceous rocks, thus affording a suitable railway grade to the point where the valley floor rises to meet the easterly dipping coal measures. Here the mines are situated. The coal seams strike approximately at right angles to the valley, thus enabling tunnels to be driven on the seams on each side of the creek, while, as this point is approaching the centre of the basin, the seams dip at much lower angles (12 to 18 degrees) than at their outcrop along Elk River escarpment. The company is working five seams here while several others have been prospected to some extent. The seams being worked with their several thicknesses, are as follows:—

No. 1,	Average thickness	10 feet.
No. 2	“	4½ feet.
No. 5	“	12-14 feet.
A	“	8 feet.
B	“	3½ feet.

Seams Nos. 1, 2 and 5 are the ones most extensively worked; Nos. 1 and 5 being opened on the north side of the valley, while three mines are being operated on No. 2 seam, viz.—No. 9 mine on the north side and Nos. 2 and 3 on the south side of the valley. The coal from all the seams except No. 2 is mined by the pillar and stall method, whereas, in the mines on No. 2 seam, the longwall system is in use. Inside the mines, haulage is by horses and air locomotives, while all the coal from the various mines is hauled to the same tippie from the several entries by steam or electric motors. The tippie, a steel structure 840 feet in length, which bridges the valley, is of the Heyl and Patterson revolving side dump pattern, and is capable of handling 4,000 tons daily. It is electrically driven and equipped with the necessary screening and picking appliances. The slack coal is stored in large bins at Fernie and is utilized there in making coke, 452 beehive ovens being in operation.

**Morrissey.**—At Morrissey another branch of the Morrissey, Fernie and Michel Creek Railway leads up the north side of Morrissey Creek to the Carbonado colliery of the Crowsnest Pass Coal Company. The Carbonado mines have been idle for some years, although at least nine seams have been worked at different times, and a large plant, including 240 coke ovens, installed. The extremely gaseous nature of the coal at this point, resulting in a number of serious outbursts of gas, has caused it to be considered expedient to abandon this colliery for the present.

On the south side of Morrissey Creek and extending to the south branch of Michel Creek on the eastern edge of the coal basin, the Dominion Government holds

in reserve a block of 45,000 acres of coal land, being part of a total reserve of 50,000 acres, the remaining 5,000 acres being situated to the northeast of Hosmer.

#### COST OF LAKE SUPERIOR STRIKE.

The Boston News Bureau of Sept. 20 says that the strike at the Lake Superior copper mines, which is now on its ninth week—but gradually breaking up—has cost the miners thus far about \$2,400,000 in lost wages, while dividend reductions ordered to date have amounted to \$625,000. Figuring probable reductions by Wolverine, Mohawk and Osceola at next declarations, the loss to stockholders will approximate \$1,000,000.

There were between 16,000 and 18,000 miners involved in the strike, with an average daily wage of \$3.50, making the daily pay roll over \$50,000.

Four Lake Superior companies have declared dividends since the strike started late in July. In the following table we present a comparison of the quarterly dividend rates of these companies, prevailing before the strike, with present rates and total losses to stockholders:

Companies	Shares.	Prev. Rate.	Pres. Rate.	Losses.
Calumet & Hecla ..	100,000	\$10.00	\$6.00	\$400,000
Ahmeek . . . . .	50,000	5.00	3.00	100,000
Copper Range . . . . .	393,712	.75	.50	98,428
Quincy . . . . .	110,000	1.25	1.00	27,500
Total . . . . .				625,928

#### KERR LAKE.

Kerr Lake Mining Company reports for year ended August 31:

	1913.	1912.	1911.
Ore sales . . . . .	\$1,182,493	\$1,044,417	\$1,231,246
Expense . . . . .	345,178	275,242	293,870
Net profit . . . . .	837,315	769,175	937,379
		1913.	1912.
Profit and loss account Aug. 31		716,992	709,817
Net profit year ended Aug. 31.		837,315	769,175
Total . . . . .		1,554,307	1,478,992
Dividends payable during year		600,000	762,000
Profit and loss Aug. 31 . . . . .		954,307	716,992

Kerr Lake Mining Company, of New York, the holding company, reports for year ended Aug. 31, 1913:

	1913.	1912.	1911.
Dividends from Kerr Lake Mining Co. . . . .	\$600,000	\$762,000	\$1,338,000
Dividends from Wettlaufer, Lorraine, etc. . . . .	652	679	6,545
Total . . . . .	600,652	762,679	1,344,545
Exp. & taxes . . . . .	19,137	21,645	33,056
Divs. pay . . . . .	600,000	690,000	1,200,000
Written off . . . . .	15,000	45,000	45,000
Surplus . . . . .	*33,484	6,033	111,488

\*Deficit.

Production amounted to 2,109,975 ounces of silver, at a cost of 21.39 cents per ounce, which compares with production of 1,855,495 ounces at a cost of 18.30 cents per ounce in the previous year. Ore reserves at the end of the year were 6,019,300 ounces, against 6,660,091 ounces at close of previous year.

Balance sheet of the operating company shows cash, short term bonds and notes, ore, etc., on hand amounting to \$868,692, with taxes and accounts payable, etc., amounting to \$47,600, leaving excess of quick assets \$821,092.



# ASBESTOS MINING IN QUEBEC IN 1912\*

By Theo C. Denis, Superintendent of Mines.

Asbestos in 1912 heads the list of mineral products of the province. After passing through a rather critical period the asbestos industry is now regaining its balance, and the outlook for the future is bright. The

following table gives details of the production of asbestos in the Province of Quebec during the year 1912:

Qualities.	No. of Men. Employed.	Wages Paid.	Shipments.			Stock on Hand.	
			Tons.	Value.	Aver. value per ton.	Tons.	Value.
Crude No. 1 .....			1,941	510,785	263.16	867	221,215
Crude No. 2 .....			3,766	379,445	100.76	2,867	310,596
Mill stock No. 1 .....			3,682	237,203	64.42	2,370	137,106
Mill stock No. 2 .....			32,689	1,018,960	31.17	8,234	301,774
Mill stock No. 3 .....			69,097	912,691	13.21	6,838	131,515
Totals .....	2,910	1,377,444	111,175	\$3,059,084.	27.52	24,176	1,102,206
Quantity of rock mined, 1,870,608 tons.							

For the two previous years, 1911 and 1910, the figures are given in the tables below:

	Tons.	Value.	A. value per ton.	Stock on Hand. on Dec. 31st, 1910.	
				Tons.	Value.
Crude No. 1 .....	1,400	\$ 388,224	\$277.30	1,358	\$ 360,304
Crude No. 2 .....	3,382	382,980	113.68	3,368	431,548
Mill Stock No. 1 .....	6,340	415,559	65.54	3,794	207,403
Mill Stock No. 2 .....	35,991	1,091,684	30.33	12,272	379,523
Mill Stock No. 3 .....	55,111	747,759	13.57	12,959	204,298
Totals .....	102,224	\$3,026,306	29.60	33,751	\$1,583,076
Quantity or rock mined during 1911, tons, 1,759,064.					

	Tons.	Value.	A. value per ton.	Stock on Hand. on Dec. 31st, 1910.	
				Tons.	Value.
Crude No. 1 .....	1,817	\$ 471,649	\$259.57	1,763	\$ 447,227
Crude No. 2 .....	1,612	196,382	121.82	3,181	440,884
Mill Stock No. 1 .....	10,313	627,635	60.88	4,938	313,053
Mill Stock No. 2 .....	44,793	1,141,374	25.48	24,417	612,065
Mill Stock No. 3 .....	22,070	230,789	10.46	6,920	99,694
Totals .....	80,605	\$2,667,829	\$33.10	41,159	\$1,921,923
Quantity of rock mined during year 1910, tons, 2,035,705.					

The classification adopted by the Quebec Mines Branch is an arbitrary one. Each mine has its own grading, and there is no uniformity between the products of the different mines. In the tables above given the values of the various grades have been grouped as follows:

Crude No. 1—Hand-cobbed asbestos valued at \$200 a ton and over.

Crude No. 2—Hand-cobbed asbestos valued at less than \$200 a ton.

Mill Stock No. 1—Products of mechanical separation valued at \$45 and over.

Mill Stock No. 3—Valued at less than \$20.

Mill Stock No. 3—Valued at less than \$20.

It is interesting to note that in 1911 and 1912, the shipments exceeded the output of the mining and milling operations for each respective year. This shows a steady evacuation of the stock on hand which had accumulated during 1910, when an abnormal production had caused a congestion of the market.

Therefore the balance between the output and shipments is gradually readjusting itself, and as the consumption is steadily increasing, the future of the industry is hopeful.

The following table shows the growth of the asbestos industry since the year 1900:

Year.	Tons.	Value.
1900.....	21,408.....	\$ 719,416
1901.....	33,466.....	1,274,315
1902.....	30,634.....	1,161,970
1903.....	29,261.....	916,970
1904.....	35,479.....	1,186,970
1905.....	48,960.....	1,476,450
1906.....	61,675.....	2,143,653
1907.....	61,985.....	2,455,919
1908.....	65,157.....	2,551,596
1909.....	63,965.....	2,296,584
1910.....	80,605.....	2,667,829
1911.....	102,224.....	3,026,306
1912.....	111,175.....	3,059,084

\*Extracts from Report of Mining Observations in Quebec, 1912. Photos by Reginald E. Hore.





**AT BLACK LAKE, P.Q.**

**Geologists looking for new minerals in the asbestos bearing rocks.**

The year 1912 therefore shows a new high record for both tonnage and total value. However, it must be pointed out that although the tonnage in 1912 increased 8.75 per cent. as compared with 1911, the total value only increased 1.07 per cent.

There is an increase in the demand for long fibre asbestos and a corresponding decrease for the lower grades. Spinning stock and shingle stock, which must be of clear and fibrous asbestos, find a much readier market than paper and mill-board stock, which are now much more difficult to get rid of. For this reason only the mines which are able to produce an appreciable quantity of the better stocks were operated this year. As a consequence of this state of things all the mines of the Broughton district were shut down during the whole of 1912. The serpentine rock in this district contains as a rule a high percentage of asbestos; this, however, is not in veins, but in the shape of short fibre dis-

seminated throughout the rock. In the Robertson district, where the asbestos rock is of an intermediate nature between that of Thetford and that of Broughton, two mines were worked part of the time.

In Thetford and Black Lake, there was a serious shortage of labour which somewhat hampered operations.

One of the important features of the year in the asbestos industry has been the reorganization of two of the large operating companies. In both cases, the principle adopted in the reorganization has been the reduction of the bonds by converting part of these into common stock, thereby reducing the fixed charges. In these reorganizations, the names of two companies, the Amalgamated Asbestos Company and the Black Lake Asbestos Corporation, have been changed respectively to Asbestos Corporation of Canada, Ltd., and the Black Lake Asbestos and Chrome Company, Ltd.



**Geologists examining asbestos veins at Black Lake, P.Q.**





At BLACK LAKE, P.Q.

Dr. J. A. Dresser describing the occurrence of asbestos to members of geological congress.

Returns of shipments of asbestos were received from mine producers as follows:

- Asbestos and Asbestic Co., Ltd., Danville, P.Q.
- Asbestos Corporation of Canada, Ltd., Thetford Mines and Black Lake, P.Q.
- B. and A. Asbestos Co., Robertson, P.Q.
- Bell Asbestos Mines, Thetford Mines, P.Q.
- Berlin Asbestos Co., Rumpelville, P.Q.
- Black Lake Asbestos and Chrome, Black Lake, P.Q.
- Jacobs Asbestos Mining Co., Thetford Mines, P.Q.
- Johnson Co., Thetford Mines, P.Q.
- Martin, Bennett Asbestos Mines, Ltd., Thetford Mines, P.Q.

The Asbestos Corporation of Canada operated four of their mines, the Kings and Beaver mines at Thetford, and the British Canadian and the Standard mines at Black Lake. The fifth mine, the Dominion at Black Lake, was not re-opened.

The Black Lake Asbestos and Chrome Co., Ltd., have actively worked the Union and the Southwark mines. Their large mill has a capacity to treat 1,000 tons of rock per 10 hours. The motive power is electricity.

The Bell mines are the only ones in the district who have done much underground development by means of tunnels. These aggregate in the vicinity of 20,000 lineal feet, which have developed a large reserve of asbestos-bearing rock.

The mill has a capacity of 900 tons of rock per 10 hour shift. In their mining and milling operations the Bell mines use 1,200 h.p., of which about one-half is electric power, and one-half is furnished by steam boilers.

The Asbestos and Asbestic Company, Ltd., are the only ones working in the Danville district. They operate the Jeffrey mine at Asbestos. This company was in continuous operation during 1912. There are two



AT BLACK LAKE, P.Q.

Examining crystals of white garnets found in the asbestos bearing rock.

Robert Harvie, Ottawa; Dr. Charles Palache, Harvard; Dr. A. C. Lawson, California.



well equipped mills, of a capacity of 1,000 tons of rock each per 10 hours. Provision is made for about 2,000 h.p., partly steam and partly electricity.

The Johnson Company operate two mines, at Thetford and Black Lake respectively. Each mine has its own mill, and both were in continuous operation during the year.

At both mines and mills steam power is used exclusively. The capacity of the Thetford and Black Lake mills of the Johnson Company aggregate 750 tons of rock per 10 hours.

The Jacobs Asbestos Mining Company operate on lot 28 in the sixth (VI.) range of Thetford. Their well equipped mill has a capacity of 600 tons of rock per 10 hours. Electric power is used exclusively in operating both the mines and the mill. The horse power used is about 700.

The Martin-Bennett Asbestos Mines, Ltd., is the latest addition to the Thetford mines. This company acquired the Ward-Ross property, situated near the Johnson mine. It had been lying idle for a great many years

The second company has its plant at the falls of the St. Francis River, two miles above Disraeli. They develop 3,000 h.p. and have an auxiliary steam plant of 2,000 h.p.

The price of electric power in these districts averages \$25 per h.p. for eight months to during the year, as generally during the winter months mining operations are considerably reduced.

It is noteworthy that there is now a growing tendency towards using steam power in mining and milling operations. The contention is that although electric power at the rate at which it is delivered would be cheaper for continuous operations, as there sometimes occur long interruptions in the work owing to various causes, such as shortage of labour, sluggishness in the asbestos market, unfavourable weather to work in the asbestos pits, etc., it is more profitable to install a boiler plant and produce steam power. The price of good steam coal on the cars at Thetford or Black Lake during 1912 was \$5 per gross ton.



Cobbing Asbestos, Black Lake, P.Q.

owing to litigation. The new mill, which is very complete and efficient, was put in operation in the spring of 1912. It has a capacity of 900 tons of rock per 10 hours. In their mines and milling operations steam power is used exclusively.

The B. and A. Asbestos Company operate on lot 9 in the fifth (V.) range of Thetford, at Robertsonville. The mill has a capacity of 450 tons per 10 hours. Electric power, 600 h.p., is used exclusively in both mining and milling operations.

The Berlin Asbestos Company have their mine and mill on lot 2 in the fifth (V.) range of Thetford. The mill has a capacity of 450 tons per 10 hours. The mining and milling operations require 400 h.p. The two last mines were only operated during a part of the year.

The electric power is distributed in the asbestos districts by two electric power companies, the Continental Light and Power Company and the St. Francis Hydraulic Company. The first of these obtain the power from Shawenegan Falls, on the north side of the St. Lawrence River. Two lines of 80 miles deliver 9,000 h.p. in Thetford, Black Lake, Robertson, East Broughton and Danville.

#### THE OUTPUT OF COPPER IN AUGUST.

The Boston News Bureau states that the copper production for August by 26 producers approximated 81,413,124 pounds, compared with 99,540,194 pounds last year, a decrease of 18,127,070 pounds. This sharp drop was directly due to the suspension of operations in the Lake Superior district. The last half of the month witnessed resumption on a small scale at Calumet and Hecla, Copper Range and Quincy, but it is very improbable that the combined output from these properties exceeded 4,000,000 pounds, which would compare with a normal monthly production of the camp of from 18,000,000 to 20,000,000 pounds.

The porphyries—Utah, Chino, Nevada Consolidated, Ray Consolidated and Miami—outputted last month 30,019,348 pounds, an increase of 1,854,320 pounds over August, 1912.

#### NIPISSING.

Nipissing Mining Company report as of September 20, shows: Cash on hand, \$1,192,297; ore and bullion in transit, \$24,245; ore on hand, \$182,980; total, \$1,399,522.



## CANADA'S NICKEL INDUSTRY\*

By Alexander Gray.

The nickel industry of Canada, centred in Ontario, was pre-natally endowed with the mineral-bearing rocks essential to it, and unparalleled in their extent and characteristically contained worth.

That much is conceded by those who have scientifically investigated the norite of the Sudbury District and by those who tediously nurtured the industry with capital and all the metallurgical, mining and metal market sciences afforded.

Nickel and copper in intricate association confounded the issues and caused pioneer capitalists and their metallurgists ruefully to confess they would be happier "with either were t'other dear charmer away." Moreover, the metallurgy of the ores had been economically solved, nickel had to await its adaptation to multifarious uses—and abuses, in the estimation of those who frown upon naval armaments.

It took so many millions to separate and popularize nickel, so many years to introduce it into the manufacture of armour plate and innumerable art—those familiar with the inner details of that paroxysmal period cannot begrudge honours and emoluments to those who made nectar with a "lemon," so to speak. Nor is it surprising in the circumstances, that most of those who jauntily undertook to engage in or participate in the nickel industry, usually came to grief.

Notwithstanding the undisputed magnitude of the natural resources of the Sudbury District in respect to these ores, the difficulties attending the refining of nickel—and marketing of the metal in large and continuous quantities sufficient to bring adequate return upon capital invested—were painfully prolonged and deterred others than those who had to furnish money in bulk to the International Nickel Company and the Mond Nickel Company. Repeated attempts by ill-equipped concerns, ended in ignominious failure, emphasizing the futility of mere promoters entertaining what exacted the unceasingly expensive energies of wealthy and skilled technical chiefs, who had devoted so much time and money to their problems they could not abandon the field.

Opportunity for competitive enterprise and a somewhat envious environment could not induce other than the Mond Company and the International Nickel Company to do little more than acquire nickel-copper-bearing areas. Occasionally mining has been pursued. The Dominion Nickel-Copper Company organized by influential Canadians; the Lake Superior Corporation; the Montreal owners of the Worthington property, all knew they had ore and devoted themselves to explorations by diamond drilling. Plants and a railroad to what is defined as the North Nickel Range, sustained by representations as to the feasibility of certain separating and refining processes, did not get beyond the contemplative. Speculators holding properties of real or problematic merit could not enthruse financiers and steel-makers into the erection of smelters. Repeatedly inquiry for properties failed to get beyond preliminaries.

Not until quite recently when expansion brought to the two producing companies named, the profits they had earned as their reward for constructive capital outlays, has it appeared at all possible to enlist anyone competent to effect the economical separation of the metals and market the same. Even now—and in spite of the support given by noted personalities—there is a halt in

the programme of those who took over the holdings of the Dominion Nickel-Copper properties, along with the Murray Mine and other areas amalgamated as the Canadian Nickel Corporation with a nominal capital of \$30,000,000. Whatever the inducement presented in these outstanding nickel properties—and, however, ambitious individuals may be to contest nickel markets with the International and Mond Companies—those best informed appreciate what the rivalry will entail.

Had the Messrs. Guggenheim, with their metallurgical staffs and mastery of metals markets, succeeded in obtaining the properties massed under the aegis of the Canadian Nickel Corporation, a battle royal might have ensued. The Guggenheims were willing. Somehow there was a misdeal. While certain of the Canadian owners favoured the American Mining and Smelting Masters, Messrs. J. R. Booth and Clifford Sifton closed with Dr. F. S. Pearson, E. R. Wood, Z. A. Lash, Sir William Mackenzie and others, for a round four or five million dollars in cash and script. Mr. J. E. McAllister, managing director of the Canadian Nickel Corporation, and adviser in the matter to Dr. Pearson, was alert. He took the trick—and it remains to get the \$10,000,000 as proposed by a debenture issue and a bonus of 125 per cent. of common stock, leaving \$7,500,000 of the \$20,000,000 of common stock to be otherwise disposed of. When that is accomplished, possibly there will be a third formidable nickel corporation, bringing the capitalization of the entire Ontario nickel country to over \$80,000,000, exclusive of what is in the Micawber class of holders and including the Alexo Company, operating near Kelso and shipping their ore to the Mond smelter.

Yet it is almost thirty years since Dr. Howie discovered the pyrrhotite and chalcopyrite on the surveyed line of the Canadian Pacific Railway, on the site of the Murray Mine which the Vivians subsequently operated and abandoned twenty years ago, now said to contain more ore of higher grade than those original nickel refiners at Swansea dreamed of. Had the Vivians retained the Murray and proved its worth, they would have become larger factors in nickel markets. It bespeaks the perplexity permeating Nickeldom that the very property which the Vivians declined to longer operate in 1894, was the 1913 basis of the transaction now in process of consummation with the Pearson interest. It would add to the ironies if the Mond English Company contracted for a considerable tonnage of newly discovered Murray ore.

Ordinarily a mineral industry requiring a quarter of a century to mature to the profit-distribution stage, would be regarded as a glorified "wild cat." Assuredly the nickel industry had a career that was precarious and vicarious simultaneously. Most of the "mystery" attached to it was due to the fact, for years, that nickel-making was unspeakably hazardous. There were no beplumed Chanticleers around Copper Cliff and Sudbury; because those preoccupied with their work had to strut softly so as not to arouse those who subscribed their millions and existed on a slim diet of hope deferred.

That the fixed capital of Ontario's Nickel Company is approaching the \$100,000,000 mark, does not warrant the assumption that the production of the metal is to be accomplished any easier, further than that there are

\*From Journal of Commerce, Sept. 13 and Sept. 20, 1913.



multiplying uses for it when competitors can supply it upon terms relatively as satisfactory as those companies now dominating nickel markets. How formidable these latter have become, in that they contribute about 80 per cent. of the world's nickel, is illustrated by the following progressive Bureau of Mines tables giving the Ontario output and value by years, since the organization of the International Nickel Company in 1902:

companies is not repeated as a disastrous experiment with mining industrial matters exacting thorough organization and sane finance. Necessarily the output of the producing nickel mines has conformed to demand. Supply never was at issue since the Sudbury District ores and the solution of their treatment. Were the world prepared to take more nickel—at a price that would yield a satisfactory profit—the world could have it, and the turn over

### NICKEL AND COPPER PRODUCTION OF ONTARIO MINES

	1902.	1903.	1904.	1905.
Production Details—	Tons.	Tons.	Tons.	Tons.
Ore raised .....	269,538	152,940	203,388	284,090
Ore smelted .....	233,388	220,937	102,844	257,745
Ordinary matte produced .....	24,691	40,416	19,123	.....
High grade matte produced .....	13,332	14,419	6,926	17,388
Nickel contents .....	5,945	6,998	4,743	9,503
Copper contents .....	4,066	4,005	2,163	4,525
Value of nickel .....	\$2,210,961	\$2,499,067	\$1,516,747	\$3,354,934
Value of copper .....	616,763	583,646	297,126	688,993
Wages paid .....	835,050	746,147	570,901	833,822
	Number	Number	Number	Number
Men employed .....	1,445	1,277	1,063	1,176
Production Details—	1906	1907.	1908.	1909.
	Tons.	Tons.	Tons.	Tons.
Ore raised .....	343,814	351,916	409,551	451,892
Ore smelted .....	343,059	359,076	360,180	462,336
Ordinary matte produced .....	.....	.....	.....	.....
High grade matte produced .....	20,364	22,041	21,197	25,845
Nickel contents .....	10,776	10,602	9,563	13,141
Copper contents .....	5,260	7,003	7,501	7,873
Value of nickel .....	\$3,839,419	\$2,270,442	\$1,866,059	\$2,790,798
Value of copper .....	806,413	1,020,913	1,062,680	1,212,219
Wages paid .....	1,117,420	1,278,694	1,286,265	1,234,804
	Number	Number	Number	Number
Men employed .....	1,117	1,660	1,680	1,796
Production details—	1910.	1911.	1912.	
	Tons.	Tons.	Tons.	
Ore raised .....	652,392	612,511	737,656	
Ore smelted .....	628,941	610,788	725,065	
Ordinary matte produced .....	.....	.....	.....	
High grade matte produced .....	35,033	32,607	41,925	
Nickel contents .....	18,636	17,049	22,421	
Copper contents .....	9,630	8,966	11,116	
Value of Nickel .....	\$2,005,961	\$3,664,474	\$4,722,040	
Value of copper .....	1,374,103	1,281,118	1,581,062	
Wages paid .....	1,698,184	1,830,526	2,357,889	
	Number	Number	Number	
Men employed .....	2,156	2,439	2,850	

#### Recapitulation.

Tons raised .....	\$4,469,688
Tons smelted .....	4,301,365
F.O.B., Sudbury value of nickel	28,722,414
F.O.B., Sudbury value of copper	14,453,331
Wages .....	13,789,802

Obviously 31.9 per cent. of the Sudbury valuation of the nickel-copper contents of the practically four-and-a-half-million tons raised was paid out to employees of the Canadian Copper Company, which is the producing organization of the International Nickel Company; the Mond Company—and latterly, in a small way, the Alexo Company. As obvious is it that the nickel industry is at its best—a best that will be more superlatively so if markets for the metal are conserved and the demoralization due to random promotion of asbestos

on capital would compensate somewhat for any reduction in the market price of the metal. But the world shied at more than so much—consequently the companies engaged in supplying it had to modulate their output and conform to the momentary requirements.

Inspection of the foregoing tables will convince economists that financial depression—periodic depressions—automatically influenced the nickel output. Had the situation been what the Englishman describes as “all beer and skittles”—otherwise defined as “all jam”—the International Nickel Company sooner might have begun to “get back some of its money.” Just as the nickel industry was beginning to benefit from enlarged markets, the 1907 panic occurred. It will be observed that the 1907 aggregate was but a trifle in excess of that of 1902, the year in which the International Company



went into the business; also it is clear that the 1908 output was below that of 1902 or of 1907.

Since then the output has almost doubled—and the ore reserves have multiplied so enormously that the leading companies are safeguarded. Concurrently there have been necessary enlargements of plants and properties, more capital has been forthcoming—and the markets secured by long-term contracts or by demonstrated ability to furnish metal markets with “the goods.”

The International Nickel Company raised 618,294 of the 737,656 tons of ore smelted in 1912. The Mond Company raised 117,568 tons and took 1,792 tons of ore from the Alexo Company. In other words, the International Company produced over 80 per cent. of the Canadian tonnage. This is about the usual proportion. Doubtless the International Company's contribution of nickel was in greater ratio, for 518,417 tons was high-grade ore from the unexcelled Creighton Mine—a mine that was a saving clause during those unprofitable years when the International Company was in what aviationists speak of as the “upper air currents.” At any rate the International and Mond Companies accounted for 99.75 per cent. of all the nickel ore mined in Ontario in 1902—and they are prepared to beat that record, if markets will take the metals. The Alexo tonnage was bought by the Mond for its high nickel content, the low copper content being no deterrent; because Mond matte shipped to Wales contains more nickel than what is

many craves a freer market in nickel, but its manufacturers side-step all proposals that they engage in mining and refining the metal. Meanwhile the International Company possesses sufficient ore reserves proved to maintain the current output for about 75 years and has funds on hand for extensions to plant. Not only will the No. 3 Mine be equipped upon an unprecedented scale, but another hydro-electric plant will be constructed next year on the Spanish River, thus doubling the power capacity. Power, tonnage, plants, cash and markets, bespeak the achievements of those who brought the International Company to the point where those who would measure swords with it must have greater dexterity, a better eye—and the essential sinews. How potential are International and Mond Companies may be determined by these figures:

**World's Production of Nickel.**

Years.	Metric Tons.	Ontario Output Tons.
1906 .....	14,300	10,776
1907 .....	14,100	10,602
1908 .....	14,600	9,563
1909 .....	17,300	13,141
1910 .....	20,100	18,636
1911 .....	24,500	17,049
1912 .....	26,500*	22,421

\*Estimated.

**INCOME ACCOUNT OF THE INTERNATIONAL NICKEL COMPANY**

	1912-13.	1911-1912.	1910-1911.	1909-1910.
Earnings of constituent companies .....	\$6,802,886	\$5,019,703	\$5,207,521	\$3,339,457
Other income .....	126,220	69,263	49,416	9,223
Total income .....	6,929,107	5,088,966	5,256,938	3,348,681
Exp. taxes, etc. ....	542,308	22,553	228,064	203,947
Net income .....	6,386,799	4,866,413	5,028,874	3,144,734
Interest, Sinking Fund, depreciation, etc. ....	1,366,494	1,284,453	1,253,274	1,077,206
Surplus .....	5,020,305	3,581,960	3,775,600	2,067,528
Preferred dividends .....	534,755	534,749	534,748	534,745
Balance for common .....	*4,485,550	3,047,211	3,240,852	1,532,783
Common dividends .....	3,491,049	2,143,412	808,778	487,978
Surplus .....	994,501	903,799	2,432,074	1,044,805

\*Equal to 11.79 per cent. on \$38,031,500 common stock.

sent by the Canadian Copper Company to the Orford Company in New Jersey in behalf of the International Company. So strongly entrenched are the two producing companies, even a fraction of their trade at other than sacrifice prices will be difficult to dislodge. They have prospered despite adversities which would have discouraged the less capable, however fiscally equipped.

Copper Cliff and Coniston Smelters as perfected and trebled have the economies long sought by the technical experts of the International and Mond Companies. Cheaper processes—and as efficient—there may be. Canadians interested in their material resources cherish the desire for a still greater nickel industry—but those who plan nickel enterprises will have to make more than a sporting bet. As yet Canadian consumption of nickel is a negligible factor. The bounty awaiting nickel refined in Canada has not enticed capitalists to provide metallurgical works in Canada for that special purpose. Ger-

While the Ontario industry has advanced 110.8 per cent. in those eight years the world's supply has increased 85.3 per cent. Having in view the Ontario Mines Department detailed data as to the output and spending power in wages of the Ontario nickel industry, it is pertinent to present the consolidated income account of the International Nickel Company in recent years:

The entrenched position of the International Nickel Company and the war chest to provide ammunition and the commissariat, and enable it to withstand a siege. On March 31st, the end of its last fiscal year, it had a cash surplus of \$4,442,664, as compared with \$3,854,177 in 1912; \$2,852,102 in 1911, and \$1,455,836 in 1910. What is more significant is the recent financing by which all the bonds of the company were retired, thereby eliminating fixed charges and putting more millions into plants and the treasury. Over \$8,000,000 in bonds were redeemed in furthering the company's purposes, greatly en-



larged facilities are to be a feature—and this while meeting dividends on the increased common. The dividend record by years and the annual surplus disclosed were as follows, despite heavy capital expenditure by which earnings were reinvested:

#### Dividend Record International Nickel Co.

Year.	Per cent. on common.	Year's Surplus.
1912-1913 .....	**11.7	\$994,501
1911-1912 .....	26.3	903,798
1910-1911 .....	17.9	2,432,074
1909-1910 .....	17.2	1,044,805
1908-1909 .....	5.3	470,671
1907-1908 .....	8.9	790,009
1906-1907 .....	14.2	1,254,769
1905-1906 .....	8.6	754,760
1904-1905 .....	7.8	668,093
1903-1904 .....	*3.8	341,102
1902-1903 .....	*6.4	559,149

\*Earned on the Preferred Stock.

\*\*Common Stock increased from \$11,582,626 to \$38,031,500.

International Company shareholders had to exercise patience. There was no dividend on the preferred shares for four years following the organization of the company. It was eight years before the common issue brought any return, owing to the necessity for re-investing surplus in plants. However, of late years, dividends have been as follows:

	Preferred Dividends.	Common Dividends.
1913 .....	\$534,754	\$3,491,048
1912 .....	534,749	2,143,411
1911 .....	534,748	3,126,859
1910 .....	534,745	487,977
1909 .....	534,733	.....
1908 .....	534,733	.....
1907 .....	534,730	.....
1906 .....	267,360	.....
	\$4,010,552	\$9,149,295

In 1912-13 the sum of \$1,051,920 was written off for depreciation to plants and exhaustion of ore—notwithstanding the millions of tons added to the ore reserves. It is conservative administration policies, such as this, which made the International Company a model in Canadian mining, reinforced as they are by what was intimated in the most recent annual report:

"We are continuing to keep our plant up to date in every respect, increasing its efficiency wherever possible, and enlarging its capacity."

So close is the nickel organization to-day it rests with the dominant companies to meet the market conditions at the moment, or over contract periods. A trifle less than 13 per cent. of the 44,221,860 pounds of nickel contained in the matte exported, went to Great Britain in 1912. The actual exports were:

	Lbs.
To Great Britain .....	5,072,867
To United States .....	39,148,993

Whereas the total as applied to Great Britain reflects a gain of 9 per cent., that for the United States represents a gain of 41.9 per cent. Therefore the importance of the American market, and a tariff which permits unrefined metal to enter the States as such, requires little emphasis. America takes the business—and caters for it, otherwise it could easily alienate a goodly portion of

it. Canada has a very substantial first profit—not anywhere near to being measured by the wage items from year to year. For this we have the authoritative pronouncement by Dr. A. P. Coleman in his most complete monograph on the nickel industry published by the Dominion Department of Mines. He says:

"The whole nickel basin includes an area of 550 square miles, divided among twenty-four townships of the regular size and shape. Mining has taken place in eight of these ten townships, while important ore deposits are known to exist in several others.

"Omitting the villages connected with the farming region of the interior basin, the nickel mining industry supports two towns, Sudbury and Copper Cliff, and four villages, with a total population of perhaps 10,000 people."

We have the authority of the Ontario Mines Department for the statement that 4,459,688 tons were raised since 1902, and to the end of 1912. Throughout the operations, and dating back to the 80's, we have the authority of Dr. Coleman for the assertion that "the total amount of ore mined in the region up to the present (1912) is roughly 5,500,000 tons, of which probably 4,000,000 were actually sulphides, containing perhaps 2,400,000 tons of iron and its associated metals, nickel itself amounting to about 133,000 tons. . . . More than half the total has come from the few hundred feet of margin at the Creighton Mine, so that things are very unequally distributed."

Substantiating this Dr. Coleman also says "the Creighton has of late years been by far the most productive nickel mine in the world, with its annual output of more than 200,000 tons of ore containing on the average 4.68 per cent. of nickel and 1.65 of copper. The total production up to the end of 1910 was 2,088,531 tons, and mining at the regular rate has gone on steadily since that time. The annual production of nickel from this mine has probably surpassed that of all the other nickel mines in the world."

The same gentleman, who has devoted years to the study of the nickel country, states that "the Creighton ore up to September, 1910, contained on the average 5.08 per cent. of nickel and 1.63 of copper with a total for the two metals of 6.71 per cent., making it the richest of the large mines with the exception of Copper Cliff. Crean Hill ore approaches it, but with the proportion of the two metals reversed. It is also the richest in the sulphides of all the large mines, or in other words, contains less rock matter than the others, 75 or 80 per cent. of the ore being sulphides. It has shown slight falling off in grade since the earlier years, since more rock is now included with the ore, but the sulphides seem to be very uniform in their average contents of nickel and copper."

