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THE DEUTSCHLAND'S CARGO

The nature of the cargo carried from the United States by Germany's submarine merchantman has been the subject of much interest. It is fair to assume that the cargo indicates the materials most needed in Germany, and it is no surprise to learn that nickel and rubber are among them. Canadians are especially interested in the nickel shipment and its origin.

According to announcements made by the Dominion Government the arrangements made with the International Nickel Company are such that no Canadian nickel can be obtained in the United States by Germany. We interpret the announcement to mean that none of the nickel of Canadian origin refined since the war began is to be obtained by German agents. It is obvious that the Dominion Government cannot have prevented the accumulation in the United States by enemy agents of a certain quantity of nickel which had passed from the hands of the refiners before the outbreak of war. And it is not unlikely that some small quantity of nickel refined since the war began has been obtained by German agents, for some nickel in the United States is not of Canadian origin. But for the Government's assurance we would assume also that some nickel of Canadian origin refined during the war may have been sold indirectly to the enemy, in spite of the fact that the International Nickel Company is making every effort to live up to its agreement.

A rather surprising statement in the "Toronto World" of July 19 casts doubts on the success of the agreement. Under an Ottawa date line appears the following:—

"If the German submarine Deutschland is taking a cargo of nickel back to Germany, it may be Canadian nickel, and the Government has no knowledge that it is not, is the view expressed by Hon. George P. Graham to-day.

"He has just returned from a visit to New York, and while there he met a man who had purchased tens of thousands of tons of nickel from the International Nickel Co. This was refined from Canadian ore, and when he purchased it, no questions were asked him as to the use that was to be made of the nickel nor as to its destination.

"This showed that no care was being exercised by the International Nickel Co. to prevent nickel from falling into German hands, and the assurance given by the Government that care was being taken was not founded upon fact. There has been no official statement yet as a result of investigation made by the Government. There has been only one statement so far. It came

from an official of Hon. Frank Cochrane's department, and was to the effect that if the Deutschland carried a cargo of nickel it would not be Canadian nickel. Mr. Cochrane is supposed to be friendly to the Nickel Trust."

Now the experience of a man who buys tens of thousands of tons of nickel is worthy of some attention. As the world is producing less than fifty thousand tons annually the man referred to must obviously be the chief purchaser of nickel from the International Nickel Company. In fact if he buys very many tens of thousands of tons, at say, \$800 a ton, his transactions might be considered of world-wide importance and as the chief factor in the nickel trade. According to the statement attributed to Hon. Geo. P. Graham this nickel king buys without any embarrassing questions as to destination. If the statement is correct what is the meaning of the Government's assurance? If the statement is not correct did a self-styled nickel king delude Mr. Graham, or did Mr. Graham or the World's correspondent incorrectly report the conversation?

In the "Globe" of July 20, under an Ottawa date line, and labelled "Canada Press Despatch," appears the following:—

"In Government circles the statement of Hon. Geo. P. Graham that Canadian nickel can be bought without question in the open market in the United States is challenged. An official statement bearing upon the whole question and giving the views of the Canadian and British Governments is promised within a few days. It is claimed that 240,000 tons of nickel are produced annually in the United States and that the Deutschland's cargo would be obtainable from that source. There is no indication of a change in the Government policy on the question."

The Globe's informant thus credits the United States with a nickel production six times that of Canada. He is evidently about as reliable as the World's correspondent.

In view of the great interest in the nickel question it is to be regretted that mis-statements of fact and unsupported charges are being so readily published in the daily press. An agitation in favor of refining our metals at home and controlling the sale of them is to be commended, but the publication of foolish reports is unpraiseworthy and not complimentary to the character of our daily newspapers.

CONTROL OF EXPORT OF NICKEL

The war has directed attention to our unsatisfactory methods of marketing products. Our dependence on foreign refineries has been more widely recognized. Nickel has attracted special attention.

The "Toronto World" may justly claim credit for arousing public interest in the nickel question. Since the beginning of the war it has repeatedly drawn attention to the disadvantages arising from depending on other countries for the refining of our matte. The

"World" has thus rendered a public service. At the same time, however, there can be little doubt that readers of the "World" have been misled by much that has been printed, for much of it is incorrect. We have found it impossible to agree with the "World" in its suggestions for overcoming what are admittedly conditions unsatisfactory to Canadians.

Early in the war the "World" demanded that the export of nickel matte to the United States be prohibited. This demand appeared to us as not in the best interests of Canada and the Allies, and unfriendly to the United States. Nickel is one of the most important metals in munition manufacture and an abundance of it is especially desirable during the war. Fear that Germany might get a little was justified; but under the agreement made it became obvious that the small amount Germany could get would be as nothing compared with the desirability of furnishing Britain and her Allies with all they required. The "World" therefore received no support from us in its demand for an embargo on nickel matte.

The "World" has repeatedly stated that the International Nickel Company is controlled by Germans. We have, however, no information which would lead us to suppose that such is the case and we incline to the belief that not only is the company controlled by Americans, but also that these much maligned Americans are very well satisfied with an agreement which does not permit them to sell nickel to our enemies. Fear of the present control of the International Nickel Company has therefore not been among our reasons for favoring nickel refining in Canada. We, however, do not overlook the fact that Canada would do well to provide that control of our nickel refineries should never be allowed to pass into German hands.

To our mind the outstanding reason for the location of the nickel refineries in the United States instead of in Canada is that the directors of the company do not think that they would increase their profits by establishing refineries here. As long as it believes that profits should be the only consideration the International Nickel Company may be expected to make no change in the location of its refinery.

During the past two years, however, the company has been given sufficient intimation that a consideration of profits alone will not be tolerated for long. Hasty action which might have proven disastrous to the munitions business and embarrassing to many American manufacturers has happily been averted; but the nickel company doubtless realizes that Canadians intend to control the export of nickel in the future.

The United States is the largest consumer of nickel and will likely prove long to be our best customer. The Americans who control the International Nickel Company have reaped great profits from their enterprise and will doubtless continue to make large profits from the industry for many years to come. Many American manufacturers depend upon Canada for nickel. The

business is very profitable and the demand is increasing, and we may therefore expect no serious setback even if the cost of refining should be slightly increased.

The International Nickel Company has established in New Jersey a refinery which suits its purpose. The investment involved is large and the local facilities for operation are claimed to be the best. To abandon such a plant would doubtless entail considerable loss. Such economic waste should be avoided if possible. A solution may be found in the use of the New Jersey plant for a limited period for refining of nickel to be consumed in the United States. The refining in the United States of the nickel to be used there is not so objectionable as the refining in the United States of nickel for export to Europe.

Canada as the chief producer of nickel should have control of the export trade. To ensure control it is essential that we should have here a refinery of large capacity, preferably of such capacity as to make us entirely independent of other countries. We should place ourself in a position to prohibit re-exportation of Canadian nickel from any other country. We should never again be dependent upon an agreement with a foreign refinery, even though the Government reports the present agreement as satisfactory. We should when desirable be in a position to export nickel only to countries which will guarantee that none of it shall be re-exported.

SERVICE RECOGNIZED

An event of more than local significance was the celebration in Calumet, Michigan, on July 15 of the semi-centennial of the Calumet and Hecla Mining Company, one of the most successful mining companies in the world.

The Calumet and Hecla Company has always taken a great interest in the welfare of its employees, and endeavored to give them fair wages, pleasant surroundings and excellent facilities for the education of their families. The result has been that many of the employees have spent the greater part of their lives in the service of the company.

In recognition of this long service the company has distributed gold, silver and bronze medals to employees. One hundred and sixty-nine recipients of gold medals have worked for the company for over forty years. Three hundred and seventy-nine men who have served for over thirty years received silver medals. Eight hundred and six received bronze medals in recognition of twenty years of service.

The Calumet and Hecla directors have shown that they have the interests of their employees at heart. That they have succeeded in keeping men in the service of the company for so many years is an evidence of this fact.

MINING AND SMELTING ON OBSERVATORY INLET, B.C.

Mr. Arthur Lakes, Jun., of the mining engineering firm of Larson & Lakes, of Spokane, Washington, recently returned to that city from a visit to Observatory Inlet, in Skeena mining division, Cassiar district of British Columbia. A Spokane newspaper recently quoted Mr. Lakes, as follows:

"It would be a hard matter to find a more prosperous community than that of Anyox, B.C., the Granby Consolidated Co's town on Observatory Inlet and the site of the big smeltery which, by the way, is one of the most complete and up-to-date copper reduction plants in the world.

"The Hidden Creek mine and the Anyox smeltery are both running full blast. The company is making much money, and its employees are getting their share, wages running from \$4 to \$5.50 a day, the latter rate for miners. Costs of production are being steadily reduced, and the company's officials feel confident that by the time copper prices shall have returned to normal, the cost of their copper laid down in New York will be as low as that of any mine in the United States with the single exception of the Kennecott, in Alaska. Two-thirds of their output of blister copper now goes to New York and the remainder to Montreal.

"Though the mine run of ore averages between 2 and 3 per cent. copper, the company has recently encountered a shoot of ore, of an extent as yet unknown, which thus far averages better than 15 per cent. copper. The company is reported to have optioned and to be prospecting the Big Swede group on one of the Queen Charlotte Islands. This property is said to hold out the prospect of being a big Copper deposit.

"About 13 miles from Anyox, on Alice arm, the Stilwells of Seattle, Washington, are equipping a molybdenum mine with a 50-ton flotation plant, which is expected to begin operations on August 1. This is probably the largest known deposit of molybdenum in the world, and as the ore occurs in quartz its metallurgy presents no problems. The owners have been awarded a contract by the Munitions Board for 100 tons of the metal in concentrate containing not less than 60 per cent. molybdenum at \$1 a pound, or \$20 a unit. From what I have seen of the ore, I believe they will not experience any difficulty in producing the grade of concentrate required, and they should clean up \$200,000 on the contract.

"The Chicago Development company, which is more or less closely allied with the Goldfield Consolidated company, has developed by diamond drilling in the Dolly Varden mine, near the head of Alice arm, extensive bodies of both dry silver and lead ores which they are now opening up with a view to production. They have constructed a fine wharf on Alice arm and are making a 17 mile wagon road to connect with the mine."

TONNAGE OF THE DEUTSCHLAND

Manifest for the Deutschland entered at Baltimore custom house discloses 3000 cases of dystuffs, an indefinite amount of scrap iron ballast, and states gross tonnage at 771 tons and net as 447 tons. American Consul Fee at Bremen, in granting bill of health, attests to 791 gross tons, but does not declare net tonnage.

If submerging tank cubic capacity is further deducted in calculations, net tonnage may be reduced to a very small amount. Upon this will depend the serviceability of submarines as cargo carriers. If these 300-foot vessels are only capable of carrying 50 or 100 tons net cargo, the enterprise will be considerably curtailed.—The Wall Street Journal Straws.

THE MANIGOTAGAN GOLD DISTRICT, MANITOBA

THE RICE LAKE, GOLD LAKE AND LONG LAKE AREAS

By Justin S. De Lury

The Manigotagan district comprises the original Rice Lake and the more lately found Gold Lake and Long Lake areas; it is thought best to use the name "Manigotagan" as "Rice Lake" is properly applicable to only the area adjacent to that lake.

Rice Lake was formerly reached by the Hole River from Lake Winnipeg, but since discoveries have extended the known mineral belt as far south-east as the east end of Long Lake, the Manigotagan River has been most used as a means of access to the district. This is the principal reason for using the name "Manigotagan."

In summer, the country is best reached by taking a large boat from Winnipeg or Selkirk on the Red River to the mouth of the Manigotagan River, up which canoes are taken, the trip from the lake to the mineral belt taking two or three days. The country rises considerably eastward from Lake Winnipeg, and owing to this frequent rapids and falls are encountered. These necessitate many portages, but as most of them are rather short and well-worn they are no great obstacle. Prospective visitors using the Manigotagan route, can reach the Rice Lake and Gold Lake areas by going into Clearwater Lake, by way of a creek and three short portages from a point where the creek enters a marsh on the river about two miles above

Professor Wallace of the University of Manitoba, who worked the area with Moore in 1912 and to whom any merit this paper may have is largely due on account of his valuable cooperation.

It was found that the known mineral-bearing belt has extended considerably in the past few years. The gold Lake prospects have been known for some time and more recently the Long Lake area has shown up some good prospects, particularly north of the East End of the lake, and northwesterly from there to Halfway Lake. The latter lake and Gold Lake were not known when Moore's map appeared but the accompanying sketch will give a rough idea of their positions and size. New finds are also reported from the Hole River country but these were not examined.

The topography of the country is similar to that of most parts of the pre-Cambrian areas of Canada. Rounded rock ridges alternate with swamp and muskeg throughout a country well supplied with small lakes and rivers, and thickly wooded with the usual kinds of trees: poplar, birch, spruce, balsam, jack pine, tamarac, etc.

A glance at Moore's map gives a good general idea of the geological relations of the country. In the accompanying sketch map, no attempt has been made to represent the geological formations; it is presented merely to add some topographic and geologic features not found in Moore's map and to indicate the general locations of the prospect camps referred to in the paper. A broad belt of pre-Cambrian rocks from a few miles to ten or twelve miles in width and from sixty to eighty miles in length extends from the mouth of the Hole or Wanipigon River on Lake Winnipeg in a south-easterly direction. The nature of these rocks is indicated by Moore's classification, given below; the belt is surrounded on all known sides by granites, intrusive at least into some of the formations. The bedding planes of the old sediments and the schistose layers of the more massive rocks are generally near the vertical in position, suggesting that they are the remains in part at least of the synclinal portions of isochinal folds. The strike of these folds is roughly parallel to the lines of contact of the belt throughout the district.

Moore's classification of the rocks of the area is given below, as it indicates in small space the outstanding rock formations of the district and will serve as a basis of reference for some remarks that follow on the relative ages and structures of some of them:

Port—Lower Huronian?—Manigotagan Series, pegmatite and gneiss.

Huronian?—Wanipigon Series: conglomerate, arkose, graywacke, chert, jasper, gray gneiss and schist.

Keewatin—Rice Lake Series: greenstone, quartz porphyry, rhyolite, trachyte felsite, green and gray schist.

Moore places the porphyry with the Rice Lake Series which is placed provisionally as of Keewatin age. This was done probably from its general close connection with Keewatin greenstone and from the fact that large portions of the porphyry might well appear as probable lava rocks and from the finding of similar rocks as pebbles in the conglomerate. It was found that the porphyry, and apparently the ore that is general throughout the district is intrusive into the greenstone, and more conclusive still, it was found to intrude sediments which almost certainly belong to Moore's Wanipigon Series, which is regarded as younger than the Rice Lake Series. Thus, the porphyry is, next to the granite, the youngest large formation of the district. It is possible that there are other older and sim-



Gold Pan Mine, Gold Lake, Manitoba

Turtle Lake. Long Lake is merely a wide portion of the Manigotagan River and can be reached by continuing up that stream and making a few portages.

Tyrrell made the first report on the region of which this mineral belt forms a part, but as his work was of the nature of a reconnaissance, his report and map are valuable from the prospectors' point of view, only in that the general geological relations and travel routes of this and the surrounding country are well presented.

Moore and Wallace visited the area in 1912 and Moore issued a brief report* and map which have been of great value to the prospector in indicating the areas of pre-Cambrian non-granitic rocks. At the time of this last visit of the officers of the Canadian Survey, the only prospects in the district were some on the Hole River to the north and west of Rice Lake, others on Rice Lake and some large barren-looking quartz veins on the west end of Long Lake. The writer who has just completed a three weeks examination of three of the more promising prospecting centres, was fortunate in being associated with

*Geology of the Shores and Islands of Lake Winnipeg, etc. A. Rep. C.G.S., Vol. XI.
**Region East of the South End of Lake Winnipeg. Summary Rep. C.G.S., 1912.

ilar porphyries in the field but improbable that the main porphyry formation is not part of the same later intrusion.

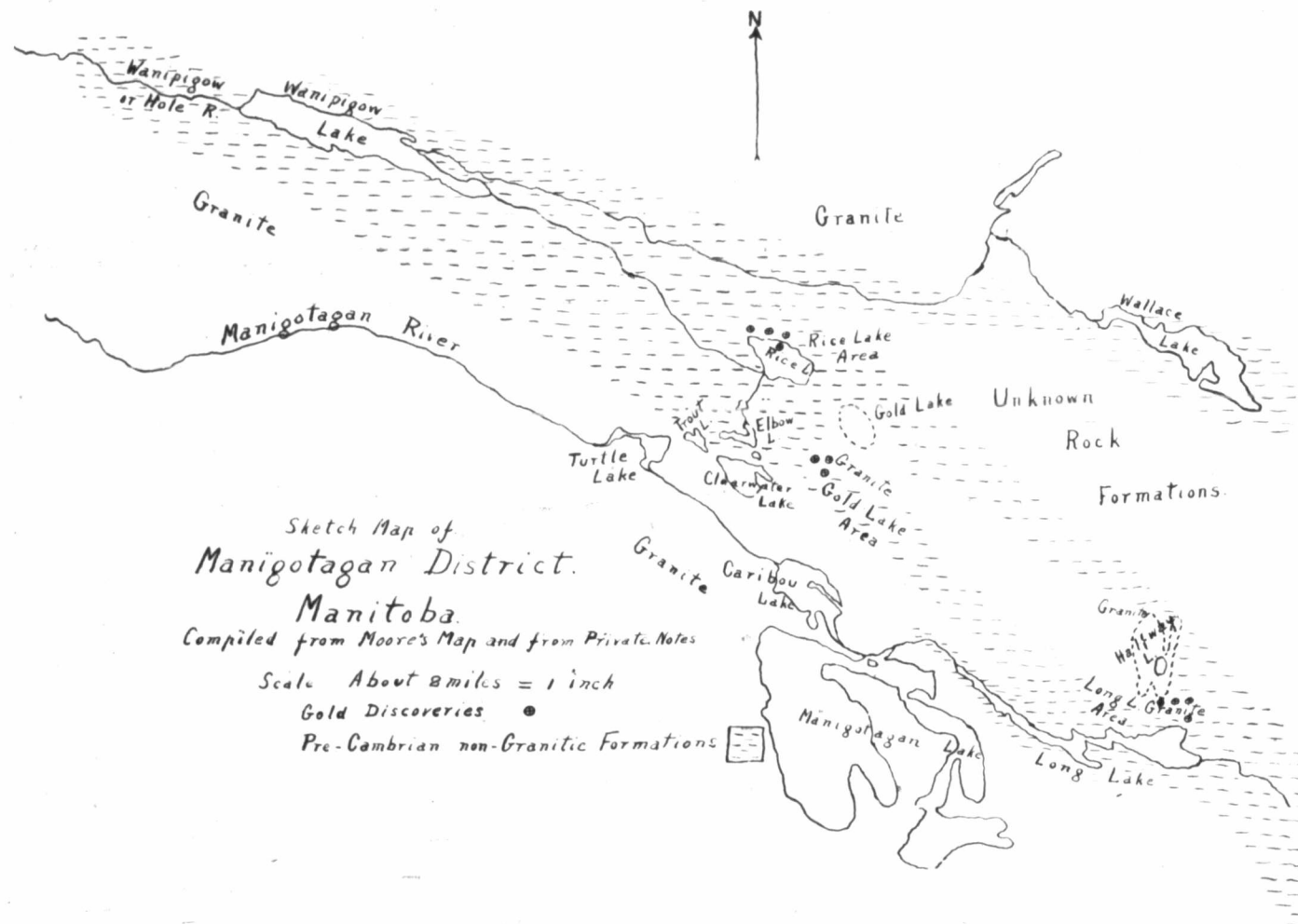
The relative ages of the formations are fairly well established but nothing in the way of correlation can be attempted until the granites of the country are differentiated and the relations of the different masses with the other rocks are established. All the contacts observed show that the granite is the latest formation of the district. Whether there is an older granite which is not later than some of the pre-Cambrian rocks of the area could not be determined, so that it would not be fitting to attempt to read any of these formations too closely into established pre-Cambrian classifications. There is one important body of granite not indicated on Moore's map and as it is of economic importance it is one of the few purely geological features represented on the sketch map. It contains some of the veins of the Long Lake—Halfway Lake area, where it

The Rice Lake Area.

A brief visit to the Rice Lake area showed little that was not reported by Moore. Since 1912 some shafts have been sunk, but these were unaccessible and as practically no stripping had been done there was little to be seen. It is claimed that rich ore was encountered in several of the Rice Lake properties but the veins seem to be quite irregular, breaking up and pinching out at intervals. Instead of good preliminary surface prospecting, machinery was taken in and the veins were followed or attempts were made to follow them underground. Nothing was being accomplished in this area and the machinery formerly used there has been moved to the Gold Lake claims.

The Gold Lake Area.

Southeast of Rice Lake is the Gold Lake area, lying between Gold Lake and Big Clearwater Lake. Assess-



Sketch Map showing Rice Lake, Gold Lake and Long Lake gold areas, Manitoba.

intrudes greenstone and porphyry on the south west side and greenstone on the northeast side. Near the Moose vein in the Gold Lake area is a similar granite and it may be that the two outcrops belong to the same body.

The greenstones of the area show types from fine grained lava showing the pillow-structure to fairly coarse diabase. All of these are more or less chloritic and show various depths of green color, but it is not to be taken for granted that they are all of the same age or are necessarily all Keewatin. The fact that there is one at least basic dyke cutting the porphyry in the Gold Lake area makes the bunching of the basic rocks more uncertain. These statements will at least show that nothing but detailed field work will solve the complex formations and structures of this district, and it is hoped that this will be accomplished during the present summer by the Canadian Geographical Survey party at present in the field.

ment work has been done on several claims in this area, but extensive development has been done only on three properties: Gold Pan, Gold Seal and Moose.

Gold Pan and Gold Seal.

Shafts were sunk on the two former some time ago and in the spring. Phenomenally rich ore was struck at a depth of about 125 feet in the Gold Pan. The shaft was sunk at a point near where a basic dyke 20 or 30 feet in thickness cuts across the porphyry. Whether this dyke had anything to do with this local high value, as similar dykes are known to have had an effect on enrichment in several Western ore bodies, is problematical. The shafts of the Gold Pan and Gold Seal were inaccessible but the outcrop of the vein could be traced for considerable distances.

Moose

Lying a short distance to the southeast of these properties is the Moose claim. Here active progress was made in prospecting by a crew of about fifteen men under the able management of Mr. John Redington, formerly of Copper Cliff and Cobalt. A shaft had been sunk over 100 feet and drifts were run each way along the vein.

Veins of Gold Lake area.

The veins of the Gold Lake area are located in porphyry which is of a fairly acid type grading from a fine grained felsite to coarse quartz and feldspar porphyries. The quartz occupies much-sheared zones in the country rock and while fairly continuous varies considerably in width and massiveness. The width varies from a few inches to about six feet in places, while the vein is occasionally split into several veins by masses of schistose country rock. The veins are close to the vertical in position and strike closely with the schistosity of the country rock which in turn is always roughly parallel to the general outcrop of the whole rock formation.

In the country between the east end of Long Lake and Halfway Lake are some veins similar in many ways to those in the Gold Lake area. The most striking difference between the two areas is that some of the more promising looking veins in the vicinity of Halfway Lake are in granite occupying similar sheared zones and resembling very closely in other respects the Gold Lake veins.

In the quartz of the veins of the Gold Lake and Long Lake areas is generally apparent some free gold. Pyrite or chalcopyrite or both generally accompany the free gold and are generally present throughout some parts of the vein. Molybdenite, galena and sphalerite are common associates in small bunches and grains. Calcite was noted in several outcrops; it can generally be found where galena and sphalerite occur, but a direct connection could not be established.

In the Long Lake veins as in those of the Gold Lake area, the position is close to vertical.

In both areas, veins have been traced for considerable distances, two of them at least, are traceable for over 2,000 feet, but as the entire length of the veins were in no case stripped and only occasional outcrops occur along the same general strike, this statement is made with some hesitation.

Possibilities of the District.

Concerning the district as a whole, it may be said that there is a large belt of country throughout which gold is found well distributed in quartz veins and accompanied by sulphides. As a rule there is some mineralization of the country rock and in places, notably in the Rice Lake area, this is quite pronounced. While none of the prospects can yet be regarded as mines, some may yet be producers and the wide distribution of gold prospects augurs well for future prospecting. No formation of the district can be said to be the most favored and practically all the large formations may and do carry gold-bearing quartz. If two formations were to be named as the most favorable, they would be porphyry and granite.

There are indications that the Provincial Government is anxious to cooperate to ensure the district a thorough trial and it is anticipated that interest will be evidenced in the construction of a road which will make the country accessible from one of the nearest railroad points.

WATER POWER RESOURCES OF WINNIPEG RIVER

We have just received a recently issued report of the Dominion Water Power Branch covering investigations of the water power resources of the Winnipeg river, one of the large rivers of Canada. These investigations were commenced about four years ago, under the advice of two prominent consulting engineers eminent in water power practice, Mr. John R. Freeman of New York, and Mr. J. B. McRae of Ottawa, Canada, and have been continuously under way. Mr. J. T. Johnston, chief hydraulic engineer of the Water Power Branch, has had immediate direction of the investigations and is the author of the report. His report is very interesting from both historical and engineering standpoints, and of import in present day consideration of national preparedness.

The Winnipeg river has played its part, and a very important one, in the extension of civilization and the settlement of the west. It was the great highway between the head of the Great Lakes and Lake Winnipeg, from which lake radiated the great system of canoe routes, to all parts of the western continent, and by its portages laid the westward route for the Indian, the missionary, the fur trader and the settler.

The engineering and economic aspects of the river for water power are, however, of predominant interest at the present time, and a cursory examination of Mr. Johnston's report will prove that there is no locality in Canada that is more fortunately situated so far as national preparedness in respect of water power is concerned, than is the province of Manitoba, particularly the city of Winnipeg. Chapter VI of the report covers in detail the comprehensive system of hydro-electric and power developed by which it is proposed that the power resources of the river will be developed to their maximum advantageous use.

The report shows that there will eventually be as much, if not more power available from the Winnipeg river than is now being developed at Niagara. What this represents to the city of Winnipeg and the province of Manitoba, can only be realized by one who realizes the tremendous import of electro-chemical and electro-metallurgical industries of world wide fame, now firmly established at Niagara, and by one who has the proper conception of the significance of the use to which Niagara power is now put, through the western portion of the province of Ontario, by municipalities, private corporations, and through the auspices of the Ontario Hydro-Electric Power Commission.

The city of Winnipeg and the province of Manitoba, have, therefore in the potential powers of the Winnipeg river, an assurance and guarantee of future industrial commercial and municipal growth, the importance of which is not appreciated.

The investigations of which this report is the result, were carried on by the Department of the Interior, primarily for administrative purposes.

BRITISH AMERICAN NICKEL

The Sudbury Mining News in its issue of July 15, published the following:

When you see such eminent men as V. Hybinette, the noted Swedish metallurgist of New York, and J. E. McAllister, Toronto, one of the principals of the British America Nickel Corporation, and Anton Gromingsoder, capitalist of Norway, looking over their property at the Murray Mine, it is pretty safe to conclude that there is something doing, and, while we are not in a position to speak definitely yet, it is taken for granted among several cautious shrewd mining men in Sudbury that all is about ready for operations to begin.

CONCENTRATING COBALT SILVER ORES BY THE OIL FLOTATION PROCESS

BY BEN HUGHES

It is now quite certain that oil flotation will be one of the standard practices of the Cobalt camp. There is probably no camp in the world, where there is such a diversity of practice as in Cobalt. All or nearly all the mines commenced operations with gravity concentration. Later cyanide was introduced in various forms of treatment and finally oil flotation. The new process as demonstrated by the Callow method has proved a remarkable success at the McKinley-Darragh mill. All the other mining companies in the camp, with the exception of the Buffalo, were waiting until the McKinley-Darragh had demonstrated the profit making character of the process in an actual mill flow. This demonstration is now to hand and every company in camp is experimenting with the process.

From a 9 ounce head the McKinley-Darragh is now getting $1\frac{1}{2}$ ounce tails, and there is little doubt that the tails will be reduced to 1 ounce. At the present time, the product being treated is that which would have gone to the slime tables. These slime tables could not reduce tails below 4 ounces and they often went 5 ounces, so that it is quite apparent that the oil flotation process and the small amount of room it occupies in comparison with other methods also commends itself to all mill men in the Cobalt camp. The McKinley-Darragh will probably regrind the sand tails and treat them with oil flotation, although the profit will be considerably less.

At the Buffalo the process will be more largely utilized than anywhere else in camp. The flotation plant should be connected up with the old mill by the second week in August. This flotation plant will have a maximum capacity of 800 tons a day from the big tailings dump and also from mine ore. Mr. T. R. Jones is also experimenting with a furnace to refine the concentrates. Some difficulty may be experienced in marketing these concentrates and no doubt a slightly higher smelter charge will be exacted, but even then there should be no difficulty in showing a good profit above existing methods.

The Nipissing is now treating the whole of the tails from its all-slime cyanide plant by oil flotation and results are said to indicate a profit per ton which will induce them to keep the plant running and even to increase it.

The Mining Corporation is not introducing the flotation process in their Cobalt Reduction plant. Mr. Fairlie has now almost completed his cyanide mill and within a very short time the Mining Corporation will refine all its own bullion. The Mining Corporation has for some time had a cyanide plant for treating the slimes. This plant proved so advantageous to them that it was decided to extend the principle to the whole of the mill. This is now being done.

The one place where oil flotation is definitely superseding cyanidation is at the Dominion Reduction. The Dominion Reduction has been crushing in solution, concentrating, cyaniding the tails and also cyaniding the concentrates. It is now determined to concentrate as before and complete extraction with oil flotation. The oil flotation plant has already been ordered and will be installed with all possible speed.

The National Mines at the old King Edward mill have torn down their little concentrating mill and are erecting in its place an oil flotation plant, with which it is intended to treat the mill tails in and near Cross Lake.

The Beaver has for some time been experimenting with a flotation plant devised by a local metallurgist and half the mill men in the camp are experimenting with flotation

It has undoubtedly been demonstrated already that the process is going to make available large tonnages of mill tailings that have hitherto been lying as waste in the Cobalt

camp. This is a new process to date on Cobalt ores and before the limit of its extraction can be known, much further experimentation will be necessary. Thanks to Mr. T. R. Jones and his staff at the Buffalo, a large amount of research work was conducted for the benefit of the camp at large, before any plant was installed at all.

To Mr. Jones also and in a minor degree Mr. Cole, must be credited the present success of the endeavor to get pine oil and other tar products from the pine stumps of the country. There is now no doubt whatever that the superior products of pine oil, creosote and coal tar can be obtained by a simple process from the waste wood products in this part of the country. In view of the very marked demand for pine oil, this is regarded as most important. It is quite realized that before these products can be produced at a profit, a considerable outlay of capital is required and a good organization. Such an organization would insure to the companies using pine oil a regular supply, which would otherwise be a matter of concern, as the demand for pine oil now exceeds all supply and any fresh contracts are made on no very satisfactory terms. The Forestry Department of the Department of the Interior at Ottawa is experimenting with the waste wood products. The Mines Branch is also making investigations.

FRENCH COMPLEX ORE REDUCTION CO.

The Daily News of Nelson, B.C., on July 8 printed the following:

If the French Complex Ore Reduction Co. can secure the necessary electrical machinery it should be turning out refined zinc at its Nelson plant within two months.

Mr. Thomas French, manager of the company, announced last night that the \$40,000 worth of bonds which had been guaranteed by the Provincial Government in order to aid in the establishment of the industry, had been sold at 97. Interest payable is 5 per cent. The price is considered to be a favorable one.

The proceeds of the bonds are now in a bank at Victoria and will be released to the company, in payment for construction work, by the Minister of Finance as the work shall proceed.

This morning Mr. French will leave for Victoria to make the final arrangements for commencing the work. Construction will be begun immediately after his return.

It may take some time to secure the electrical machinery, but Mr. French is hopeful that he will be able to arrange to get it without waiting the usual period manufacturers are now demanding on account of press of orders.

The company will treat complex zinc ores by an electrolytic process which has proved successful under experiments. It has secured a power rate of one-quarter cent a kilowatt from the City of Nelson.

Mr. French expects to get an extraction of 90 per cent. of the zinc contents of the ore treated. The lead and silver contents will also be saved and shipped to a silver-lead smeltery.

EXPLORATIONS ON LINE OF G.T.P.

Mr. W. P. Hinton, traffic manager of the Grand Trunk Pacific Railway when speaking in Vancouver, B.C., of the development that has taken place along the western part of that railway said, in part: It is gratifying to note the extensive exploration work being conducted in the highly mineralized areas of the Skeena and Bulkley rivers, in British Columbia, especially on copper bearing properties. Heavy shipping of copper ore to smelteries is already taking place. There are also several gold and silver mines which will in the near future also furnish traffic for the railway.

A DREDGE KING OF THE KLONDIKE

BY FRANK G. CARPENTER

Since I have come to Canada I have acquired a contempt for Aladdin. At every step here I am meeting common, everyday men who are enslaving genii a million times mightier than those of the Arabian Nights. They rub the lamps of their genius and palaces of mechanical wonder spring forth almost in a night. They give their orders and change the course of a river. They raise their hands and valleys are turned upside down. They even send their minions into the stony ice vaults that have been locked since the age of the glaciers to bring forth the gold so long held by Jack Frost.

It is such men who are conquering nature in the valley of the Klondike, who are ripping the skin from the ribs of old Mother Earth and picking out the gold that lies next her bones. I have already written of the Yukon Gold Company, the child of the Guggenheims, which is operating in the creeks that have poured millions into the lap of the world. My subject today is Joseph W. Boyle, the dredge king whose dominions are forty square miles of the gold-bearing earth through which the Klondike itself cuts its way. His territories begin within almost a stone's throw of where the river flows into the Yukon and they run to beyond Hunker creek for a distance of about seven miles. They cover altogether an area of over 25,000 acres, and the most of this is mixed with nuggets, grains, dust and flour of fine gold.

The tract is known as the Boyle concessions. It consists of leases from the government of Canada giving Mr. Boyle the right to work the lower valley of the Klondike up to the crest of the mountains on both sides of the river. The greater part of it is in the wide bed between the hills through which the fast-flowing Klondike runs. At a distance it looks like farm land and when the concessions were granted much of it was covered with gardens. It had all been cleared of woods by the gold hunters of the early days, and a great part of the tens of millions of dollars' worth of gold dust and nuggets that were the first yield of this region came from here. When Mr. Boyle got the property the rich pockets had been practically exhausted. The people declared that all of the gold had been won and that the land would never be fit for anything else than moose pastures.

Mr. Boyle thought otherwise. He reasoned, "if so much gold has come from the valley and the creeks running into it, there cannot but be quantities of gold dust and grains scattered through the bed rock of which the valley is made." He went upon that supposition and got the concessions, and as a result he is potentially one of the very rich men of the world. I do not know just how much gold he has already taken out of the ground, but I understand that the crop of this year will be more than \$1,500,000, and that of this more than a million will be profit. Moreover, this sum will all come from gold-bearing earth, which carries values of only about 26 cents to the ton, and which until Joe Boyle stripped off the surface had been locked in the glacial ice that has been in a frozen state for thousands of years. It was the job of Joe Boyle to learn how to work these low values at a profit.

But first let me introduce you to the Joe Boyle of today. "Joe Boyle" is the title by which he goes here. He has no frills about him, and, though every one pays him respect in manner and thought he is as plain as a pipe stem. I wish you could see him. He is the personification of the combative. A giant of a man, he is straight and well formed. He is broad-shouldered, big-framed, stands six feet in his stockings and weighs more than 200 pounds. He has a big head, a broad and high forehead and eyes like

blue steel. His appearance is that of a fighter, and it does not belie him. His jaw is of iron and its grip is grim death. He is a positive man. He knows what he wants and how to demand it. He is a good companion and hail-fellow-well-met with those whom he likes. I am told that he is also a good hater and is human throughout. He stands well with his employees, and addresses each of them by his first name. In speaking of him they refer to him as "Joe Boyle" or "J. W. B." but they understand that he is the boss and that everything must be done just as he says.



J. W. BOYLE

Dredge King of the Klondike

I have spoken of Joe Boyle as looking like a fighter. That is the predominant feature of his character. He has had to fight all of his life, and today he would rather fight than do anything else. He began his fight as a boy. His father was a horse farmer in eastern Canada. He lived at Woodstock, Ontario, and there kept racing stables and bred and raised fine horses. When J.W. B. had reached seventeen this life grew too tame for him and he started out to make his own way. His success was not great, and when a sea captain asked him to go before the mast he became a sailor and as such travelled over a great part of the world. He was wrecked several times, and in

going from the Island of St. Helena around the Cape of Good Hope his ship sprang a leak and the men had to work the pumps for 4,000 miles from there to Bombay. He finally rose to be quartermaster of an English steamer and then came back home.

A little later he struck out for the west, and when some of the first gold mines of the Yukon were discovered he was in Seattle. One of his friends at that time was Frank Slavin, the bareknuckle champion prizefighter of the world. I am not sure, but I think Boyle was Slavin's trainer and manager. At any rate, the two started to Alaska together. They "mushed" it from Dyea over the mountains and got to the Klondike shortly after gold was discovered. Boyle and Slavin worked together for a time and Boyle was afterward engaged in placer mining with Swift-water Bill. "Swift-water" made several fortunes which he frittered away. Mr. Boyle was superintendent of his mines.

Joe Boyle was twenty-eight years old at this time. He was not doing as well as he hoped at his mining, and he conceived the idea that there was a fortune to be made in the earth after the miners had left, and also in the timber that then covered a great part of the Klondike valley. It was as far back as 1899 when he stood on a little hill above the Klondike river and debated as to the size of the tract he would lease. He determined to take all of the land within sight, and then made out the papers for the gold territory which he now has.

He also made a claim for the timber. The latter was ten miles in length, extending through and beyond the territory which he is now mining. Every one laughed at the mining property, but he had to fight for his timber. As soon as his application was known his competitors at Dawson saw the authorities and had them require him to stake out the whole ten miles of his property. This was when the claim was just on the edge of being perfected, and the announcement was made at 3 o'clock in the afternoon before the last day required. Boyle started on foot that afternoon and tramped all night, blazing his way and marking the limits. He had to wade through swamps, blaze the trees and drive stakes. The work was exhausting, but he kept on until he thought he had marked out not less than fifteen miles. He got back to Dawson at 9 o'clock the next morning only to find a number of men ready to jump his claim if it had not been staked. When the claim was measured according to law; it was found that his stakes fell short only twenty feet of the ten miles allotted. After that he started saw-mills. He got \$100 a thousand and made money out of his lumber and wood. He has now from this same claim the timbers he uses in his dredging operations, and has a sawmill connected with his electric plant at North Fork, where lumber is sawed by electricity.

It was his lumber profits that gave Mr. Boyle the money that enabled him to go to see capitalists and finance his mining concessions. He first formed an alliance with the Rothschilds, by which he was to have one-third and they two-thirds of the stock. The understanding was that they were to furnish the money, amounting to some millions, and that Mr. Boyle was to manage the property and superintend its developments.

Then the Rothschilds tried to squeeze out "J. W. B." They questioned his title and planned a reorganization. Joe Boyle carried the matter to Ottawa and fought them in the courts, where he finally got a judgment against them for more than \$600,000. The Rothschilds wanted to get rid of him, and offered him a million dollars for his share of the stock. He refused and in return made them an offer of \$400,000 for the two-thirds that they held. At first they laughed, but they finally reconsidered and accepted his proposition. Mr. Boyle then formed another company known as the Canadian Klondike Mining

Company, by which name the property is known to this day.

I have already given you the extent of the Boyle concessions. They include seven miles of the mile-wide Klondike valley and they run to the crest of the hills on each side. The whole territory contains more or less gold. Mr. Boyle tells me that 150,000,000 cubic yards of it has already been prospected and proved, and that there is probably 100,000,000 yards more. This makes a total of 250,000,000 cubic yards, the most of which is yet to go through the great dredges, and in addition there are forty or fifty millions yards of gold-bearing gravel that will be sluiced down the hills by the hydraulic giants.

Mr. Boyle says that the bed of the valley contains about 26 cents' worth of gold to the cubic yard and that it costs on the average about 8 cents a yard to get the gold out. At this estimate the gold in the valley amounts to somewhere between forty and fifty millions of dollars.

This vast sum is free gold in the shape of flour, dust and small nuggets scattered through the earth in such infinitesimal quantities that the output of a wagon load is not as big as a pinch of your fingers. The most of the gold lies as far from the surface of the earth as the height of a three or four story house, and with the exception of a foot or so of moss and muck on the top the material consists of gravel, the stones ranging in size from bowlders of quartz and granite as big as a peck measure down to pebbles the size of a pea and even fine sand. In many places this material under the moss is frozen as though it were one great block of ice, the bowlders, pebbles and sand being cemented together more tightly than the nuts in peanut brittle, and in this frozen mass is found the gold.

In the rich creeks where the Guggenheims have been operating the earth carries values to the amount of 60 or 70 cents worth of gold to the ton. It pays to thaw the ice out by steam, but this can be done only at a cost of about 30 cents to the ton. In the Boyle concessions, where the earth carries only 26 cents' worth of gold, some other method of thawing had to be found, for the steam-point process would cost 4 cents more per ton than the possible output. Mr. Boyle studied the problem and decided to make the sun and the river do his work for him. He found that if he could get rid of the muck and the moss, the great non-conductor that covered the frozen mass, the sun would gradually make its way down to bedrock. It would thaw the earth to a depth of ten feet in the summer and the next winter's freezing would make solid only about six feet of this thawing. He found that when the next summer came the sun would poke its rays through the six feet of the ice made in the last winter and then jump through the thawed ground left from the last summer and melt four or five feet more of the ancient ice strata below. In short, if the moss could be taken away, the sun would melt its way to bedrock.

Then came the question how to get the muck off at a price that would pay. Here the forces of nature about him were again brought to bear on the question. He found that the Klondike itself would serve for this job. All that he had to do was to dam it in places and turn the course of the river this way and that. The current soon washed off the moss and the muck and when turned again left the gravel just right for the work of the sun.

The next process was to handle the melted material with such economical machinery that not an ounce of energy or a cent of expense went to waste. He investigated the subject of dredges and had some of the largest of these machines that have ever been built made for the purpose. He experimented and had them made better and better. He then brought them in pieces by sea to Skagway and carried them over the mountains and down the Yukon to Dawson and put them to work. His dredges

each cost in the neighborhood of a half million dollars apiece and he has three of them, which are now lifting up the bed of the Klondike valley and turning it, as it were, upside down. The dredges gouge out the earth to a depth of thirty or forty feet, taking up rock of all sorts, from boulders as big as a half-bushel basket to earth as fine as the flour of which mushroom crackers are made. They lift this stuff in great steel buckets at a ton to the bucket, to the height of a six-story house, and pour it through revolving screens, so that the rock, gravel and sand are carried away, and every bit of the gold is caught in layers of cocoanut matting not unlike that used on an office room floor. At the close of each twenty-four hours the mats containing the gold are lifted out and washed in a tub. The gold and black sand fall to the bottom and the mats are put back again.

This, in brief, is the way Joe Boyle mines gold. It is only in brief. It gives no conception of the mighty dredges and the other machinery used in the handling. I despair of describing the dredges. Each is as big as a seven-story block. It is 130 feet long and sixty feet wide, and it weighs 2,000 tons. The machinery is of manganese steel, although this is inclosed in a wooden framework made on the ground.

This giant is moved by electricity. The falling water from the mountains twenty miles off gives it its power, and makes it work as though it had brains. It is the nearest live thing I have ever seen in machinery. It has two great legs at the back with which it walks, as it were up the valley, gouging out its pathway and carrying the pond of water in which it swims with it as it goes. Each of the legs is a square tube of steel which weighs thirty-two tons. It runs to the top of the dredge and at the bottom ends in a steel point which is dropped far down into the bed of the river. With this as an anchor the dredge swings around as though on a pivot, digging out the thawed earth in front of it and cutting a swath two feet in depth around an arc 300 feet long. When this has gone down to bed rock it moves a little and sinks its other leg into the earth and thus cuts another two feet, swinging back and forth until all the earth in front of it down to bed rock has passed through the dredge. At the same time the debris is carried away on a steel framework by a moving belt at the back much like the chaff and straw of a threshing machine. This debris consists of boulders and gravel which are piled up in a ragged path of desolation behind.

Each of these dredges will handle 500 tons of rock in an hour and keep up that average all the day through. It will handle 12,000 cubic yards in a day, or one or two million cubic yards in a season. The three dredges now working will actually handle more than 6,000,000 cubic yards of such material this year, or enough to fill a train almost as long as the distance around the earth. One day's output of a single dredge would comprise 12,000 loads of a ton and a half each, and if put upon wagons with the noses of each team of two horses resting on the tail-board of the wagon in front, the wagon train would be sixty miles long. Each wagonload would contain 26 cents' worth of gold, and of that about 18 cents would be profit. This seems very little as to the individual ton, but it amounts all told to more than a million dollars a year.

MANITOBA'S MINERALS

Charged with the mission of reporting on the economic possibilities of Manitoba, particularly with regard to its mineral wealth, Professor R. C. Wallace, professor of geology at the University of Manitoba, and J. S. De Lury, lecturer on geology at the University, will leave Winnipeg shortly and proceed to the mine fields of The Pas, and

spend three or four weeks in the mining area of this northern district. From there they will proceed to other parts of the province, and will investigate districts particularly in eastern Manitoba.

The two geologists are working under the public utilities commission for the provincial government, and by their efforts the university is thus assisting the province in arriving at an estimate of the mineral resources of Manitoba. They have recently visited the Rice Lake area.

"Quite favorable," is Prof. Wallace's summary of the prospects of Manitoba in regard to the gold mining industry. He claims that what is needed is the inducement to the province of a larger number of good prospectors. "I have faith in the prospectors already here," he added, "and some of them are doing extremely good work."

Turning to his forthcoming trip to The Pas, the professor said: "One must not forget that the district north or The Pas is figuring to-day more extensively in mining literature than any other part of the province. There as a large bed of ore there which is being diamond drilled at the present time, and if the ore continues to any depth there is a likelihood that there will be a large mine there soon."—Manitoba Free Press.

STAKING CLAIMS IN MANITOBA

Commenting on the mining regulations in the North West The Pas Herald says:

The one-line staking law should be abolished, and four lines and four posts substituted, as the one line is a very poor method, and, especially so after the writing on the posts becomes unreadable. Then it makes it impossible to ascertain how much ground a man has on each side of his line. In the Beaver lake section to-day there are hundreds of claims that show a blazed line and not one word of the inscription readable.

GRANBY CONSOLIDATED CO.

Commenting on the earnings of the Granby Consolidated M.S. and P. Co. during the fiscal year ended June 30, and more especially during May, the Wall Street Journal states that "by the middle of July the Granby Co. will have cash and copper in sufficient amount to at once retire all its outstanding bonds. The company does not owe a dollar, there not being any loans against its copper holdings."

The estimated earnings of the company for the eleven months ended May 31, according to the same authority total \$4,500,000, and for the full year ended June 30 more than \$5,250,000, the earnings of May alone being stated as exceeding \$800,000.

"Granby Co's operations in the last year," continues the Journal, have shown results far exceeding the hopes entertained for the property by its most optimistic friends. The new smeltery at Anyox has given, and continues to give, an excellent account of itself, and the plant has got down to an operation basis where economies planned for it demonstrate their worth.

"Development has been carried on at the Hidden Creek mine and it is understood new tonnage will have been added to ore reserves by the next annual report shall be published. At the Midas mine, in Alaska, much development work has also been accomplished, and shipments of ore from that property to Anyox will constitute a factor in Granby Co's production this summer."

The company's May output of copper, 4,727,929 lb. was the largest monthly production ever turned out by the company. Of that quantity, 3,383,230 lb. was contributed by the Anyox smeltery, while the Grand Forks plant produced 1,344,699 lb.

FROM LAKE ATHABASKA TO GREAT SLAVE LAKE

BY CHARLES CAMSELL

During the summer of 1914, an exploration was carried out in the hitherto unexplored region lying between Athabaska and Great Slave lake and east of Slave river. The expedition was undertaken with the object of obtaining as much information as possible on the geography, topography, geology, and natural history of a region that had previously been visited by only one man who had left any written record of his journey. That man was Samuel Hearne, an officer of the Hudson's Bay Company, who crossed the region in company with a band of Chipewyan Indians in the winter of 1771-72 as he was returning to Fort Churchill from his voyage of exploration to the Coppermine river.

The exploration carried out by the writer consisted of a single canoe traverse across the region from south to north leaving Lake Athabaska at a point a few miles west of the mouth of Charlot river and entering Great Slave lake at the mouth of the Taltson river about 40 miles east of the mouth of Slave river. Parts of the route are traveled by the Indians that live and hunt in the region, but the whole route is apparently not known to any single individual, and there are certain parts of it that have never been traveled by any one of the present generation. As a result it was found impossible to get any native to accompany the expedition in the capacity of guide and the route was followed with the aid only of a rough sketch drawn by an Indian, and in which there were many blanks.

Though a period of five and a half months elapsed from the time the party left Ottawa on May 5 until its return on October 18 only about 2 months of this time was actually employed in geographical and geological investigation of the field, the remainder of the time having been taken up in travel to the point of starting on Lake Athabaska, and from the point of completion of field work on Great Slave lake.

Our course to the point on the north shore of Lake Athabaska where exploration actually began followed the usual boat route from Athabaska, at the end of the railway-line, down the Athabaska river to its mouth and thence northeast for about 100 miles on Lake Athabaska. The return journey from Resolution, on Great Slave lake, was made by way of Slave river to Lake Athabaska and thence by the Athabaska river to the point of starting at Athabaska.

The unexplored portion of northern Canada, exclusive of the islands of the Arctic, is embraced in a number of blocks of territory marked off from each other by the travelled routes of explorers. The largest of these blocks has an area of about 75,000 square miles and the total number of those over 5,000 square miles in extent is about twenty-five. The aggregate area of all the unexplored blocks is over 850,000 square miles or about one-fourth of the total area of continental Canada.

One of the largest of these unexplored blocks is that across which our traverse was made. It covers an area of about 53,000 square miles and extends in a north and south direction from Athabaska lake to Great Slave lake and Hanbury river, and in an east and west direction from Slave river to the Thelon and Dubawnt rivers. It embraces the whole of the basin of the Taltson river and the headwaters of the Thelon river. It includes the extreme northwest corner of the province of Saskatchewan and the northeast corner of the province of Alberta, but the greater portion of it is in North West Territories, beyond latitude 60 degrees north.

From Edmonton, which is a convenient starting point for expeditions into that northern country, the region may

be reached by either of two routes. One follows the course of the Athabaska river for 430 miles, to Lake Athabaska, and the other lies over the new Edmonton, Dunvegan, and British Columbia railway to Peace River Crossing and thence follows the Peace river to Athabaska lake.

The only means of entering this unexplored block of territory in the summer and of travelling through it, is by canoe, and there are several Indian canoe routes leading into it from points on Athabaska lake, Slave river, and Great Slave lake. Most of these routes lead to a point on the edge of the Barren lands near the headwaters of the Taltson river, which has been a rendezvous for many years for the Indians of Forth Smith, Fond du Lac, and Resolution, during the autumn hunting season.

The chief results of the expedition into the region north of Athabaska lake were the carrying of a survey across an unexplored block of territory 53,000 square miles in extent; the exploration of two streams previously unexplored, the Tazin and Taltson rivers, for a distance of about 290 miles; the exploration of a number of lakes, ranging from 15 to 30 miles in length, along the course of these rivers; and **the location of a number of belts of the older, pre-Cambrian, stratified rocks in which minerals of economic importance may occur.**

The Taltson river drains practically the whole of the country between Athabaska and Great Slave lakes, east of Slave river to the 108th meridian. Its main tributary is the Tazin, which drains the region immediately north of Athabaska lake, while the Taltson river itself carries the water from the region between the east end of Great Slave lake and latitude 61 degrees, its headwaters interlocking with those of the Thelon river.

Neither the Tazin nor the Taltson can be considered navigable for large boats, except in short stretches, and steamers could only ascend the Taltson river from Great Slave lake for a distance of 23 miles, to the first falls. Falls and strong rapids occur at frequent intervals and in our descent of the two rivers it was necessary to make about forty portages, the longest one mile in length, and to run dozens of rapids.

The basin of the Taltson river lies entirely within the Laurentian Plateau region, and its physical features of land and water are characteristic of the great region that comprises the northeastern part of the continent of North America. It is a country, when viewed on a large scale, of moderate relief and rounded outline, but in detail it is rugged, broken and rocky. It abounds in lakes, and its streams flow in ill-defined and irregular valleys, rarely more than 100 feet deep.

The highest elevations in the region are on the immediate shores of Athabaska lake where the hills rise somewhat abruptly to a maximum height of about 700 feet above the lake or about 1,400 feet above the sea. From there, the surface slopes gradually and regularly, northwest, to Great Slave lake. In consequence of this general character of the region the height of land between Athabaska and Great Slave lakes lies about 3 miles north of Athabaska lake and the average slope of the upper level of the plateau from there to the mouth of Taltson river at Great Slave lake is about 5 feet to the mile and presents no decided break at any point.

The Taltson river flows northward to Great Slave lake following the slope of the land surface; but, like most rivers in the Laurentian Plateau region, it has no well defined valley nor has it an evenly graded profile. It is characterized rather by a succession of level stretches and short, sharp falls. Here and there, for considerable

distances, its valley is well defined and regular: but more generally, it flows from one expansion to another through narrow, gorge-like openings at which there are as a rule direct falls or strong rapids. For the greater part of its course it flows through a rocky country, on which there is little or no soil; consequently, there are few gravel beaches and the river itself is clear and carries no sediment. Within 30 miles of Great Slave lake, however, it enters an alluvial plain which has been built up in the past by Slave river and is a part of the ancient delta of that stream. Here, the river cuts a shallow valley in the old delta deposits, exposing sections of sands and silts.

The country abounds in lakes, all of them remarkable for the clearness of their water and the beauty of their surroundings. The largest of these are: Tazin lake, 29 miles long and 8 miles wide, Hill Island lake, about 24 miles long and 2 miles wide, Tsu lake 17 miles long, and Thekulthili lake, a lake which we did not thoroughly explore, but which is at least 25 miles long. They are all rock basins, with irregular shore-lines and few beaches.

Over the greater part of the region the bed-rock has no covering of soil nor loose material. Here and there sand-plains or patches of boulder clay occur; and, towards the mouth of the river, the bed-rock is covered by sediments from Slave river. On account of the lack of soil there are no possibilities for agriculture even if the climate were more temperate. The forest trees are small and stunted and no commercial timber, other than pulpwood, occurs anywhere in the whole region. The principal trees are spruce, Banksian pine, poplar, barch, and tanarack.

The lakes and streams abound in fish, including whitefish, pike, suckers, and lake trout. Game, however, is scarce except in the winter season when caribou come into the region in great numbers from the Barren lands. Besides these, there are a few moose and black bears. All the fur-bearing animals common to the Mackenzie River are found here.

The country is inhabited by Indians known as Caribou Eaters, a branch of the Chipewyan stock, who trade at Fort Smith. A few other Indians, also, from Chipewyan, Resolution, and Fond du Lac hunt over parts of it.

The **commercial possibilities of the region** are small and it is not likely to support any population except, possibly, such as might be engaged in mining pursuits. Agriculture is out of the question and unless economic minerals are found in it, it will always remain unsettled. So much of this block of territory remains to be explored that it is impossible to say, yet, what it may contain in the way of minerals. Quartz veins were noted in the Tazin rocks in several places, notably at Hill Island lake, a region which it might be worth while to prospect. These veins may possibly prove in places to be gold-bearing.

All the solid rocks of the region are of Pre-Cambrian age. The oldest rocks encountered are a series of schists, quartzites, conglomerate, narrow beds of limestone and argillite, and some volcanic rocks, all classed together under the name Tazin series. They occur in several isolated bands which trend northwest to north and are entirely surrounded by granite or gneiss. These bands are merely remnants of a once more widespread series of rocks which were reduced in area by the intrusion of the granites and by erosion. They are economically the most important rocks met with since they are cut by a number of quartz veins which may contain some of the precious metals. These bands of Tazin rocks are the areas to which prospectors should devote their attention in prospecting in the region.

The Tazin rocks are everywhere intruded by granites and gneisses of a great, composite batholith, which covers 86 per cent. of the country along the route of our traverse. Granites and gneisses of different ages are here grouped together, but some of the massive varieties are clearly younger than the gneissic. The trend of the gneiss is mainly north

and south, conforming to the trend of the rocks in the Cordilleran region rather than of those in eastern Canada.

No information is available with regard to the climate of the region traversed except that obtained during the months of July and August from our own observations. During these two months the prevailing conditions were bright, warm days and cool nights. Storms of wind or rain were infrequent and the rainfall was so light as to interfere very little with the progress of the work.

The maximum temperature recorded at noon was 86 degrees F. on July 25. Frost was not noted until September.

The four factors which influence the climatic conditions in this region are: (1) the warm winds from the west; (2) the presence of the two large bodies of water on either side, namely, Athabaska lake on the south and Great Slave lake on the north; (3) the cool winds coming over the Barren lands from Hudson bay on the east; and (4) the absence of soil or other loose material on the bed-rock over a great part of the region.

Ice remains in Athabaska lake until the middle of June and in Great Slave lake somewhat later, and no doubt has the effect of retarding the advance of the spring, particularly in the country bordering these lakes. The proximity of the Barren lands on the east and of Hudson bay has a similar effect, so that spring is much later in this region than in the same latitude farther west, towards the foot of the Rocky mountains. These two factors so counteract the effects of the warm winds from the Pacific as to produce, also, a somewhat lower average temperature throughout the year than that which prevails in the same latitude farther to the west.

Judging by information obtained from the natives, the precipitation of rain and snow is very much the same as it is at Chipewyan where the average rainfall for the year is about 15 inches and the snowfall 4 feet.

It appears that the winter temperatures are not too low to permit of people living in the region with some degree of comfort. The chief drawback to travel and residence in the region are the myriads of mosquitoes in the summer months. These pests are in such numbers in the months of June and July, and in the early part of August, that some protection from them is absolutely necessary when travelling either through the woods or on the lakes and streams.

The lakes and streams of the region abound in fish, but the variety is not great. Nearly all the larger lakes contain lake trout and whitefish. Pike, suckers, and loche are found nearly everywhere in the rivers. The inconnu and rayling are caught in the lower part of the Taltson river below the last falls, but so not ascend to the upper parts of the stream.

THE QUEEN GROUP.

In connection with a report that the Queen group of gold mines, in Sheep Creek camp, Nelson mining division of British Columbia, Northwest Mining Truth" says: "The Queen group is equipped with a 20-stamp mill. The Queen mine has been developed to a depth of 700 ft. On the lowest level the drift is 20 ft. wide and the average value of all the ore of that width mined for more than 100 ft. in length was \$9.50 a ton. The saving made on the amalgamating plates is about 60 per cent. of the gold. much of the remainder is contained in concentrate from the tables, which is sent to a smelting works. There is a large accumulation of tailing which it is expected will pay well when treated by cyanidation or flotation. The Queen group includes the Queen Yellowstone and Alexandra mines. Ore of good grade has also been developed on three levels in the Alexandra.

SULPHIDIZING AND FLOTATION OF OXIDIZED ORES

BY O. C. RALSTON AND GLEN L. ALLEN

Flotation of oxidized minerals depends upon a preliminary "sulphidizing" by any method that will convert at least the surface of the mineral particles to a sulphide of the metal. This step is followed by flotation of the "artificial" sulphide, which results in a concentration of the metallic values in the low-grade oxidized ore being treated.

The methods of sulphidizing that have been investigated by the U.S. Bureau of Mines in cooperation with the department of Metallurgical Research of the University of Utah are as follows:

Sulphidizing (1) by the use of hydrogen sulphide on either the dry or the wet crushed ore, (2) by the use of solutions of the various sulphides and sulpho-compounds of sodium, (3) by the use of solutions of the various sulphides and sulpho-compounds of calcium, (4) by the use of sulphur vapor, (5) by the use of a sulphureted oil, (6) with colloidal sulphur.

It has been found that treatment by some of these methods will form a film of sulphide over the surface of the particles of such minerals as lead carbonate or copper carbonate, whereas in other cases the mineral particles are sulphidized to the core. Other methods failed to give any results.

All of the above methods of sulphidizing have been tested on a great number of carbonate-of-lead ores. Some of these ores contained silver and some contained lead as the principal metal. A number of the ores have been successfully concentrated and others refuse to yield to concentration by flotation. In general, a high alumina content (acid soluble) in an ore seems to prevent the application of sulphidizing and flotation.

In sulphidizing with hydrogen sulphide gas, as applied to the lead carbonate ores, it was found that the best method of applying the gas to a dry powdered ore was in a tumbling barrel with the gas inlet in the end. Sulphidizing in a glass bottle showed that the ore blackened quickly after the application of the hydrogen sulphide gas. On attempting to float out lead sulphide from the ore as soon as it had blackened it was found that a low extraction of lead was obtained and likewise a low-grade concentrate, unless the pulp was previously acidified with sulphuric acid. By acidifying the pulp, cleaner concentrates were floated but the extractions of lead remained low. Only by prolonged treatment with hydrogen sulphide gas could the extraction of the lead be raised to commercial grade. With a number of ores eight hours' treatment gave an extraction of over 80 per cent. of the lead.

The use of hydrogen sulphide was considered for the reason that it can be generated quite cheaply. With iron matte available at \$5 to \$10 per ton, and sulphuric acid at from \$5 to \$10 per ton, the cost of the hydrogen sulphide resulting, including labor, etc., is between \$30 and \$50 per ton. If this gas in combining with the metal in the ore produces only a superficial film of sulphide, and does not penetrate to the center of the particles, it might be possible to make a ton of the gas sulphidize many tons of ore.

Unfortunately hydrogen sulphide attacks the metallic particles of the ore with such avidity that by the time the latter are sulphidized sufficiently to permit of good extraction by flotation, they have also been sulphidized to the core and practically a chemical equivalent of hydrogen sulphide, to the lead in the ore, has been absorbed. Even coarse pieces of ore in a bottle absorb the gas with evolution of heat, and on breaking open the pieces the black coloration is seen to have traveled deeply into the particles.

Owing to the fact that the value of the lead concentrate obtained is very low as compared to the amount of hydro-

gen sulphide necessary to sulphidize it, this process is not regarded as commercially practicable.

Application of hydrogen sulphide to the ground ore suspended in water does not seem to be subject to the same difficulty. True "filming" of the particles with a film of lead sulphide seems to take place, and the extractions possible after a short treatment with the gas are satisfactory. The speed of travel of molecules of hydrogen sulphide gas, as compared with the speed of travel of the same molecules in solution affords an explanation of the difference in the action of the gas when applied to dry pulverized ore as compared to its action when applied to pulp suspended with water.

The best results on lead carbonate ores have been obtained when sulphides of sodium were used for the sulphidizing agent. The sodium sulphide must necessarily be introduced in solution and seems to cause true filming. The sulphides of sodium considered commercially applicable are the normal sulphide of sodium, Na_2S , sodium polysulphides, Na_2S_4 and Na_2S_5 , and the sulphhydrate of sodium, NaSH . Of these, the latter, the sulphhydrate, seems to be very effective, as is evidenced by the quicker blackening of the pulp, and the deeper, blacker color formed. The normal sulphide is almost as effective; the polysulphides seem to be the least active. Different ores require 10 minutes to 24 hours of contact with the solutions of sodium sulphide used, depending on the properties of the ore and on the strength of the solution of sodium sulphide. Amounts of sodium sulphide varying from 10 to 20 pounds per ton of ore are usually sufficient, and should be applied to pulp containing about one ton of water per ton of ore, in order that the solution may be as strong as possible during the sulphidizing stage of the process. After a good black color has developed and the color has ceased to increase in blackness, the pulp is diluted with water to a 3:1 or 4:1 mixture and floated in either mechanically agitated or pneumatic machines. The market for sodium sulphide is limited and it should be obtainable at considerably less than 2 cents per pound.

The polysulphide of calcium, obtained by boiling powdered sulphur with slacked lime, seems to be satisfactory for ores that yield easily to sulphidizing, but is sluggish in its action, as compared to the sulphides of sodium. The normal sulphide of calcium is only slightly soluble and hence its use was discontinued as a possible sulphidizing agent. The sulphhydrate of calcium is the most active of these agents, but has not been tested to any extent in this work, as there is doubt as to whether it would be commercially feasible to prepare such a compound.

Sulphidizing with sulphur vapor has been tried with little success, for the reason that it must be applied at a temperature above the boiling point of sulphur in order to prevent condensation of the sulphur. This means that the ore must be heated to a temperature above 445°C . There seems to be no difficulty in obtaining elemental sulphur vapor commercially, as pyrite will give up half of its sulphur content when heated in a closed space, and sulphur dioxide gas can be reduced to elemental sulphur by passing it through a heated zone in the presence of a reducing agent. As lead itself is easily reduced from its carbonate form, the temperature might as well be raised to the point where the lead can be liquated out, a reducing atmosphere being used instead of a sulphidizing atmosphere.

The use of a sulphureted flotation oil, in which loosely combined sulphur is available for combination with carbonates of lead or other metals, and the rest of the oil is then available for "oiling" the artificial sulphide, has

given very little encouragement in the tests conducted by the bureau.

Finally, colloidal sulphur, mentioned as a possible method of sulphidizing, does not seem to combine with lead carbonate at all. It floats as a white lining of the air bubbles in the flotation machine, and brings up very little lead with it.

Usually the precious metals contained in a lead carbonate ore accompany the lead. The writers have noticed that the silver extraction will lag behind the lead extraction when the ore is sulphidized with sodium sulphide, and that the reverse has usually been true when hydrogen sulphide was used.

Oxidized Copper Ores

Many attempts have been made, both by large operating companies and by other experimenters, to float the carbonate and other oxidized minerals of copper. For that reason the testing of such ores by the writers has been limited.

Hydrogen sulphide seems to be by far the best medium for sulphidizing oxidized copper ores previous to flotation. When applied to the dry ore, the writers found the same conditions as those mentioned for lead; the particles are sulphidized to the center, which requires an excessive amount of hydrogen sulphide. Applied to wet pulp, the hydrogen sulphide seems to cause true filming. The writers' work has yielded black concentrates, but they are informed by Mr. Callow, of the General Engineering Co., that the company has been able to reduce the amount of sulphur used to a point where the froth is green with slightly coated malachite. He states that as little as one-half pound of sulphur per ton of ore is giving good extractions in the plant of the Magma Copper Co., at Magma, Ariz., where his company has put in the first successful installation of this kind.

Sodium sulphide has been tested by a number of the larger companies who have some oxidized copper minerals in their sulphide ores. The amount of oxidized copper in such ores is usually a fraction of one per cent., so that two or three pounds of sodium sulphide per ton of ore are all that is necessary. This is usually added to the machines during flotation, or to the mixing tanks before flotation. The writers' experience is that if some little time of preliminary contact is allowed before flotation is attempted, better sulphidizing of the material will result.

Calcium polysulphide has been used for some time in a number of the large copper concentrating mills with indifferent success, and seems to be detrimental in some instances. On the ores tested by the writers fair results were obtained if the calcium polysulphide was allowed to act until the ore had become well blackened.

It is stated that sulphur vapor was tested at one of the large plants for flotation of oxidized forms of copper and gave better results than any other method of sulphidizing. Of course this method has the disadvantage of having to be applied to dried, heated, and finely divided ore.

Sulphureted oils are being used at a number of plants to supplement other methods of sulphidizing and considerable secrecy is observed as to the technical details of this work.

So far as the writers know, colloidal sulphur does not assist in the flotation of oxidized forms of copper. Neither has the silicate of copper been successfully floated by sulphidizing flotation. It will blacken when sulphidized, but resists flotation. Possibly it still presents a silicate surface, rather than a sulphide surface to the flotation elements. For this reason a number of the large copper companies are seriously contemplating leaching the oxidized copper ores, rather than lose what silicate of copper may be present.

Repeated attempts to float the natural sulphides along with sulphidized minerals have failed, as the sulphidizing agents cause trouble with the flotation of the natural sulphides. By careful adjustment this difficulty has been solved in one plant, though the details are not available.

Oxidized Zinc Minerals

Attempts to float the oxidized particles of zinc from their ores, both before and after sulphidizing by most of the above methods, have met with no success whatever in the laboratory experiments of the writers. They are informed that some headway was made with the problem by Prof. Traphagen, at the Colorado School of Mines, but that the sulphide film seemed to come off too easily. However, poor results were obtained, whatever the cause.

The writers' experience has been that most of the carbonate ores of zinc contain important amounts of the silicate, and this may be one reason for the nonsuccess of this work, for the same reasons that copper silicate will not float.

Direct flotation of oxidized minerals of the kind mentioned, so far as known, has not been successfully accomplished. In all of the successful work witnessed by the writers there has been some form of alteration of the oxide to the sulphide. A number of parties claim to be successful in the flotation of copper carbonates without sulphidizing, and others in the flotation of scheelite, fluorite, and magnetite. The authors were unable to verify these statements.

Concentration of natural sulphide ores by the flotation process has met with such success that attempts have recently been made to apply the process to the flotation of ores other than natural sulphides.

As inquiries on this subject are frequently received by the U.S. Bureau of Mines, it has been thought best to publish a summary of the results so far obtained from the experimental work on oxidized ores at the Salt Lake City station of the bureau, in cooperation with the department of metallurgical research of the University of Utah. The work has been directed by O. C. Ralston, assistant metallurgist of the bureau, and was carried on for the most part by G. L. Allen; N. C. Christensen and R. W. Johnson also assisted with the work.

As above stated, this paper is only a summary, or a preliminary report of the experiments on the flotation of oxidized ores. More complete details as regards the flotation of carbonate ores of lead will be given by the writers in a paper on that subject.

ENLARGING ZINC REFINERY

The Daily News, Nelson, B.C., on July 10 printed the following among other mining news: Extension of facilities for the manufacture of refined zinc at the electrolytic plant at Trail smeltery includes the construction of a new building 140 by 200 ft. Work was begun last week with a gang of 56 steel workers. About 270 tons of steel will be used. The output refined zinc is to be increased from 15 to 30 tons a day.

SHIPMENTS FROM KOOTENAY

Published figures show Kootenay, B.C., shipments of zinc ore and concentrate during the month of May to have been as follows: From Sullivan mine, Kimberley, 4798 tons; Galena Farm mine Silverton, 702 tons; Standard mine, Silverton, 904 tons; Lucky Jim mine, Zincton, 596 tons; Utica mine, Adamant, 30 tons; total, 7030 tons. The ore from the Sullivan mine went to the Consolidated Mining and Smelting Co.'s reduction works at Trail, B.C.; the product from the other mines was shipped to United States Smelting Works.

THE PREVENTION OF EXPLOSIONS IN COAL MINES

NOTES ON MR. WILLIAM SHAW'S PAPER ON "COAL DUST, HOW IT AFFECTS THE MINES OF THE CROW'S NEST PASS"

BY JAMES ASHWORTH.*

"The paper on "Coal Dust" presented at the meeting of the Rocky Mountain Branch of the Canadian Mining Journal, may be best treated by taking up Mr. Shaw's conclusions one by one:—

1,—“Adopt the panel system”—The paper being unaccompanied by plans or diagrams makes the conclusion under this head far from convincing as to any advantage which may accrue outside the division of a mine into districts as is already compulsory under the Mines Regulation Act. The division of one coal mine in South Wales into panels did not save the lives of the men in any panel.

(2),—“Leave solid barriers of coal between lifts,”—The above remarks re plans will also apply to this conclusion.

(3),—“The driving of a dip entry for an intake airway.” This conclusion does not call for remark but it is good advice.

(4),—“The Enlarging of cross cuts between chutes,”—The reasons for this conclusion are certainly NOT obvious without further explanations and diagrams. To enlarge cross cuts must mean a very much higher cost for air stoppings and brotting.

(6),—“Do not allow the removal of bodies of gas during the time that the majority of the workmen are in the mine, whether or not the mine be dry and dusty.”

Surely the provisions of the Mines Regulations Act, General Rule 8 B.C. Act, and the Special Rules cover this suggestion and make it compulsory.

(7),—“The installation of a water spraying system or, where that is not possible, the installation of inert barriers in all roads leading from the dry and dusty section to other sections of the mine.”

The water spraying suggestion calls for the first notice, as Mr. Shaw has in the body of his paper shown that this system is a positive impossibility in the icy cold mines of the Crows Nest Pass at the time of the year when it is assumed that water in some form would be the most necessary. It seems curious under such conditions that he should recommend it as a “practical” alleviation. The writer has for many years endeavoured to show that water vapor in any form cannot restrain an explosion, and he finds Mr. Shaw confirming this, by stating that not less than 30% can restrain the extension of an explosion what 30% means will be realized when the writer also adds that it is impossible to charge the air with more than 5% of water vapor, and then only when it is in the form of steam, and further that the highest explosive effects of a mixture of explosive gas and air is only attained when 5% of water vapor is present in the air. The futility of depending on any sort of spray or moistening of the air of a mine, as a safety precaution is thus proved and has now been acknowledged by the U.S. Bureau of Mines. In the early part of his paper Mr. Shaw states that “the air entering these mines in winter shows a relative humidity of from 45% to 50%; the return air from the same mines shows a relative humidity of from 90% to 100%; therefore, the mines are more dry and dusty in winter than during any other season of the year. This, then, is the season when danger is most extant.”

It is particularly misleading to make these statements in “percentages of humidity,” because the low heat of the intake air say 10 degrees may be saturated by only 0.8 grains of water vapor, and yet this represents 100% humidity, whereas air at 70 degrees would carry 8.0 grains

and also give 100% humidity. Consequently when statements are made in per centages of humidity they do not convey any practical fact, and yet it would be fair to argue that 0.8 grains of water vapor per cubic foot when present in the ventilating air current of a coal mine provides as great a factor of safety (if there is any safety from damp air), as if the air carried ten times that weight of water, viz. 8.0 grains. Most people will say that such a conclusion is absurd, and so it is, yet both air currents would be saturated.

In Mr. Shaw's seventh conclusion, he also introduces the question of “inert dust barriers,”—this is the latest of the so-called preventatives against the extension of an explosion flame, from whatever cause it originates, and is designed to “make safe” the use of explosives in dusty gaseous coal mines. Mr. Shaw says truly in his 5th conclusion that the best prevention is “the elimination of explosives in the blasting of coal.”

The writer might leave the subject at this point but for the fact that the majority of operators, officials and miners, have no real desire to shut out blasting, and therefore this suggestion of inert dust barriers needs to be discussed as carefully as the watering or so called humidity cures.

The whole of the possible success of the “inert shale dust” cure depends on one factor in the proposition, viz, does the sound wave or air wave, caused by the initiatory explosion precede the flame of the explosion. If it does not, then the flame will have passed before the safety shelves are thrown over, and consequently when the shelves are thrown over it is too late to arrest the flame. The velocity of the flame of an explosion may be 3,000 feet per second, or more, and in this regard Mr. Shaw has said, in his second paragraph, that 0.19 ounces of fine coal dust per square foot on the sides of the roadways is sufficient to propagate an explosion, it becomes clear that a much less quantity in the air current is sufficient, whereas those who think that a cloud of fine dust is necessary base their arguments on what Col. Blackett has called the “pioneering cloud,” and there are a large number of people who think that it is impossible to have coal dust explosion without a so-called pioneering cloud of dust being first formed. If this cloud of dust did precede the flame throughout, then the flame would be choked by the excess of dust. Mr. Shaw ventures the opinion that the force of an explosion takes the centre of the road on which it is travelling and doubtless it does fill the whole of the roadway, but the flame effects are most frequently and principally demonstrated on the upper half of the roadway. Although Mr. Shaw seems to be of opinion that water spraying has the advantage over the inert dust cure, yet he goes on to say, that water spraying could only be adopted during 8 months of the year, and therefore during the other four and driest, what he considers the most dangerous time of the year, inert stone dust would have to be used. If inert dust will arrest the propagation of a coal dust explosion flame it ought to be still more effective in preventing the origination of an explosion. Further it is assumed, that a considerable percentage of fire damp is present, then neither inert dust nor water spraying would be effective.

Mr. Shaw does not explain what is covered by the word “gas”—This however is a very important point because it has been absolutely proven by analyses that the gas of Crows Nest Pass mines is not necessarily methane only, but a mixture which often contains ethane, and sometimes

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sulphuretted hydrogen and the writer believes also free hydrogen also.

The presence of these gases renders "firedamp" more dangerous than when it consists of methane only. The "greasiness" of some of the Crows Nest Pass coal dust is another noticeable feature.

Mr. Shaw's final conclusions, which read as follows, may be taken together,—viz, No. 8,—“That the very careful attention of all mine officials be directed to the ventilation and presence of gas, and dry coal dust in the mines.” No. 9,—“That the officials of all the mines should make an effort to enlist the co-operation of their workers, and the worker should endeavour to co-operate with the officials in these important matters which so vitally affect the safety and welfare of all concerned.”

Acts of Parliament and Special Rules, have been put into force to both officials and miners to do their duty, and yet we continually find when investigating the cause of mine disasters that some one, through what has been called the fallibility of man, has taken a chance” which ended disastrously.

The four main preventatives of explosions are,— (1) to abolish blasting in coal with either Nonobel No. 1, or any other explosive,— (2), to use no electricity for any purpose inside a dusty fiery mine,— (3), not to carry very high pressure air in pipes into the mine,— (4), where possible adopt some form of longwall working.

ORE RECEIPTS AT TRAIL, B.C.

