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REGINALD E. HORE

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CIRCULATION

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COAL AND WAR

The normal production of the collieries of Nova Scotia is 7,000,000 tons per year. The production in the year 1913 reached 7,250,000 tons, but this was a peak-point in the curve of outputs. The figure of 7,000,000 tons is a conservative and fair representation of what the collieries of Nova Scotia should be putting out at this time. The actual production for 1916 will not greatly exceed 6,000,000 tons. Unless some improvement takes place—and it is difficult to see where the improvement is possible—the production of 1917 will decline to about 5,250,000 tons.

There seems to be no good reason to anticipate a cessation of hostilities before the autumn of 1917, and there are many well-posted observers who think that hostilities will extend into 1918. In any case, demobilization after peace is declared will be a slow and delicate process, and no person can foresee the condition of industry and trade, when that much-desired time shall finally arrive. Some eminent men see great prosperity immediately following the war. Others again see trade depression, labor troubles, and many unpleasant things. The truth is that no one knows, and one man's guess is as good as another man's. Nevertheless, it seems in every way probable that during 1917 no great number of men will return from the colors to the mines, and it is not only probable, but very likely, that more men will leave the collieries to join the colors.

The year 1916 has seen a great trade revival in Canada, and what almost amounts to a saturnalia of prosperity in the United States. Notwithstanding stock-market rumors and the speculations on the length of the war that vary the antics of the "war-brides," does anyone seriously see any diminution in the manufacture of war munitions in the near future? The daily wastage of millions of men on the almost continuously active front that encircles the Central Powers in itself calls for more and more supplies, and this takes no account of reserves and stocks, of reconstruction, and of new and extending markets.

Canada plays no mean part in the resources of the Empire to-day. She has become a financial factor of importance. If the recent Canadian War Loan had been for \$250,000,000, instead of \$100,000,000, it would have been easily raised. Our own little army of approaching 400,000 men requires supplies that bulk quite largely in the industries of a population of under eight millions, to say nothing of the far larger bodies of men that we must assist in munitioning.

If it has taken three months to get Thiepval and Combles, is it not fair to assume that we are still a long way from the bridgehead of the Rhine? There are other and unknown factors in this war that may upset all calculations on the resistance of the Central Empires, but has the German so far shown any signs that he will not fight a stubborn and indefinitely prolonged rearguard action as he withdraws to German soil? The most responsible and best-informed military opinion at the front has seen no deterioration in the German

morale, and no diminution in his ammunition supply. The power that can resist the Allied glacier in France, can hold the Russians at Kovel, and can simultaneously carry through a vigorous and on the whole successful offensive in the Dobrudja, while stubbornly resisting all along the Macedonian front, is a power still to be reckoned with.

Therefore it seems probable that the coming winter and all next summer will see the manufacture of munitions carried on with an intensity that even the present phenomenal rate has not yet approached. All this activity is based upon coal. Coal is the basic, indispensable, paramount munition of war.

If, then, while the sinews of the Empire are being strained to the utmost to munition our armies, and to provide adequate stocks against the "knock-out" which Mr. Lloyd George has foreshadowed, the Canadian coal production declines, as we have shown that it must decline, is there not a very grave mistake somewhere?

In the United States the bituminous coal production in the first half of 1916 increased over the first half of 1915 by thirty-five per cent. It is estimated that the production for the twelve months will reach the stupendous total of between 575,000,000 and 600,000,000 tons, which compares with the best previous annual production of 500,000,000 tons in 1913.

In Great Britain the Board of Trade has undertaken a house-to-house canvass asking for greater economy in the use of coal, pointing out that economy in coal consumption will have the following results:

- (1) Increased power to help our Allies.
- (2) Increased power to strangle German trade and injure the German economic position, by means of arrangements with neutral shipowners and neutral merchants, based on the supply of coal.
- (3) An improvement in the foreign exchanges, and consequently a reduction in the cost of goods purchased abroad.

Are we so wealthy in Canada that we can afford to spend millions of dollars in the United States for coal that could and should be mined in Nova Scotia? