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Editor

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CIRCULATION

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CONTENTS.

KOWKASH

In this issue we publish two articles on the Kowkash district, Ontario, where gold has recently been discovered. Mr. P. E. Hopkins, a geologist on the staff of the Bureau of Mines, who has been studying and mapping gold areas in other parts of Ontario, found conditions at Kowkash favorable so far as geological formations are concerned. Mr. Charles Spearman, of Haileybury, also found conditions similar to those in gold-producing areas.

Neither shows an inclination to go into raptures over the gold thus far discovered at Kowkash. They are each able, however, to confirm the report that gold has been found in a district which has not yet been carefully prospected. That should be enough to warrant prospectors going into the district. There is no guarantee that Kowkash will ever be a producing district. There is a fair chance, however, that important bodies of gold ore may be found. In mining you must take a chance. No one knows that better than the prospectors.

EXPORT OF CONTRABAND ORES

The order-in-Council prohibiting export of a number of metals and minerals is making difficulties for producers in various parts of the Dominion. For some of our products there is little market in Canada and the loss of the United States market would be serious. Metal prices are very high just now and it would be folly to interfere with shipments that are not intended for use of the enemy.

As a matter of fact there is no intention to restrict export of metals or minerals, provided satisfactory precautions are taken against such articles reaching the enemy. All the large exporters are aware of this and have been able to export products as desired. There seems, however, to have been more publicity given to the order-in-Council than to the necessary procedure to be followed in making shipments. As a result conditions are by some believed to be worse than they are.

In British Columbia several small operators found themselves embarrassed by the order-in-Council and appealed to the Provincial Mineralogist, Wm. Fleet Robertson, for assistance. Mr. Robertson took up the matter with the Department of Trade and Commerce. Mr. R. Grigg, Commissioner of Commerce, in reply, explained that special licenses are granted by the Customs Department permitting export to the United States after the matter has been investigated.

"If an application is sent in to the Customs Department giving all information an official will be sent to investigate and if all the circumstances are approved

of and a guarantee given that the goods are not to be sent to enemy countries a special license is granted."

That some such precaution is desirable few will deny. Unfortunately it makes proportionately more trouble for small operators than for large companies. Some occasional shippers seem to be unaware that any provision has been made to facilitate exports.

CANADIAN PATRIOTIC FUND

The demands upon the Canadian Patriotic Fund are such that an appeal must be made to all for its support. At present 20,000 families are being maintained by the fund at a total cost of $400,000 per month. Applications are increasing as rapidly as ever. The greater our armies become, the greater become also the number of dependants. The longer the war lasts the greater the sum needed to support each family.

Under the circumstances, everyone naturally wishes to contribute to the fund. Some bear more than their share of the burden, while others are satisfied with making a very small contribution.

The employees of some companies have agreed to give one day's pay to the fund. This is a method of subscribing that is especially desirable.

Dr. James Douglas has accepted the chancellorship of Queen's University. The University is to be congratulated. Dr. Douglas is a staunch friend of learning and one of the foremost mining men in America.

Cobalt silver mines are coming more into favor with investors again. Important discoveries have been made during the past few months, and the market for silver has recently much improved.

The Mines Branch has issued a report by Mr. L. H. Cole on the Salt Deposits and Salt Industry of Canada. As pointed out by Mr. Cole, the only salt deposits now being exploited in Canada are those in Southern Ontario. There are, however, extensive salt deposits in Western Canada, which may eventually be worked. Mr. Cole's report contains much interesting information on salt, its occurrence in Canada and methods of treating it.

According to a recently issued Government report, the total number of foreign-born residents of Canada at the time of the last census, 1911, was 752,732, of whom 344,557 were naturalized. The total number from Europe was 404,941, of whom 184,493 were naturalized. The number of alien Germans was 16,294 and of Austrians and Hungarians 60,481. And yet last week the New York World announced that we have 600,000 German-Canadians under surveillance here.

In "United Empire," the Royal Colonial Institute Journal, attention is drawn to the desirability of breaking down German influence in the metal industry wherever it is found to exist. The editorial writer says: "Even prior to the war we had become in far too great a measure dependent on German smelting firms for our supplies—an error on our part which might have been avoided, which has proved costly since the outbreak of hostilities, and which is much too dangerous to be committed again." The determination to encourage the refining of zinc ores in Canada is in line with the policy advocated by "United Empire."

The production of nickel and copper in Ontario is now greater than ever before. Thanks to the wonderful deposits of the Sudbury district and the great demand for nickel, for purposes of peace as well as for war, the nickel mining companies are making unprecedented profits.

Accompanying the recent rise in the market price of Nipissing are several rumors. One is that the company will acquire control of the property of the Peterson Lake Mining Company, which immediately adjoins the Nipissing and could be very economically explored. Coupled with these rumors are the declaration of the regular quarterly dividend of five per cent., and an improvement in the price of silver. There seems to be good ground for the rumor in regard to the Peterson Lake property. As yet, however, no official statement can be made. It is only given out that Nipissing is negotiating for control of a silver property. Increased activity will doubtless follow if control is transferred to the big company.

The gold production of Ontario during the first six months of 1915 was $3,570,072, as compared with $2,011,069 for the corresponding period of 1914. The mines of the Porcupine district have in a few years brought Ontario to the front as a gold-producing province. The indications are that Ontario will continue for years to make a large gold output.

ELECTRO ZINC CO., LTD.

Ottawa, Sept. 24.—Letters patent have been granted to the Electro-Zinc Co., Ltd., with headquarters at Sherbrooke, Que., and a capitalization of $24,000. The incorporators comprise Leland D. Adams of Oakland, California, mining engineer, and Charles H. Maxey of Rutherford, N.J., mining operator. The company will operate mines, smelters and refineries. The bounty recently offered on zinc has no doubt been the inducement for the formation of the company.

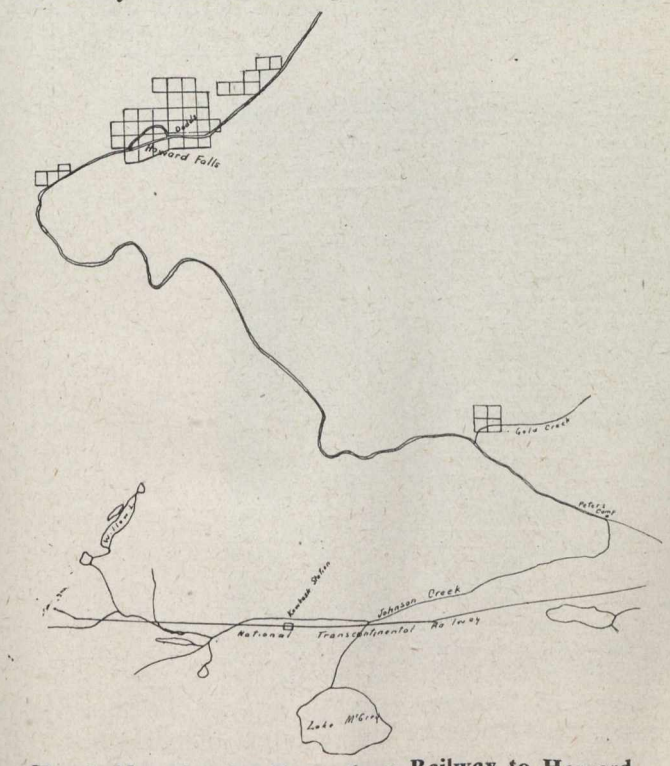
THE KOWKASH GOLD AREA

By P. E. Hopkins.

In accordance with instructions from Mr. T. W. Gibson, Deputy Minister of Mines of Ontario, I left Toronto on September 6th, and proceeded to Kowkash to make a preliminary examination of the recent gold discovery in that area.

Kowkash station is 297 miles west of Cochrane on the National Transcontinental Railway. The recent discovery nine miles northwesterly from Kowkash Station near Howard falls on the Kawa-kash-kagama river, shortened to Kowkash.

The canoe route commences one and one-half miles east of Kowkash station at Johnson creek which flows two and one half miles northeast and enters the Kowkash river. Two portages, one of one hundred yards around a log jam, and one of four hundred yards around Howard falls, occur on the Kowkash river. It requires about seven hours to make the twenty miles canoe trip.



Sketch Map showing Route from Railway to Howard Falls, Kawashkagama River

The country is of low relief and consists of rocky hills up to 100 ft. or more in height separated by large swamps, semi-muskegs and sand and gravel areas. The rocky hills are covered with a dense growth of small timber and moss and sometimes large loose boulders, which make prospecting somewhat difficult. The height of land at Redmond, 15 miles west of Kowkash station, has an elevation of 1,122 ft. This northwest and southeast divide separates the waters of the Great lakes from those of Hudson Bay.

Early Exploration and History of the Kowkash Region.—The gold discovery occurs on the river which the Indians call Kawa-kash-kagama, which signifies sparkling water. This name has been shortened to Kawashkagama by the Geographic Board. The National Transcontinental Railway has further shortened the word by naming the station Kowkash, which the prospectors have likewise done to the name of the river. Hence the name of the new gold area.

The part of the Kowkash river near the gold find was examined by Dr. R. Bell and is described in the annual report of the Geological Survey of Canada for 1870-71; also by party number 5, Exploration of Northern Ontario, issued by the Ontario Department of Crown Lands, 1900, p. 156. In this later report E. V. Neelands, geologist with party number 5, blazed the way for the prospector when he stated "Huronian rocks, mainly chlorite and other soft green schists, occur on the Kawa-kash-kagama [Kowkash] river from about four miles below the Wawong portage to the northern limit of exploration (Howard falls)—The most promising district is the country on the Kawa-kash-kagama river below the Wawong portage.. Here Huronian exposures are numerous, mostly chlorite and other soft green schists. Several samples from small quartz veins in this district showed traces of gold, and it might be that careful prospecting in this district would be rewarded." W. J. Wilson and W. H. Collins' map number 964 published by the Geological Survey, Ottawa, which roughly outlines this Kowkash Keewatin area is being much used by the prospectors at the present time. (Extracts from the reports by E. V. Neelands and W. J. Wilson were published in the Sept. 15th issue of the Canadian Mining Journal.)

Mr. E. W. King Dodds made his spectacular gold discovery on August 21st, 1915, by walking over the rocky hill below Howard falls, which had been burned clean of moss and trees on the previous day. The news of the very spectacular ore caused a rush of about 400 prospectors to the neighborhood and about 75 to 100 claims were staked within three weeks.

General Geology of the Kowkash Region.—In the Kowkash area is a belt of Keewatin rocks 10 to 15 miles wide and extending from the north end of O'Sullivan (or Sesekenaga) lake in a southwest direction through Howard falls and across the height of land at Redmond. This whole Keewatin area is worth prospecting for gold. For miles around this Keewatin belt are Laurentian granite and gneiss rocks, as will be seen on Wilson and Collins' map.

The Keewatin are largely massive, fine-grained green chlorite and hornblende rocks which are in places altered to schist. Some of the chlorite rock is altered diabase. Numerous exposures can be seen along the Kowkash river from three miles below where Johnson creek enters the Kowkash to within a mile of the driftwood portage. Altered basalts showing the pillow or ellipsoidal structure are common. They are well exposed from Howard falls to beyond the Dodds gold showing, on the portage below Howard falls and around O'Sullivan lake. They are in places gone to chlorite schist. With the basalts are small agglomerate areas. Cutting these greenstones are numerous white-weathering quartz-porphyry dikes up to 30 ft. or more in width. They contain numerous white quartz phenocrysts the size of peas in a grey to green fine ground mass.

Porphyry like that of Porcupine.—The porphyry contains some quartz stringers, is schistose in places and resembles the quartz porphyry at Por-

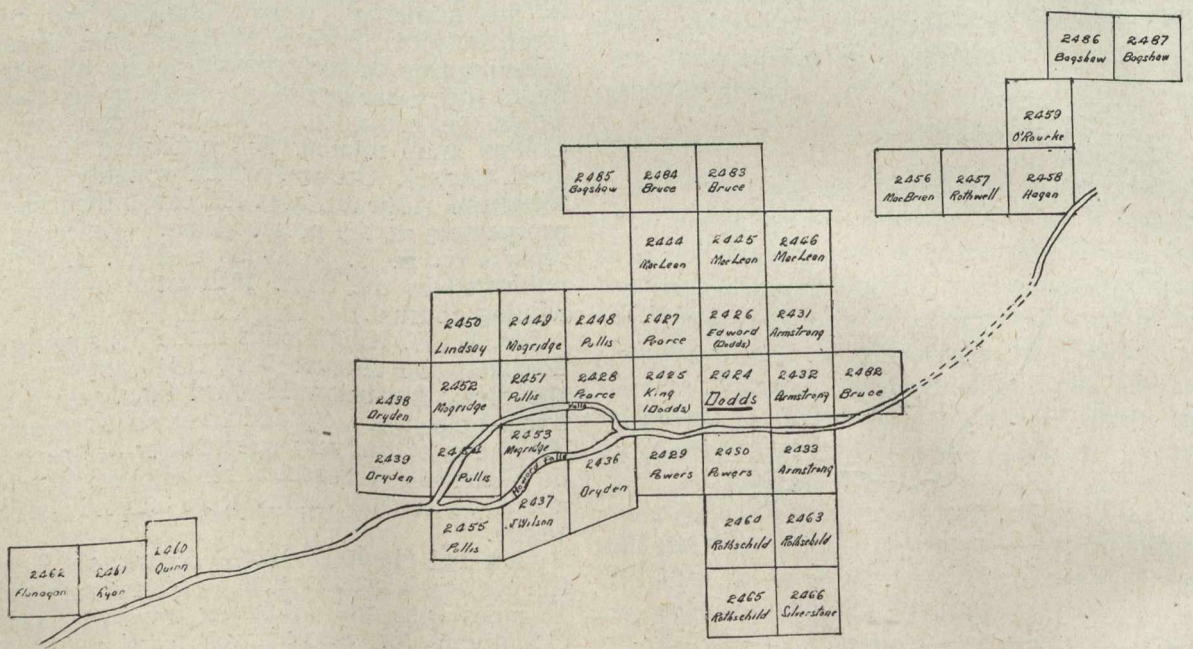
cupine, Goodfish lake and north of Schreiber. The main exposures seen extend for a mile eastward from Howard falls and around O'Sullivan lake. About two miles below Howard falls and one chain from the left bank is a large hill which has been recently burned. The south fringe of the exposure is a slate and conglomerate similar to the Timiskaming sediments in Porcupine, Kirkland lake and Munro township. The sediments dip vertically and strike 25 deg. north of east. The slate is very cherty. The pebbles of the conglomerate are drawn out and consist of chert, quartz porphyry, amygdaloidal basalt and gneiss. North of the sediments is a large volume of massive pillow lava. Judging from reports the rocks near Redmond may be old sediments. Around the centre portage between Abamasagi and O'Sullivan lakes is a fine slate-like biotite and chlorite schist striking 35 deg. east of north and dipping from 50 to 80 deg. south-eastward. These may be of sedimentary origin. At the last portage into O'Sullivan lake is an actinolite rock, below which are numerous massive serpentine exposures. A gabbro and diabase, probably the youngest rock in the area occurs about 300 yds. north of the Dodds gold find. Dikes a foot in width also cut the basalt on the Dodds claim. The direction of ice movement was 35 to 40 deg. west of south.

E. W. King Dodds' Gold Discovery.

Dodds' gold quartz vein, which is the only reported discovery up to the present, is five-eights of a mile below Howard falls and 800 ft. north of the river. The vein strikes 8 deg. south of east and appears to dip 75 or 80 deg. to the north thus conforming in strike and dip with the country rock. The vein which is somewhat lenticular is up to 4 or 5 in. in width and can be traced about 40 ft., ending in drift on either end. The quartz is glassy and largely free from sulphides. Spectacular gold was seen in place over an area about five inches long and one inch wide. This showing extended five inches along the hanging wall side of the vein. Similar and richer specimens were reported to have been taken from the four or five feet adjacent to the showing. On the hanging wall side of the vein is a rusty schist band six inches wide and heavily mineralized with fine pyrite. The wall rock is pillow lava (basalt) which is altered to schist in places. A mineralized quartz-porphyry dike occurs about a chain south-east of the gold showing.

Other Resources.

The timber is mostly second growth some of which has been recently burned. The trees consist of small spruce, poplar, balm of gilead, pine, birch and cedar, some along the river attaining a diameter of two feet. There is some good agricultural land. Whitefish, pickerel, pike, suckers and brook trout up to two feet long are plentiful in the Kowkash river. W. J. Wilson



Dodds' and Surrounding Claims, Kowkash District

Conclusion.

The geological formation of the Kowkash district is somewhat similar to that of the Big Duck lake area north of Schreiber,* 100 miles south, Goodfish lake (Morissette township) and to Tisdale township in the Porcupine gold area. Numerous small glassy quartz veins some of which are mineralized with pyrite occur over the whole area, the Dodds vein containing a very spectacular gold showing. This would suggest the advisability of a thorough prospecting of the Keewatin area.

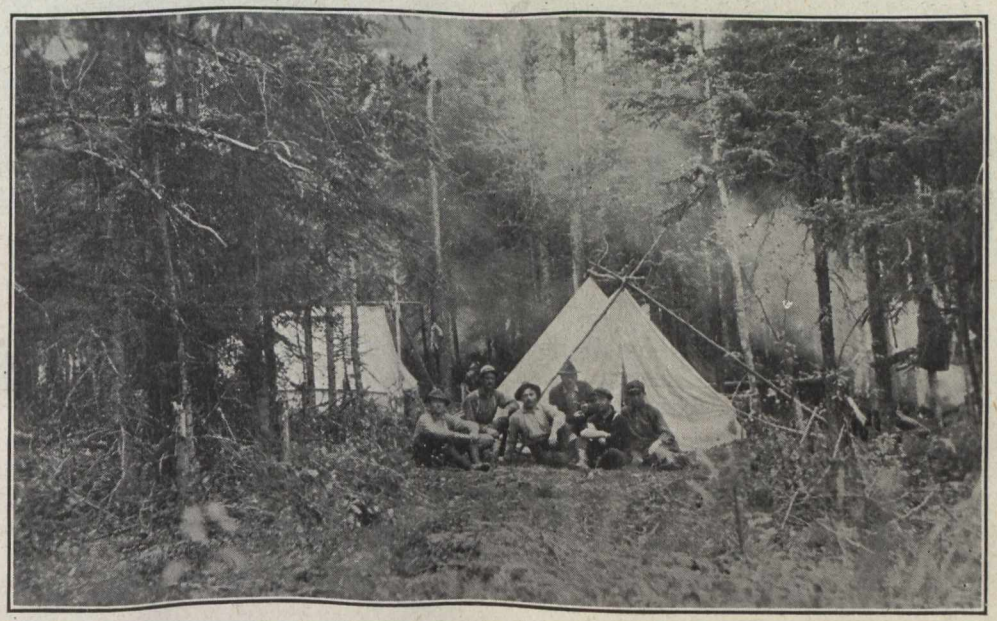
All the information on the area is being compiled by the Ontario Bureau of Mines, and a map will be published about October 1st.

*See Map No. 24b, Part I, Vol. 24, Bureau of Mines, Report, 1915.

THE KOWKASH DISTRICT, ONTARIO

By Charles Spearman.

Northern Ontario has once more come into the limelight, a rich discovery of gold having been made on that part of the northern watershed of the Height-of-Land, drained by the Kawashkagama (Kowkash) river. Kowkash station—the telegraph office and nearest railway station to the new discovery, is about three hundred miles west of Cochrane on the Government Transcontinental Railway. As the crow flies the new discovery is about fifteen miles north-west of Kowkash station, but the railway could be reached in ten miles or so by following a line directly south from the discovery. Here is another instance where the Ontario Government operates a Pullman service into the very heart of a resourceful area and within a step of a new discovery, as was the case with Cobalt, Swastika, Kirkland Lake, Kelso, Porcupine, Munro Township, Sesekineka, etc., all located within the last ten years. It appears that wherever a new railroad line is constructed to open up a portion of New Ontario, that portion usually goes on record as having valuable mineral resources.



On the Portage at Howard Falls, Kawashkagama River

The Kowkash district lies in the Thunder Bay district, Port Arthur mining division, and embraces an area of about five hundred square miles. This area presents a flat, monotonous topography, relieved here and there by such glacial phenomena as kames, eskers, moraines, etc.; the highest point being the Height-of-Land, which roughly speaking parallels the Kowkash river on the western side, at a distance of from eight to ten miles from the river, and has an average altitude of about twelve hundred feet, in this district.

Nearly all the area may be classified as low lying "muskeg," covered by dense vegetation consisting of various kinds of mosses and such evergreens as spruce, jack pine, balsam, some cedar and tamarac, nearly all of the latter being dead but still standing. Of the deciduous trees, poplar, alder and birch are abundant on the higher ground. The mosses in places form a carpet over two feet thick, which is usually underlaid by a stratum of decomposed vegetable matter (muck), then comes a stratum of a firm plastic homogeneous grey variety of clay resting on bed rock. As revealed in the railway cuts and river banks, the total depth of overburden is not very great, probably not averaging over three and a half feet, of which from six inches to two feet is moss. Often in the lowest portions of the area bed rock is found with a shallow mantle of moss; but this is rather the exception.

Small areas have been fire swept some time ago and present typical "wind falls," especially in the low mossy ground, where the dead trees are interlocked in almost inextricable confusion. It appears that most of the roots were in the decomposed vegetable stratum underlying the moss, and when this covering was slowly removed by the fires the trees were deprived of the support of the roots. These dead trees rest on the clay stratum, and when visited by fires a clean sweep is the result, leaving exposed the clay in good shape for trenching operations. A typical example of this is seen on the King-Dodds "discovery" claim.

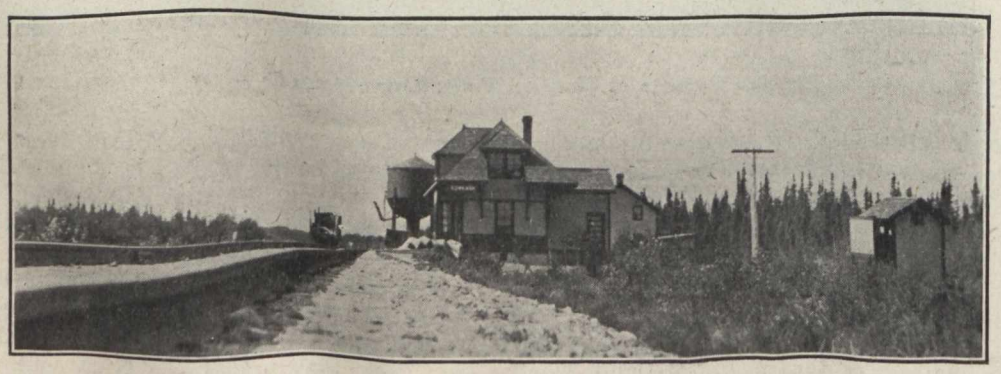
The streams of the area are comparatively large, and on the whole sluggish, except for occasional falls and rapids, and usually meander about one hundred per cent from the direct line. Numerous small brooks and creeks, famed for their excellent speckled trout, empty into the main watercourses.

The history of the Dodds discovery dates back scarcely two months. It appears that E. King Dodds, equipped with the necessary grub-stake and Wilson and Collins' geological map, was exploring the Keewatin area of Northwestern Ontario in the hope of finding gold. He camped at Howard falls, commenced prospecting among the debris of a "wind-fall" located near the rapids and discovered an outcrop of Keewatin schist. It is said that he then started a fire in the "wind-fall,"

which swept it practically clean of all organic matter and left exposed, for about two feet, a four inch quartz vein. This portion of the vein was phenomenally rich. Portions of ore broken off weighing several ounces were about twenty-five per cent. native gold. Just after the discovery, Dodds met Armstrong, a civil engineer, Pearce, an editor of a Toronto paper, and Powers, a prospector of Haileybury, returning from investigating a reported silver discovery in Northwestern Ontario. They made arrangements whereby Armstrong, Pearce and Powers staked around the Dodds discovery. Then the news got to the outside world, and soon scores of canoes and hundreds of prospectors hailing from all parts of America began to descend the stream from the railway to the scene of the discovery.

Johnson Creek, National Transcontinental Railway

The Kawashkagama river.—The trains usually stop at Johnson Creek, one and one-half miles east of Kowkash station, and it is from this point that the trip begins. The westbound "National" is due at Johnson Creek at 2 a.m., and immediately after detraining everyone makes preparation for an early start in the morning. Johnson creek, a tributary of the Kowkash river, is a rather shallow meandering stream with low banks, and an average width of about 25 feet. From the railroad to the point where it joins the river, is about four miles in length. Three miles down stream from the confluence, Rupert's falls, a small rapids, is reached. This is easily run; but must be "portaged" or "poled" on the return. About two and a half miles further down stream the first outcrop of rock is seen on the right bank of the river. It is a green Keewatin chlorite schist, showing abundant pyrite, striking nearly east and west and standing almost vertical, and having a slight dip to the southeast. Occasional outcrops are seen along the rest of the route to Howard falls, and are for the most part schistose derivatives of the medium acid Keewatin rocks, together with such massive basic rocks as gabbro, diabase, diorite, etc. Ten miles down stream from Rupert's falls is the first portage, where the river is blocked for a hundred feet or so by driftwood. About five miles further on Howard falls is reached. The total head at this falls is about nineteen feet and drops in three cascades, each separated by a couple of hundred feet. The second portage is at this point and is seventeen chains in length—across the island which divides the falls. Fifteen minutes from the falls the Dodds



Kowkash Station, National Transcontinental Railway

"discovery" is reached. About four miles north from Howard falls is located another falls with a drop of about fifteen feet or more, and, like Howard falls, is divided by an island. From this point into Abamasagi lake, ten or twelve miles, the river is much shallower and wider, averaging about one hundred and fifty feet as compared with about a hundred feet for the first portion, and contains many boulders which just come near enough to the surface of the water to catch a canoe, and it is a familiar sight to see where canoes have registered on the various rocks by leaving a small patch of the particular color of paint with which the canoe was covered. The current in this portion of the river is relatively strong, due to the shallowness.

At the point where the river empties into Abamasagi lake is located an Indian encampment. These Indians do not understand English or French, and no information regarding the country could be gathered from them. The Kowkash river empties into a shallow weedy portion of Abamasagi lake, and almost immediately turns sharply to the east and empties into Sesekenaga or O'Sullivan lake. Between the above two large lakes, the river maintains its main characteristics as to size, etc., and three short portages mark the only interruptions on this eight mile course. There are many rock exposures along the banks, and in many places the river follows the general strike of the country rock, approximately east and west, and thus flows between the vertical walls of the upturned schist. The exposures along the river and on O'Sullivan lake are principally schists derived from more or less basic rocks, and Laurentian granite and gneisses. Many quartz veins are present;

On the Kawashkagama River—Meal Time

Rapids About 4 miles below Howard Falls

but most are apparently barren. Some of the schist on the south shore of O'Sullivan lake is well metallized with pyrite and some of the quartz veins contain much pyrite. There is another Indian encampment where the river empties into O'Sullivan lake and also near the mouth of the river on the south shore of the lake.

The geological reconnaissance by Messrs. Wilson and Collins, made in 1903-4 will convey a very good idea of the geology of the area (see Sept. 1 issue). According to their investigation, there is a Keewatin "core" bounded on the west by the Height-of-Land, on the northwest by a line drawn from the source of the east branch of the Kowkash to the northeast arm of O'Sullivan lake, excluding Abamasagi lake, which lies within the Laurentian, on the east by a line drawn from the northeast arm of O'Sullivan lake to Rupert's falls, and thence to Fleming lake, and bounded on the south by a line drawn from Fleming lake to a point southwest to the Height-of-Land and beyond. The formation within this "core" and as seen at the very few exposures is made up of Keewatin greenstones, both massive and schistose. The massive varieties seen being acid quartz-porphyry, felsite, rhyolite, andesite, andesite porphyry, quartz diorite, diorite, gabbro, diabase, vesicular obsidian, etc. The schistose varieties are derivatives from the above massive rocks and may be classified as sericite and hydromicaceous schists, hornblende schist, biotite schist, chlorite schist, etc.

The general strike of the formation in this area is a little north of east, and in general the dip is nearly vertical.

The Dodds Discovery.—At the Dodds "discovery," the vein complies to the strike of the formation, which is about fifteen degrees north of east and probably dips with the formation. The wall rocks are sericite or some hydromica schist, and chlorite schist, the whole being much impregnated by pyrite. Several quartz-porphyry intrusives are exposed not far from the "discovery." No development work has been done on the discovery to date.

From the standpoint of the prospector, there exists to-day a no more promising area for exploration than that just outlined above. In many places throughout the area the geological conditions strongly resemble that of the Porcupine district. It is unfortunate for the district that most of the bedrock is obscured by organic matter, but experiment has shown that this may be removed if the proper steps be taken, rendering subsequent exploration comparatively easy. There are numerous other Keewatin outcrops scattered here and there throughout a vast area outside of the Kowkash district in Northern Ontario, which are well worthy of earnest investigation and are easily accessible by means of the various water routes, on which headquarters could be established for the exploration of the surrounding country.

INTERNATIONAL NICKEL.

International Nickel Co. reports to Stock Exchange a consolidated general profit and loss statement for four months ended July 31, 1915, as follows:

Gross earnings, $4,411,049; other income, $40,353; total income, $4,451,402; expenses and taxes, $272,528; net income, $4,178,874; depreciation $488,494; surplus, $3,690,380; common dividends, $1,901,575; balance, $1,788,805; preferred dividends, $133,689; profit and loss surplus, $1,655,116.

GOLD STRIKE AT MONTAGUE MINES.

By W. R. Bateson.

Apparently once again is the Montague Gold District about to justify its long standing reputation as a rich gold producer, if one may judge by indications that have come to light during the past summer.

As was to be expected from past experience, it is in the "Skerry Lead" in the Simon Kaye Property where the very encouraging discovery has been made: a find not only encouraging because of its richness; but chiefly so because it occurred below the "break," which is in this case a plane of faulting intersecting the "Skerry Lead" in this place at a depth of 65 ft., and throwing it 30 ft. to the south.

Now all the previous rich ore in the "Skerry Lead" was found above the fault, and some mining men were of the opinion that the lead might be lean below the fault. The writer always held the opinion that as the fault occurred long after the formation of the lead, it would have no influence upon it; which opinion now seems to be confirmed.

The enrichment is due to a small quartz "angular" or stringer coming from the south and cutting through the slate belt until it struck the "Skerry Lead." The plate, in the immediate neighborhood of the quartz of the "Skerry Lead" is highly mineralized with mispickel for some distance below the point where the "Angular" met the lead. The "Angular" seems to follow the lead downwards, and to have enriched it along its course. The gold occurs coarsely disseminated in the quartz, but in immediate contact with the mispickel near and in the slate. The lead varies in width from one to six in., but the south side of the lead seems to contain the most gold.

The specimens of ore obtained in August are very spectacular, and probably exceed 250 oz. to the ton in richness. Now that the development of the mine where this enrichment occurred is being continued well below the fault there is a probability of any zones of good gold bearing quartz continuing uninterruptedly to considerable depths. In the probable assurance of this fact lies the chief value of the discovery made in the Montague Gold District in August.

KEUFFEL AND ESSER.

Keuffel and Esser have been awarded three grand prizes for exhibits at the Panama Pacific Exposition.

The exhibit comprises every requirement of the engineer for field or office work. The engineering instruments displayed include instruments of every type, from the small hand instruments used for the roughest preliminary survey to a triangulation theodolite, reading angles to single seconds, and a photo-theodolite, representing the finest types of precision instrument construction. Many new improvements and time and labor saving devices are being shown, among which may be mentioned the K. & E. stadia circle, a device simplifying to the last degree the reduction of Stadia measurements and obviating the necessity of using the charts, tables and slide rules now familiar to the engineer. The slide rules shown include many new types.

The Surveyor's Slide Rule reduces the calculation of azimuth-meridian and stadia reductions and other hitherto complicated calculations to mere mechanical operations and enables the [illegible] the field to compile these [illegible] engineer's transit

STRUCTURAL FEATURES OF THE PORCUPINE ORE DEPOSITS

By Alfred R. Whitman

There has already been much good work done on the geology of the Porcupine district, and many valuable contributions made to technical literature. Of the many contributors Mr. A. G. Burrows of the Ontario Bureau of Mines was one of the first in the field and has devoted the most study to its phenomena. Therefore since this discussion is limited to the structural features, the reader is referred for a background of general geology to Mr. Burrows' writings, particularly those in the bulletins of the Ontario Bureau of Mines. To facilitate further reference a general bibliography is also appended.

The writer entered the field in January, 1914, as geologist for the McIntyre Mine under the management of Mr. R. J. Ennis, being the first person regularly employed in that capacity in the district. The utility of work of that sort was to be demonstrated, and it thus became urgent early to discover what line of study would yield the most prompt economic returns. It soon became evident that this line would be structures.

Certain structural features, and unfortunately the most important ones, cannot be discussed in this brief article, but in these studies certain other significant aspects of the structures were developed, and will be described.

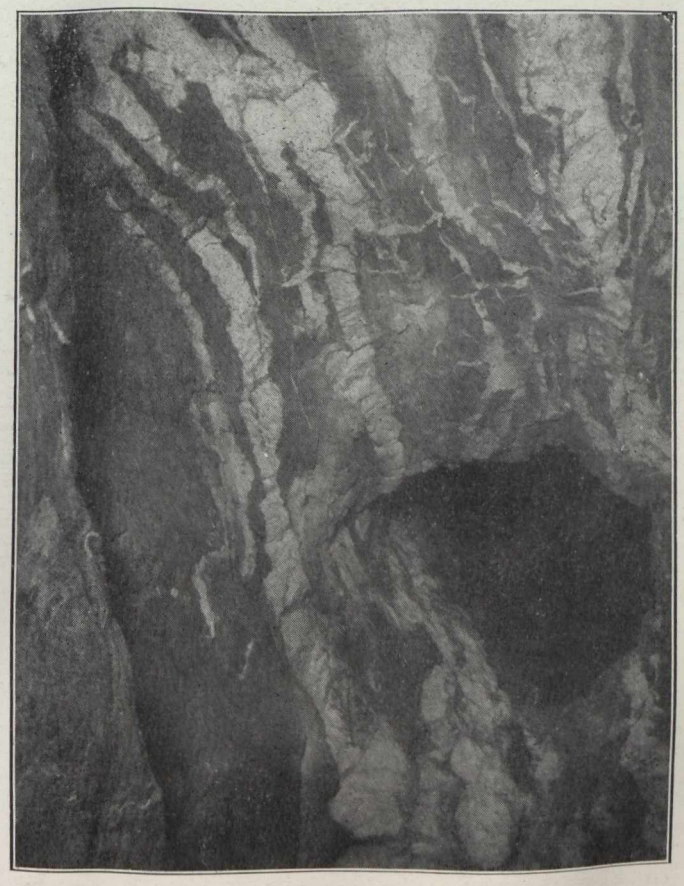
In pursuit of these studies the neighboring surface was worked over to good advantage, and the other mines kindly rendered assistance by giving the writer access to their underground workings. As a result of these general investigations it became apparent that no rules of structure bearing upon the whereabouts of unknown ore-bodies or the continuity of known ones could be made to cover all cases, each small locality having its own peculiarities. This proved true to a remarkable degree, since the five chief types of ore body have thus far proven to be almost completely limited to five of the principal properties of the district, one type to a property with a single exception.

Types of Ore Bodies, Porcupine Gold Deposits.

Dome Type.—This type having received the least study is least understood. It is best developed at the Dome Mine, where the discovery outcrop which gave the name to the mine and the type of ore body was a great dome-shaped mass of white quartz. The complete form of one of the high grade bodies, as described by Mr. C. D. Kaeding, the manager, is similar to that of a pear or plum stood on end with the large end uppermost. Of this relatively high grade mass the upper portion is chiefly quartz, the lower part consisting essentially of mineralized schist and scattered irregular veinlets of quartz. As the management expresses it, they have found other plums in their pudding. The "pudding" is a mineralized belt in which these ore bodies lie surrounded by aureole-like areas of low grade ore. The first "plum" had cross sections of 100 ft. and 200 ft. and an extreme depth of 400 ft., having lost most of its upper portion by erosion. The second one has not been completely explored but is known to have cross sections of [illegible] 60 ft. and to extend from the 257 ft. level, below the 550 ft. level, being elliptical in cross section and more variable than the first.

The structure is ill-defined but is appears originally to have been essentially a region of differential strains in which irregular fractures were developed and a certain permeability produced in the schist, rendering the affected rock susceptible to general impregnation with auriferous pyrite and free gold, and erratic silicification and replacement by quartz, through the agency of ascending solutions.