BY E. JACOBS.

Ore receipts at the Consolidated Mining and Smelting Co's reduction works at Trail, British Columbia, during six months ended June 30, 1916, compare favorably in total quantity with those of the corresponding periods of the years 1914 and 1915, respectively. There is a slight difference in the number of days in the several periods under notice, since the figures for the 1916 period are to June 30, inclusive, while for 1915 they include one day in July and for 1914 two days in that month, but these differences do not materially affect the totals for comparative purposes. However, taking the actual number of days the several periods cover, it is found that the average quantity of ore received daily during the 1914 period of 183 days was 1002 tons, that for 182 days in the 1915 period 1196 tons, and that for 182 days of 1916 1349 tons a day. The totals for the several periods were as under:

FROM	DURING PERIOD ENDED		
	July 2, 1914 Tons	July 1 1915 Tons	June 30 1916 Tons
East Kootenay—			
Fort Steele div.....	10766	21642	36872
Windermere div.....			137
Golden div.....		33	85
Total.....	10766	21675	37094
West Kootenay—			
Ainsworth div.....	10167	2924	7969
Slocan div.....	10875	2385	7261
Nelson div.....	14076	1831	1511
Trail Creek div.....	127925	172856	172816
Trout Lake div.....	30	56	
Revelstoke div.....			415
Total.....	163073	180052	189972

Boundary—			
Grand Forks div.....	120	170	239
Greenwood div.....	40	258	75
Total.....	160	428	314

Yale			
Kamloops div.....		228	2690
Yale div.....		8	41
Total.....		236	2731

Cassiar—			
Omineca div.....	806	101	257

Total from British Columbia Mines.....	174805	202492	230368
Alberta		10	52
Ontario			39
United States	8667	15125	15007
Total from all sources.....	183472	217627	245466

Summary—			
From Consolidated Co's mines.....	145341	196116	205201
Custom ores.....	38131	21511	40265
Total of receipts.....	183472	217627	245466

DETAILS OF ORE RECEIPTS IN SIX MONTHS OF 1916.

East Kootenay—

	Tons	Tons
Giant, Golden.....	20	
Monarch, Golden.....	65	
Lead Queen, Windermere.....	137	
Park Group, Fort Steele.....	12	
St. Eugene, Fort Steele.....	422	
Sullivan, Fort Steele.....	36438	37094

West Kootenay—

Ainsworth div.—		
Bluebell, Riondel.....	3556	
Comfort, Riondel.....	84	
Cork-Province, South Fork.....	6	
Crescent, Coffee creek.....	28	
Florence Co., Princess creek.....	656	
Gallagher, above Ainsworth.....	21	
Highland, Cedar creek.....	917	
Martin, South Fork.....	30	
No. 1, above Ainsworth.....	2381	
Utica, Adamant.....	290	7969
Slocan div:		
Apex, New Denver.....	26	
Comstock, Four-mile creek.....	13	
Galena Farm, Silverton.....	642	
Hewitt (Silverton Mines).....	258	
Idaho-Alamo, Howson Creek.....	27	
Jo Jo, N. Fork Carpenter Creek.....	7	
Lucky Thought, Four-mile creek.....	260	
Molly Hughes, New Denver.....	26	
No. 1.....	26	
Noonday, Cody creek.....	121	
Rambler-Cariboo, McGuigan.....	906	
Reco, above Cody.....	70	
Ruth-Hope, Sandon.....	407	
Slocan-Payne, Sandon.....	31	
Slocan Star, Sandon.....	560	
Standard, Four-mile creek.....	3716	
Wonderful, above Sandon.....	71	
Yakima, above Sandon.....	22	7189

Slocan City div:			
Black Prince.....	28		
Enterprise, Ten-mile creek.....	29		
Meteor.....	15	72	
Nelson div:			
Emerald, Salmo.....	436		
Eureka, Eagle creek.....	509		
Granite-Poorman, Granite.....	117		
Hudson Bay, Deer Creek.....	112		
Molly Gibson, Kokanee Creek.....	72		
Perrier, near Nelson.....	29		
Queen, Sheep Creek.....	228	1503	
Arrow Lakes div:			
Millie Mac.....		8	
Trail Creek div:			
Centre Star group, Rossland.....	93918		
Josie group, Rossland.....	8247		
Le Roi, Rossland.....	70580		
Velvet, near Rossland.....	71	172816	
Revelstoke div.:			
Lanark, Illecillewaet.....		415	
Boundary—			
Grand Forks div.:			
Emma, Denoro.....	213		
Golden Eagle, North Fork.....	26	239	
Greenwood div.:			
Kokoma.....	5		
Sally, Beaverdell.....	70	75	
Yale—			
Ashcroft div:			
Storm, Highland valley.....		41	
Kamloops div.:			
Fog Horn, North Thompson river.....	52		
Iron Mask, Coal Hill.....	2597		
Pot Hook, Coal Hill.....	41	2690	
Coast—			
Omineca div.:			
Silver Standard, near Hazelton.....		257	
Alberta—			
Yellow Jacket, Lake Louise.....		52	
Ontario—			
Tip-Top, Kashahowe.....		39	
United States—			
Washington:			
Ben Hur, Republic.....	2099		
Knob Hill, Republic.....	1577		
San Poil, Republic.....	5419		
Tom Thumb, Republic.....	267		
Edwards, Valley.....	13		
Bonanza, Evans.....	345		
Delphia, Danville.....	29		
Lead Trust, Northport.....	9		
Norman Mines, Northport.....	528		
United Copper, Chewlah.....	5007	14793	
Idaho:			
Green Monarch.....	15		
Keystone.....	126		
Sand Point M. & P. Co.....	5		
Venezuela.....	35		
Lakeview.....	33	214	
Total receipts.....		245466	

The greater part of the increase in East Kootenay in the first half of 1916 as compared with the two other years was from the company's Sullivan mine, from which 10,063 tons was received in the corresponding period of 1914, 21,642 tons in that of 1915, and 36,438 tons in that of 1916. The increase this year would probably have been greater but for the fact that flood waters prevented receipt of the usual quantity of ore, only 420 tons having reached Trail during the last nine days of June as compared with 903 tons a week which had been the average for six immediately preceeding weeks. The Giant, Lead Queen, and Park group, were new, though but small, shippers in 1916.

Ainsworth division of West Kootenay made an increase of 7,045 tons in 1916 as compared with the first half of 1915, in which latter period the adverse effects of the European war on the metal markets were still being experienced. The first half of 1914, however, saw a production from Ainsworth Mines 2290 tons greater than that of 1916. The chief decreases in 1916 were of 1616 tons from the Consolidated Co's Highland mine and 914 tons from its No. 1 mine. New producers were the Florence Mining Co's Hope group with 656 tons, and the Comfort, Crescent, Gallagher, and Martin with much smaller shipments.

Slocan district also made a generally similar recovery from the effects of war troubles, its 1916 total of 7261 tons being 4876 tons greater than that for the corresponding period of 1915. While the comparison with the first half of 1914 shows a decrease of 3,614 tons, it is but fair to point out that shipments of zinc ore to the United States were considerably higher in 1916 than in 1914, so that were complete returns available it would most likely be found that there was little, if any, decrease in total quantity of output for the first half of this year as compared with that of two years ago. Further, flood waters practically stopped the shipment of ore during the latter half of June of this year. However, the chief cause of the decrease was the considerable reduction in the output of silver-lead ore from the Standard mine, the figures for which for the 1916 period were 3716 tons compared with 7677 tons for that of the 1914 period due in large measure to the fact that the production of zinc concentrate was pushed latterly so that advantage might be taken of the high price obtainable for spelter. Several Slocan mines that shipped in 1914 were not on this year's Trail list, namely, the Eastmont, Ottawa, Richmond, Eureka, Surprise, and Van Roi, of these the Ottawa is resuming production, and the Surprise will do so as soon as its new concentrating mill shall be completed. The Galena Farm, Noonday, and Wonderful were new shippers together with two or three others that each sent out a smaller quantity of ore.

The small tonnage of ore received this year at Trail from mines in Nelson division, as compared with 1914, was due chiefly to the suspension of production at the Silver King mine shortly after the outbreak of the war, for while receipts at Trail from that mine totalled 10,803 tons in the first half of 1914, there was not any production at all in 1915 or 1916. Again there was 2579 tons of lead ore received in the 1914 period from mines in the neighborhood of Salmo, as compared with only 548 tons this year. Then the Yankee Girl at Ymir shipped ore to Trail in 1914 but not any this year. On the other hand the Eureka with an output of 509 tons of Copper-gold ore and the Granite-Poorman group with 117 tons of gold concentrate are among the gains for 1916.

Total shipments to Trail from Rossland mines, while practically the same in the first half of 1916 as in that of 1915, compare favorably as between 172,816 tons in 1916 and 127,925 tons in 1914. The chief increase was made by the Le Roi, with 70,580 tons in 1916 against 35,284 tons in the corresponding half of 1914, while the Centre Star

group shipped 93,918 tons in the former period against 81,825 tons in the latter. There was a falling off in the total from the Josie group (Le Roi No. 2, Ltd.), the 1916 amount having been 8,247 tons against 10,778 tons to July 2, 1914.

The only other districts in the Province calling for comment are the following: In Revelstoke division, the Lanark, at Illecillewaet, which made several small shipments late last year shipped 415 tons of silver lead ore this year; the Emma, in Boundary district, after several years of inactivity, last May shipped 213 tons to Trail; the Iron Mask, near Kamloops, though hampered by flood troubles in the latter part of June, reached a total of 2597 tons received at Trail to June 30 of this year as compared with 1946 tons for the whole of 1915, and there were two new small shippers—the Fog Horn and the Pot Hook—also from Kamloops division. Receipts from Omineca division, in the Coast district, were 257 tons this year, against 101 tons in the first half of 1915 and 806 tons in that of 1914. Although not connected with ore receipts at Trail, it should be borne in mind that the comparatively big production of copper ore in Boundary district is smelted at local works to the extent of approximately 5000 tons a day, and that about 6000 tons of gold ore is milled monthly at the Hedley Gold Mining Co's 40-stamp mill, in Similkameen district.

Ore receipts from mines in Washington and Idaho—the latter in but small quantity—were 15,007 tons this year against 15,125 tons for the first half of 1915 and 8,667 tons for that of 1914. Latterly, the Ben Hur, Lone Pine, and Surprise mines, in Republic camp, Washington, have been off the Trail list, but large increases from the San Poil, Republic, and the United Copper, Chewelah, have almost offset those losses.

Altogether, the outlook is favourable for a still further total increase in the ore receipts at Trail, consequently it is to be expected that there will be a gradual enlargement of output of refined gold, silver, lead, copper, and zinc.

MCINTYRE PORCUPINE MINES

Under date of July 21, President Alex. M. Hay issued the following memorandum of production and development of the McIntyre properties for the quarter ended June 30, 1916.

McIntyre Ore: tons milled 30,452; value per ton \$8.29; gross value \$252,530.35; recovery \$241,650.05; Operating costs \$128,847.36 or \$4.23 per ton; operating profit \$112,802.69. Profit from Milling Custom Ore and from subsidiary Company operations was \$9,262.15. Total \$122,064.84. There was treated 3,721 custom ore.

During the period, Crosscut No. 1001 on the 1,000 ft. level, from McIntyre Extension Main Shaft to No. 5 Shaft was completed, and raising operations to connect the Workings with No. 5 on the 700 ft. level are now under way. On the Boundary Vein on the 1000 ft. level about 150 ft. of drifting has been done. Box holes have been cut and stopes started at a height of 18 ft. above the level, both on the property of this Company and on McIntyre Extension ground. In the drifts East and West schist inclusions were met with, reducing the grade of ore. Above the level, however, in the new stopes, the vein is of an average grade of \$13.00 and varies in width from eight to twenty-five feet.

At No. 5 shaft, drift No. 714 has been advanced 225 ft. East of 7D Crosscut, and has maintained the same high grade of ore as was shown at the point of intersection.

No. 4 shaft has been sunk to a depth of 800 feet, where a Station is being cut, and it is expected that Mining operations will be commenced on the 700 and 800 ft. levels early in August.

The McIntyre Jupiter Mines began Mining operations early in May, and are now delivering about 65 tons of ore per day to the McIntyre Mill.

The McIntyre Extension Mines have now commenced Mining operations, and deliveries of ore from this source have begun.

In order to increase the settling capacity of the Mill, extra tanks have been ordered, and the necessary additional construction is now under way. This addition will increase the capacity of the Mill to 500 per day. While deliveries of material, etc., are uncertain, it is expected that the addition will be completed by the middle of October.

In order to facilitate the conduct of operations, the question of consolidating the three Companies has been under consideration. With this object in view, arrangements are being made for an independent examination of the three properties, and should the Directors agree upon a basis for such consolidation, the terms will be submitted to the Shareholders for their consideration and approval.

The Petroleum Review, London, in its July 8 number has the following:

"In view of the ever-increasing demands for the products of crude oil, one wonders when the extraordinary rich oil shale deposits in the Dominion will be operated in a manner their contents deserve. Year after year the output of crude oil in Canada registers a decline, and this in spite of the fostering care of the Dominion Government which has for years past granted a bounty upon every gallon of crude oil produced at home. Last year, for instance, according to the preliminary report issued by the Canadian Department of Mines, the total output of crude oil in the Dominion was only 215,464 barrels (this excluding Alberta), and its value is given as \$300,572. Thus, in spite of increased prices for crude oil during the past twelve months, the value of Canada's oil output for 1915 is the lowest yet recorded. Surely it is time that attention were paid to Canada's oil shales, and their commercial exploitation! The wealth of oil content is beyond question, for the shales are in many places far richer than those now so successfully operated in the Midlothians, while the distribution over large and well-placed areas renders their exploitation one of comparative ease. Our own opinion is that, with a little enterprise, the oil shales of Canada can prove themselves to be well worthy the serious attention of our largest oil-producing companies."

M. C. M. REUNION.

The 1916 reunion of the Michigan College of Mines will be held at the College, Houghton, Mich. on Aug. 8, 9 and 10.

The executive committee is inviting all former students, graduate and non-graduate, and every former member of the college staff. Owing to the mailing list not being perfect, especially with reference to non-graduate students, some may not receive the formal invitation. It is the wish of the committee that all should attend.

Mr. James Fisher is secretary of the committee and will be pleased to send information about the Reunion.

HUDSON BAY ZINC.

A late report from the Hudson Bay zinc mine, near Salmo, Nelson mining division, is to the effect that work on the 300-ft. level continues to develop ore in both directions and that to the southward, in new ground, especially large and fine orebodies are being found. Taking into consideration the work done on both 300 ft. levels the indications are now that the ore shoot will prove to be about 2000 ft. in length.

PERSONAL AND GENERAL

Mr. A. D. Little, formerly of Boston, Mass., who is organizing a natural research department for the Canadian Pacific Railway Co., when in Vancouver, B.C., early last month had a conference with Hon. Lorne A. Campbell, Minister of Mines for British Columbia.

Mr. W. Clayton Miller, consulting engineer for the Cassiar Crown Copper Co., left Spokane, Washington, on July 7 for Telkwa, Omineca Mining division of British Columbia, to visit the companies mining property in that neighborhood and to advise as to further development of it.

Mr. Alex Smith, one of the owners of the Surprise Silver-lead-zinc mine, situated above Cody, Slokan, B.C., has returned to that district after an absence of three months spent in Ontario and New York.

Mr. J. A. Poyntz, for several years in charge of the development of the Utica mine when Mr. Chas. F. Caldwell, of Hases, B.C., was at the head of that enterprise, is now superintending the further development of the U. S., Bell, and other zinc mines, also situated in central Slokan, near the dividing line between Ainsworth and Slokan mining divisions. The Jackson, U. S., and Bell are among a number of well-known mining properties in Jackson Basin about half a dozen miles south of Whitewater, in which Mr. Caldwell has succeeded in interesting mining men resident in Spokane and other United States cities.