Without intending to make comparisons which might be deemed invidious, the metallic contents of the basic Creighton ore saved the day for the International Nickel Company when duly supported by that from the Crean Hill and Copper Cliff mines. Such high grade ore made it easier for metallurgists and those in charge of metal markets in behalf of the International Company to make dividends and equip the properties. Combined with all of this is the proved ore reserves in the numerous areas owned by the International Company. Whether those reserves actually total 50,000,000 or 60,000,000 with—more to come—they are ample for all emergencies. Presently the Frood, or No. 3 Mine, will place the International Company in a very strong position. Some idea of this Frood section will be conveyed to the laity by this extract from Dr. Coleman's monograph:



"The widest part of the band of norite and gossan is 900 feet across, a little to the South of the Froid Mine; and the whole gossan-covered area far surpasses any other in the nickel region, being probably four times as large as the gossan surface at Creighton or Whistle mines, which come next to it. It was an axiom of the early prospectors that a large area of gossan meant an important ore body, and in this case at least their belief was justified. . . . Though No. 3 mine was found early in the history of the region, it was not worked, beyond some stripping and the sinking of pits, until 1899. In the following year a railway switch from the Stobie mine gave an outlet for ore from the mine, but four years later, in 1903, the mine was closed down after 107,942 tons of ore had been sent to the Copper Cliff smelter. The ore ran 2.66 per cent. of nickel and 1.39 per cent. copper, the two metals making up

4.05 per cent., so that it was considerably richer than its neighbour the Stobie mine.

"The results of systematic diamond drilling across the ore deposit by the Canadian Copper Company (the operating end of the International Nickel Company) have since proved the amount of ore of a similar grade to be enormous, certainly 35,000,000. . . . The Canadian Copper Company also is sinking three compartment shaft to a depth of 500 feet and building a direct railway to Copper Cliff, giving a much shorter connection than the former roundabout route past Stobie and Sudbury. It may be expected that this greatest of known nickel deposits will soon be sending ore to the smelters of the two producing companies, and adding greatly to the available supply of the region."

(To be continued.)

## GRANBY CONSOLIDATED COMPANY'S MINE AT PHOENIX, BRITISH COLUMBIA

By O. E. Leroy.

The production of the Boundary district (including the Osoyoos Mining Division) from 1896 to the end of 1912 amounts to 13,744,338 tons of ore, containing 938,125 ounces of gold, 5,035,953 ounces of silver, and 334,874,378 pounds of copper, having a gross value of \$73,312,913. Approximately 60 per cent. of the tonnage was furnished by the mines at Phoenix.

The copper-bearing portion of the Boundary district occupies an area of about 25 square miles, and includes the important centres of Phoenix, Greenwood (Deadwood) and Summit. It was in 1891, following the discoveries at Rossland, that prospecting was actively carried on in the three above named camps. In that year most of the ground subsequently proved to be productive was staked. The low grade character of the ore proved a great disappointment which was partially offset by the discovery that the ore was almost self-fluxing. The field, however, was open only to large companies with financial resources beyond those of the average individual. The two companies at present operating were early in the field; the Granby Consolidated Mining, Smelting and Power Company confining its attention to Phoenix, and the British Columbia Copper Company operating at Deadwood and Summit. The smelter of the former was built at Grand Forks and the first furnace blown in in 1900. Its capacity has been increased from 1,200 tons to between 4,000 and 4,500 tons per day. The latter company commenced smelting at Greenwood in 1901. The present capacity of its furnaces is about 2,600 tons per day.

**Ore Deposits.**—The copper deposits occur at intervals along the edges of zones of contact metamorphism and also at the base of the zones or in some non-outcropping intermediate position.

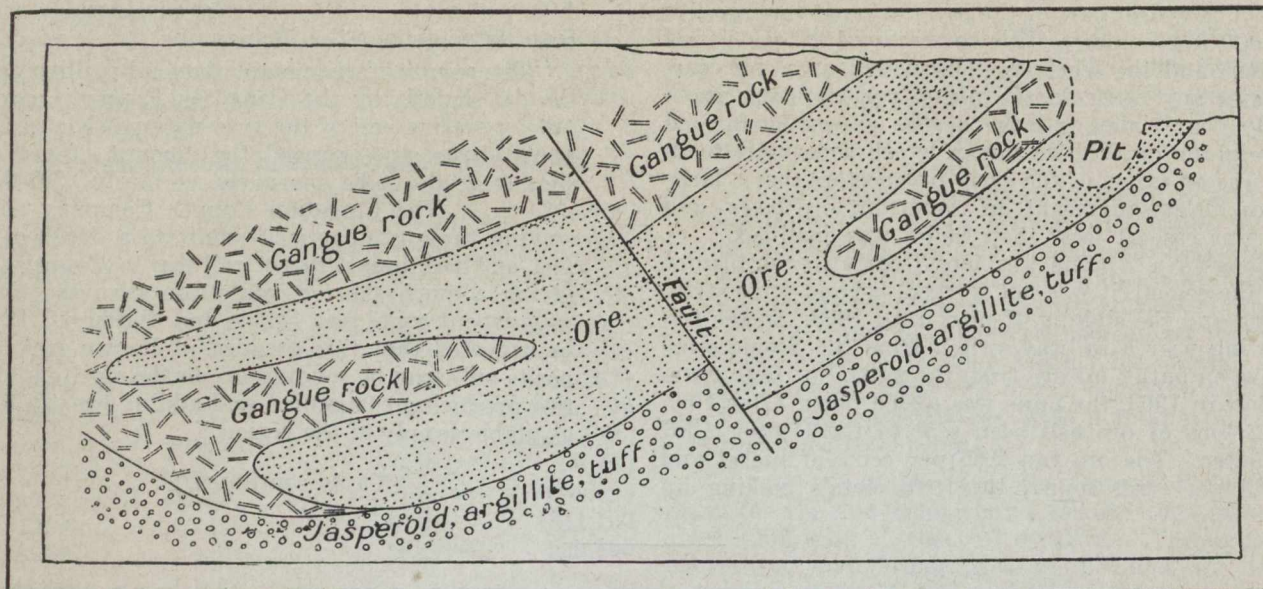
The zone in which the principal deposits occur is horseshoe-shaped. The west limb is 3,200 feet long and 1,000 feet wide, while the east limb is 2,250 feet long and from 350 to 1,000 feet wide. The thickness varies from one foot or so to 350. The floor is jasperoid or in places the siliceous rocks of the Knob Hill group.

**Knob Hill Ironsides Mine.**—The ore body of this mine owned by the Granby Consolidated, is the largest and most typical of the camp. The ore body is composite in character and consists of two lenses which coalesce about their central portions. Along the outcrop these appear as distinct ore bodies separated by a varying thickness of the lime-silicate gangue rock. The western lens is at least 2,500 feet long, from 370 to over 900 feet wide, and from 40 to 125 feet thick. The eastern lens is apparently shorter, but approaches the magnitude of the other in width and thickness. The general strike along the outcrop is about N. 10° E. with dips to the east ranging from 45 to 60 degrees. The dip flattens with depth and on the lower levels averages from 15 to 30 degrees. The general pitch of the ore bodies is about 18 degrees to the north-east. The vertical range from the south end of the main "glory hole" to the lowest working levels is 675 feet. The structural footwall is the jasperoid zone of the Brooklyn formation, and in places, the siliceous rocks of the Knob Hill group. The hanging wall is a purely commercial one and the ore either grades insensibly into barren gangue or terminates sharply against a gouge-filled fissure. The ore bodies and adjacent rocks are traversed by an intricate system of fissures which run in all directions and dip at all angles. They have had a most important influence on ore deposition as they formed channels for the ore-bearing solutions which permitted a uniform distribution of their metallic contents. In many cases the ore adjacent to these fissures is of noticeably higher grade. Some of the fissures have been subsequently filled with banded quartz, calcite and chalcopyrite.

The only displacement noted is along one of the major fissures which faulted the ore body with a throw varying from zero to 120 feet along a dip of 55 degrees to the west.

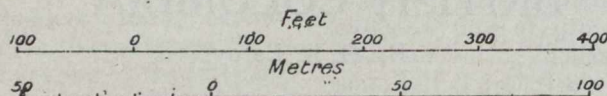
The ore is mainly massive with local banded areas. It consists of chalcopyrite, which with pyrite and hematite is finely and uniformly distributed through a gangue composed almost exclusively of garnet, epidote, quartz, calcite and chlorite. The pyrite occurs





Geological Survey, Canada

Section across ore-body, Knob Hill-Ironside Mine



in grains, crystals and streaks, while the hematite (specularite) occurs in platy aggregates. Magnetite occurs in masses and irregular lenses at intervals through the ore bodies, but it is relatively unimportant. The average content of the ore is: copper 1.25 per cent.; gold 0.04 ounces, and silver 0.3 ounce per ton. Along the outcrop the ore has been leached out in part but has produced no noticeable secondary enrichment at lower levels.

The zone of contact metamorphism and the development of lime-silicates is believed to have been the result of metasomatic replacement of limestone by solutions above the critical temperature carrying ferric iron, alumina and silica and consisting mainly of water gas strongly ionized. Epidote and garnet, etc., were formed, and the magnetite was probably formed contemporaneously with them. When the formation of the above was well advanced the character of the solution changed somewhat and chalcopyrite, pyrite and hematite were deposited in and along the numerous minute fissures and cavities in the lime-silicates. Calcite and quartz were the last to deposit and completely filled the remaining minute spaces. In the absence of any direct evidence, as there are no large bodies of igneous plutonic rock in contact with or adjacent to the zone of contact metamorphism at present, it is suggested that these zones were overlain by more or less irregular and thick sheets of granitic rock, and that these were the cause of the metamorphism of the limestone and the source of the mineral bearing solutions. The circulation would thus be descending and lateral and would account for the ore bodies terminating abruptly at comparatively shallow depths either against jasperoid or crystalline limestone. The age of the deposit is referred to as post-Jurassic or the period immediately following the intrusions of the granodiorite batholith of the Boundary district. The ore bodies suffered from erosion in the early Tertiary and are overlain unconformably by Oligocene sediments.

**Method of Mining.**—The ore bodies are mined along their outcrops by large open quarries or “glory holes” and underground by a system of tunnels and shafts. Stopping by the pillar and room method is used entirely below the level of the “glory holes.” The development work is based on the information gained by extensive prospecting with diamond drills.

#### MICHIGAN MINE MANAGERS REFUSE TO RECOGNIZE WESTERN FEDERATION.

Following a meeting of the mine managers, Saturday, Sept. 20, a reply was delivered to John H. Moffit, federal emissary at Houghton, to offer the good offices of the United States Government in effecting a settlement of the Michigan copper miners' strike. Mr. Moffit made a proposal to the mine managers last Wednesday. The text of his proposal was not made known, but the reply yesterday was to the effect that the mine managers and companies are inflexible in their purposes not to treat in any way with the Western Federation of Miners, not to consider that organization as a party to any proposed arbitration of the present labour trouble.

The text of the reply, signed by every mine manager in the district says:

“Honourable John A. Moffit, special representative U. S. Department of Labour. Dear Sir: The undersigned, being managers of the copper mines of the counties of Houghton and Keweenaw, in the State of Michigan, desire to express to you their most sincere appreciation of your offer of the good offices of the department in bringing about an adjustment of the existing strike, involving part of the mine workers of our companies, submitted to us in yours of Sept. 16.

“The first offer submitted by you begins with the proposition, ‘That all of the issues involved in the strike shall be settled by arbitration.’

“The real issue involved in the strike is recognition of the Western Federation of Miners as an organiza-



tion entitled to represent through its officials, the mine workers of the district. This has been publicly announced in speeches and in print by the officials of that organization themselves.

"In like offers of mediation made by the Governor of Michigan personally and through personal representatives appointed by him and acting by his authority, we have heretofore definitely declined to treat with the Western Federation of Miners, either directly or indirectly. This conclusion was arrived at in the first instance because of the past history of the federation in its operations throughout the mining districts of the west; because it was and is our firm conviction that the domination of the employees of the mining companies by that federation would not be to the best interests of our employees themselves; and because the federation was entirely unjustified in attempting to speak as the representatives of our employees for the reason that, according to our best information at the time of the inception of the strike, confirmed by all the information which we have obtained since then, their number did not exceed twenty-five per cent. of the employees of the companies (and in many instances a much smaller percentage) were members of the organization and the large majority of our employees were not willing to be dominated by that organization.

"It should also be recognized that because of the attitude of the officers, leaders and organizers of the Western Federation towards the mining companies and their officials and employees, there could not be a resumption of mutual relations and good will and confidence between employers and employees so long as the employers or any part of them are under the influence or domination of the federation. This should be apparent from the nature of the teachings and utterances of the officers, leaders and organizers of the Federation, as set forth in their published speeches and in their official publications.

"**Large Force at Work.**—All of the larger mines of the district have resumed operations with a large portion of the normal forces of their employees, who are entirely satisfied with conditions. In the case of the Calumet and Hecla, after deducting from the normal force those who are known to have removed from the district by reason of strike conditions or for other reasons, from 80 to 85 per cent. of its employees have returned to work and are now engaged in their several occupations. Similar conditions (with varying percentages) exist at the other larger mines of the district which are now in operation.

"Under these circumstances it is our judgment that we would be remiss in our duties towards the great majority of our employees if we should take any action which in any manner would recognize the Western Federation of Miners as the representatives of the mine workers or as dictating or dominating the actions of our employees, even to the extent of an arbitration as to their right to recognition or as to any other difference, real or fancied, which the federation may urge.

"For these reasons, among many others which might be mentioned, we must adhere to our position that we will in no manner deal with the Western Federation of Miners, either directly, through mediation, arbitration or in any other way.

"**The Only Demand was for a Conference.**—The only issue involved at the time the strike was called by the Western Federation of Miners was our refusal to enter into any conference with a committee of representatives of the federation. The only demand that was made was for such a conference, with a statement that

if we were not willing to meet the officials of the Western Federation of Miners it would be taken as proof that the situation could not be settled peaceably.

"**No Grievances Submitted.**—We have had no other grievances submitted to us in any way, either officially or otherwise. This was not a grievance of our employees, but was a grievance of the federation represented by their officials and organizers from other states, who are entirely unjustified in making any claims to a right to represent the employees of the mines of this district.

"Both of your propositions as submitted by you, involve arbitration or discussion by or with committees, a part of them to be chosen 'By the mine workers now on strike.'

"The mine workers now on strike are those only who are members of the Western Federation of Miners. As above stated, they constitute but a small part of our employees. No method of choosing or appointing arbitrators or committees by 'the mine workers now on strike' could be devised in which such choice will not be the direct choice of the Western Federation of Miners, as such, and with that federation we will have no dealings of any kind.

"It cannot be too definitely understood with relation to the present situation that the mining companies cannot and will not in any manner recognize or deal with the Western Federation of Miners. They do not represent our employees, but, on the contrary, under present conditions, they stand between the employers and the employees as the only bar to a satisfactory and amicable adjustment of all existing differences.

"Because of this situation and without any lack of full appreciation of the efforts of yourself and the Department of Labour, we feel that it is necessary to say to you that we cannot accept any plan of mediation or arbitration between the mine employers and 'The mine workers on strike,' which is but another designation for the Western Federation of Miners.

"But we suggest to you, in view of the situation as above stated, and as it exists in the counties of Houghton and Keweenaw at this date, that if you should use your personal influence and the influence of the Department of Labour to induce the officials, organizers and leaders of the Western Federation of Miners to come to a full realization of the futility of any attempt to secure recognition in this district or retain a standing therein which would permit them to remain as a factor of influence among our employees or any portion thereof, and to withdraw themselves and their influence from the present situation and from the district, there would be nothing in the way of an early adjustment of any differences or grievances, if they exist, between the employers and their employees. In this way and in this way only can the present deplorable condition be remedied or adjusted.

"Since the inception of the strike it has been stated in published speeches of the officials of the Western Federation of Miners that they demanded an eight-hour day, abolition of the one-man drill, and a minimum wage of three dollars per day for all employees. No grievances of that kind were stated or submitted to the companies in any form.

"**As to the working hours,** it may be stated to you, as was stated to Judge Murphy, who was here on a similar mission in behalf of the Governor of Michigan, that for some time prior to the inception of the strike there had been under consideration by the several companies the institution of an eight-hour day for underground employees, so far as that rule could be



made practicable. The present strike situation does not alter the intention of the companies in that regard. It is known to the companies that a large number of their underground employees do not want the eight-hour day, and are opposed to it, but we will state to you that if the eight-hour day for our underground employees is desired by them, or a sufficient majority of them, it will continue to be given favourable consideration.

**"The One-man Drill Question** is purely and simply a manufactured grievance. We know it to be the fact that those who operate these drills do not want them abolished. The continuation of mining industry in this district requires the use and application of every modern appliance for the reduction of cost. It is made necessary by the low copper contents of the rock and the expense of deep mining, as compared with higher production of other competing districts. The one-man drill is an economic necessity which has come to stay. The conditions of its use have been prescribed by the Legislature, and the question of its abolition is one which could not be submitted to arbitrators.

**"As to the Minimum Wage Question,** the conditions at the different mines vary to such a large extent that no scale can be adopted applicable to all the different conditions. This has been impossible in the past and will continue impossible in the future, and would be as unfair to the labourers themselves as to the companies.

"We greatly regret that the situation is such as to render the plan of arbitration or of conference with a committee or with representatives of the Western Federation of Miners an impossibility to us. With the elimination of that organization, arbitration or mediation would become wholly unnecessary, as we are convinced that there would be no difficulty in adjusting satisfactorily all questions that might arise between our employees and the respective companies by whom they are employed. Dated at Houghton, Michigan, Sept. 20, 1913."—Mining Gazette.

#### PHILADELPHIA MEETING OF MINING CONGRESS.

Manufacturers of mining machinery, rescue and first-aid apparatus and safety appliances, are to be given an opportunity to display their wares before the mining men of the country at a great industrial exposition, to be held under the auspices of the American Mining Congress, in Philadelphia, Pa., the week of October 20th.

This exposition, the first of its kind in America, will be held in conjunction with the annual convention of Mining Congress, and the double attraction is expected to attract thousands of interested men. There is a tentative plan to have a gold mining camp in full operation, with a mill crushing the ore. Horticultural Hall, the biggest place of its kind in Philadelphia, situated in the heart of the city, has been engaged for the occasion.

While the plans are still in embryo, a number of the leading manufacturers have already been approached and have shown sufficient enthusiasm to lead to the belief that all of the space will be taken in a short time and that there may not be enough to take care of all who apply.

A number of the big coal companies that have developed the "Safety First" movement at their mines, are now negotiating for large amounts of space, to show the mining men and the public what they are doing in behalf of their men. These companies will

send rescue and first-aid crews, and there is talk of exhibition drills between the various crews. The United States Bureau of Mines will be represented by one of its safety cars and a picked crew of helmet men. The State of Illinois and a number of the big anthracite companies, may send rescue cars for exhibition purposes.

"This exposition will not only be of untold value to the mining men of the country," said James F. Callbreath, Secretary of the Congress, "but it will also show the magnitude of the industry to the entire country. We know that it is a gigantic industry, second only to agriculture, employing directly more than a million and a half men, and with a yearly output of two billion dollars, but the public has never given it the recognition it deserves. The convention which will be held at the same time as the exposition will be the most important body of mining men ever gathered together. The industry has been making great strides in the last few years, and a number of problems have arisen that are to be discussed straight from the shoulder."

The Convention is to be the first get-together affair of all the mining interests of the country, and an attempt is to be made to show the need of a stronger national organization, that will represent all phases of the industry and lead to the placing of the industry in the important place it belongs. Perhaps the leading topic of the Convention will be the new system of mine taxation recently put in operation in some States and being discussed in others at the present time. The West can unite with the East upon this proposition, for Colorado and Arizona have new taxation laws for the mines, and so have Pennsylvania and Michigan. Colorado mining men are claiming that they are doubly taxed, and that their industry will suffer. Arizona is making similar claims, and it is understood that Michigan is very much dissatisfied. An increase in the price of Pennsylvania coal is threatened by reason of the new tax law in that State.

Altogether, the exposition and the convention promise to bring together a great gathering of mining men, and much good is expected from its deliberations.

#### RAMBLER-CARIBOO.

A meeting of directors of the Rambler-Cariboo Mines, Limited, was held in Spokane, Washington, U. S.A., on September 10, when reports that had quite lately come from the company's mine manager were submitted. The president of the company, Mr. A. F. McLaine, has been quoted as authority for the statement that the company's net profits are now more than \$10,000 a month, with prospects of still better results shortly. The company's silver-lead mine and concentrating mill are in the Sloean district, British Columbia. The mine has been opened to a depth of about 1,425 feet below the apex of the vein, and ore is being stoped on four or five levels down to and including that depth.

#### ALBERTA COAL.

The first session of the third Alberta Legislature was opened at Edmonton, Alberta, on September 16. It is noteworthy that in the "speech from the throne," as printed in the newspapers, there was not a single word of reference to the mining industry of the province. Yet, according to statistics supplied to the Canada Department of Mines by Mr. John T. Stirling, Provincial Inspector of Mines, Alberta in 1912 produced 3,446,349 tons of coal, valued at \$8,471,126.



## BOOK REVIEWS

**Introduction to the Study of Igneous Rocks**—By George Irving Finlay, Ph.D., Assistant Professor of Geology, New York University—McGraw-Hill Book Co., N.Y.—Price, \$2.00, net.

The author aims in this book to select from the large body of observed facts bearing on the identification of rocks with the microscope those which it is desirable for the beginner to get command of in the course of his early studies. The work is intended as an introduction to the exhaustive treatises on the subject.

The title is somewhat misleading. The book contains no description of the mode of occurrence of igneous rocks, no discussion of their origin. Such phenomena as differentiation are not even mentioned. There is no discussion of alterations. The book might better have been designated as an introduction to the study of the microscopical characters of rocks and a quantitative classification.

The determination of the igneous rocks in hand specimens—the means actually in use by nearly all those who study rocks in the field, is dismissed in a rather cursory manner. A careful examination with the hand lens should be recommended as the most readily available means of determination of rocks, and the student should study large collections of properly labelled specimens in order to be able to make comparisons before resorting to the use of the microscope. That the author is overanxious to use thin sections for determinations is indicated by such statements in regard to lavas as this: "If we see laucite we conclude safely that the rock should be put with the phonolites, but otherwise we have no good reason for such a determination."

The chapter on movement of light in crystals is similar to that in several other texts already available.

Chapter IV., The identification of the essential minerals of igneous rocks; Chapter V., Description of the Accessory Minerals; and Chapter VI., The Igneous Rock Types, form the most interesting and original portion of the text. The distinctive characters of the rock minerals are well pointed out and helpful. Brief statements of the composition of the common rocks are given.

The last half of the book contains little material not readily available in other works, being largely a synopsis of chapters from Idding's *Igneous Rocks* and the *Quantitative System of Classification* advanced by Messrs. Cross, Iddings, Pirsson and Washington, together with methods of calculating the chemical analyses of rocks.—R. E. H.

**General Metallurgy**—By H. O. Hofman, E.M. Met. E., Ph.D., Professor of Metallurgy in the Massachusetts Institute of Technology—McGraw-Hill Book Co.—Price, \$6.00, net.

In this work the author has endeavoured to give a general introduction to the study of metallurgy. It is not a treatise on the metallurgy of copper or of iron or of lead; but a discussion of the properties of metals, alloys, metallic compounds, fuels and refractory materials, of metallurgical processes and apparatus of mechanical metallurgical operations and of metallurgical products. It has a place by itself in the literature.

There is no other modern text which covers the same field.

The subject is treated from the standpoint of the metallurgist who has a leaning towards physical chemistry. The theory of solutions developed by physical chemists is applied to the study of the metals and alloys. Elementary statements of the theories are given; but the text is not greatly overloaded with information that the student may already have gathered in his study of general chemistry and physics.