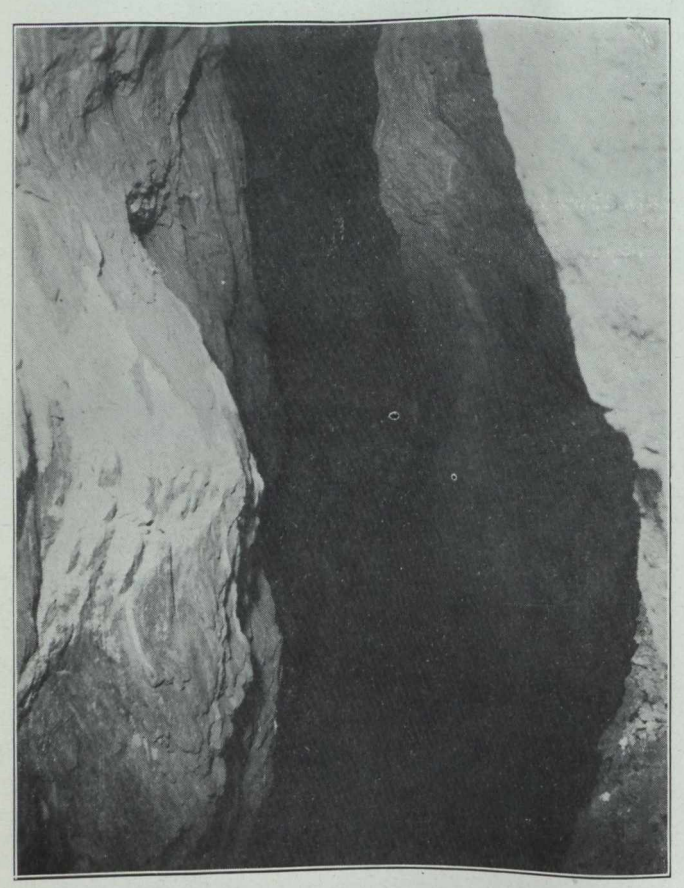
In addition to these two "plums" other smaller ones of similar character have been found. The mineralized zone in which these occur lies immediately north of the contact of the chief local boss of quartz-porphyry and mainly south of the sedimentary rocks referred by Burrows and Miller to the Temiskaming period.



Lode Structure. No. 517 Stope, McIntyre Mine

Lode Type.—This type, as best exemplified on the Hollinger property, has been most carefully studied. The ore bodies included in this class have always been referred to as veins, which designation is not altogether inappropriate in common usage, since they are essentially vertical tabular bodies ranging in length to 1000 ft. or more, and in width to over forty ft., being in many cases nearly solid masses of quartz. They are here classed as lodes (1) because they were not formed in fissures nor sharp lines (2) because they are essentially not

solid masses of quartz formed either by crustification or by accretionary growth, but are substantially masses of quartz veinlets with inclusions and partitions of mineralized schist. Often these veinlets of quartz coalesce over widths of thirty ft. and for considerable distance; but however much coalescense may prevail the mode of origin and the general structure are of the lode type, e.g. Nos. 1 and 4 veins of the Hollinger Mine. As a special case under this general definition, another variety



View Showing Form of Orebody of Lode Type. Looking East in No. 310 Stope, McIntyre Mine

of lode is certain zones of mineralized schist with only a few quartz veinlets, e.g. No. 2 and No. 5 veins of the Hollinger Mine. The quartz lode is also well exemplified on the McIntyre property south of Pearl Lake in No. 310 and 4M veins. Neither sort of lode is characterized by well defined walls, but both are conspicuously lacking in them, the country rock outside the quartzose portion of the lode often being mineralized and containing high values several feet away. Ignoring this cause of irregularity, definite walls would still be lacking, as the veinlets of gold bearing quartz penetrate out irregularly into the schist and are not uniformly arranged. Usually a given lode varies in width considerably and rapidly from point to point, leaving, after excavation, stopes of wavy contour with smooth but often extreme embayments and constrictions.

Within the walls, such as they are, the quartz veinlets and mineralized schist are distributed in various proportions, sometimes one dominating to the exclusion of the other. Usually both take the form of nearly vertical tablets intermixed with each other. At times where quartz is dominant it is represented only by thin discontinuous sheets or seams giving a banded appearance to the quartz masses. Where the schist is dominant the quartz veinlets conform roughly to the lamination and fractures of the schist as if of subsequent origin.

Often this banding in the quartz veins is conformable to an irregularity in one of the walls or both, as if the irregularity had been there in the schist first, and the vein had grown around it leaving remnants of it, like shore lines, in the vein which had gradually replaced it.

The absence of any sharp walls and the irregularities in dip and strike of the lodes, as well as the absence of any indications of planes of rupture at the ends of the lodes in continuation of them, precludes any possibility of their having formed on faults or shear zones. In fact study has made it clear that they have formed in zones rendered permeable by tension strains. There were few or no open spaces such as could give rise to crustification phenomena, but within the limits of certain zones lateral tensile stresses produced lines of minimum compression allowing the ascending solutions which are presumed to have given rise to the veins, an opportunity to circulate upward among the foliae and minor fractures and joints of the schist.

Contact Lode Structure. No. 417 Stope, McIntyre Mine

Fissure Vein Type.—The Jupiter Mine has a vein which well illustrates this type of ore body, but probably an even better example, and one which has been much more closely studied, is No. 5 vein of the McIntyre Mine, on the north side of Pearl Lake. This vein was the first recognized by the writer as being of this type, and constitutes an excellent example.

In the most restricted sense, wherein a "true fissure vein" means a crustified deposit formed in

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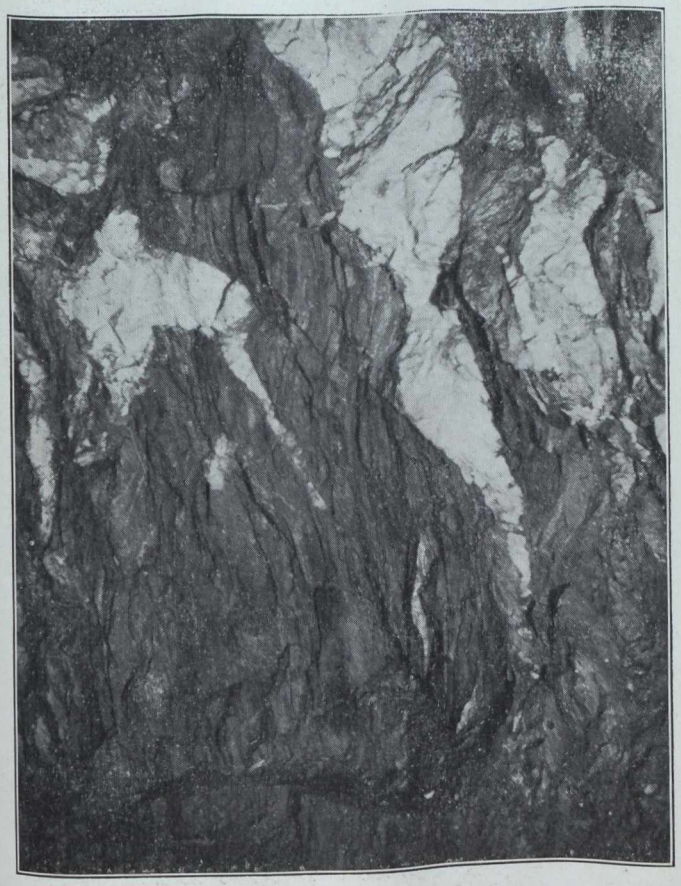
open fissure, the term cannot properly be applied to this vein, nor to any other in the district; but the sense in which this is called a fissure vein is that it was formed along a thrust fault, through the replacement of its hanging wall.

No. 5 vein of the McIntyre is a banded vein of irregular width, with a well defined foot wall and no distinct hanging wall at most points. Here and there where a strong joint or an old fault converges with the foot wall or lies near to it, the vein has



Unfaulted Masses of Ore, showing Origin Subsequent to Joints and to Schist Structure. No. 311 Stope, McIntyre Mine

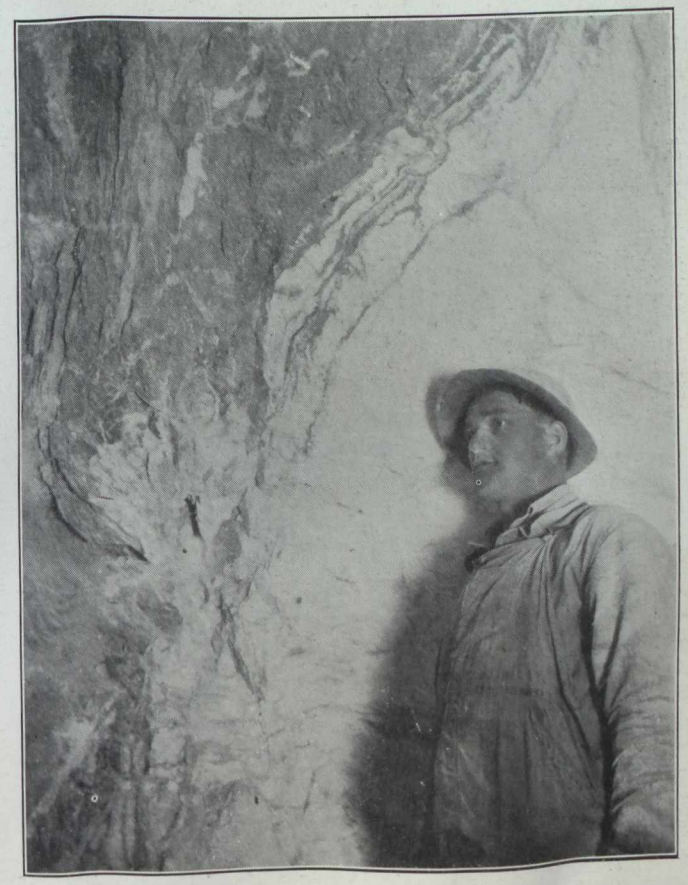
adapted it as a hanging wall, and confined itself within it. But generally the hanging wall side of the vein is irregular and ill-defined, merging into the country rock either by the diffusion of values or by the extension of quartz veinlets into it. The average width approximates 4½ ft., although ranging from one in. to forty ft. The foot wall strikes a few degrees north of east in its western part and as much south of east in its eastern part, dipping at about 65 deg. to the north; but the latter portion is so narrow as to be unworkable, the greatest widths occurring where the strike is most northerly.

The footwall is smooth in many places and slickensided, with a thin film of gouge on it, although frequently mineralization has penetrated it. In one case this had occurred to such an extent that a 12 ft. width of vein extending for 20 ft. along the foot wall had formed beyond.

The bending of the vein is attributed to the mode of its growth, the bands which are of mineralized schist being regarded as residues from incomplete replacement of the hanging wall as the vein e[illegible]nded outward by a process of metasomatism. [illegible]f mineralized schist, within the vein, about which are similar bands, tend to support this view.

Contact Vein Type.—As distinguished from the fissure vein and contact lode types, this sort of vein finds its sole representative in the Porcupine Crown Mine. Here, the orebody, which appears to have been somewhat contorted by subsequent pressure, follows approximately the contact of a quartz prophyry stock with the older volcanic series. It does not lie along the contact at all points, since this is extremely irregular, but it conforms to it as well as a single fissure could, cutting across both promontories and embayments in the margin of the intrusive mass. As tentatively believed by the management, the channel in which the vein formed by replacement of the channel walls seems to have been a tension rupture, due perhaps to the contraction of the intrusive stock on cooling.

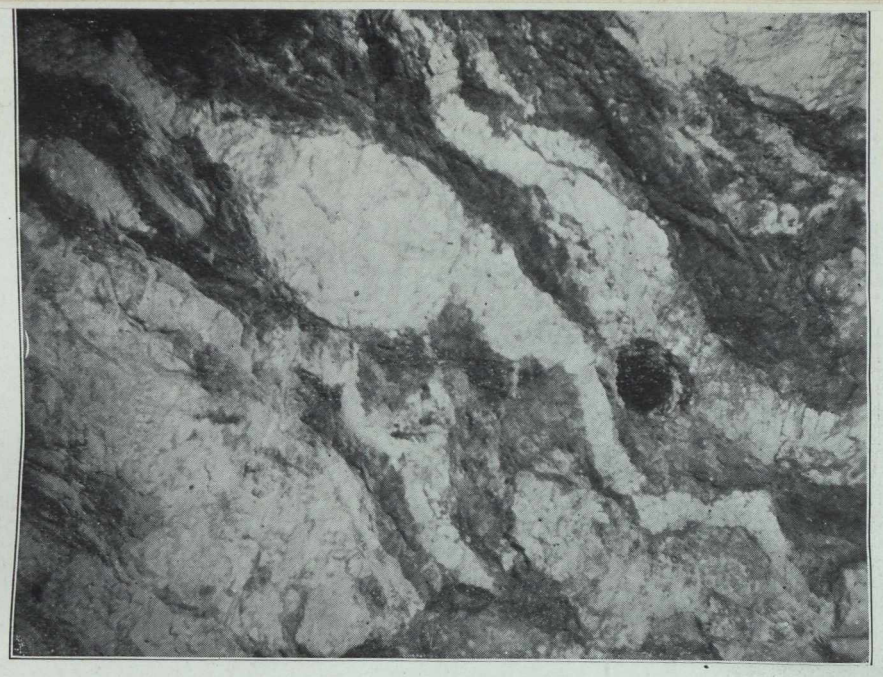
Contact Lode Type.—The most studied and perhaps the best representative of this type of deposit is the "contact vein" of the McIntyre Mine. It was most typically developed where mined in stopes Nos. 317 and 417, north and north west of No. 4 shaft.



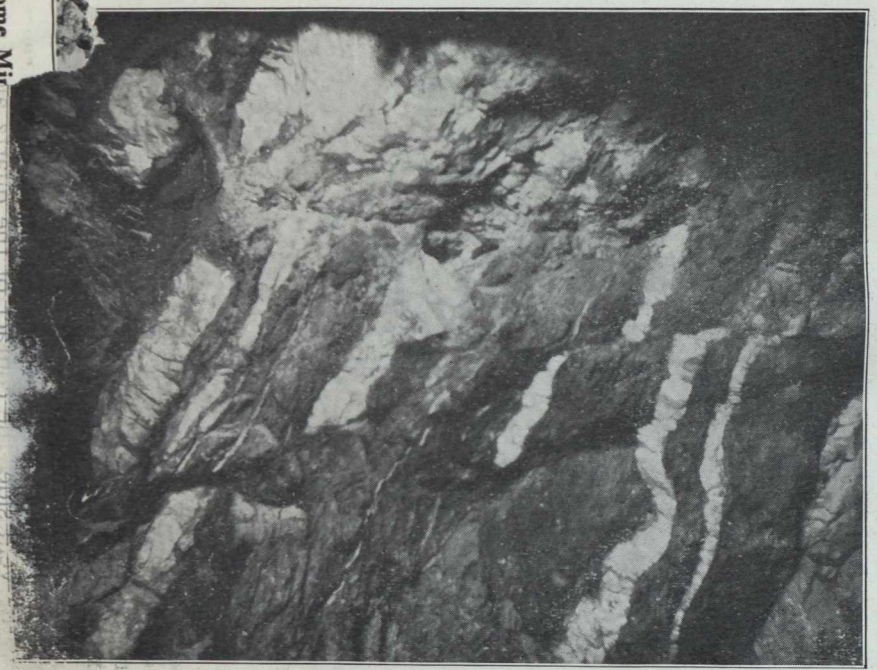
View showing Banded Structure at Margin of Vein, indicating Metasomatic Growth of Orebody. McIntyre Mine

This body consisted of a mineralized zone along the contact of the basaltic schists with the south wall of the quartz-porphyry stock underlying Pearl Lake. In this zone were usually many veinlets of quartz, sometimes coalescing and again remaining separate, or perhaps even dwindling in size and number until the quartz constituted only a small proportion of the millable material. The schist in this zone was usually impregnated with finely crystaline auriferous pyrite and free gold, while the

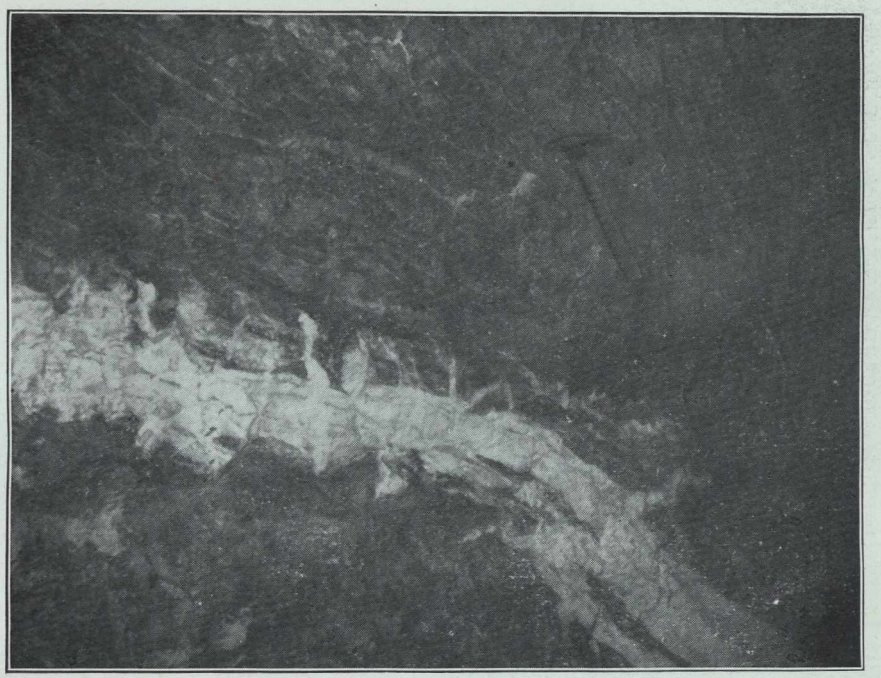
Thrust Fault, showing Phenomenon of Drag in Schist. Looking East, 400 ft. Level, Pearl Lake Mine.



Lode in Quartz-Porphyry, Indicating Formation of Ore to be subsequent to Development of Schist Structure in Rock. 200 ft. level, No 15 Shaft. McIntyre Mine.



Thrust Fault, showing Increasing Throw Upward, lower veinlet is thrown one foot. Rock is quartz-porphyry schist, the most plastic formation of the district. Looking west, 200 ft. shaft station, No. 1 Shaft, McIntyre Mine.



Cross Veining. No. 311 Stope, McIntyre Mine.

quartz often carried small quantities of scheelite and zinc and iron sulphides, with free gold grains occasionally in spectacular aggregates.

Like the Lode Type of the Hollinger the quartz veinlets have a general tendency to conform with the schistosity, but frequently vary from it within the zone in freakish and fantastic ways. At certain points a discordance was observed in the attitudes of laminae of the basaltic schist, and of the quartz porphyry. In general however, conformity was produced by lateral pressure both before and after the formation of the ore body, which resulted also in the bending of the schist laminae into approximate parallelism with the lode in immediate contact with it.

Significance of Structures.

In all the ore bodies described above there are to be found inclusions of schist surrounded by undeformed vein matter. The general crushed condition of the vein quartz is sufficient evidence in itself, of deformation of the ore bodies; but in spite of this, there are spots virtually free of such crushing, and even at such points in many instances are to be found inclusions of schist as much altered and foliated as that outside the vein, showing that the wall rock had been in a schistose condition before the formation of the ore bodies.

Many cases have also been found in conjunction with lodes and irregular ore bodies, of the local conformity of ore masses with joints. Sometimes this conformity consists in a veinlet lying in a joint, and at others in the limitation of an ore body or the control of its form by a joint. Evidence of this sort, which is abundant, is regarded as indicating the greater age of the joints.

Here and there ores are found in the quartz porphyry, sometimes being entirely enclosed by it, and sometimes running into it from the surrounding schist. In such cases the usual structure is that of the lode type, the constituent veinlets of the orebody tending to conform to the foliae of the schistose quartz-porphyry, indicating that even the quartz-porphyry intruded into the schistose basalts had itself become a schist by the time the veins were formed.

The genetic significance of the structures lies chiefly (1) in the conformity of the ore bodies to schist laminae, joints and faults, and (2) in the banded character of some of the veins. Both these features, together with the absence of symmetrical banding and comb structure which is taken as indicating crustification in open fissures, point conclusively to replacement as being the mode of origin of the ores, the solutions having evidently circulated among the schist laminae and along the joints and faults replacing the rock along these channels of flow with quartz and other vein matter.

That metasomatism was the mode of replacement is indicated by an internal structure of individual quartz veins. It consists in an almost universal fringing of the veins and veinlets with a border of ferrodolomite. This fringe or border of carbonate varies from a quarter to one sixteenth of an inch in most cases, but sometimes is much narrower, being invisible to the naked eye in unweathered veins and only being detected in weathered outcrops by a thin band of limonite resulting from the oxidation of the iron in the carbonate.

Under the microscope the function of th[illegible] dispensable border of carbonate is most clearly [illegible] on the vein [illegible] act of the quartz an[illegible] bonate conforms to the molecular structure of the rhombohedral grains of carbonate, penetrating into the cleavages, and frequently preserving their structures. This shows that the quartz replaced the ferrodolomite, molecule by molecule. On the other side the carbonate band is in contact with the wall rock. On this contact the ferrodolomite penetrates in among the schist laminae in such a way as to show that it was the growing front of the vein. The carbonate, however, does not preserve the schist structure, since the force of crystalization of the rhombohedral aggregates was so great as to destroy the foliae they invaded.

This matter of the replacement cannot be dwelt upon in the present discussion, further than to say that the evidence points to this order of events during the growth of the veins; there was essentially but one period of mineralization, in which the same solutions produced the various effects, first replacing the silicates of the wall rock by ferrodolomite, and then promptly replacing the latter by silica. This probably signifies local automatic oscillation of the conditions of chemical equilibrium, in the mixed solution, carbonate being the more stable in the presence of the silicates, and silica being the more stable in the exclusive presence of carbonate.

It may also be mentioned that the time precipitation of the sulphide, gold, and scheelite, was during the replacement of the carbonate by silica.

Faulting.

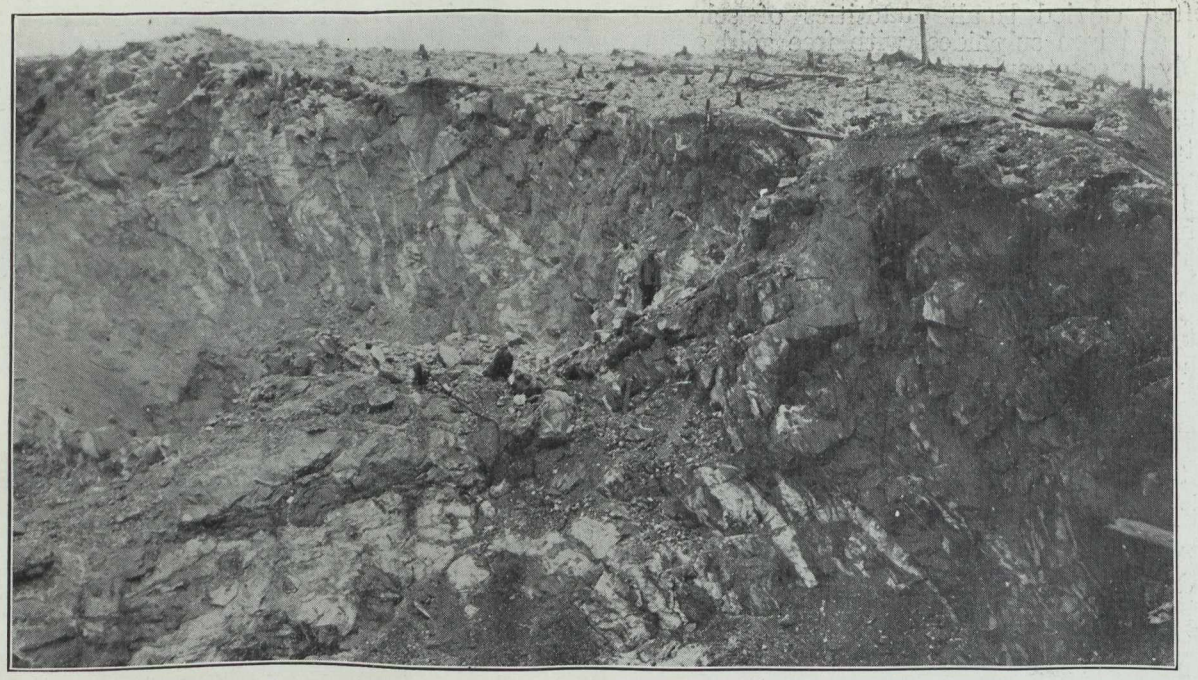
One of the most important structural features is the faulting. It was not confined to any one period in relation to the veins, both preceding and following them, and to some extent probably going on at the same time. The faults antedating the veins are important as forming the loci of the veins, while those succeeding them are of importance as constituting the substance of some of the most vital problems connected with the finding and mining of ore bodies.

Of the Post-vein faulting one of the most notable features is the fact that all the faults known are due to thrusting, there being no gravity faults as yet recognized. But these are not known to conform to any single large system of which there is a major or sole fault of great dimensions underlying the entire system. On the contrary, the schists seem to have constituted such a relatively plastic medium, that the compressive stresses where relieved by fractures were taken up by many faults of lesser throw and more or less promiscuous arrangement. It may be said, however, that these lesser faults often occur in small groups or systems, the greatest known major throw being 130 ft.

These faults dip into all but the northwest quadrant, but the greater proportion and most significant of them, dip into the southeast quadrant, the average dip being south of southeast.

Three sorts of systems have been recognized:

(1) **Step faulting,** which is similar to that recognized in gravity faulting, consists in the taking up of a thrust dislocation by a number of closely related parallel faults. A case of this kind was well developed in No. 315 Stope of the McIntyre Mine, the thrust being from east of northeast, and the dip being at about 10 deg. in that direction. In these, quite flat faults, the surfaces of movement [illegible]dulating and deeply corrugated along the [illegible]tal throw was about [illegible] minor faults



Gold Quartz, Dome Mine

seemed to vary, however, one giving place to two or three over-lapping ones, or vice versa.

(2) **Pairs and trios are usually arranged after the same manner as the great thrust systems** in which there is a distinct sole with minor steeper subsidiaries in the hanging wall side. However, these systems are not here arranged in the manner illustrated by Leith in his "Structural Geology." That is, all the faults do not focus, nor is there a set of subsidiary faults connected with the major one, but all along the dip of the major fault which may have an inclination of from 35 deg. to 65 deg. there are steeper branches running off into the hanging wall side, and from these in many cases similar steeper branches of still less throw going off into their hanging walls. This phenomenon is well illustrated in Faults No. 5 and No. 41 of the McIntyre Mine, on the former of which the major throw was 110 ft.

(3) **Block faulting,** although well illustrated at several places, is best exemplified at the Porcupine Crown Mine, where after a period of tedious and skilful work the faulted vein was recovered beyond one of these systems of block faults. In this system two principal faults bounded a wedge shaped block three hundred feet across at the widest part within the mine workings. On the bounding faults the throws were nearly equal. They converged toward the south west and in depth, the dip of the more northerly one being into the south east quad-

Gold Quartz, Dome Mine

Gold Quartz, Dome Mine.

rant at about 68 deg. and that of the more southerly into the northwest quadrant at about 78 deg.

All the phenomena capable of being depicted graphically have been faithfully represented on the mine maps, giving an excellent record of what was found in the search for the lost vein. From a study of these maps, it appears that within the wedge-block there was a surprising amount of minor faulting both of the block and step types, representing powerful crushing effects. It is to be hoped that some day this data may be published, as it is a very instructive example of block and step faulting under compression.

Dragged ore fragments are frequently found in large faults, and the schists adjacent to such faults often show drag phenomena. The fault surfaces are also corrugated due to the irregularities of hardness in the walls, thus indicating the line of movement of the fault, the drag indicating the direction.

Another notable feature of the faults in these schistose formations is that although there are several faults of large throw (110 ft. and 130 ft.) whose ends have not yet been found, the majority of smaller faults of throw less than fifteen ft. are of short length and depth, the throw diminishing rapidly in all directions from the maximum point. In other words they are quite finite and often circumscribable within the mine workings. Notable examples of this are found in the McIntyre Mine in the cases of Faults Nos. 17 and 40.

Gold Quartz, Dome Mine.

This is due to the plasticity of the schists, acute stresses being quickly absorbed through the mobility of the medium. Thus a fault wherever encountered is to be regarded as a more or less elliptical surface of dislocation on which the throw diminishes in all directions from the maximum at the centre. As a consequence of this, when a vein is faulted at the centre of such a surface the strikes coinciding, the portion of it cut by the centre of the fault must be thrown further than the other parts, causing the plane of the vein to be warped above and below the fault with the concavities facing each other. No good example of this has been completely worked out, but in the case of No. 40 fault which cut No. 317 vein in No. 417 drift and stope, there was a striking diminution of throw in both directions from the maximum of 15 ft., the zero points being out of the vein on the level because of the discordance of strike of the two planes.

Thus the faults appear to be distributed throughout the schist in the three dimensions of space as elliptical surfaces of movement, representing the disposition of acute stresses developed during the general compression of the region. They are often connected with veins.

It may be said in concluding, that evidence has been sought, and not found, to support the view that deformation of the veins has in any case bent the quartz without fracturing it, or that bends have been produced in veins subsequent to their formation by any other means than crushing. But judging from the nature of the bends and the character of the crushing of the veins, there has scarcely been any folding or sharp bending in any of them since their formation, the compression of the schist having been more than two thirds completed before the veins were formed.

It may also be said that the plasticity of the schists represented by this one fourth or one third compression since the formation of the veins, appears not to have been universal, having been localized in a way not yet clearly understood; speaking generally, the uneven plasticity, and therefore the irregular deformation of the schists, has resulted in the production of such a variety of structural conditions at different points in the district, that each mine may be assumed to have its own peculiar structural problems, and these can be recognized and solved only by receiving close individual study.

Bibliography of Porcupine Geology.

Burrows, A. G.—1911—"The Porcupine Gold Area of Ontario," Ont. Bureau of Mines 20th Ann. Rep. Vol. 20, Pt. 2; 1912—"The Porcupine Gold Area," same Vol. 21, Pt. 1; 1913—"The Porcupine Area." Intern. Geol. Cong. 12 Guide Book No. 7 by Ont. Bureau of Mines.

Baelz, Walter—1912—"The Gold Fields of Northern Ontario," Can. Min. Jour. Vol. 33, p. 299.

Fleming, W. L.—1911—"Economic Features of Porcupine Ores," Eng. & Min. Jour. Vol. 92, p. 253.

Hore, Reginald E.—1910—"Porcupine Gold Deposits," Can. Min. Jour., Nov. 1, 1910; "The Porcupine Trail," Oct. 15, 1910, Can. Min. Jour.; —1911—"On the Nature of Some Porcupine Gold Quartz Deposits"; Journ. Can. Min. Inst., Vol. 14—Bull. No. 5 same; Min. and Scientific Press, Vol. 102, p. 588; 1912—"Mines and Ores of Porcupine," Eng. & Min. Jour., Vol. 93, p. 891; 1912—"On the Origin of the Porcupine Gold Deposits," Bull. Can. Min. Inst., March, 1912. 1913—"Gold Deposits of Porcupine District, Ontario," Econ. Geol., Vol 8, No. 5, Aug., 1913.

Knight, Cyril W.—1911—"Mineral Associates at Porcupine," Min. & Sci. Press, Vol. 102, p. 530.

Linsley, Thayer—1911—"The Ore Deposits of Porcupine," Eng. & Min. Jour., Vol. 91, p. 1005.

Loring, W. J.—"The Porcupine Gold Field," Mining Magazine, Vol. 4, No. 4, p. 284.

Miller, Willet G.—1910—"The Porcupine District of Ontario."

MacLean, T. A.—1912—"Notes on the Porcupine Gold Region, Ontario," Min. Soc. Nova Scotia Jour., Vol. 17, p. 82.

McDonald, P. B.—"The Porcupine Gold District, Ontario," Mining Science, Vol. 63, p. 231.

Meyer, Ralph A.—"The Porcupine Gold Area," Min. & Sci. Press, Vol. 102, p. 756.

Stansfield, John—"Microscopic Examination of Some Typical Sections of Porcupine Rocks and Vein Matter." Can. Min. Jour., Vol. 32, p. 109.

Shaw, S. F.—"Some Notes on Porcupine," Eng. & Min. Jour., Vol. 92, p. 1223.

Gold Quartz, Millerton Mine, Porcupine.

THE DETERMINATION OF COBALT AND NICKEL IN COBALT METAL

By C. A. Knittel†

The only methods for the analysis of Cobalt Metal which the writer has been able to find in the literature, are given by C. M. Johnson in his book, "Chemical Analysis of Special Steels, Steel-making Alloys and Graphites." Considerable differences between Steel Works Chemists and the Coniagas Reduction Co. laboratory seem to show the desirability of further information on this subject. The following method has been employed in this laboratory for some time, duplicates checking within 0.02%:

One gram of drillings contained in a 150 c.c. conical flask provided with a trap* (made of a calcium chloride tube) is treated with 20 c.c. of Hydrochloric Acid (S. G. 1.12). A gentle heat is applied until all action ceases. 1 c.c. of nitric acid (S. G. 1.4) is now added to dissolve any remaining metallic residue. As soon as the action of the nitric acid ceases, the trap is rinsed, removed, and the solution evaporated to a syrup. The contents of the flask are taken up with 30 c.c. of water and filtered.

The siliceous residue on the filter is washed with water (acidulated with a few drops of hydrochloric acid), incinerated and fused with five times its weight of potassium pyrosulphate. The fusion is dissolved in a little water, and added to the main filtrate. The slightly acid solution of the metal is warmed and saturated with hydrogen sulphide. The sulphides of arsenic, copper, etc., are removed by filtration, thoroughly washed with acidulated hydrogen sulphide water (1 c.c. HCL : 100 H_2O) and the filtrate caught in a 350. c.c. casserole.

To expel the H_2S, the contents of the casserole are evaporated low, the iron oxidized with a few drops of bromine, 0.2 grams ammonium chloride added, and the evaporation continued to dryness at water bath temperature.

The dry chlorides are taken up in a little water, 0.1 grams of ammonium formate added, and the whole diluted to 50 c.c. The solution is heated until a precipitate of basic formate of iron separates. Very dilute ammonia is now added until the solution is only slightly acid. After further heating for a minute or so, the precipitate of basic iron formate is allowed to settle, filtered and washed with a hot dilute (0.1%) solution of ammonium formate.

The washed iron precipitate is dissolved off the filter with hot dilute (1 : 5) hydrochloric acid, the filtrate caught in the casserole in which the iron precipitation was made. The solution of the iron precipitate is neutralized with ammonia; ammonium formate added, and the iron precipitation repeated in a volume of about 50 c.c.; the precipitate filtered and washed with the hot dilute ammonium formate solution.

The united filtrates from the two iron separations are evaporated with the addition of 8 c.c. concentrated sulphuric acid until fumes of sulphur trioxide are copiously evolved.

The sulphates are taken up in water and transferred to a 180 c.c. tall beaker, keeping the volume of the solution to about 50 c.c. 60 c.c. of ammonia (S. G. 0.9) is now gradually added to the solution in the beaker (kept cool in running water) followed by 10 c.c. of (20%) ammonium bisulphite solution.

The cobalt and nickel are now deposited together with a current of 2.5 amperes. When the solution is colorless, the cover glass and the sides of the beaker are rinsed down with water, and the current reduced to 0.5 amperes, allowed to pass until a few c.c.'s of electrolyte tested with potassium sulphocarbonate show that the cobalt and nickel are completely deposited. The cathode is removed with the usual precaution, dried, and the deposited cobalt and nickel weighed.

The cobalt and nickel are dissolved off the cathode with 30 c.c.'s of nitric acid (1 : 3), the cathode rinsed, removed, and the solution of the metals boiled to expel nitrous fumes. The solution is diluted to 500 c.c.'s, neutralized with ammonia, made faintly acid with nitric acid, heated to about 50-60°C and the nickel precipitated with 30 c.c.'s of a 1% alcoholic solution of dimethylglyoxim, followed by 10c.c. of 20% ammonium acetate solution.

The precipitate is allowed to stand for four hours, filtered on asbestos, washed twice with hot water re-dissolved, and the precipitation repeated in a volume of 200 c.c.

After standing for an hour in a warm place, the nickel precipitate is filtered into a Gooch crucible, washed with hot water, and dried at 130-140°C for forty-five minutes. The weight of the precipitate multiplied by O.20316 equals the nickel, which, subtracted from the cobalt and nickel found by electrolysis, gives the cobalt by difference.

Notes and Precautions.—Cobalt metal as now commonly found in the market contains from 98-98.5% cobalt plus nickel. For this reason the amount of but 0.2-0.3 grams of material recommended by Johnson for the determination of the cobalt and nickel seems scarcely sufficient, as the weighing errors involved would appreciably affect the results. The indiscriminate use of large quantities of acids for solution and oxidation is to be condemned, as the getting rid of the excess only consumes time, and increases the chances of mechanical loss.

In filtering the sulphides of copper, arsenic, etc., and the basic iron, one should choose the size of the filters with due regard to the volume of the precipitate to be filtered. The separation of iron as basic formate is preferred on account of the ease with which it can be washed, and the formates are completely decomposed on evaporation with sulphuric acid.

The presence of acetates in the electrolyte seems to retard the complete decomposition of the last traces of nickel. In one instance on electrolyzing material containing 97.5% cobalt and 0.8% nickel in the presence of acetates, 1 mgr. of nickel was found in the electrolyte 30 minutes after complete deposition of the cobalt. The volume of the elect-

—Methods in Chemical Analysis.
†Reduction Company, Limited, St. Catharines, Ont.

rolyte should be kept within the limit specified above, as the complete deposition of the metals from such dilute solutions as employed by C. M. Johnson, is unnecessarily prolonged. Johnson saturates the electrolyte with hydrogen sulphide after deposition of the metals, and assumes that any precipitates formed consist of cobalt, but this precipitate is very often considerably contaminated with Al. and Mn.

It has been found that the amount of cobalt and nickel remaining in the electrolyte after electrolysis, as conducted in this laboratory, is less than 0.1 mgrm., amounting to less than 0.01% on a one gram sample. Hence the correction used by C. M. Johnson is not employed because its value is doubtful.

The cathodes used are of the preforated type with an effective surface of 90 square cms. The anodes are spirals made of 0.04 inch wire, 5-8 in. diameter, 6½ turns.

MINERAL PRODUCTION OF ONTARIO

The output of the metalliferous mines and works of Ontario for the six months ending 30th June, 1915, as reported to the Ontario Bureau of Mines, is shown by the following table, which gives also the production for the corresponding period of last year:

	1st six months, 1915	1st six months, 1914
Gold	$3,570,072	$2,011,069
Silver	5,188,763	7,063,418
Copper	1,229,894	1,197,059
Nickel	3,393,528	2,872,843
Iron Ore	288,296	118,119
Pig Iron	2,856,040	4,429,664
Cobalt	34,443	22,581
Cobalt oxide (including nickel oxide)	56,812	379,152

Gold.—Of the total yield $3,267,620 came from the mines of Porcupine. The remainder, $302,452, was the combined product of the Canadian Exploration Company at Long Lake, the Tough-Oakes Mines at Kirkland Lake, and the Cordova Mine in Hastings County. The principal Porcupine outputs were Hollinger and Acme $1,764,690, Dome $589,234, Porcupine Crown $382,001, McIntyre $346,997. The production of the Porcupine group is steadily increasing, and the existing scale of operations, if maintained for the full year, will give an increase of about 50 per cent over the yield for 1914.

Promising developments are in progress in other fields. At Kirkland Lake the Tough-Oakes mill is working steadily and satisfactorily, and other prospects there are being opened up. The Huronia Mine in Gauthier township, east of Kirkland lake, is being tested, and more or less work is in progress on the finds at Goodfish lake north of Kirkland lake, also in Boston township. Quartz of remarkable richness has been encountered in the shaft of the Dobie-Leyson claim in the township of Munro. Samples were shown at the recent Canadian National Exhibition, Toronto, carrying up to 2,000 or 2,500 ounces of gold per ton. It is estimated that at least a ton of such ore has so far been obtained, together with a considerable quantity of $40 and $60 ore. Gold has also been found at Howard falls on the Kawashkagama river, corrupted or abbreviated into "Kowkash"—near the crossing of the National Transcontinental railway about 300 miles west of Cochrane. A number of prospectors have gone into the area, and a good many claims have been staked. One of the geologists of the Bureau of Mines is at present on the ground making a preliminary examination of the rocks, but his report has not yet been received.

Silver.—The diminution in the output of silver continues, the falling off as compared with the first six months of 1914 being $1,864,655. Part of the shrinkage is due to the fall in price of silver since the war began, but in any event a decrease was to be expected. The Nipissing mine remains at the head of the producing list, with a yield of $1,139,387, Mining Corporation of Canada (Townsite, Cobalt Lake and City of Cobalt mines) being second with $773,192. Coniagas follows with $565,-816, Kerr Lake, with $410,476. A feature of recent operations in the camp is the development of a rich series of veins by the Mining Corporation of Canada under the townsite of Cobalt. Gowganda yielded $49,126, Miller Lake-O'Brien being the one producing property in that area.

Nickel and Copper.—The output of nickel has never been so great as it is at the present time. Demand is insistent, and producing companies are working their mines and smelters at full capacity. As compared with the corresponding period of 1914 the value of the copper output increased by over 2 per cent., while that of nickel went up by over 18 per cent. The quantity of ore raised was 548,579 tons, and of ore smelted 550,870 tons. The Canadian Copper Company and the Mond Nickel Company are the producing concerns.

Iron Ore and Pig Iron.—The output of iron ore was wholly from the Helen and Magpie mines owned by the Algoma Steel Corporation, and considerably exceeded that of the same period last year. The production of pig iron fell off 38 per cent in value.

Cobalt.—The chief outlet for cobalt oxide—the ceramic works of Europe—has been closed by the war. Consequently the shipments from the silver refineries have been greatly reduced, falling off in value 85 per cent. Some consignments have been made to Great Britain and the United States. Metallic cobalt is now being produced both at Deloro and Thorold, and is finding a use in the manufacture of high grade and high speed tools, also for the plating of metallic objects, replacing nickel for this purpose.

Molybdenite.—There is a strong demand for the ores of molybdenum. The principal one is molybdenite, of which there are many occurrences in Ontario, though so far they have shown the usual pockety and uncertain characteristics which mark deposits of this mineral wherever found. Concentrates carrying 85 or 90 per cent of molybdenum sulphide bring as much as $1.75 per pound. The demand is from steel-makers in England, whose supply before the war came from Germany, mainly as ferro-molybdenum. Nine-tenths of the product is used in making special alloys for ordnance-working tools. Parties in a position to supply molybdenite can be put in touch with buyers by corresponding with the Director of the Imperial Institute, London, Eng.

MINE PUMPING*

By Charles Legrand.

The problem of mine pumping is so much affected by local conditions, and those conditions are so liable to changes during the life of a mine, that the best system to use is difficult to determine. The experience of the writer has been that, in general, for copper mines, electric pumping is most satisfactory unless the quantity of water to be pumped is great or the mine does not use electric power for any other purpose. As a rule, however, figuring on the cost of necessary power plant, the total cost of installation is greater with electric pumps than steam pumps.

As the water is liable to be gritty, outside-packed plunger pumps are to be recommended, and if the water is not acid, or only slightly so, chilled cast-iron plungers pay for their extra cost very quickly in diminished cost of packing. With chilled plungers it is possible to use metallic packing instead of soft packing, if the water is not too gritty nor the lift too high.

In vertical pumps this packing is satisfactory for lifts up to 400 ft., in the experience of the writer, and may be found satisfactory for higher lifts.

For water slightly acid, cement-lined pump bodies have given good satisfaction.

For acid water, both plungers and pump bodies should be made of acid-resisting bronze.

For high lifts, especially with gritty water, a satisfactory pump valve is difficult to find. To reduce the unbalanced pressure on the valve at time of opening it is advisable to have narrow seats; this, however, brings high pressures on the seats when the valve is closed. On large valves for lifts of 600 to 1,000 ft. we have used leather, hard rubber, vulcanized fiber, and soft brass; for clear water the latter has given best satisfaction.

The difficulties due to grit make it advisable to have large sumps where water can settle, and if possible, to have two of them so that they can be cleaned alternately.

At the mines of the Old Dominion Copper Mining & Smelting Co., Globe, it was found that a small air ejector discharging into a mine car is a very convenient way to clean mud and sand from a sump.

Steam Pumps.—The steam pumps can be divided into two broad classes: the direct acting, with simple, compound, or triple-expansion steam cylinders, and fly-wheel pumps with compound or triple-expansion steam cylinders. All the steam pumps are usually run condensing, both for steam economy and because exhaust steam cannot be discharged in the mine.

The steam consumption per water horsepower diminishes in the order given above and the complexity of the pumps increases as the steam consumption diminishes.

The simple direct-acting pump is so uneconomical in steam consumption that it should not be used for permanent pumping although very simple and convenient in emergencies. It can also be used with compressed air instead of steam.

The compound direct-acting pump for small power is a satisfactory pump.

The triple-expansion direct-acting pump is fairly economical in the use of steam if proportions of steam and water ends are correct for the lift. In a great many installations this is not the case and the steam end of the pump is too large for the work done, increasing considerably the steam consumption per horsepower. It is quite usual for mine managers to specify a higher lift for the pump than they expect to have when the pump is installed, so as to enable them to put the pump at a lower level later on.

If a pump has to be ordered for such a change of lift it will be found advantageous to order the pump for the correct lift but specify the water end strong enough to stand the maximum pressure expected in the future. When lift on pump is increased the size of plunger can be altered at small cost to keep the correct proportions between steam and water ends. This naturally decreases the capacity of the pump in proportion to the lift.

All the direct-acting pumps take comparatively little room and are easy to move from level to level.

The compound and triple-expansion fly-wheel pumps are more economical in use of steam, but are much more expensive of installation, require more room, and must be installed on good foundations that will not move or move as a whole. Their use can generally only be justified if the quantity of power to be delivered is considerable, steam expensive, and the probable life of the mine will repay the difference in cost.

Whether a surface condenser or a jet condenser should be used depends on local conditions. The surface condenser has less moving machinery and uses less steam than the jet condenser, but is liable to be out of service a longer time while tubes are being cleaned.

The question of proper size of steam line between boilers and pumps is one which usually is not given sufficient attention, most steam lines being too large for maximum economy. The writer has found in most cases that it is advantageous to have a steam pipe which gives a drop of pressure of 5 to 10 lb. between boilers and pumps, as the reduced condensation pays for the loss of pressure. When a small pipe line is used the usual separator at the pump should be made a separator-receiver, to steady the flow through the pipe line.

All steam pumps have a great advantage where flow is variable, as the speed and delivery of pump are easily adjustable to varying conditions.

Electric Pumps.—The electric pumps can be divided in two broad classes: the plunger and centrifugal pumps.

The plunger pumps are of many designs; the writer generally prefers the vertical type as giving more even wear on packing and plungers and taking less floor space, although they require more head room.

For high lift the quintuplex pump having a practically steady flow on the discharge is advantageous, as it can be used without air chamber.

The motors are generally geared to the pump through a single or double reduction of gears. If straight spur gears are used it is not advisable to have a single reduction of more than 8 to 1, and slow-speed motors have to be used. If herringbone

*A paper to be read at the San Francisco Meeting American Institute of Mining Engineers, September, 1915.

gears are used single reduction of larger ratio is permissible, allowing a motor of standard speed for pump drive. The herringbone gear is more efficient than the spur gear, but requires much closer adjustment of pitch line, so that bearings have to be made adjustable to maintain proper distance between pinion and gear shafts. For this style of drive the proper design of bearings is very important.

A flexible coupling between pinion and motor shaft usually pays for itself by reduced maintenance of motor, although on pumps using 50 h.p. or less, a motor with outboard bearing, and either a fabric or raw-hide pinion geared directly to pump without coupling, have been found quite satisfactory.

With alternating-current motors, unless special motors are used, it is necessary to unload the pump at start by means of a bypass valve. Motors with high starting torque can be obtained, but are less efficient than standard motors, and are not necessary unless the pump is to be used with an automatic starter.

Direct-current motors will start the pump under full head, with a starting rheostat made for this service.

The writer has had little experience with centrifugal pumps. As a rule they have the advantages of great simplicity, and ease of connection to motor, having no gearing; they are, however, less efficient than plunger pumps and have to be designed for exactly known conditions. They are sensitive to change of motor speed or changes of head, in a high-lift pump of moderate capacity the passages are small, the water travels at high speed, and if at all gritty the wear upsets the proportions of the pump and quickly affects the efficiency.

With plunger pumps the amount of water delivered can only be altered by varying the speed of the motor, starting and stopping the pump as required by the flow of water, or by passing a portion of the water to the pump suction.

The first method is easy where direct current is available, but more complicated or less efficient where alternating-current motors are used.

The second method can be used with both systems of power, but is hard on the power plant if pumping load is a large proportion of the total.

The third one is inefficient in the use of power, as the pump is working at full load at all times.

As the efficiency of electric pumps is not much affected by their size, where flow of water is variable it is advisable to have more units of a smaller capacity so that the number of units running can be adjusted approximately to the quantity of water pumped and one unit started and stopped by hand or automatically to take care of the variation of water level in the sump.

Electric pumps usually require less attendance than steam pumps and reduce the quantity of heat liberated in the mine, which is a considerable advantage in hot mines.

The electrical measurements are so much easier to make than the steam measurements that an electric pump is likely to be kept at a higher efficiency. With an electric pump it is easy to show the attendants the evil effects of packing the glands too tight and the large amount of power that can be thus consumed without heating the plungers.

The electric plunger pumps can be operated at a lower lift than they are built for with very little loss of efficiency.

Air Lifts.—Where the proper submergence can be obtained an air lift is inexpensive to install and will handle very great quantities of water in a small space, and although the cost of the air is comparatively great, there are practically no other running costs. This method cannot be used from the lowest level of a mine, without a lot of complications, as there is then no way to get the proper submergence.

Air lifts were used at the mine of the Old Dominion Copper Mining & Smelting Co. at Globe in a recent emergency when water flow increased on the upper levels of the mine and got beyond the pumping capacity of the plant. A 10 in. air lift raising the water 200 ft. (exclusive of friction), using air at 90 to 95 lb. pressure at the power plant, required the following amount of air (measured by flow meter) at a barometric pressure of about 27 in. of mercury.

Gallons Water per Minute	Cub. ft. Free Air per Minute	Cub. ft. Free Air per 1,000 gal.
1,011	1,353	1,338
1,680	1,809	1,080
1,794	2,262	1,261
1,925	2,658	1,375
1,965	3,219	1,638

Another lift raising the water 431 ft. exclusive of friction gave the following results:

Gallons Water per minute	Cub ft. Free Air per minute	Cub. ft. Free Air per 1,000 gal.
1,122	3,051	2,718
1,233	3,306—3,395	2,681—2,753
1,233	3,484—3,395	2,825—2,753
1,291	3,832—3,875	2,968—3,002
1,291	3,919—3,875	3,035—3,002
1,325	4,089	3,086

In these tests, which were kept up from 1 to 2 hr. each, the measurements of air were taken with a General Electric Co. air-flow recording meter installed carefully and checked after test according to instructions furnished by the makers; the results are probably correct within 5 per cent.

The measurements on water were obtained by taking the reduction of speed of the pumps when air lift was working and the water level in sump kept constant and a volumetric efficiency of 90 per cent. assumed for the pumps. All pumps were equipped with revolution counters.

The average speed of the pumps was recorded before and after the air test to insure that the water flow had not changed in the mine. The quantities of water are very nearly correct.

The above figures are not given as absolute, but only to give a rough idea of what can be done with an air lift. In both cases the submergence was about 190 ft.

Tests on Steam and Electric Pumps.—In the following table are given the results of some tests on various sizes of steam and electric pumps. These tests were taken under running conditions and for steam pumps the water fed to boilers was taken as used by the pumps, all the auxiliaries of the boiler plant being run from another source of supply.

Tests 1, 2 and 3 were taken by condensing the exhaust of the pump and weighing the condensate and estimating the volumetric efficiency of water end at 90 per cent., as the delivered water was not measured.

Tests 4 to 9 were not taken by the writer.

Tests 10 and 11 are on triple-expansion four-cylinder pumps with two low-pressure cylinders. On these tests steam was superheated 35 deg. when leaving boilers and the pumps were tested together.

Tests 12, 13, and 14 were on pumps immediately after starting.

Test 15 on same pump as No. 14 after two weeks run.

Test 16 is on single-reduction spur-gear pump.

Test 17 is on single-reduction herringbone-gear pump.

Test 18 is the best test on air lift for 200 ft.

Test 19 is the next to the best test on same.

Test 20 is the best test on air lift for 431 ft.

Test 21 is the next to the best test on air lift for 431 ft.

On Tests 18 to 21 the steam consumption per water horsepower-hour is based on air compressors requiring 38 lb. of steam per 1,000 cu. ft. of free air, delivered compressed to 9 lb. gauge pressure.

Steam Pumps

Kind of Pump.	Steam Cylinders Inches	Water Plunger, Inches	Stroke, Inches	Speed Rev. per Min.	Water Del'd During Test, Gal. per Min.	Lift Including Friction, Feet	Steam per Water Horse-power-hour	Boiler Pressure, Pounds
Single Duplex	9	8¼	10	33.0	270	120	98.0	135
Single Duplex	14	8½	10	33.0	285	111	135.0	135
No. 1 Exhaust in No. 2 as a Compound Pump	....	..	..	..	350	120	78.0	135
Triple Expansion Duplex	10–15½–26	8	24	14.1	278	591	61.5	122
Triple Expansion Duplex	15–23–39	10	24	12.7	391	926	49.4	125
Triple Expansion Duplex	15–23–39	10	24	21.7	658	629	42.1	131
Triple Expansion Duplex	18–28–47	12	24	13.0	584	1,056	35.9	143
Triple Expansion Duplex	18–28–47	12	24	25.7	1,207	1,056	27.8	142
Cross-Compound Fly Wheel	19–35	5–5-8	36	32.4	502	1,059	27.3	110
Triple Expansion Fly Wheel	14–26–26–26	7–5-16	36	38.0	878	652	18.0	137
Triple Expansion Fly Wheel	14–26–26–26	6–3-8	36	32.0	553	883	18.0	137

Electric Pumps

Kind of Pump	Motor, Horse-power	Water Plunger, Inches	Stroke, Inches	Speed Rev. per Min.	Water Delivered During Test, Gal. per Min.	Lift Including Friction, Feet	Steam Based on 25 lb. per Kw-Hr.
Vertical Triplex Double Reduction	10	4	9	36	51	475	32.7
Vertical Triplex Double Reduction	20	4	9	37	54	1,162	28.1
Vertical Triplex Double Reduction	50	9	10	37	302	423	29.1
Vertical Triplex Double Reduction	50	9	10	37	303	423	25.6
Vertical Quintuplex Single Reduction	110	4½	12	40	159	1,155	23.1
Horizontal Quintuplex Single Reduction	250	9	18	52	1,245	506	22.2
..	..	..	Air Lifts		..	Excluding Friction	
..	..	..	..	..	1,680	200	48.7
..	..	..	..	..	1,794	200	57.5
..	..	..	..	..	1,122	431	57.0
..	..	..	..	..	1,233	431	57.6

The Thomas Davidson Manufacturing Company of Montreal, Canada, have closed a contract for the installation of a Snyder Electric Furnace. The furnace will melt and refine cold steel scrap, producing high grade steel for casting into blanks for the manufacture of shells. This is the second Snyder Furnace to be contracted for to produce steel for use in making war munitions. The other furnace will be installed at Sherbrooke by the Canadian Brakeshoe Company. In view of the stringent requirements with regard to war munitions, it is significant of the development of electric furnaces that they are being installed for this purpose. The Thomas Davidson Manufacturing Company are well known as manufacturers of stamped utensils and as tin and sheet iron metal workers and the cuttings from their stamping department will be used together with scrap available in the district for melting down in the Snyder furnace.

BUREAU OF MINES PUBLICATIONS.

The Ontario Bureau of Mines has issued a list of Publications, including Reports, Maps, and Bulletins (revised to August 1st, 1915), compiled by Mr. W. R. Rogers, topographer.

Many of the earlier reports and maps are now rare, and some copies have been secured by purchase. Such are now offered for sale at a price of one dollar and twenty five cents each for Reports, and ten cents each for Maps, prepaid. Where possible, libraries will be furnished with bound volumes. All the other reports and maps published by the Bureau of Mines are distributed free of charge.

Persons possessing rare volumes of Bureau of Mines' Reports for which they have no further use would oblige the Department by communicating with the Deputy Minister of Mines.

Complete sets of the Reports of the Bureau of Mines are to be found in most of the larger libraries both in Canada and abroad.

NORTH-WESTERN PLACER-GOLD FIELDS

The British Columbia Correspondent of the Canadian Mining Journal writes that, in his opinion, there is much truth in the following communication to one of the daily newspapers published in Victoria, B.C., and since a similar plea might well be made for placer-gold regions in other parts of the Dominion than the Northwest, he suggests that the information contained in the letter, which was headed "Northern Gold-bearing Area," and was signed "Sourdough," will probably be read with interest by others than residents in British Columbia, if reprinted in the Journal. The letter follows:

Among the many remedies advanced towards alleviating the present financial stringency throughout British Columbia too little attention has been turned to the opportunities offered by the exploitation of the placer grounds of the province.

The fields now being rendered more accessible by railways under construction are undoubtedly helping to direct attention to a source of wealth that has for many years lain practically dormant, but the possibilities of placer gold being made to play a large part in our prosperity, does not seem to have yet engaged the consideration of the general public as it is entitled to do.

The falling off of the yield of placer gold in the province is owing to lack of new discoveries, exhaustion of known fields, difficulties of transportation, and the opportunities that have been offered during the past years in making money in real estate.

The foremost factor in the falling off of the yield of placer gold lies fundamentally with changing conditions; just as surely as the old-time pioneer, braving the hardships of the wilderness to found a home on the far fringe of civilization has passed away, so too has the old-time prospector, hence the millions of acres of unprospected ground in the province today, lying for the most part beyond the reach of only the most venturesome. Those regions, were they rendered more accessible, would bring into being a new race of prospectors, and who can say that their rewards would not be similar to those of the men of '49, '62, and '97.

Within the area lying between northern British Columbia and Yukon Territory lie hundreds of miles of unexplored regions that are known to be gold-bearing. There is room for a dozen Klondykes there, and every possibility of finding paying fields once the barrier of transportation difficulties is removed.

Warburton Pike, an authority whose knowledge of this territory is unquestioned, wrote as follows as far back as twenty years ago: "If a man carefully examines a map of the northern territories he will see that there is an enormous stretch of country bounded by the Yukon on the west, the main range of Rockies on the east, and the Liard on the south, over which the white man's foot has never trodden, and yet it is the birthplace of large streams that give every promise of wealth. The Pelly, the Ross, the McMillan, and the Stewart, with the Yukon from the east all have their sources in this district, while south of the unkown divide, the Francis, Hyland, Black and Beaver rivers drain large areas toward the Liard. All these streams have been proved to bear gold at their mouths, but the exploration of their upper waters has always proved a task beyond the power of the poor prospector. South of the Liard again lies another little-known area, embracing the Omineca and Peace River districts. All this country lies in the mineral belt extending northward from California, and has proved wherever examined to be rich in precious metals. What bigger field for enterprise could be opened for any colony?

"Of all the unexplored region left on the earth's surface there is none that offers a more enticing field for exploration or more promise of practical reward to the enterprising traveler than the country drained by the tributaries of the Yukon and Mackenzie. It is a land with a great future, clear of native troubles or political complications, and British Columbians have only themselves to blame if they fail to take advantage of the possibilities placed ready to their hands."

The above, written nearly twenty years ago, is as true of today as it was then. The country is still unknown, the prospector is still handicapped by the difficulties of transportation; the gold is there; let means of access be provided and this rich territory be rendered capable of yielding up its treasures.

There is a lamentable want of knowledge in regard to the potentialities of northern British Columbia and at the same time a wilful disregard of the possibilities of this great area, because it lies so far from the direct spheres of influence of the present centres of population. Anything directly tending to the further upbuilding of those centres would be eagerly considered when advantages to the province as a whole would be ignored.

These are hard words to say, but if we are ever going to make real progress in British Columbia they cannot be lost sight of.

A broader minded policy is badly needed, as well as a greater knowledge of the assets of the province. The government has done much to assist in many ways the furtherance of this knowledge, but much remains yet to be done. The blame lies at the door of the people themselves, who by their apathy in regard to everything except what they are personally interested in have retarded the advancement of the province as a whole.

Suppose the railway from Vancouver to Fort George had been built, say from a point on the Grand Trunk Pacific Railway to the north, it would have formed a long link in the chain of railways that will ultimately connect Alaska with this province; but a proposition such as this would have been negatived at once by the people because it would not have directly benefited their interests so far as they could see, owing to their want of knowledge of real conditions and a lack of perception of the advantages to be gained to the province as a whole.

Similar ignorance to that displayed regarding the Northwest only a very few years ago is still in evidence as far as northern British Columbia is concerned, and the sooner the true conditions in regard to it are made known the sooner will the whole province reap the benefit.

The placer mining laws have remained on the statute books practically unaltered for many years. No one can gainsay that they have been as nearly perfect as it was possible to make them, but laws must change with conditions, and if a revival of the placer mining industry is to be desired, then freer and more elastic mining laws are required. If the laws in regard to quartz claims were applied to placer claims, a grubstaker would have some pro-

tection. At the present time all he has is an interest in a placer claim that may be staked. His interest ceases if the claim lies unworked for a period of seventy-two hours during the open season, and without the grubstaker no very great increase in the number of prospectors may be looked for. We know that any effort to change the placer mining laws will meet with opposition, mostly from the man who never washed a pan of gold in his life nor put a dollar into a proposition to help someone to do so. The question is an open one, but if the placer mining is to be revived stumbling blocks must be removed, whether they are laws, lack of knowledge, of transportation, or whatever stands in the way.

We do know that there is gold in British Columbia, but we have been too busy diverting the golden stream from the coffers of the investor that has flowed so steadily for many years to consider the unminted wealth that lies almost to our hand; wealth every dollar of which is a dollar gained, even the interest on which remains in the province.

No one can deny but what the hard times we have passed through have taught us a lesson. We are still learning it today and its first-fruits are a renewed interest in the development of our natural resources. Agriculture, timber, and fisheries are being considered as they never were before, also lode-mining, in so far as our limited means will allow, but placer-mining has yet to again come into its own.

Individual efforts can accomplish a lot, but united efforts can do more. We want more knowledge of our virgin fields, easier means of reaching them, and if such is shown to be needed, better laws for working them.

INTERNATIONAL NICKEL CO.

The International Nickel Co., the common stock of which (there is $38,000,000 common and $9,000,000 preferred) has just climbed above $200 a share has become a most prosperous mining-manufacturing corporation, not so much on account of the European war as by reason of its domination of the world's nickel market. Yet it cannot be classed as a "trust." Its good fortune rather lies in the fact that it owns and operates the largest and richest nickel deposit in the world.

The Boston News Bureau back in August, 1906, gave the first detailed account of the company's operations, as annual reports did not convey much information. At that time the common sold at $110 although it had been as high as $140. It paid no dividends however. Gross values below ground were then estimated at $450,000,000, which consisted of 15,000,000 tons of ore averaging $30 per ton.

Gross values, say the management, have since been increased as follows:

17,000,000 tons $30 ore	$510,000,000
30,000,000 tons $15 ore	450,000,000
Total	960,000,000

This tonnage indicates 60 years of life in reserve at present rate of extraction.

The company has never leaned strongly to the side of publicity, and stockhloders, now receiving at the rate of 20 per cent on their common stock, say the management, "have been treated too liberally to persist in seeking information." With the listing of the shares on the New York Stock Exchange more will be known.

Sudbury, Ontario, is the home of the wonderful deposits of the International Nickel Co. The ores run high in nickel and copper. They also contain other by-products including gold and platinum. Copper production has been running about 3,000,000 pounds a month, which under current high prices has also been adding materially to treasury receipts.

Despite the new demand that has sprung up for nickel the International Co. has not advanced prices. Formerly it shipped large quantities of nickel to Germany but this outlet was cut off with the outbreak of the war. The product has been fully cared for, however, by means of the growth in demand from other quarters.

Earnings have been running at the rate of about 32 per cent per annum against 20 per cent paid in dividends. A substantial surplus has been accumulated, it being estimated at $8,000,000. As the company conducts a cash business it does not need a large working capital, so that outlook for either an increased or extra cash dividend or another stock distribution appears to be very favorable.—Boston News Bureau.

BEAVER CONSOLIDATED MINES LIMITED.

The directors of the Beaver Consolidated Mines, Limited, report for the quarter ending August 31st, 1915:

Drifting, 876.5 ft.; Crosscutting, 303.5 ft.; Sinking, 151.5 ft.; Raising, 268.5 ft.; Stoping, 1,133.5 cubic yds.

The main shaft is down to a depth of about 1,100 ft. As stated in previous reports, the directors deem it advisable to continue sinking the shaft until the lower contact between the Diabase and Keewatin formations is reached. "During the months of June and July, we encountered some loose ground in the shaft which retarded our work very materially, but the record of sinking for August has been very satisfactory. The price of silver has been so low for the last few months that we did not consider it good business to raise the ore and convert it into bullion on which storage and other charges have to be paid; consequently, we have kept the drills working mostly on development. There is a great deal of ground yet to be prospected on the upper levels of the property, and, recently, on the 300 ft. level, in driving on a small vein from one of the main drifts, we encountered a body of ore which looks very promising both as to high-grade and mill rock. The physical condition of the mine is excellent. The addition to the mill has been completed with the exception of the lining for one of the ball mills. This has not arrived yet, although it has been on order for three months. As soon as it reaches the property and is installed, the daily capacity of the mill will be increased to 150 tons."

From the following statement, it will be seen that the company had quite an amount of bullion in storage in New York on August 31st.

Bullion in storage in New York	235,075.54 oz
Bullion due from Smelters	22,801.88 oz
Ore bagged at Mine	56,634.00 oz
Total	314,511.42 oz
Cash on hand	$116,017.25

PERSONAL AND GENERAL

Over 600 undergraduate students enlisted from the University of Toronto alone, last year's senior champion Rugby team sending 17 men out of 23, and the three championship hockey teams sent 18 out of 24.

The prospective retirement from the Government of Hon. Louis Coderre, Secretary of State and Minister of Mines is again being discussed. It is known that Mr. Coderre is desirous of leaving political life, and there seems to be a strong probability of his appointment in the near future to one of the vacant judgeships in Quebec Province.

A cheque for the sum of $10,000 has been received by His Honor Judge Kehoe, President of the Sudbury Branch of the Canadian Patriotic Fund, from the Mond Nickel Company, Coniston, as a donation to the Fund.

Mr. J. Murray Riddell, of Iron River, Mich., was in Toronto during September on his honeymoon.

Mr. C. W. Wright has returned to Sardinia.

Dr. T. O. Bosworth, of London, is investigating petroleum resources of the Peace River district, Alberta.

Mr. Robt. Bryce, after a brief stay in Toronto, has returned to the Western United States.

Mr. W. F. Ferrier left Toronto for the West on Sept. 17. He expects to be away for several weeks.

Mr. J. B. Tyrrell has returned to Toronto after visiting the Kowkash district.

Mr. C. F. Schaber has been appointed division engineer for the Tennessee Coal, Iron and Railway Co.

Dr. Thomas H. Norton, commercial agent of U. S. department of commerce, announces discovery by a government chemist of a new and seemingly practicable method for extraction of potassium carbonate from feldspar. Should it prove a success, it will give to America a practically unlimited supply of potash.

Dr. Frank D. Adams, of Montreal, has been in the West. According to a published press despatch, he and Mr. W. J. Dick, mining engineer to the Conservation Commission of Canada, have been investigating "deposits of phosphate of lime in the Banff National Park in the Rocky Mountains."

Mr. H. Foster Bain, formerly editor of Mining and Scientific Press, San Francisco, but now editing The Mining Magazine, London, England, had his name freely mentioned for the position of Director of the United States Bureau of Mines. Immediately he learned that his friends were working in his interests, he cabled to Mr. T. A. Rickard, now editor of Mining and Scientific Press that he would not be a candidate for the appointment, but that he supported Mr. H. Van Manning, who had long been the friend and assistant of the late Director, Dr. Joseph A. Holmes. Mr. Manning's appointment as Director has since been made and announced.

Mr. Howland Bancroft, of Denver, Colorado, has gone to Bolivia, for which country he left New Orleans on August 11

Mr. Lorne A. Campbell, M.L.A. in British Columbia for the constituency of Rossland, and general manager of the West Kootenay Power and Light Co., has returned to Rossland from a trip to Ontario, where his father was very ill. Mr. Campbell, Sen. died shortly after his son's arrival at home.

Mr. M. S. Davys, of Silverton, Slocan Lake, B.C., managing director of the Silverton Mines, Ltd., operating the Hewitt-Lorna Doone group of silver-zinc mines and concentrating mill in Silverton camp, has returned to British Columbia from a business trip to New York. The Minerals Separation flotation process has been successfully adopted at the Silverton Mines company's plant.

Mr. Geo. Watkin Evans, of Seattle, Washington, a coal mining engineer who two or three years ago gave much attention to the coal measures of the Groundhog basin, in the upper Skeena district of British Columbia, and afterward superintended the mining of about 1000 tons of coal in the Matanuska field, Alaska, for U. S. Navy to test, is again in that country investigating mining conditions and property.

Mr. Colin Fraser, formerly on the staff of the Geological Survey of New Zealand and a much-valued assistant to Dr. J. McIntosh Bell when the latter was Director of the Survey of that country, has been making a geological examination of the famous Mt. Morgan mine in Queensland, Australia. Several years ago Mr. Fraser spent some time in Canada looking over mining properties, both in Ontario and British Columbia, in the interests of capitalists resident in England.

Mr. H. W. Hardinge, of New York City, president of the Hardinge Conical Mill Co., after a trip through the chief mining districts of northern Ontario, returned to New York, and later proceeded to San Francisco to there attend the meeting of the American Institute of Mining Engineers.

Mr. J. P. Keane, who for some years was manager of the Cariboo-McKinney mine and mill in Camp McKinney, British Columbia, during the dividend-paying days of that gold property, and later engaged in developing the Wonderful silver-lead mine, near Sandon, Slocan, B.C., was in Victoria recently, endeavoring to make arrangements to lease or purchase a concentrating mill in the Slocan, so that he and his associates might resume the custom ore-concentrating business they had successfully established at Sandon, Slocan, but which has been interrupted by the burning of the Ivanhoe mill they were working under lease until its destruction on August 30th.

Mr. J. S. Kimball, of San Francisco, California, several weeks since examined the Valdes Copper Co's Copper Mountain group of mineral claims situated on Quadra island, on the east side of Discovery passage, between the Mainland of British Columbia and Vancouver island. A description of this property, by Mr. J. W. Astley, of Toronto, was printed in the 1914 Report of the Minister of Mines for British Columbia.

Mr. Anthony J. McMillan, official liquidator of the Le Roi Mining Co., who has been at Northport, Washington, in connection with negotiations for the sale of the company's smelting works there to mine owners operating in the Coeur d'Alene district of Idaho, has been spending a few days in Victoria, B.C. The Northport smeltery is being prepared to smelt lead as well as copper ore.

Mr. G. W. Ottreson, manager of the Kildare Mines, Ltd., an eastern Canadian company engaged in the exploration of placer-gold property on Slate Creek, Omineca, British Columbia, on which stream are situated the placer claims covered by the fourteen leases held by the company, has finished his work in the field for the 1915 season and was at his home in Seattle early in September.

Mr. Stuart J. Schofield, of Ottawa, is continuing his geological examination of country east of Kootenay Lake, in British Columbia, for a report thereon to the Director of the Geological Survey of Canada.

Professor Francis A. Thomson, head of the department of mining engineering of the State College of Washington, and Professor F. M. Handy, assistant professor of economic geology for the same department, have returned to their college duties at Pullman, Washington. During the summer Professor Thomson spent several weeks in West Kootenay, B.C., and afterward visited the Panama-Pacific International Exposition, while Professor Handy was occupied in investigating the geology of the Similkameen country about Oroville, near the International Boundary line.

Mr. Walter Harvey Weed, of New York City, has returned to the United States from Newfoundland, where he had been doing professional work.

Mr. Fred R. Weekes, who during one season superintended the work of developing a number of mineral claims on Copper mountain, near Princeton, in the Similkameen district of British Columbia, for the British Columbia Copper Company and allied interests, has removed to Darwin, California, from New York city.

Mr. Clyde White has returned to Sandon, Slocan, B.C., from the Portland Canal mining division of British Columbia, where he had for some time been engaged in directing development work on one of the chief mining properties of that part of the province.

Messrs. Bruce and Oscar V. White were in Spokane early in September, where they attended the funeral of their brother, the late Byron N. White. They have since returned to Slocan, B.C., where the former is part owner and in charge of the Noonday mine, and the latter superintendent of the Slocan Star mine and concentrating mill.

OBITUARY.

On Saturday night, September 11, Byron Noel White died at Spokane, Washington. The "Spokesman-Review," of Spokane, published the following obituary notice:

"Byron N. White, who has been prominently identified with the mining industry of the Northwest for the last quarter of a century, died of paralysis at the family home, Spokane, early last night. He was the father of Prosecuting Attorney John B. White, of this city.

"Mr. White's illness dates back three years and he had been seriously ill for the last eighteen months, when he suffered a stroke of paralysis. Since that time he was confined to his home. On September 4 he suffered the third stroke and was in a state of coma thereafter.

"Mr. White was born in St. Thomas, Ontario, 65 years ago and came to Spokane about a quarter of a century ago from Ontonogan, Michigan, where he was engaged in iron and copper mining. He was one of the original owners of the celebrated White Pine mine, which has recently become an important copper producer.

"Upon arriving at Spokane, Mr. White engaged in mining, with which he continued to be connected until he was taken ill. He was one of the original owners of the Slocan Star mine, in British Columbia, and at the time of his death he was still largely interested in that property. He was also interested in the Pueblo mine, in Whitehorse copper camp, southern Yukon Territory, and, as well, in mining properties in Oregon. Beside, he operated in Mexico for a time.

"Mr. White was married in 1884 to Miss Sarah Blackwood, at Chatham, Ontario. Prosecuting Attorney White is their only child. Two brothers, Bruce and Oscar V. White, both of Sandon, Slocan, B. C., and two sisters, Mrs. Charles Culver, of Seattle, and Mrs. T. Sharp, of Spokane, survive."

It may be added that Mr. White's chief mining activities for a number of years were in connection with the development and productive operation of the Slocan Star mine, situated near Sandon, British Columbia. To acquire the Slocan Star group, which eventually comprised about a dozen mineral claims, in 1892 the Byron N. White company was incorporated as an extra-provincial company, under the laws of Wisconsin, U. S. A., with an authorized capital of $500,000. Its directors were: Byron N. White, Spokane, president and general manager; J. Hoyt Smith, Milwaukee, vice-president; J. W. Dadmun, Milwaukee, secretary-treasurer; and David Vance and Frank L. Vance, both of Milwaukee. Oscar V. White, of Sandon, B.C., was mine superintendent, which position he still occupies. A published statement of "total gross shipments" during a period of twelve years, 1894-1905, both inclusive, shows the following gross value: Shipments of ore, $1,291,728; of silver-lead concentrate, $1,229,641; of zinc concentrate, $154,061; total, $2,675,430. The total of dividends paid by the company during that period was $542,600. Protracted and costly litigation between the Star Mining and Milling Co. as plaintiffs, and the Byron N. White Co. as defendants, during a period of about ten years, was finally determined by a judgment of the Supreme Court of Canada, leave to appeal from which was refused by the Privy Council in England in the year 1909. The cause of this litigation was a trespass by the defendant company in following the dip of the Slocan Star vein and the extraction of the ore from the property of the plaintiff company; the defendants asserting that they were entitled to do this by reason of the existence of the apex of the vein upon the surface of their mineral claims, which had been located at a time when the mining laws of British Columbia granted to the locator what are known as "extra-lateral rights." This litigation was a source of great anxiety and vexation to Mr. White, who to its conclusion maintained that his company was in the right. However, the final decision of the courts was against him, and later, in 1911, a merger was arranged and the Slocan Star Mines, Ltd., organized to acquire and operate both properties concerned, with Mr. Byron White as one of the directors and Mr. Oscar White as mine superintendent, since which time the property has been extensively further developed.

Sir Richard McBride, Premier and Minister of Mines for British Columbia, when informed of the death of Mr. White, said to a representative of the Victoria "Daily Colonist": "I regret exceedingly the death

of Mr. White, whom I knew intimately for many years. No man ever did more for the mining industry of British Columbia than he, judged from the standpoint of personal efforts. Not only did he invest large sums of his own money in mining properties in this Province, but he induced other capitalists to come over to our side of the International Boundary line and take an interest in the development of the country. He had the greatest faith in the future of British Columbia as a mineral-producing country. His loss will be greatly felt."

Mr. R. F. Green, M.P. for the Kootenay district in the Federal House of Commons, said: "British Columbia has suffered a real loss in the death of Mr. Byron White. I knew him intimately and was aware of many plans he had afoot looking to the further development of mining properties in this country. He was always an optimist in regard to the future of British Columbia, and I know that he was personally responsible for the introduction of large sums of capital. It was his prediction that British Columbia is destined to become one of the greatest mineral-producing countries in the world, and he never hesitated to back his judgment with his money. The development of the Slocan district was largely the result of his initiative, while in recent years he had also been paying attention to Southern Yukon, where he was largely interested in the development of a copper property."

Prof. C. E. Hayden, a mining engineer of Bellingham, Washington, was accidentally killed on Sunday afternoon, August 29, on a trail about 20 miles north of Harrison lake, British Columbia, when a shotgun carried by J. B. Ellinger, a member of the party, was accidentally discharged, the loads of both barrels entering Mr. Hayden's side. Death was instantaneous. The party was returning on horseback from a visit to a mining property, when Mr. Hayden attempted to pass Mr. Ellinger on the rather narrow trail, with the result that the hammers of the double-barreled gun which Mr. Ellinger was carrying across his saddle, caught in the horn of the saddle, causing the discharge of both barrels and the death of Mr. Hayden.

DIVIDENDS FROM BRITISH COLUMBIA MINES.

Last month the **Standard Silver-Lead Mining Co., Ltd.,** operating a silver-lead-zinc mine and a concentrating mill near Silverton, Slocan Lake, British Columbia, paid a dividend of 2½ cents a share on its 2,000,000 shares. The total of this profit disbursement, which was made on September 10, was $60,000. It is stated that the company's net profits for the month of July were $85,000. Owing to a suspension of ore production in August, 1914, consequent on the outbreak of war, no dividend had been declared since September, 1914. Prior to that month, however, there had been for more than two years a monthly dividend-payment of $50,000, with an occasional extra dividend of a like total.

The Consolidated Mining and Smelting Company of Canada, Ltd., operating mines at Rossland, in the Slocan district, and in East Kootenay, respectively, and the copper and lead-smelting works and lead-refinery at Trail, has declared its Dividend No. 18, of two per cent. for the quarter ending September 30, payable October 1; total for the quarter, at $2 a share, $116,098. This company makes its quarterly dividend payments at the rate of 8 per cent. per annum.

The Granby Consolidated Mining, Smelting, and Power Co's dividend for the current quarter, at the rate of $1.50 a share on its issued shares will total about $224,975. In its issue of September 11th the Boston Commercial said: "While it is quite possible that the directors may not increase the Granby Co's quarterly dividend beyond $1.50 a share when they meet this month, it seems reasonably certain that stockholders will receive a large extra in December or January." Elsewhere in this number of the Journal appears a brief statement of the company's smelting operations, made by the general manager when he was in Spokane, Washington, last month.

The Hedley Gold Mining Co., operating the Nickel Plate-Sunnyside group of gold mines and a 40-stamp mill and cyanide plant in Camp Hedley, Similkameen, at the end of September paid its customary five per cent. on its issued capital of $1,200,000, or a total for the quarter of $60,000. It is the rule of this company to pay a similar amount at the close of each of three quarters of each year, and then at the end of the fourth quarter make a larger distribution. Last year, owing to war conditions the directors deemed it wise to maintain a cash surplus in hand of at least $100,000, consequently the dividend for the final quarter was ten per cent., making the year's total of dividend disbursements to shareholders $300,000, instead of 15 per cent. for the last quarter with a total of $360,000 for the year, as had been paid in both 1913 and 1912. When the company's general superintendent was in Victoria a few weeks ago he stated that so much ore of good grade had been opened in the mine that this year's total of dividends may confidently be expected to be similar to those of 1913 and 1912.

J. M. TURNBULL TO BE PROFESSOR OF MINING.

It is reported from Vancouver that among other appointments made recently to the Faculty of the University of British Columbia, was that of Mr. Turnbull, of Trail, to be professor of mining.

Mr. John Moncrieff Turnbull, who for years has been on the mining engineering staff of the Consolidated Mining & Smelting Company of Canada, Limited, graduated from McGill University, Montreal, Quebec, in 1897, as bachelor of applied science, with the first rank honors in natural science. During the comparatively long peroid he has been engaged in mining engineering with the Consolidated Company he has had a close and an extensive experience with the productive mining industry of British Columbia, beside which in his capacity of examining engineer he has traveled throughout the various districts of the Province and has examined many mines and mineral claims, so that he has acquired much valuable information relative to its mineral resources, both developed and potential.

The appointment would, therefore, appear to be an eminently wise one, for mining students are likely to derive much benefit from one so well qualified to give accurate information concerning mineral occurrences and metalliferous mining methods in British Columbia.

SPECIAL CORRESPONDENCE

PORCUPINE, MUNRO TOWNSHIP, KIRKLAND LAKE AND KOWKASH

Kowkash.—The rush into Kowkash followed the usual course of all stampedes. They usually break out in the fall because the prospectors have been able to work since the early summer and have had a good opportunity to make finds and to stake their discoveries. The news filtered out and the rush commenced. Those who arrived in the stampede found that no work had been done in the country and that it had never been prospected before with the exception of the little trenching that had been done on the original discovery. They swarmed over the country and tied on to the Dodds' claims, placing out their four corner posts without the least attempt to make discovery. Then those who had merely gone in to stake with a view of instant sale came out and proceeded to say that the country was all swamp and did not hold very good prospects. The prospectors who are in the business all the year round or who were well backed are staying in the bush and doing all the work they can in the next two months before the snow falls. The one discovery to date is on one of the three claims held by E. King Dodds, a prospector who has been working along the T. C. R., since the early spring. The vein is four inches wide of very remarkable ore indeed and this particular shoot is about fourteen ft. long. The formation is chloritic schist and quartz porphyry as far as yet can be ascertained. The Ontario Geological Survey with commendable promptitude sent in Mr. P. E. Hopkins who is now at work collecting information for a hastily revised Geological map for the use of prospectors. This will be compiled and rushed out with the greatest possible speed. The department of Lands, Forests and Mines also ordered Mr. T. A. McArthur to go into Kowkash and decide for them whether it would be desirable to establish a Mining Recorder's office right at headquarters. A more easy camp to reach, it is hard to imagine. Taking the National out of Toronto at eleven o'clock one night it is possible to take the pullman to Kowkash and leave it at two o'clock the morning after next. At the point where the prospectors are leaving the railway, Johnson Creek, two shacks have already been erected, but there is no station until Kowkash is reached a mile and a half east; here the T. C. R. has placed an operator. From Johnson Creek the paddle to the Dodds' claims is not much more than twenty miles; across country it would not exceed ten miles. Johnson Creek is a tributary of the Kowkash River and the Kowkash River flows into the Albany River. The scene of excitement is very close to the height of land at this point, the waters of course running north. There are no rapids which cannot easily be run until Howard Falls is reached. Howard Falls is a height of about fifteen ft. and application has already been made to the department of Lands, Forests and Mines, for the right to develop it in case the camp becomes a producing one. The Dodds find is about a mile and a half beyond Howard Falls. The country is singularly like Porcupine in its topographical features. On first sight it appears to be merely swamp but a little careful scrutiny will show many regular outcrops probably covered with moss. This can be easily prospected and many of the claims staked have at least rock upon them, although no one stayed to make the discovery which is necessary in the Mining Act. While nothing as yet has been proved beyond the existence of very rich quartz in a narrow and short shoot of ore there is a disposition to regard the new field as very promising. There are already rumors of further strikes, but these latter have not at this date been corroborated.

Further inducement to visit Kowkash is the remarkable speckled trout fishing to be found in the waters of nearly all the streams in this section of the country. The easiness of the trip tempted many business men who had no intention of staking to make the trip into Kowkash. Many of the old prospectors who have been earning a regular wage in the various mines of the North for the past two or three years threw up their jobs in order to again take to the bush.

The Schumacher Mill is now treating ore. The plant commenced operations on the first of September and it is now treating from 75 to 85 tons a day. It is expected that there would be no difficulty in gradually raising the capacity to 150 tons a day. The mill is running very smoothly and Mr. Houston has had very little difficulty with it.

Hollinger.—The last monthly report of the Hollinger showed that a sweeping cut had been made in milling costs. The mill costs for the 28 days ending August 12th only amounted to $9.84 per ton. This was on a tonnage of 28,358. For the period ending July 15th, the milling costs were $1.067 and for the period ending June 17th the milling costs were $1.106 per ton, thus showing a very substantial decrease in the milling costs per ton. The mining costs were also down a little and the grade was slightly lower, being $9.03 per ton, against $9.26 for the corresponding period. Of the 28,358 tons treated 2,640 came from development and 25,182 from stopes. There is as yet only a few tons of ore being stoped below the 525 ft. level. The mill ran 96,17 per cent. of the possible running time, treating 39,955 tons of which 28,358 tons was Hollinger ore and 11,597 tons Acme Gold Mines ore

COBALT, GOWGANDA AND SOUTH LORRAIN

Nipissing.—According to a paragraph in the last monthly report of the Nipissing there is a possibility that the extension of the vein found on the Cobalt Lake fault will be picked up on the Nipissing at depth. The ore recently found at the south end of Cobalt Lake on the fault is so rich that its development is of considerable importance to the Nipissing. The ore body where it has been developed is not far from the Nipissing boundary and it is dipping towards it. The paragraph reads: "Recent developments on the Cobalt Lake fault by an adjoining company have been favorable and it is possible it will enter Nipissing ground at depth. Any development of the fault in Nipissing ground will have to be left until this possibility has been definitely determined."

For the first time in many years the amount of

ore mined at the Nipissing exceeded that of customs and Nipissing ore shipped. The amount mined differs only $900 from the July output but the shipments showed a drop from 262,616 to 118,047. The figures for the past three months are:

	Ore Mined.	Nipissing and Customs Bullion Shipped.
June	175,552	$376,486
July	179,998	262,616
August	179,048	118,047

A very extensive scheme of increased development has been mapped out; this includes cross cutting from the Meyer in many directions. One of these cross cuts will be run from the first level of the Meyer to pick up small but rich veins showing signs on the first level or on the surface. Other exploration is in favorable ground between the Meyer and 80. From the tunnel level of vein 96 on the Little Nipissing hill a cross cut is being run into new territory to discover what lies beneath certain well defined fissures found on the surface An arrangement has been made between the O'Brien Mining Company and the Nipissing Mining Company whereby the Nipissing will commence exploration work from No. 14 shaft on the O'Brien. This shaft was sunk some years ago about 100 ft. from the Nipissing claim 402. A cross cut was run almost to the boundary between the two properties. Cross cutting will commence east and west from this point near the boundary in order to discover if there are any profitable ore bodies in the vicinity. The formation is partly in the conglomerate and partly in the diabase.

The Shamrock Mine has now been dewatered and a cross cut has been started south on the 400 ft. level. It will be pushed to within 30 ft. of the Beaver line, when cross cutting will commence east and west parallel to the line with the intention of picking up extensions of Beaver veins.

The Right of Way Mining Company is still obtaining very good results from its operations at the south shaft. Recently an extension of a high grade vein has been picked up and it is quite possible that it will produce considerable ore.

The Silver Queen lease which is now in the hands of Mr. Stuart Thorne is also doing quite well.

BRITISH COLUMBIA

Generally, reports from the various metalliferous mining districts of the Province continue to indicate progress, with production being well kept up. For instance, the total quantity of ore received at the Consolidated Mining and Smelting Co's smeltery at Trail during four weeks ended September 9, was 37,527 tons, an average of 9,382 tons a week. This compares with 32,107 tons for four weeks ended August 12, an average of 8,027 tons a week. The total of ore receipts at Trail for the 36 weeks of 1915, to September 9, inclusive, is 305,700, an average of 8,492 tons a week.

It is noteworthy that several small mines that had not been on the list of producers for some time recently made small shipments of ore to Trail. Among these are the Ottawa, in Slocan City division of West Kootenay; the Rio, and the Buffalo, in Slocan division; the Sally, in Boundary district; the Sunrise and Silver Cup, near Hazelton, in Omineca division; the Copper King group, in Nicola district; and the Monarch, near Field on the C.P.R. mainline railway.

The progress of the negotiations toward the establishment of zinc production in the Province has attracted attention, particularly in West Kootenay district, and it is hoped that practical results will be the outcome.

West Kootenay.

Ainsworth.—Shipment of concentrate from the Bluebell mine, on the eastern shore of Kootenay lake, opposite the town of Ainsworth, has been resumed after a year of non-productiveness, the result of the European war. About 200 tons of concentrate from that mine reached Nelson on August 12, in transit to the smeltery at Trail. The wagon road from Ainsworth to the Skyline mine, owned by Mr. A. W. McCune, of Salt Lake City, Utah, has been cleared and repaired; it is understood that this is preparatory to work being resumed on the Skyline, which has long been unworked. Wagon-road connection between the Florence Mining Co's property and the Highland concentrating mill is being provided, so that ore from the Florence mine may be hauled to the mill. It is expected that the production of ore at the Cork-Province mine will be maintained and shipments to Trail be continued as long as there shall be water available for operating the Cork concentrating mill. Higher up the Kaslo & Slocan railway is situated the shipping place for the Utica mine, on Paddy's mountain, from which it is intended to ship ore in larger quantity than has been practicable in the past. A promising shoot of ore has been opened on the Marten group, on the south fork of Kaslo creek and ore is being packed out for shipment.

Slocan.—News items from the New Denver "Slocan Record" are as follows: The aerial tramway of the Ruth-Hope, near Sandon, was started about the end of August. W. J. McMillan, of the Alps mine, north fork of Carpenter Creek, has lost two of his packhorses, which slipped from the trail and fell over a bluff. Silver ore is being packed down from the Mountain Con mine to the railway at Sandon. A telephone has been put in at the Galena Farm mine, south of Silverton, the adit is being advanced about 200 ft. a month at this mine. Mr. J. P. Keane, who was one of the lessees of the Ivanhoe mill, went to Victoria early in September to endeavour to make arrangements for leasing or purchasing the concentrator near Rosebery. Development of the Echo property, above the Standard mine, is reported to be satisfactory; lately the drift has passed through concentrating ore, with occasional stringers of clean ore up to five inches in width. About 40 tons of ore has been shipped from the Wakefield mine, high above Four-mile creek; the ore runs 130 oz. silver to the ton and 40 per cent lead. Work has been discontinued there for the winter. Development work has been resumed in the No. 8 crosscut adit of the Standard mine. Snow fell on the tops of mountains in the district that are 6,000 to 7,000 ft. high. A shipment of 22 tons of antimony ore was made to England in August from the Alps mine.

Mr. Oscar V. White, superintendent for the Slocan Star Mines, Ltd., is reported by the "Spokesman-Review" to have said, when in Spokane recently: The drift on our ninth level, 100 ft. above the main adit, has entered a promising body of galena ore much sooner than we expected to reach

the first ore-shoot on this level. On the No. 8 level we have opened two shoots of ore, respectively 125 and 150 ft. in length. The first-mentioned shoot shows an average of 2 ft. 6 in. of clean galena and 4 ft. of concentrating ore. The second shoot varies in width from 5 to 20 ft. The clean ore occurs in alternate bands of lead and zinc, the former predominating. From the zinc ore taken from this drift recently we sorted out by hand a carload that averaged 44 per cent zinc and 45 oz. silver to the ton. Throughout the oreshoots in the lower workings of the mine the silver value runs just about what it did above, namely, an ounce and a quarter silver to the unit of lead. Both of these ore shoots have been raised in to the No. 6 level, the lowest of the old workings. The showing of ore in the second shoot in No. 6 level is especially fine. The main adit (tenth level) will still have to be extended 300 ft. to reach the first ore shoot. Owing to shortage of water, we are working only one shift at present in our concentrating mill, but if rain does not soon come we shall put into operation our auxiliary steam plant and thus remedy this condition. Our rate of production is 150 tons of lead and 250 tons of zinc concentrate monthly. Our zinc concentrate is lower grade than the crude ore when the ore is rich enough to sort by hand; it averages 35 per cent zinc and 20 oz. silver to the ton. We have on hand 2,000 tons which should net us $40,000. We are negotiating with buyers of zinc and expect to soon close a contract. When shipment of zinc shall be resumed, we shall ship monthly about 80 tons of crude zinc ore in addition to the concentrates.