Mr. W. Munroe Archibald, one of the Consolidated Mining and Smelting Co.'s mining engineers, has returned to Trail, B.C., after having visited mining properties in the neighborhood of Hazelton, Omineca mining division of that province.

Mr. S. S. Fowler, of Riondel, Kootenay Lake, B.C., general manager of the New Canadian Metal Co., was on the Coast early in July obtaining material to repair drainage done by floods in June to the Bluebell mine and concentrating mill water-supply line.

Professor Arthur Lakes was last month visiting at the Lucky Jim zinc mine, on the Kases & Slokan Railway, B.C. His son, Mr. Harold Lakes, is superintendent at the Lucky Jim.

A press despatch from Edmonton, Alberta, published July 4, stated that the Alberta Government had appointed Corporal MacAskill, a returned soldier, formerly of the Edmonton 9th Battalion, who had been invalided home and discharged, to the position of superintendent of the Mine Rescue Station at Lethbridge, Alberta. Corporal MacAskill is an experienced miner.

Mr. Ben Hughes, Editor of the Northern Miner and special correspondent at Cobalt for the Canadian Mining Journal is going into training for the front in a few weeks. Mr. Richard Pearce will succeed Mr. Hughes as editor of the Northern Miner.

Mr. John Redington is at Gold Lake, Manitoba. He is manager of the Manigotogan Mining and Development Company.

Mr. Ralph Scott is in Toronto.

Information has been received in Victoria, B.C. to the effect that Major Edward C. Musgrave, who was in England when the war broke out and quickly obtained a captaincy in the King's Royal Rifles, had been awarded the D.S.O. decoration. Major Musgrave was well known on Vancouver island, where he was for several years superintendent of the Tyee Copper Co.'s Tyee mine on Mt. Sicker, the largest and most productive metal mine on the island. After resigning his position with the Tyee Copper Co., he was for a time engaged in mining in the United States and went thence to Mexico, in which latter country he was a mine manager until times became troublous, when he returned to British Columbia, and later went thence to England. Major Musgrave is a graduate of the Royal

Military College, Kingston, Ontario, at Queen's in which place also he took a course in mining engineering before entering upon his mining career in British Columbia. Of three brothers, one who was a successful mine manager in Mexico is this year doing field work for the British Columbia Department of Mines, and another has had years of successful practice as an assayer, for some time in British Columbia and afterward in Mexico.

The Sullivan Machinery Company of 122 So. Michigan Ave., Chicago, and Salisbury House, London, England, has established an agency in Holland with Messrs. Petrie & Co. Heerengracht, 141-145 Amsterdam as its special representatives. Messrs. Petrie & Co. will sell the Sullivan Air Compressors, Rock Drills, Hammer Drills, Diamond Core Drills, Quarrying and Coal Mining Machinery in the Netherlands. This new arrangement replaces the Sullivan Machinery Company agency previously at the Hague.

ZINC PRODUCTION AT TRAIL, B.C.

Reports from Trail, B. C. according to a western newspaper indicate that the new electrolytic reduction works forming a recently added department of the smelting plant of the Consolidated Mining and Smelting Company of Canada, Ltd., is proving an economic success. Mr. James Breen, when travelling to Spokane in company with Mr. F. M. Guernsey, who had just resigned the position of superintendent of the electrolytic zinc plant to join the staff of the Gunn-Thompson interests in Nevada under the general managership of Mr. W. H. Aldridge, formerly managing director of the Consolidated M. and S. Co., was informed by Mr. Guernsey that the plant was now turning out daily 16 tons of electrolytically refined zinc and was headed toward a production of 25 tons a day. When Mr. Breen inspected the plant a few weeks ago its output was in the neighborhood of 10 tons daily.

Another indication of the success of the electrolytic zinc works is the announced intention of the Consolidated M. and S. Co., which some months ago took over the entire capital stock of the West Kootenay Power and Light Co., to add to that company's plant at Bonnington Falls, on the Kootenay river below Nelson, B.C., a unit having a capacity of 6000 horse-power. While there has been a general improvement in the mining situation in the Kootenay district of late and consequently a considerable increase in the demand for electrical power, the requirements of the mines would not consume sufficient current to necessitate such an addition. It is to be presumed, therefore, that the current to be developed will be utilized entirely by the present zinc-reduction works or an addition thereto.

BOOK REVIEW.

Mining Manual and Mining Year Book, 1916, by W. R. Skinner, Published by Walter Skinner, London, E.C. Price \$4.25. For sale by book department Canadian Mining Journal.

This is the 30th year of a record of information concerning mining companies. The compilers have endeavored to place before the public a standard reference book on mines, and they have succeeded. The mines interesting to Londoners are scattered all over the world and the labor involved in such a compilation is correspondingly great.

While primarily a record of mining companies the Mining Manual or "Skinner's Red Book" as it is not infrequently called, contains an abundance of general information on mines and mining. Naturally South Africa figures prominently in this work and those who have occasion to hunt up data on the Rand mines will find the Manual a handy reference volume.

SPECIAL CORRESPONDENCE

COBALT SOUTH LORRAIN AND GOWGANDA

McKinley-Darragh.

By far the most interesting developments in the underground workings of the camp to-day are at the McKinley-Darragh. It would be entirely premature to place too much importance on the successful development of another section of this property, until further drifting has been done; but it can be said now that developments are most promising for the opening up of an entirely new mine. The management has always believed, previous to about a year ago, that when the veins were worked through the conglomerate to the Keewatin, that further research into Keewatin or along the contact would be futile and a purposeless waste of money. Research work undertaken about a year ago, demonstrated latent possibilities and since that time exploration has been pushed along fault lines to the north and east. Quite recently in a cross-cut from the winze at 400 feet, before the conglomerate was struck, the cross-cut picked up a vein in the Keewatin—barren as is usually the case. Immediately the face of the drift entered the conglomerate the character of the vein changed and within a few rounds there was some silver showing. This development is the more promising, since the vein was discovered by a system of working out various faults in this part of the ground, at exactly the point where it was expected. There is therefore no reason to believe that the extensions of further orebodies worked in the upper levels of the conglomerate should not be discovered in this section of ground to the north and east of the present workings. Such a development would be important not only to the McKinley-Darragh, but would undoubtedly stimulate further exploration along the contact in other mines.

The Savage Mine of the McKinley-Darragh is still shipping but the supply of ore is running short and unless more discoveries are made, this auxiliary of the McKinley-Darragh Savage Mines will shortly be closed down.

Hudson Bay

While slashing down the party wall of vein 64 between the Hudson Bay and the Nipissing, the Hudson Bay Mining Company has discovered a very rich lens of ore 50 feet from the Nipissing line. It parallels vein 64. It is from 6 to 8 inches wide, of very high grade. As far as can be ascertained it has no direct relation with vein 64. The extent of it has not yet been ascertained and it may just be a lens lost by the old management, or it may really be another vein, in which case, of course, it will be of the utmost importance to the Company. This find has nothing to do with the exploration work which is being carried out in the north-east corner of the property.

Reeves Dobie

The Reeves Dobie at Gowganda has taken out 22,143 pounds of very high grade silver ore. This ore was obtained at a depth of 23 feet and not more than 20 feet away from the old mill. The work is being carried out by Mr. Christopherson and his Minneapolis associates, upon a small scale. The ore is being gouged out from the surface and little effort is being made to develop the property beyond such point as ore is actually seen to exist.

The great handicap to the Gowganda camp is the Gowganda road. This has been deteriorating in the last two years, until now it is merely a bush trail. The 27 miles can not be made in much less than 11 hours, so vile is the going and freighting teams are obliged to take very small loads

Adanac

Another patch of high grade has been struck in the west winze of the Adanac. The winze is now down over ten

feet from the point where the first leaf silver was encountered and it is still holding well. The Cartwrights have now sold out their entire interests to a Buffalo Syndicate.

Ore Shipments

The ore shipments from the camp in June were as follows:—

	High	Low	Tons
Aladdin.....	26.77		26.77
O'Brien.....	31.00		31.00
Penn Canadian.....	85.76		85.76
Seneca-Superior.....	79.11		79.11
LaRose.....	43.65	85.60	129.25
Min. Cor.—Townsite City	169.07		298.43
Cobalt Lake.....	129.36		
McKinley-Darragh.....	195.54		195.54
Coniagas.....	63.30		63.30
Dominion Red.....		329.50	329.50
Beaver.....	47.87		47.87
Timiskaming.....	42.04		42.04
Kerr Lake.....	30.28		30.28
Casey Cobalt.....	63.30		63.30
Wattlaufer.....	12.26		12.26
	1019.31	415.10	1434.41

Lorrain Consolidated

The Lorrain Consolidated in South Lorrain has been pumped out and a gang of men is now at work. Mr. Mark Harris has secured substantial backing for this silver prospect and there is no doubt that it will receive full value in development.

Trethewey

The Trethewey Mining Company is now making regular shipments and will continue to do so as the ore lasts. The first shipment went out in June.

Peoples

The Peoples Mining Company have now started drills in the shaft. It was found necessary before doing so, to build a bulk head on the 200 foot level, 25 feet from the shaft and a dam on the 100 foot level, so as to insure the workings being comparatively dry. The shaft is 310 feet deep and it will be continued to the contact, an estimated depth of another 250 feet. It is estimated that 80 feet can be made each month.

Coniagas

The Coniagas Mining Company has declared a dividend for August the first. Owing to various reasons, not fully disclosed to shareholders, the Coniagas Mines passed the spring dividend, but will now resume payments on the old basis.

Nipissing

The Nipissing production in the month of June showed increase of almost \$3,000, but bullion shipped fell from \$420,822 in May to \$193,403. This was probably due to the fact that the Nipissing does not believe that the lower price of silver obtaining will be permanent. The development at vein 490 is still quite promising. Below the 4th level the south drift was in ore all the month and was advanced 54 feet. There are 3 veins in this drift and it was generally necessary to make the drift 8 to 12 feet wide. The largest vein assayed at times as high as 2300 the 3 veins averaged for the month 8 inches, assaying 1200 ounces. During the latter part of June the north face has shown two veins aggregating 6 inches in width and averaging 1200 ounces. The winze level is at a depth of 112 feet below the 4th level. The vein has now been drifted on for a total distance of 390 feet, of which amount 300 feet will average 1000 ounces over 6 inches. About 75 tons a day

are going to the low grade mill from the surface dumps near shafts 12 and 86. The fire which destroyed the refinery building, only occasioned a loss of three days time. There was no loss to contents.

PORCUPINE KIRKLAND LAKE AND BOSTON CREEK.

New Fields.

The rushes to various alleged new gold fields have simmered down. The second sampling of veins said to carry good value on the Hurricanaw River has been disappointing and many prospectors returned without even staking. On the Transcontinental west, two or three companies are working with small gangs of men. One or two companies are working near Tashota and one is developing the King Dodds property. There are not many prospectors in this section of the country. Kamiskotia too, has been more or less abandoned since the Chisholm corporation threw up the option on the Jamieson claims. As long as good prospects can be found and worked near the railway, there will not be much competition for prospects far back in the bush and away from railway communication.

Hollinger

The first report of the Hollinger Consolidated has been received. It is noted that in order to comply with the proposals for the merger, the Hollinger surplus of over \$1,600,000 has been converted into a deficit of over \$178,000. This is very largely due to the fact that the merger dates from January the 1st, 1916 and thus calls for the disbursement of \$720,000 in dividends, to shareholders Mines. This is the amount that shareholders of the Hollinger Gold Mines were paid before the merge was carried into effect. It is noted in the report that the new mill is not making such speedy progress as could be desired, owing to the slow delivery of material. Until additions are completed, the maximum capacity of the plant has been fixed by the management at 1900 tons a day. The maximum has not yet been reached, through various causes, but it should soon be so. The average mining costs per ton from January the 1st to June the 16th, amounted to \$2.03 per ton. Of this amount no less than \$0.56 per ton is credited to development or the getting of stopes ready for the time when the new mill would make increased demands on the tonnage of the combined properties. The milling costs were \$0.89 per ton and total costs, including taxes, etc., were \$3.61 per ton. The average value of the ore treated was \$8.80 per ton. This compares with \$8.00 in May and \$9.09 in April. Total costs were slightly less in May and mining costs very much less than the average for the period. During the whole of the first period of the year, prior to the merger becoming a fact at the mine, there was no ore stoped below the 550 ft. level and only 11,349 tons on that level. It is therefore apparent that while there has been a large amount of ore developed below this level on the Hollinger, there has been no necessity to stope any of it to date.

Schumacher

It has been decided to sink a new shaft at the Schumacher Gold Mines. This shaft will be put down between the present shaft and the shore of Pearl Lake. The first level will be at a depth of 200 feet. During the month of June the Schumacher mill treated ore of a gross value of \$24,500. This compares with \$21,000 in May. Mining and milling costs for the past 4 months have averaged \$3.80 per ton. The mill averaged around 340 tons per day.

Dome Lake

At the Dome Lake a new drum for the cyanide treatment of the concentrate tails has been ordered. This

drum is reported to be a success metallurgically, but mechanically there were so many defects that it was found impossible to keep it running more than 50% of the time. The new orebody at the 400 foot level is holding out well.

Vipond

The report of the Vipond for the period ending June 30th was disappointing. The tonnage milled was 10,185 and bullion produced \$37,600. Total operating costs amounted to \$4.45 per ton, so that there was a net loss on every ton milled. It should be pointed out however, that the last day of this quarter was probably the last day on which the lower grade ore at the upper levels of the Vipond had to be relied upon to make profit. The preparation for stoping on the 400 ft. level was practically completed on June the 30th and a far better grade of ore is now being treated in the mill, from the 400 ft. level. It is understood that while the negotiations for the merger of the North Thompson and the Vipond have not yet been consummated the deal is still in the air and may be completed at any time.

East Dome.

Mr. W. J. Trethewey, manager of the West Dome Consolidated, has purchased the Excelsior Mining Company's properties in Shaw Township. Before the break-up, the Excelsior Mining Company had taken in the small two-stamp mill from the Gold Reef and operated it. They were compelled to desist at the time of the break-up, owing to the lack of supplies and work had not been resumed since. It is known that there is a narrow vein of quite rich ore and a sulphide dyke which may be made to pay, if worked on a large enough scale.

Lake Shore

Kirkland Lake development is receiving a great deal of attention. This is partly due to the larger plans of the Lake Shore mine. After opening up one of the richest shoots of gold ore which has been seen in the north country, the Lake Shore has closed down to install a much larger power plant and to work out details for a mill. The Lake Shore has on three levels developed a tonnage which certainly justify the erection of a mill. In the meantime the power plant will be installed and as soon as it is running further development will proceed.

Teck-Hughes

Developments underground at the Teck Hughes are favorable as far as they have gone. Stopes have for some time been full of ore and nothing but development work is proceeding, until power can be obtained from the mill. The mill is now so near completion that it could be run within a very short time. As it will be at least October before any power can reach the camp, there is no hurry on the part of the management to put the mill in a position where it can be turned over at once.

Hydro Electric Power

The transmission line from Cobalt through the farming district, Boston Creek and Kirkland Lake has actually been commenced. Quite a little difficulty was experienced in obtaining the right of way through the farming townships, after it had been found impossible to make arrangements with the T. & N. O. to share their right of way. The bargaining with various townships took no little time and held up actual construction. Now actual construction has commenced. Many of the poles are on the ground. The copper wire has all been purchased and gangs have been set to work at various points to clear bush where necessary. The line will be 65 miles in all and the sub-station will be near the Tough-Oakes. There is no doubt that completion of the line will almost cut the fuel bills of the existing operating companies in two. While the Tough-Oakes is supplied with some electric power, its demands have so outrun the supply that it will still be

the largest customer of the Northern Ontario Light & Power Co., in the Kirkland Lake district. The Company has given no guarantee of when the line will reach Kirkland but as estimated, the power should be available in October or November.