Following the shorter introductory chapters on properties of metals, alloys, metallic compounds and ores is a long chapter—236 pages—on fuels. This contains a very instructive discussion of the properties of fuels and methods of determining them. The numerous types of coals and their uses, the methods of coking and of saving the by-products, liquid fuels, gases, gas production and apparatus for burning the fuels are among the numerous subjects dealt with.

Chapter VII. is devoted to refractory materials. Properties and uses of fire-clay, fire-brick, silica, barite, lime, etc., are described.

Chapters VIII., IX. and X. are devoted to pyrometallurgical, hydrometallurgical and electrometallurgical processes and apparatus. The treatment of these subjects is excellent, as an endeavour is made to elucidate principles rather than to describe special methods.

Chapter XI.—350 pages—is devoted to mechanical metallurgical operations. In view of the existence of Prof. Richards' excellent text book on this subject, there seems to be unnecessary duplication here, though recognition of the fact that mechanical methods are of constantly increasing importance to the metallurgist is obtained by treating ore dressing in the same text rather than in a separate one.

Two short chapters are devoted to metallurgical products and economic considerations.

The volume will prove a very useful one and will doubtless be adopted by many teachers who have been looking for a work which deals with metallurgical principles.—R. E. H.

### HEDLEY GOLD.

The Hedley Gold Mining Company, operating the Nickel Plate group of mines, Similkameen district, British Columbia, recently declared its customary quarterly dividend and bonus, together 5 per cent., on the issued capital of the company, which is \$1,200,000. This distribution of \$60,000 makes the total of profits divided in 1913 \$180,000. Last year the final distribution of the year was at the rate of 15 per cent., making a total of 30 per cent. for 1912; for December, 1911, it was 10 per cent., and the total for that year was 25 per cent. The 1913 profits are understood to have thus far been higher than in either 1912 or 1911.

### GOLD REPORTED NEAR TELKWA, B.C.

Western papers report a new gold strike at Sibola Creek, a tributary of the Tahtsa River, 100 miles south-east of Telkwa, B.C. No official news is yet available. Telkwa is on the line of the G.T.P., and a rush of men engaged in construction work is regarded as not unlikely.



## PERSONAL AND GENERAL

Mr. H. C. Meek, general superintendent of the Dome mine, has returned to Porcupine after an absence of several months.

Mr. E. L. Bruce, who had been assisting Dr. C. W. Drysdale in local geological investigation, left Rossland, B.C., on Sept. 6 for New York City, to resume duty as an instructor in mineralogy at Columbia University.

Mr. Howard W. Du Bois, of Du Bois, Mixer & Armas, Philadelphia, Pa., was at Barkerville, Cariboo district, B.C., at the end of August.

Mr. John L. Retallack has been visiting Similkameen and Tulameen districts, British Columbia.

Mr. C. J. Seymour Baker has returned from London, England, to the Cariboo district of British Columbia, to continue experiments in extracting gold from black sand, on which problem he has been working for several years.

Mr. George L. Fraser has retired from the management of the Columbia Coal and Coke Company, which for several years has been developing a coal property near the lower Tulameen River, British Columbia.

Mr. Desaix B. Meyers, of Los Angeles, California, has been examining the Emerald lead mine, in the vicinity of Salmo, Nelson mining division, B.C.

Mr. Chas. H. Clapp, who for five or six years has done geological work on Vancouver Island, British Columbia, for the Geological Survey of Canada, has gone to Arizona to commence his new duties as Professor of Geology at the University of Arizona.

Mr. Lionel Hill, assistant to the manager for the Le Roi No. 2, Ltd., has returned to Rossland, B.C., from a visit to England.

Mr. Frederick K. Brunton, assistant superintendent at the British Columbia Copper Company's smelting works, has returned to Greenwood, Boundary district, B.C., from Butte, Montana, where he attended the meeting of the American Institute of Mining Engineers.

Mr. Donald G. Forbes, who has been investigating mining conditions in Portland Canal, Queen Charlotte Islands, and other coast districts for the British Columbia Department of Mines, is now giving attention to Valdes Island, which is one of a number of islands lying between Vancouver Island and the mainland of British Columbia.

Mr. E. R. Davidson, of Spokane, Washington, manager for the Eagle Lode Mining Company, recently let a contract for driving about 1,000 feet of tunnel on the company's Eureka group, in Ainsworth mining division, B.C.

H. W. Johns-Manville Co. has opened a new branch at Galveston, Texas. This concern owns asbestos mines at Danville, Quebec.

Prof. Francis A. Thomson, head of the mining engineering department of the State College of Washington, Pullman, Washington, last month made a long trip to the head waters of Crawford Creek, a stream emptying into Kootenay Lake, British Columbia, to examine some copper claims.

Mr. Hamlin B. Hatch has returned to South Porcupine after spending five months exploring and prospecting in the district of Patricia, Northern Ontario.

Mr. W. J. Watson, manager for the Tye Copper Company, has returned to Ladysmith, Vancouver Island, B.C., from several months' travel in Europe and elsewhere.

Mr. Jas. Ross, president of the Dominion Coal Company, died on September 20, after an illness of two weeks.

Mr. Robt. B. Stewart has returned to Toronto from Alberta.

Dr. Waldemar Lindgren's work on Mineral Deposits is now ready.

Mr. Peter MacLaren, formerly manager of the Scottish Ontario mine, Porcupine, has returned to Tisdale Township to take charge of the property of the Success Gold Mining Company.

Mr. C. W. Wright, manager of the mining interests of Lord Brassey in Italy, who was recently in Western Canada mining districts with the Geological excursion, has returned to Italy.

Mr. Reginald E. Hore has returned from a visit to the Michigan copper mining district.

Dr. Willet G. Miller was given the honorary degree of LL.D. at a special convocation of the University of Toronto, August 14. Friends of Dr. Miller are arranging to present him with an oil portrait of himself as a mark of esteem from the mining fraternity.

The American Mining Congress meets in Philadelphia October 20 to 24.

### JAPANESE COAL BOGEY.

On September 6 "Coal Age," New York, printed as an item of news the following: "Vancouver, B.C.—Public indignation over the forced importation of Japanese coal, as the result of the refusal of the operators to arbitrate the strikes in mines near here, is liable to effect, it is said, the opening of Government mines in Alaska. The mine operators declare that they will import Japanese coal until the strikers return to work, and the owners are being bitterly denounced as responsible for this situation." Occasionally "Coal Age" is unfortunate in its selection of news items relating to British Columbia. Under the circumstances that there are not at any British Columbia port facilities for unloading coal from any sea-going vessel, nor accessible bunkers to store it in if it were unloaded, the alleged "public indignation" is somewhat superfluous. It is probable the freight rate on coal from Rocky Mountain coal fields in Canada would be less than the cost of unloading and storing Japanese coal, so the statement that mine operators threaten to import Japanese coal is only one of the wild allegations of agitators. The Western Fuel Company has arranged to get Japanese and Australian coal shipped to San Francisco to supply its customers there, but that is "a horse of another colour." In this connection it may be mentioned that the Canadian Collieries (Dunsmuir) Limited, which ever since the strike was called last September, has been working its Cumberland mines with non-union men, during the last few days of August and on toward the middle of September had got its output of coal from that colliery up to an average of fully 2,000 long tons a day. On September 8 2,290 tons was produced, and on September 10 2,287 tons, while the daily average for six working days to September 10, inclusive, was 2,014 tons. The general average when conditions were normal, before the strike, was only about 2,100 tons. Then non-union men have gone back to work in the same company's mines at Extension, where production is being resumed, although the electric locomotives having been destroyed by the strikers, the output will necessarily be comparatively small until power haulage facilities shall be restored. It is understood that the Pacific Coast Coal Mines Company intends to resume coal mining without delay at its South Wellington colliery. The Japanese coal bogey, therefore, will soon pass out of the limelight.—E. J., Victoria, B.C.



## SPECIAL CORRESPONDENCE

### COBALT, GOWGANDA, ELK LAKE AND SOUTH LORRAIN

**Draining Kerr Lake.**—Already the draining of Kerr Lake has revealed veins of ore which appear from their surface indications to be likely to reimburse the Crown Reserve Mining Company and the Kerr Lake Mining Company for their trouble. The pumps have lowered the lake more quickly than was anticipated.

Six new veins, which the underground plans do not show below, have been picked up. All these veins show some native silver. The largest of the new veins was found on a point of rock about 150 feet straight north of the old No. 1 shaft. The vein has been traced for 50 feet and runs from two to four inches of two thousand ounce ore. This strike is almost due east and west, and is supposed to be one of the Fleming series. Another series of small veins, three in number, were found just west of the pipe line. The largest of these, nearest the shore, is two inches, and can be traced for several hundred feet in places, showing as a mere crack in the rock. Fifteen feet south is another vein, quite narrow, but traced for some distance, while eight feet further is the third of the series. These veins are immediately north of No. 9 shaft. Further to the west are two other veins, running from mere cracks to two inches in width. Plans will immediately be made to cross-cut these veins from levels that are already being worked under the lake. Until these new ore bodies are more carefully surveyed, it cannot be said with certainty that they are not being worked below, but with the data at present available it does not appear probable. All these leads have excellent possibilities.

It has been found necessary already to move the scow upon which the pumps are placed further into the lake, as the waters are receding much more rapidly than it was at first thought would be the case. The water level has been already lowered sixteen feet, and, as a result, the bay at the Crown Reserve end of the sheet of water is bare. Now one pump has been laid off in order that hydraulicking operations in sluicing off the mud at the bottom may be commenced. The Crown Reserve will sluice off the thick covering of mud which overlays the conglomerate formation, but will not trouble to lay bare the diabase for some time.

**Beaver.**—The quarterly report of the Beaver Consolidated mine shows that the net balance on Aug. 31 was \$127,910. A vein, which has been worked with advantage on the 450 foot level, has recently been cut at the 500 foot level, and shows there four or five inches of high grade ore. On the 530 foot level, 52 feet from the No. 3 vein, a new vein was cut two inches wide, of 1,900 ounce ore, and on a branch of the same level is also yielding good ore. On the 460 foot level there is a shoot of ore on the main vein for 400 feet in the drift, and it is holding good in both faces. Other developments are satisfactory. But the main development for the Beaver Company is at the Beaver Auxiliary at Elk Lake, the property they took up under option last year. In the south drift on the vein some remarkably high grade ore is now showing. When the vein was first cut 60 feet east from the new shaft the values were not at all promising, running only a few hundred ounces. But now a rich ore shoot is being worked in the south face, the values running five or six thousand ounces over the width of two and a half to three inches. There is no pay ore in the north face yet. Another interesting vein was cut; but it has not

been drifted upon yet. There are still three payments of \$5,000 to be made on the property.

**The Lumsden Mining Company,** South Coleman, announces the interesting fact that at the 250 foot level the vein they were drifting upon in the Keewatin also holds good across the contact in the diabase. There have been some very rich but quite short shoots of ore on this vein, but the ore in the diabase runs higher than any previously encountered.

**Bullion Shipments.**—An announced rise of \$2.50 per hundred pounds express on silver bullion shipped to London has induced the Nipissing to consign their shipments to New York. The steamship companies state that they have been getting little or nothing out of the freight and intend to raise the price of oversea shipment at the end of the month. If no compromise is arrived at, nearly all the bullion will go to New York, as the slightly better rate allowed by the London brokers will not counterbalance the increase in the express rate. The Nipissing at first did ship all their bullion to New York, as did the Buffalo mine, but they afterwards found it to their advantage to make London their market.

**South Lorrain.**—While the shutting down of the Wettlaufer in a month or six weeks deprives South Lorrain of its only consistent shipper, the good luck experienced at the old Keeley and the Curry has caused a little revival of interest in that outlying silver section. In the Wettlaufer mine the fifth and lower levels are already flooded, and in a month's time the water will be allowed to rise to the 200 foot. Before the winter actually sets in the mine will be closed down tight. While recent reports have been quite pessimistic as to this property, there is a feeling among mining engineers acquainted with the property that the possibilities of the mine have not yet been exhausted.