Nelson.—It is stated that arrangements are being made to obtain electric power for operating a compressor at the Eureka copper mine, on Forty-nine creek. The H. B. lead-zinc mine, on Deer creek, a few miles east of Salmo, has been bonded by a Spokane man, whose intention it is to employ 35 to 40 men and to increase the ore output of the mine. Development work is being done on the Aspen group, by P. F. Horton; this property is higher up Deer Creek than the H. B. and Zincton, of which latter Mr. Horton was in charge last year.

Molybdenite.—The following information concerning a group of molybdenite claims in the southern part of Nelson mining division, was recently published in Vancouver: The Molly group, 17 miles from Salmo, owned by Messrs. Bennet, Benson, and Ross, the value in which consists almost altogether in molybdenum, has been bonded by Mr. Morton A. Merrill, of Vancouver, who is putting the property in shape to make shipments of molybdenite from it. Mr. Merrill lately returned to the coast from a visit to the property and stated that preliminary work had been completed. In order to provide for the transportation of the ore, there is required a surface tramway about 1,000 ft. in length down to the millsite; also the construction of a wagon road four miles to connect with the existing road to the Nelson-Spokane railway. Arrangements have been made for these improvements, and the chief question now having the attention of the management is the kind of mill to be put in for concentrating the ore. Mr. G. R. B. Elliott, who is in charge of the work, has been to Denver, Colorado, to see the working of the Wood process, and either a water or oil flotation process will be installed at Lost creek to treat the Molly mine ore. In any case, since the first unit of the plant to be put in will be small, the mill will be only an experimental one, but those interested estimate that they will make a profit even with a small plant. While clearing for the tramway and flume and the preparation of the millsite have been in progress, development of the orebody has been continued, so that there is now enough ore on the dump to supply a small mill for several months. To this information may be added the statement that an account of this property, written by Dr. Chas. W. Drysdale, of the Geological Survey of Canada, who visited the property last autumn, will shortly be printed.

General Notes.

From Hazelton has come news to the effect that by the end of August more than 200 cars of copper ore had been shipped to Anyox from the Rocher Deboule Co's mine, and that after the completion of additional house accommodation for miners more men would be employed and the output of ore be enlarged.

It has been reported that a number of claims on which are showings of copper ore have been located at the head of Snowshoe creek, in Cariboo district. Other mineral claims have been staked for lode-mining in various parts of the district in recent years, but owing to distance from a railway there has not been much development work done on them notwithstanding that indications of the occurrence of ore are promising.

The dead body of a well-known placer miner, named William Stevenson, has been found in his tent near the Similkameen river about a mile above Princeton. As appearances suggested that the deceased had died while asleep, from natural causes, the district coroner did not deem an inquest necessary. Stevenson had not mined long in Similkameen district, but was known in Kaslo and Spokane. Among his effects were found bank deposit receipts showing that he had about $4,000 in several banks.

The Roberts & Schaefer Company, Engineers and Contractors, Chicago, announce the award of the following new Coal Mining Plant contracts:

Messrs. Peale, Peacock & Kerr, of New York, a two-track steel tipple with car haul, using Marcus Patent Picking Table Screen, for Mine No. 9, Winburne, Pa.

Russell Coal Mining Co., Russellville, Pa., equipment for Marcus Patent Picking Table Screen for Mine No. 24.

The National Fuel Company of Denver, Colo., have awarded a contract for a new wood tipple at Shamrock Mine, Colorado.

The Cabin Creek Consolidated Coal Co., of Charleston, W. Va., have awarded a contract for a Marcus Coal Tipple equipment for installation at Kayford, W. Va.

Mr. Geo. L. Carter, President of the Carter Coal Company, Coalwood, W. Va., has authorized the Roberts & Schaefer Company to proceed with the building of a large Marcus Patent Coal Tipple with "Rands" Loading Booms, which was contracted for some months ago, for the new mine recently sunk at Coalwood known as the Olga Mine. This will be one of the largest installations in West Virginia. The Carter Coal Company also gave the Roberts & Schaefer Company a contract last week for a new Marcus wood tipple for Nora Mine at Coalwood, W. Va.

FRENCH'S PROGESS FOR REDUCTION OF ZINC-LEAD ORES.

The "Daily Colonist," published at Victoria, British Columbia, on September 12, printed the following:

The Provincial Government has decided to extend a measure of financial assistance to a mining project which promises to exert an important influence upon the problem of zinc production in British Columbia, and which will, as an immediate development, have the effect of placing in operation at Nelson a demonstration plant.

This announcement is made by Sir Richard McBride, Premier and Minister of Mines, who explained that for some time the Government has had under consideration representations made by the French Complex Ore Reduction Company, Ltd., of Victoria, the chairman of which is Mr. Albert F. Griffiths. The company, which has obtained the patent rights of the French process for the electrolytic deposition of zinc, has made successful experiments with small plants for the past five years, and believes the time has arrived when steps should be taken to demonstrate the commercial possibilities.

Evidence placed before the Government, said Sir Richard, tended to show that the process can be successfully employed on a large scale in the treatment of zinc-bearing ores and after investigation by officers of the Mines Department, it has been decided to assist the company in completing its financial arrangements so that a demonstration plant of some practical usefulness may be established at Nelson. Beside this measure of assistance the Government will lease to the company on favorable terms the old Fairview plant at Nelson, which reverted to the Province some time ago, after it had been abandoned by those who were operating it.

Mr. Griffiths explained last evening that the company was hopeful, as a result of the action of the Government, of being able to make such financial arrangements as would enable it to almost immediately commence putting the Fairview plant at Nelson in order for the demonstration work. It is planned to put in two units, of one-ton capacity each.

Mr. Thomas French, who will superintend the erection of the plant, is at present in the city, and plans to leave for Nelson shortly to survey the Fairview plant. He has no misgivings about the practicability of the project, numerous experiments on a small scale having removed every vestige of doubt on this point. It was Mr. French's father, Mr. Andrew Gordon French, who invented the process for the electrolytic treatment of zinc ores. The latter died only a few weeks ago in Glasgow.

Sir Richard McBride said that the Government was moved to extend a measure of aid to the company at this time in view of the possibility of encouraging the greater production of zinc in British Columbia, a matter of vital concern just now to the Imperial Government, in view of the use of zinc in the manufacture of munitions of war.

GRANBY CONSOLIDATED CO.'S OPERATIONS

The "Spokesman-Review" on September 12, published the following interview with Mr. F. M. Sylvester, general manager for the Granby Consolidated M. S. and P. Co.: "Both plants of the Granby Co. are running at full capacity and together turning out copper at the rate of 3,500,000 lb. a month, or 42,000,000 lb. a year. The smeltery at Grand Forks has eight furnaces in operation, treating 100,000 tons of ore monthly. At the smeltery at Anyox the fourth furnace was blown in about August 15. The quantity of ore treated there averaged 62,500 tons a month for May, June and July; in August about 75,000 tons was smelted. The working force at Anyox, where there is still construction work in progress, numbers between 850 and 900 men.

"About a year ago the Granby Co. added to its holdings the Bonanza mine, near Granby bay, but as we do not at present need its ore we have not yet put it in shape for producing. We also acquired some mines on Prince of Wales island: these were supposed to have been worked out, but we have been taking some ore from them, chiefly from the Mamie, worked at one time by Sam Silverman. We have developed the Midas mine at Valdez, Alaska, to the shipping stage, but owing to a scarcity of vessels we have not yet been able to ship ore thence to Anyox, and we may yet have to buy our own steamer for this purpose.

"To the best of our ability we are encouraging mine-owners in Northern British Columbia and Alaska to ship their ore to Anyox, but as yet we have not received much custom ore. The only shipper on a comparatively considerable scale has been the Rocher Deboule mine, near Hazelton, B. C., from which during the last two months we have received about 6,000 tons of copper ore."

A ONE-MAN POWER DRILL.

A new type of powerful coal drill has been recently developed and placed on the market by the Jeffrey Mfg. Co., of Columbus, Ohio, builders of coal mine and tipple equipment.

The motor and drill mechanism proper are mounted on trunnions in a carriage, which may be raised or lowered in a vertical channel-iron frame by means of a 3-8 in. steel rope. One end of this rope is fastened to the top yoke of the frame and the other end to a drum on the carriage. This drum is rotated by a handle to wind up the rope and to raise the carriage. A ratchet and pawl are provided on the drum to prevent the carriage from dropping when the handle is released.

When it is desired to move the drill from one place to another, the carriage carrying the motor and mechanism is lowered to the bottom of the frame and the drill rolled along on the wheels provided on the bottom cross-yoke, in a manner similar to an ordinary hand freight truck.

The motor of this drill is rated at 3 h.p. The total weight of the drill is approximately 300 lb. It is made sufficiently rugged and powerful to drill through any material against which the auger will stand up.

With the means employed on this drill for raising and lowering and with the wheels provided for moving it from place to place, only one man is required to move, set up, adjust and operate the machine.

Full particulars regarding this drill can be obtained by writing to the Jeffrey Manufacturing Company, Power Building, Montreal.

TECK-HUGHES.

Teck-Hughes Mines were formally handed over to the Buffalo Mines crowd at the annual meeting of the former company held in Toronto, Sept. 17th. Mr. C. L. Denison of Buffalo was elected President and General Manager of the new company, R. W. Pomeroy of Buffalo Vice-president, H. D. Crooks of Toronto Secretary, and H. Clark of Cobalt Treasurer. The directors are A. W. Johnston and J. F. Thompson, both of New York.

By the agreement of purchase two-thirds of the issued stock of Teck-Hughes was sold to the new interests at slightly below the present market value, which is 7¾. The four by-laws brought before the company were put through. A bond issue will be made amounting to $150,000 for working capital, which is to be taken up by those now in control.

Some time after Teck-Hughes was organized, London interests got an option on the property, and after expending $37,500 on development work refused to take up the option. Nipissing next got an option, and after spending $40,000 backed out because they could not agree as to the purchase price. Ore was blocked out by them, however, valued at $350,000. Actual work is now under way, and a plant is being erected of one hundred tons capacity. The shaft on the mine is already down 265 ft., and 3,000 ft. of drifting has been done. The Teck-Hughes property lies four miles from Swastika.

FUEL SUPPLY OF THE PRAIRIES.

One of the most important problems in Canada at the present time is the provision of an adequate supply of cheap fuel for the population of our Prairie Provinces. Very large areas of these provinces are underlain by beds of subbituminous coal and lignite, which are estimated to contain 100,000,000,000 tons of these fuels. As yet, however, practically all the fuel used in that portion of the plains east of Brandon is imported from the United States, while that used in the country west of Brandon is brought chiefly from the coalfields of the Rocky mountains. This entails a long and expensive haul, which results in a high-priced fuel, and any temporary interruption of the supply gives rise to a coal famine.

The reason why the mineral fuels of the plains have not been utilized is that they are expensive to mine, owing to the absence of supplies of mine timber on the treeless prairies; they are also of a lower grade than the coal from the Rocky mountains, containing a large percentage of moisture. They thus have a lower heating value than the fuels from the mountains, and furthermore when they are exposed to the atmosphere after being mined, they dry out to a certain extent, and in so doing crumble to pieces or even fall to powder, so that they cannot be readily handled and will not bear transportation. Such being the case, if these fuels are to be made available for household use, they must be briquetted, or if they are to be used for manufacturing purposes, they must be either briquetted or used in gas producers.

A series of trials of Canadian fuels, recently carried out by Dr. J. B. Porter and Prof. Durley of McGill University for the Mines Branch of the Department of Mines at Ottawa, show that these fuels of the plains are excellently adapted for use in the gas producer and are thus well suited for the production of power. The question as to whether they can be briquetted, when necessary, at a sufficiently low cost to make the enterprise commercially profitable, has not yet been established. Fuels of this general type are briquetted in Germany, on an enormous scale, and the United States Bureau of Mines is now investigating the possibility of briquetting the lignites of North Dakota. Any lignite can, of course, be briquetted if a suitable binding material is employed. This however, entails additional expense, but many of the German lignites and some of those occurring in North Dakota can be briquetted without the addition of any binding material. It is thus very important that an investigation should at once be made into the question as to whether there are not, among the great deposits of fuel underlying the Canadian plains and outcropping on their surface, some at least which can be worked for the production of a cheap briquetted fuel which will stand transportation, and thus supply a need ever more insistent as the population of the Prairie Provinces increases.—Dr. Frank D. Adams, at 1915 Annual Meeting of Commission of Conservation.

AMERICAN MINES AND WORKS DIVIDENDS.

With an even 100 companies participating, there were dividends amounting to $44,708,963 paid to stockholders of American mines and works during the first 8 months of 1915, according to reports made to Mining and Engineering World. While this record is considerably below that paid during the same period in 1914, there is every indication that the remaining 4 months will witness record-breaking dividend disbursements, which will bring the total for the year to as large a figure as that for 1914.

What with heavy demands for the various metals at much higher prices than a year ago, and with a promise of a continued demand for some time to come, matters pertaining to the mining industry in general are particularly promising.

The 100 companies participating in the above disbursements have an excellent record in that they have paid dividends since incorporation of $917,540,919, on an issued capitalization of $702,510,525.

Of the above, 28 are copper properties, all but one operated in the United States, and they participated in the present year's disbursements to the extent of $18,508,417. Since incorporation these companies have paid dividends totaling $446,450,651. Issued capital totals $243,818,550.

Fifty-one of the above companies operate gold-silver-lead-zinc properties and their disbursements for the 8 months total $13,785,857, and since incorporation $213,390,336. Eighteen are Canadian properties, with disbursements to their credit during the 8 months' period of $3,618,196, and since incorporation $56,865,715. But three Mexican companies report as having paid dividends in 1915, they having paid but $652,821.

Six metallurgical companies have had a prosperous year, for they have divided among shareholders so far this year $8,249,672. Since incorporation their combined disbursements total $173,859,281.

Six securities-holding corporations have distributed dividends so far this year amounting to $9,571,048, and since incorporation $186,513,767.

MARKETS

STOCK QUOTATIONS.

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

Sept. 23, 1915.

New York Curb.

	Bid.	Asked.
American Marconi	37.00	37.50
Alaska Gold	32.25	32.50
British Copper	.50	1.00
Braden Copper	8.75	8.87½
California Oil	308.00	310.00
Chino Copper	45.00	45.25
Giroux Copper	.50	1.50
Goldfield Cons.	1.25	1.31¼
Green Cananea	40.00	42.00
Granby	85.25	85.50
Inspiration Copper	35.00	36.00
International Nickel	216.00	217.00
Miami Copper	27.50	27.75
Nevada Copper	14.25	14.50
Ohio Oil	147.00	149.00
Ray Cons. Copper	21.87½	22.00
Standard Oil of N. Y.	198.00	200.00
Standard Oil of N. J.	473.00	476.00
Standard Oil (old)	1375.00	....
Standard Oil (subs.)	975.00	....
Tonopah Mining	5.25	5.37½
Tonopah Belmont	3.87½	4.12½
Tonopah Merger	35.00	37.00
Yukon Gold	2.25	2.62½

Porcupine Stocks.

	Bid.	Asked.
Apex	.03	.03½
Dome Extension	.28¾	.29¼
Dome Lake	.22	.23½
Dome Mines	22.00	23.25
Foley O'Brien	.28	.35
Hollinger	25.35	25.70
Jupiter	.11¾	.12
McIntyre	.48	.48¼
Moneta	.07	.07¼
Pearl Lake	....	.00½
Porcupine Gold	....	.00⅝
Porcupine Imperial	.06⅝	.06⅞
Porcupine Crown	.71	.73
Preston East Dome	.05⅛	.05¼
Porcupine Vipond	.67½	.68
Porcupine Tisdale	.01½	.02
West Dome	.08¼	.08½

Cobalt Stocks.

	Bid.	Asked.
Bailey	.05	.05⅛
Beaver	.31	.32
Buffalo	.45	.65
Chambers Ferland	.14	.16½
Coniagas	4.00	....
Crown Reserve	.37	.38
Foster	.03	.04½
Gifford	.01½	.01⅞
Gold Reef	.03⅞	.04¼
Gould	.00½	.01
Great Northern	.02¼	.03
Hargraves	.01⅛	.01¼
Hudson Bay	20.00	25.00
Kerr Lake	3.85	4.00
La Rose	.48	.54
McKinley	.23	.25
Nipissing	7.25	7.35
Peterson Lake	.22	.22¼
Right of Way	.05⅜	.05⅝
Silver Leaf	.01½	.02
Teck Hughes	.08½	.08¾
Temiskaming	.37	.37¼
Trethewey	.12½	....
Wettlaufer	.08	.10½
Seneca Superior	....	.75

TORONTO MARKETS.

Sept. 25, 1915—(Quotations from Canada Metal Co., Toronto)
- Spelter, 18 cents per lb.
- Lead, 6¼ cents per lb.
- Tin, 37 cents per lb.
- Antimony, 40 cents per lb.
- Copper Casting, 19 cents per lb.
- Electrolytic, 19 cents per lb.
- Ingot brass, yellow, 13c.; red, 15 cents per lb.

Sept. 25, 1915—(Quotations from Elias Rogers Co., Toronto)
- Coal, anthracite, $7.75 per ton
- Coal, bituminous, $5.25 per ton.

NEW YORK MARKETS.

Sept. 23, 1915—Connellsville coke (f.o.b.) ovens—
- Furnace coke, prompt, $1.65 to $1.75 per ton.
- Foundry coke, prompt, $2.30 to $2.60 per ton.

Sept. 23, 1915—Tin, Straits—
- Copper, Prime Lake, 17.62½ to 17.87½ cents.
- Electrolytic copper, 17.75 to 18.00 cents.
- Copper wire, 19.25 to 19.50 cents.
- Lead, 4.50 cents.
- Spelter, 14.00 to 14.25 cents.
- Sheet zinc (f.o.b. smelter), 16.00 cents.
- Aluminum, 98 to 99 p.c., nominal, 48.00 cents.
- Platinum, soft, $50.00 to $54.00 per ounce.
- Platinum, hard, $54.00 to $58.00 per ounce.
- Quicksilver, $89.00 per 75 lb. flask.

SILVER PRICES.

September—	New York.	London.
10	48⅞	23⅝
11	48¾	23 9/16
13	48⅜	23 9/16
14	48¼	23½
15	48½	23 9/16
16	48⅜	23 7/16
17	48¾	23⅞
18	48⅝	23½
20	48¾	23 9/16
21	49⅜	23¾
22	49¼	23¾
23	49⅛	23⅝