Boston Creek

At Boston Creek the Miller Independence has found another vein 500 feet north of the first discovery, which promises to be of great importance. Only a very little surface work has been done on it yet, but it shows free gold and some telluride ore in fair quantities.

At the R. A. P. Syndicate in Boston Creek all underground work is now proceeding under contract. In the 200 foot level another shoot of rich ore has been encountered.

MINERAL INVESTIGATIONS IN BRITISH COLUMBIA.

The importance of the mining industry and the possibilities of its development were emphasized by Hon. Lorne A. Campbell, Minister of Mines for British Columbia, in a speech on the second reading of the Government bill to devote \$200,000 toward the construction of roads, trails, and bridges to mining properties.

"The object of this Act is to aid in the development of mines," said Mr. Campbell. "It is a well known fact that in the early days of the province mining was the chief industry and was brought about by the early prospectors from the south of the line, who came to British Columbia and opened up the country by means of trails and roads at their own expense or by parties who were interested in prospecting. We find that when the country reached a certain stage of development these prospectors were assisted by the Government up to a certain percentage of the cost of said trails. Later, when ore was found in payable quantities, many of these trails were widened and turned into wagon roads and later were followed by railways. This applies more particularly to the interior of the province. The development brought about by the early prospector was the means of establishing an industry that has increased from year to year until today we find that the start of many other industries which have been established can be attributed to mining.

"At present all roads, trails, and bridges are under the Department of Public Works, and it is not contemplated in this bill that the Mines Department should in any way encroach upon the province of the Works Department, but that the latter shall be provided with extra funds to enable it to supply the special aid, as outlined, to mineral districts which in the opinion of the Minister of Mines are in need of such aid. The experience of the Public Works Department has shown that many claims have been made on the different district votes, more particularly for the construction of trunk roads and providing means of transportation for the settlers.

"In many instances the trails and roads to mineral districts receive only a very small proportion of the district grant, and it is the intention of the Mines Department to arrange that whatever portion of the general grant is available for roadwork in mineral districts, the work of constructing trails or roads will be carried on as in the past and that in the event of

a shortage of funds a certain percentage of the money available under the provisions of this bill may be used to carry to completion the work of constructing such trails and roads; but no expenditure will be made until such time as the Minister of Mines is satisfied that the expenditure is warranted.

The latter part of section 3 gives power to grant partial aid to parties who have found it necessary to construct their own roads, but no such aid will be given until such time as this work is completed and is inspected by an engineer, and if the work is up to the standard as established by the Government, and is approved, a refund, not to exceed 50 per cent. of the total cost, will be made on account of the expense of such work; and any such road built by private parties is as much open to the public as to the builders, because experience has shown that when roads so constructed become public property and open to the use of the public, other property is opened and operated.

"The reference I have made to Bill 77 leads me to make further reference to Vote No. 25, contained in the estimates this session, in which the sum of \$24,000 is provided for the Department of Mines for the expenses of temporary parties in the field, including salaries and travelling expenses. The amount voted for this purpose in 1915 was \$6,000; the increase this year had in contemplation an extra amount of field work to provide the data which will be required by the Minister of Mines in considering applications under Bill No. 77. I believe that many applications will be made for special aid under this bill, and in order that the department may be in a position to determine which applications are worthy of consideration, it is our intention to have at least one qualified mining engineer occupied in making examinations.

"Of late considerable interest has been taken in the iron deposits of the Coast district with a view to establishing an iron and steel industry. In this connection we have undertaken a special investigation for a report on the subject. I have already started one engineer in the investigation of the iron ore properties on Vancouver Island, and I intend, as soon as arrangements can be made, to have iron properties tributary to the Coast investigated, and possibly others in the interior as well.

"I have arranged for a party under a competent engineer to make a thorough investigation of the district in the neighborhood of Alice Arm, of Observatory Inlet, and north of Stewart, at the head of Portland Canal; this on account of the attention that is being attracted by the success attained by the Granby Company at Anyox, and by prospects which are showing signs that further development work will lead to the opening of other shipping properties. It is planned also to put several parties in the field to examine mineral locations along the mainland coast and islands adjacent.

"It is my intention, further, to have a party start at Hazelton, on Skeena river, and travel through a section of the country lying in a south-easterly direction, continuing to the line of the Pacific Great Eastern Railway. This district gives signs of much promise in indications of mineralization.

Still another party is contemplated to examine mineral discoveries northward from Vancouver and along the general route of the Pacific Great Eastern Railway. Other parties will do field work in the interior of the province."

DIVIDENDS PAID BY BRITISH COLUMBIA MINING COMPANIES.

Published figures make it appear that the total of dividends of mining companies operating in British Columbia for the current year to June 30 will be \$1,666,850. The amounts set against the several companies on the dividend-paying list are as under:

Company.	Total for Half-year.
Con. Mining and Smelting.....	\$ 420,517
Crow's Nest Pass Coal	186,378
Granby Consolidated	449,955
Hedley Gold	120,000
Sheep Creek Motherlode	137,500
Rambler-Cariboo	52,500
Standard Silver-Lead	300,000

Total for six months \$1,666,850

The amount for the Consolidated Mining and Smelting Company of Canada, Ltd., is much higher than for the corresponding period of last year, out new stock has since been issued, so there is more outstanding now.

The total for the whole of the year 1915 was \$1,586,820, and for 1914 \$1,689,331. It would appear, therefore, that there is good reason to expect the total for 1916 to be as much as the combined total for the two immediately preceding years. Further, there is, certainly in the case of the Granby Consolidated Co. and probably in other instances, a much larger amount of undivided profits this year than for the corresponding periods of the two previous years with which compari-

STANDARD SILVER-LEAD MINING CO., B.C.

Delay in smeltery settlements prevented completion of the financial statement of the Standard Silver-Lead Mining Co. for April until June 9. The company operates mines and a concentrating mill near Silverton, Slocan, B.C. The statement shows that the net profit for the month was \$86,773, which, added to the balance on March 31 of \$284,163, made a total of \$370,936, less dividend of \$50,000 paid on April 10, or \$320,936 net. Of this amount \$201,263 was cash in bank and \$167,921 value of ore shipped but not then settled for, less due on vouchers and payable, \$48,427.

The total receipts for April were \$131,309, as follows: Preliminary settlements for 729 tons of silver-lead products, \$95,115, from zinc sales \$26,847, umpire's awards \$1,052, boarding house \$4,097, store supplies \$3,387. Disbursements were: For ore production \$21,586, tramping \$953, milling \$4,790, power \$489, general expense \$918, shipping and selling \$1,639, boarding house \$3,351, taxes \$3,000, insurance, etc., \$1,036, development \$3,279, Aylard tunnel \$2,254, home office account \$1,234, total \$44,535.

The net profit for April was much less than for March, there having been much more ore settled for in connection with the latter month and a net profit of \$136,943 credited. March settlements were for 1,295 tons of silver-lead ore and concentrate, \$172,347, and for zinc \$5,432, as compared with April amounts shown above.

BY-PRODUCT COKING OF COAL.

The great development of by-product coking of coal in Germany has assured her an uninterrupted and adequate supply of modern explosives. The value of this development may be measured by the importance of munitions in deciding the outcome of the war.

In the past the whole world has been dependent upon Germany for dye-stuffs and other substances prepared

from the derivatives of coal tar. Thus both in peace and war Germany possessed a great industrial advantage over other nations.

British plants are now being established to cope with the demand for picric acid and trinitro-toluene, while the United States is also profiting by the lesson learned from the war. Before the war there was but one company in the United States producing distillation products on a large scale, while the latest statistics show that over 8,000,000 tons of coal were carbonized in by-product ovens last year, yielding over 4,800,000 gallons of benzol and 1,300,000 gallons of toluol. The full annual capacity of the benzol recovery plants now in operation and in course of construction is estimated to exceed 20,000,000 gallons.

Although Canada has the third largest reserves of coal in the world, beehive coke ovens, wasting the by-products, are still used in some sections and not a single additional by-product oven has been installed since the war. The war should teach Canada the obvious lesson that, whether for war or peace, it is criminal folly to neglect the utmost utilization of those resources which are lying latent in her bounteous supplies of bituminous coal.—W. J. D.

MINERAL PRODUCTION OF BRITISH COLUMBIA IN 1915.

The following are the revised official figures of the mineral production of British Columbia in 1915, and, for comparative purposes, those for 1914 as well:

	1914		1915	
	Quantity.	Value.	Quantity.	Value.
Gold—				
Placer, oz.	28,250	\$565,000	38,500	\$770,000
Lode, oz.	247,170	5,109,004	250,021	5,167,934
Total gold		\$5,674,004		\$5,937,934
Silver, oz.	3,602,180	1,876,736	3,366,506	1,588,991
Lead, lb.	50,625,048	1,771,877	46,503,590	1,939,200
Copper, lb.	45,009,698	6,121,319	56,918,495	9,835,500
Zinc, lb.	7,866,467	346,125	12,982,440	1,460,524
Total value of metalliferous		\$15,790,061		\$20,762,149
Coal—				
Tons 2240 lb.	1,810,967	6,338,385	1,611,129	5,638,952
Coke—				
Tons 2240 lb.	234,577	1,407,462	245,871	1,475,226
Miscellaneous products		2,852,917		1,571,181
Total value of production		\$26,388,825		\$29,447,508

The increase for 1915 over 1914 of \$3,058,683 is nearly 12 per cent. The gross value of the metallic minerals recovered in 1915, \$20,762,149, represents an increase of \$4,972,088, or about 31.5 per cent., as compared with that of 1914. The highest previous total value was that for 1906, for which year the value of the metallic minerals was \$18,432,502, but the average prices of silver, lead, and copper were higher. For last year they were: Silver 49.7c., lead 4.673c., and copper 17.275c.; for 1906 silver was 68c., lead 57c., and copper 19.3c., which gave the earlier year an advantage in regard to those metals of more than \$1,000,000. The production of copper last year was larger by 5,462,000 lb. and of zinc by 4,482,000 lb. than in any other year in the history of mining in the province.

MARKETS

NEW YORK MARKETS.

July 25, 1916—Connellsville Coke—
 Furnace, spot, \$2.65 to \$2.75.
 Contract, \$2.35 to \$2.50.
 Foundry, prompt, \$3.25 to \$3.50.
 Contract, \$3.25 to \$3.50.

July 25, 1916—Straits, Tin, 38.00 cents.

Copper—
 Prime Lake, nominal, 25.00 to 25.50 cents.
 Electrolytic, nominal, 25.50 to 26.00 cents.
 Casting, nominal, 23.50 to 24.00 cents.

Lead, Trust price, 6.50 cents.
Lead, outside, 6.25 cents.
Spelter, prompt western shipments, 10.42½ cents.

Antimony—
 Chinese and Japanese, nominal, 13.50 cents.
 American, nominal, 13.50 cents.

Aluminum—nominal—
 No. 1 Virgin, 98-99 per cent., 59.00 to 61.00 cents.
 Pure 98-99 per cent. remelt, 57.00 to 59.00 cents.
 No. 12 alloy remelt, 47.00 to 49.00 cents.
 Powdered aluminum, \$1.00 to \$1.15.

Metallic magnesium—99 per cent. plus, \$3.50 to \$3.75.
Nickel, 45.00 to 50.00 cents.
Cadmium, nominal, \$1.25 to \$1.50.
Quicksilver, nominal, \$80.00.
Platinum, nominal, \$60.00.
Cobalt (metallic), \$1.25.
Silver (official), 67½ cents.

Metal Products.—Following base prices are all f.o.b. mill, but prices are purely nominal.
 Sheet copper, hot rolled, 37.50 cents.
 Sheet copper, cold rolled, 38.50 cents.
 Copper wire, nominal, 31.00 cents.
 Copper wire, nominal, October, 28.75 cents.
 High sheet brass, 38.00 to 39.00 cents.
 Seamless brass tubing, 44.00 to 45.00 cents.
 Seamless copper tubing, 44.50 to 45.50 cents.
 Brazed brass tubing, 45.50 to 46.50 cents.
 Brass wire, 38.00 to 39.00 cents.
 Brass rods, 38.00 to 39.00 cents.
 Sheet zinc, f.o.b. smelter, 15.00 cents.

TORONTO MARKETS.

July 27—(Quotations from Canada Metal Co., Toronto)—
 Spelter, 14 cents per lb.
 Lead, 8¼ cents per lb.
 Tin, 45 cents per lb.
 Antimony, 20 cents per lb.
 Copper, casting, 27 cents per lb.
 Electrolytic, 28 cents per lb.
 Ingot brass, yellow, 15 cents; red, 18 cents per lb.

July 27—(Quotations from Elias Rogers Co., Toronto)—
 Coal, anthracite, \$8 per ton.
 Coal, bituminous, \$5.50 per ton.

SILVER PRICES.

	New York, cents.	London, pence.
July 7.....	60¾	29½
" 8.....	62	29¾
" 10.....	60	28¾
" 11.....	61	29¼
" 12.....	67¾	29½
" 13.....	62¾	30
" 14.....	62¾	29¾
" 15.....	61¾	....
" 17.....	62¾	29½

" 18.....	62¾	29¾
" 19.....	62¼	29¾
" 20.....	62¾	29¾
" 25.....	62¾	29½

STOCK QUOTATIONS.

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

As of close July 25, 1916.

New York Curb.

	Bid.	Asked.
Atlantic Steel	55.00	62.50
Canada Cement	64.00	65.00
Consolidated Arizona	1.37	1.50
Emma Copper .....	.43	.47
Howe Sound	4.62	4.75
International Petroleum	10.25	10.50
International Nickel (new)	44.50	45.00
Kennecott Copper	46.12	46.50
Maxim Munitions	4.75	4.87
Midvale Steel	62.87	63.12
Magma	14.50	15.00
Mother Lode .....	.32	.33

Porcupine Stocks.

	Bid.	Asked.
Apex .....	.07¼	.07½
Dome Extension .....	.34½	.35
Dome Lake .....	.32½	.33
Dome Mines .....	.25¾	.26
Foley O'Brien .....	.50	...
Hollinger	29.25	29.50
Jupiter .....	.28	.30
McIntyre	1.44	1.50
McIntyre Extension .....	.40	.45
Moneta .....	.12¾	.13¼
Plenaurem .....	...	.70
Porcupine Crown .....	.71	.74
Porcupine Imperial .....	.03¾	.04
Preston East Dome .....	.04½	.04¾
New Ray .....	.40	.41
Teck Hughes .....	.25	.26
West Dome .....	.35	.36

Cobalt Stocks.

	Bid.	Asked.
Adanac	1.82	1.88
Bailey .....	.07½	.07½
Beaver .....	.37	.38
Buffalo .....	...	1.12½
Chambers Ferland .....	.20	.20½
Coniagas	4.00	4.40
Crown Reserve .....	...	.45½
Foster .....	...	.07
Gifford .....	.05	.05¼
Gould .....	.00¼	.00½
Great Northern .....	.04	.05
Hargreaves .....	.03¾	.04
Hudson Bay	57.00	...
Kerr Lake	4.40	4.55
La Rose .....	.60	.65
McKinley .....	.53	...
Nipissing	6.80	6.95
Ophir .....	.06¾	.07
Peterson Lake .....	.22¾	.23
Right of Way .....	.04	.05¼
Seneca Superior .....	.45	...
Temiskaming .....	.53½	.54
Trethewey .....	.21	.22
York Ontario .....	.01¼	.02
Wettlaufer .....	.11	.12½