On the other hand, forty feet of high grade has been opened up on the new strike at the Keeley mine, now being worked by the Associated Gold Mines of Western Australia, of which Dr. Bell is the representative in Canada. This is their first entry into the Northern Ontario field.

The Curry claim, which is being worked by the Pittsburg syndicate, is mining good ore on two levels. Other properties working are the Maidens and the Proudfoot fraction, upon which the late Dr. Beattie Nesbitt once had an option. This latter property is being diamond drilled. The Bellellen has just closed down.

**McKinley-Darragh-Savage.**—The production from the McKinley-Darragh-Savage for the month of August amounted to 212,098 ounces, which is a slight decrease in comparison with the month of July. But the quarter ending in August has been so productive that the McKinley could easily have maintained the old rate of dividend. However, the management does not count on a recurrence of the good fortune in the striking of unexpected high grade ore shoots.

### PORCUPINE, SWASTIKA AND KIRKLAND LAKE

**Hollinger Gold Mines, Ltd.,** is adding twenty more stamps to the mill, making sixty in all. Ground has already been broken. It is understood that the addition is in part intended to accommodate ore from the Dixon property, which the Hollinger Gold Mines is now working.



The gross output for the four weeks ending August 12 amounted to \$141,732, and the surplus to \$625,202, after paying all dividends, which have just passed the million dollar mark. The approximate average value of all ore hoisted was \$18.37 per ton. Based upon the total tonnage of ore and waste hoisted the cost per ton was \$2,398.

The principal development underground was the cutting of the main vein at the 425 foot level. It there shows a width of ten feet and a value of \$18 a ton. Mr. P. A. Robbins, general manager, reports: "We now have a total of 16 headings advancing in ore, four upon the 100 foot level, seven upon the 200 foot level, 3 upon the 300 foot level, and two upon the 425 foot level. Besides this we are doing a considerable amount of cross-cutting, and during the week have picked up No. 5 vein at the 100 foot level; No. 8 vein on the 200 foot level, and No. 34 vein on the 300 foot level. Thirty-seven drills are working double shift."

**Hughes Porcupine.**—A change is announced in the management of the Hughes Porcupine property in Whitney township. Mr. York has left that company to take charge of the Mine d'Or Huronia in Gauthier township, near Larder Lake. This company has a plant working and a small ten stamp mill on the ground. It will be set up and be operating before the snow flies.

**Bureau of Mines Survey.**—Mr. A. G. Burrows, of the Ontario Geological Survey, and his assistant, Mr. Percy Hopkins, are again in the field studying the country in the vicinity of Sesikinik Lake. This is an extension of the Kirkland Lake field, of which Mr. Burrows made an exhaustive study this summer. The map which is to be issued by the department of the Kirkland Lake area is eagerly awaited.

penses, and so the premier mine of the Swastika section is closed down. The Lucky Cross mine and mill are also both silent. Swastika is now devoid of all activity. Kirkland Lake is, however, quite active.

**Teck-Hughes.**—The Teck-Hughes is doing extensive work at Kirkland Lake, both in sinking and drifting. The No. 1 shaft is now down 226 feet, the veing being in porphyry. From the No. 2 vein, at the 100 foot level, a vein has been cut showing some free gold.

**Wright-Hargraves.**—On the Wright-Hargraves, which is under option to Mr. Cartwright and his associates, ore is being sacked. Sixty bags have been taken off and will be shipped when a full carload is obtained. Most of this has been obtained from the No. 1 vein, which is 350 feet east of the old discovery. An incline shaft is now being sunk and is down about forty feet and a steam plant is in operation.

**Power for the Kirkland Lake Mines.**—Power is one of the prime needs of the Kirkland Lake camp. Tentative offers have been made to the Gold Fields, Limited, for the purchase of their power at Raven Falls, and there is a scheme afoot to increase the capacity of the plant owned by Mr. Pete Farah at Charlton and to run a transmission line from that point.

**Kert.**—The Hon. David Mitford, of London, has taken up the other half interest in the Kert claim in Teck township. Extensive trenching and stripping has been carried out on the property.

**Tough-Oakes.**—It is probable that for the present the Foster-Tough-Oakes Company will be content to mine with their present mill equipment. Good results are being obtained in the drift on the vein at the 100 foot level. The high grade streak is 25 inches wide and ore which will be hand picked for shipment to the



General View of Plant, Swastika Mine, Ont.

The Swastika Mine has closed down. After doing pioneer work in this particular section of the country for years, the Swastika blossomed out as a full grown mine about two years ago. Mr. Frank Armstrong took an option upon a considerable block of the stock and spent considerable money in developing the mine. There was a good ore shoot on the 200 foot level and above, but below that level exploration has failed to disclose pay ore. The ten stamp mill has not been in operation more than a year. The grade of ore being put through, together with the low extraction possible with simple amalgamation, did not pay current ex-

smelter is being broken for a width of two feet. Ore is already being bagged for the next carload shipment. The ten stamp mill is only making an extraction of about 57 per cent. of the ore from the dump; but it is paying current expenses at the mine.

## BRITISH COLUMBIA CARIBOO.

**Barkerville.**—Drilling, to test the gold-bearing gravel, has been commenced at the Meadows, below the old Kurtz and Lane shaft, on Williams Creek, Cariboo, by a New York syndicate, the object being to ascertain



the suitability or otherwise of the ground for gold-dredging. A Keystone drill, steam-driven, is being used in making the tests.

**Quesnel.**—Announcement has been received of the intention of the Provincial Labour Commission to hold sittings in Cariboo district during September. The dates are: Tete Jaune Cache, 9th; Fort George, 12th, and between 13th and 25th Barkerville, Quesnel, 150-Mile House, Clinton, Lillooet and Ashcroft.

Mr. A. Stewart, resident engineer at Quesnel for the Public Works Department, has arranged to make a tour of inspection of the route of the proposed wagon road between Barkerville and Fraser River—from Bear Lake through to Fraser River, via Goat River.

**EAST KOOTENAY.**

**Fernie.**—On August 17 a train consisting of 101 cars of coal and hauled by one locomotive (a Mallet compound), left the Great Northern Railway Company's yards at Fernie, Crow's Nest Pass.

On August 19 the members of the International Geological Congress Excursion C2 were entertained at a smoker at Fernie. In the course of a short address made by Mr. W. R. Wilson, general manager for the Crow's Nest Pass Coal Company, by request of the visitors, that gentleman said that in no mining region where he had been was the science of geology more necessary to the successful prosecution of coal mining than right there in the Crow's Nest Pass, where conditions of the most extraordinary character made the mining of coal from the earth a business on which must be brought to bear every aid that science, skill and experience could afford.

**SLOCAN.**

**Silverton.**—Shipments of silver-lead ore and concentrate to Trail by the Standard Silver-Lead Mining Company during August totalled about 1,100 tons. This included some 200 tons of crude ore and 900 tons of concentrate. The zinc concentrate made at the company's mill has been stored latterly; of this product from 500 to 600 tons is made monthly, with the mill running only one shift. This is in addition to the silver-lead concentrate, which is shipped regularly, as far as transportation arrangements conveniently admit. The output of ore from the Standard mine is chiefly from stopes between levels Nos. 6 and 5 and Nos. 5 and 4. The ore body being mined in the latter gives from 7 to 8 feet of clean ore, beside much mill feed ore. The lower stopes, between 6 and 5, also yield considerable ore. No. 7 adit, being driven at a vertical depth of about 300 feet below No. 6, is now in more than 1,400 feet, with 400 feet more to be driven before the face will be under the portal of No. 6. One shoot of ore has been cut by No. 7—lead ore with some zinc—but this working will have to be advanced to about 3,800 feet from the portal before it will be vertically under the ore body being mined between 6 and 5. Preparations are being made to extend No. 8, which is 750 feet vertically below No. 6; the old adit is being retimbered before resuming driving.

**TRAIL CREEK DIVISION.**

**Trail.**—Ore receipts at the Consolidated Mining and Smelting Sompany's works at Trail during four weeks ended August 28 were as under.

From.	Tons.
East Kootenay—	
St. Eugene .....	145
Sullivan .....	2,607
	<hr/>
	2,752

Ainsworth—	
Bluebell .....	463
Maestro .....	157
No. 1 .....	233
Retallack & Co. ....	118
Silver Hoard .....	96
Utica .....	63
	<hr/>
	1,130

Slocan—	
Eastmont .....	29
Idaho-Alamo .....	87
Noble Five .....	22
Rambler-Cariboo .....	262
Richmond-Eureka .....	31
Slocan Star .....	79
Standard .....	989
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	1,499

Nelson—	
Emerald .....	142
Silver King .....	369
Yankee Girl .....	480
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	991

Rossland—	
Centre Star .....	11,539
Giant-California .....	31
Inland Empire .....	25
Josie (Le Roi No. 2) .....	1,706
Le Roi .....	4,042
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	17,343

Lardeau—	
Ajax .....	88
Ferguson .....	22
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	110

Boundary—	
No. 7 .....	59
District not specified—	
Bonanza .....	94
Golden Zone .....	22
Pittsburg .....	14
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	130

Republic (U.S.A.)—	
Belcher .....	355
Ben Hur .....	1,206
Knob Hill .....	150
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	1,711
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Total .....	25,725

**BOUNDARY.**

**Grand Forks.**—Figures published locally show the Granby Consolidated Company's production of blister copper in 1913, to the end of August, to have been 14,492,997 pounds from 829,979 tons of ore, of which 820,240 tons was from the company's own mines at Phoenix and 8,830 tons custom ore. Largest monthly quantities were those of March, when the quantity of blister copper produced was shown as 2,020,000 pounds, and of ore treated 108,871 tons—107,931 tons from Granby Company's mines and 940 tons of custom ore. August figures are: Blister copper produced, 1,827,300, from 101,722 tons of ore—99,641 tons from Granby Company's mines and 2,081 tons of custom ore.

Shipment of ore from the Union group of mineral claims in Franklin camp, north fork of Kettle River,



has been commenced. It is stated that more than 100 tons of ore of shipping grade is on the dump and being sacked for hauling to the present terminus of the Kettle Valley Railway, about 18 miles from Grand Forks. The ore has to be hauled in wagons 28 miles to the railway, whence it is taken to the Granby Company's smelting works. Cost of hauling to railway is given as \$15 a ton, and railway freight and treatment charges as \$6. Value is in silver and gold. No ore had been sent out in bulk previously, from Franklin camp claims.

#### YALE.

**Hope.**—The size of the ore body lately opened in the Aufeas mine, on Wardle Creek, has not yet been determined. So far a width of 26 feet of ore has been proved, but no wall has yet been found. The ore is arsenopyrite, with a little chalcopyrite, and gold is the principal valuable metal it contains.

The old Murphy property, situated on the north side of Fraser River, about one mile above Hope Railway station, has been bonded by A. Beamer and A. E. Raab, of Hope. The original mineral claim was located and development was done on it in the early sixties; later several other claims were located, and now the whole group is under bond. An 800 foot adit, driven long ago, has been cleaned out, and is being extended to connect with an old shaft. The ore is gold-copper of good grade.

#### COAST DISTRICT.

**Vancouver.**—A news item published in the Vancouver Daily Province read as follows: "Compromise has been successful in ending the strike at Britannia mines, Howe Sound, which has been in progress since February last, and which affected some 600 men. As a result of negotiations, which have extended over some weeks, notice is given that at a meeting of the local members of Britannia Miners' Union, held on August 27, the strike has been declared off. Notice of this action has been sent to all parties interested."

Shortly afterward the vice-president and general manager of the Britannia Mining and Smelting Company caused the following to be published in Vancouver: "There has appeared in the various papers published in Vancouver a notice that the strike at Britannia mines had been declared off, a compromise having been arranged with this company. So far as this company is concerned, we desire to state that no compromise of the strike has been arranged by nor on behalf of the company, and so far as the company is concerned the conditions are the same as they were in February of this year."

It may be added that in February less than one-half of the 700 men then employed by the company (that being the full number then on the company's pay roll and including Japanese and Chinese labourers employed in railway grading and other surface work, and some 50 white carpenters engaged in erection of buildings), went out on strike at the behest of the local officials of the Western Federation of Miners. Within six weeks the places of miners, shovellers, trammers and other underground men who had struck, were filled, and ever since Easter the company has been turning away men seeking work at its property. Not one of those who struck work has been re-employed, all having been warned when they responded to the call of the Union that it would be useless for them to seek work at the Britannia again, since it would not be given them. The management emphatically denies having made any compromise with or concession to the strikers, nor does it intend to. Its mines are now operated by non-union labour entirely. It is noteworthy that the

output of ore for eight months of 1913, to September 1, was approximately 132,000 tons, that quantity having been 11,300 tons greater than for the corresponding period of 1912. The local Union officials blundered badly in calling a strike, and the Britannia members have had to pay the penalty. They were employed by a company financially strong, with years of work ahead of it; they were being paid at the highest rate of wages obtaining at the copper mines of the province; the food supplied to them was the best obtainable, and the bunkhouse accommodation generally better than at most mines; while in provision for recreation, in hospital accommodation and medical attention, and in other matters, the company had done all that reasonable men could expect of it. The chief result of the attempt of Union officials (who over-rated their power to deal as they pleased with the Britannia Company to coerce the company) has been to bring about the establishment of a strong non-union camp at the largest productive metal mine in the Coast district, and this the men who responded to the strike call now realize.

**Nanaimo.**—The Western Fuel Company and the Pacific Coast Coal Mines Company have not conceded the demands of the officials of the United Mine Workers of America, nor have they yet resumed work. A number of fire bosses and others are keeping things in shape at the Western Fuel Company's mines, but the company's headquarters at San Francisco having made arrangements to get from Australia and Japan all the coal it will require to supply its customers in that city, and having as well chartered two vessels to take coal from Puget Sound, Washington, to San Francisco if needed, there is no immediate need for it to attempt to operate its mines here. It is understood the Pacific Coast Coal Mines Company will shortly endeavour to operate its mines at South Wellington. The Canadian Collieries (Dunsmuir), Limited, is resuming work at its Extension colliery; the output of the mines at its Cumberland colliery has latterly averaged more than 2,000 tons of coal a day, which is within one or two hundred tons of the average when things were normal before the labour trouble arose.

#### PORTLAND CANAL.

**Stewart.**—By the middle of September the low level adit being driven by the Portland Canal Tunnels, Ltd., within four miles of the town of Stewart, at the head of Portland Canal, had reached a distance from its portal of about 2,000 feet. Assuming that what appears to be the main vein of the fissure zone of the Portland Canal Mining Company's group of mineral claims continues to depth, the calculation made before the work of driving the adit was undertaken was that a distance of 2,300 feet would have to be driven to reach the vein, on its dip, at 620 feet below the surface working known as the Richard cut. On August 25 a 5-inch veinlet of quartz was cut by the adit; the quartz contained a fair proportion of pyrite and a very little galena. On August 28 the face of the adit was in a larger vein of white quartz containing pyrite, and crossing the adit diagonally. This vein has since been proved to be 11 feet 6 inches wide and to be fairly well mineralized with pyrrhotite. The manager reports that while he does not expect the ore from this vein to assay more than a dollar or two, the really interesting question is what will be found at the junction of this vein with the main vein to cut which the adit is being driven. The point of junction is calculated to be about 150 feet south of where, assuming projections to be correct, the adit will enter the main vein.



## STATISTICS AND RETURNS

### COBALT ORE SHIPMENTS.

The ore shipments for the week ending Sept. 20 were:

	High.	Low.	Tons.
McKinley-Darragh . . . . .	1	..	28.15
Miscellaneous. . . . .	1	..	45.65
Hudson Bay . . . . .	2	..	61.67
Nipissing. . . . .	..	2	63.26
O'Brien Mine . . . . .	1	..	31.21
Cobalt Lake . . . . .	1	..	31.80
Beaver. . . . .	1	..	31.82
	7	2	193.56

The bullion shipments for the week are:

	Bars.	Ounces.	Value.
Nipissing. . . . .	101	121,815.25	\$72,817
Buffalo. . . . .	65	66,680.00	40,500
Crown Reserve . . . . .	45	48,790.00	29,268
	211	237,285.25	\$142,585

The bullion shipments for the year to Sept. 20 are:

Mine	Ounces.	Value.
Nipissing. . . . .	4,329,276.11	\$2,407,017.42
Penn-Can. . . . .	14,141.60	8,456.90
Buffalo. . . . .	1,191,941.90	742,301.57
Crown Reserve . . . . .	364,056.00	222,877.25
Dom. Red. . . . .	352,183.40	203,277.15
Townsite. . . . .	36,818.40	30,364.04
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 . . . . .	67,817.79	40,873.48
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
Lumsden. . . . .	1,814.40	1,079.00

6,556,403.61 \$3,860,935.51

### MINERAL PRODUCTION OF THE PROVINCE OF QUEBEC DURING 1912

Substances.	No. of Workmen.	Salaries.	Quantities.	Value.	Value in 1911.
Asbestos, tons . . . . .	2,910	\$1,377,444	111,175	\$3,059,084	3,026,306
Asbestic, tons . . . . .	..	..	25,471	23,358	19,802
Copper and sulphur ore, tons . . . . .	205	112,215	62,107	631,963	240,097
Gold, oz. . . . .	..	..	26,526	14,591	11,500
Silver, oz. . . . .	30	14,989	980	19,924	11,800
Bog iron ore, tons . . . . .	..	..	..	..	4,041
Oehre, tons . . . . .	..	..	..	..	2,469
Chromite, tons . . . . .	53	13,374	7,054	32,010	28,174
Mica, lbs. . . . .	109	51,820	499,981	99,463	76,428
Phosphate, tons . . . . .	5	2,000	164	1,640	5,832
Graphite, tons . . . . .	156	45,209	1,210,278	50,680	33,613
Mineral water, gals. . . . .	17	3,345	99,452	39,854	65,648
Titaniferous ores, tons . . . . .	16	3,720	1,127	4,024	5,684
Slate, squares . . . . .	25	..	1,894	8,939	8,248
Cement, bbls. . . . .	1,063	926,064	2,684,002	3,098,350	1,931,183
Magnesite, tons . . . . .	5	800	1,714	9,645	6,416
Marble . . . . .	282	141,832	..	252,041	143,451
Flagstone . . . . .	4	550	..	600	500
Granite . . . . .	637	268,762	..	358,749	308,545
Lime, bush. . . . .	294	130,759	1,705,937	455,570	284,334
Limestone . . . . .	1,547	768,562	..	1,363,555	1,128,402
Bricks, M. . . . .	1,443	483,509	154,546	1,284,232	1,129,480
Tiles, drain and sewer pipe, pottery, etc. . . . .	154	67,750	..	203,100	142,223
Quartz . . . . .	..	..	..	..	1,125
Kaolin . . . . .	67	15,256	40	520	..
Feldspar . . . . .	5	2,000	110	2,200	600
Peat . . . . .	10	..	500	2,000	700
Sand . . . . .	99	20,222	..	170,600	62,000
Glass sand . . . . .	..	..	..	..	1,179
Phonolith, tons . . . . .	4	228	170	418	..
<b>Totals . . . . .</b>	<b>9,140</b>	<b>\$4,450,410</b>		<b>\$11,187,110</b>	<b>\$8,679,786</b>



**STOCK MARKETS.**

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.) Sept. 24, 1913.

	Bid.	Asked.
Alaska Gold	21.50	22.00
British Copper	1.75	2.00
Braden Copper	7.62½	7.75
California Oil	191.00	193.00
Chino Copper	41.50	41.75
Giroux Copper	1.25	1.75
Green Can.	6.75	7.00
Miami Copper	22.75	23.25
Nevada Copper	16.75	17.00
Ohio Copper	.50	.62½
Ray Cons. Copper	19.50	19.75
Standard Oil of N. Y.	152.00	154.00
Standard Oil of N. J.	371.00	373.00
Standard Oil (old)	1135.00	.....
Standard Oil (subs.)	735.00	.....
Tonopah Mining	4.75	4.87½
Tonopah Belmont	7.06¼	7.12½
Tonopah Merger	.68	.70
Inspiration Copper	16.00	16.50
Goldfield Cons.	1.87½	2.00
Yukon Gold	2.25	2.37½

**Cobalt Stocks.**

Bailey	.05½	.06
Beaver	.34	.34½
Buffalo	2.10	2.40
Canadian	.19	.22
Chambers Ferland	.13	.14
City of Cobalt	.25	.40
Cobalt Lake	.40	.45
Coniagas	7.20	7.40
Crown Reserve	1.62	1.65
Foster	.02	.04
Gifford	.01	.03
Gould	.03¼	.03½
Great Northern	.13	.13½
Hargraves	.02	.03
Hudson Bay	75.00	80.00
Kerr Lake	4.10	4.25
La Rose	2.25	2.28
McKinley	1.50	1.54
Nipissing	8.75	8.85
Peterson Lake	.27¼	.27½
Right of Way	.04½	.05
Rochester	.02	.03
Leaf	.02	.02½
Cochrane	.40	.50
Silver Queen	.02½	.04
Timiskaming	.24	.25
Trethewey	.30	.35
Wettlaufer	.14	.15
Seneca Superior	2.40	2.70

**Porcupine Stocks.**

Apex	.00½	.01
Crown Chartered	.00¾	.00½
Dome Extension	.04¾	.05½
Dome Lake	.20	.21
Dome Mines	11.50	14.00
Foley O'Brien	.20	.23
Hollinger	16.85	17.30
Jupiter	.15	15½
McIntyre	2.10	2.50
Moneta	.03	.06
North Dome	...	.45
Northern Exploration	.25	1.00

Pearl Lake	.31½	.32
Plenaurum	.50	.80
Porcupine Gold	.08¼	.09
Imperial	.01½	.02
Porc. Reserve	...	.14
Preston East Dome	.01½	.02
Rea	.12	.18
Swastika	.03¼	.03¼
West Dome	.10	.15

**Sundry.**

American Marconi	4.87½	5.00
Canadian Marconi	2.00	3.00
Porcupine Crown	1.20	1.25

**TORONTO MARKETS.**

Sept. 24—(Quotations from Canada Metal Co., Toronto).

- Spelter, 5 cents per pound.
- Lead, 5.75 cents per pound.
- Tin, 45 cents per pound.
- Antimony, 9½ cents per pound.
- Copper, casting, 17½ cents per pound.
- Electrolytic, 17½ cents per pound.
- Ingot brass, 11 to 15 cents per pound.

Sept. 24.—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto).

- Summerlee No. 1, \$26.00 (f.o.b. Toronto).
- Summerlee No. 2, \$25.00 (f.o.b. Toronto).

Sept. 24.—(Quotations from Elias Rogers Co., Ltd., Toronto).

- Coal, anthracite, \$7.75 per ton.
- Coal, bituminous, lump, \$5.00 per ton.

**GENERAL MARKETS.**

**Coke.**

Sept. 22.—Connellsville coke (f.o.b. ovens).

- Furnace coke, prompt, \$2.50 per ton.
- Foundry coke, prompt, \$2.90 to \$3.00 per ton.

Sept. 22.—Tin straits, 41.85 cents.

- Copper, Prime Lake, 16.75 cents.
- Electrolytic Copper, 16.50 to 16.62½ cents.
- Copper wire, 17.75 to 18.00 cents.
- Lead, 4.75 to 4.80 cents.
- Spelter, 5.75 to 5.80 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.
Sept. 11	60¼	27¾
" 12	60¼	27¾
" 13	60¼	27¾
" 15	60¼	27¾
" 16	60¼	27¼
" 17	60½	27¼
" 18	61	28¼
" 19	61½	28¾
" 20	61¾	28¼
" 22	62¼	28¼
" 23	61¾	28¼
" 24	61¾	28¼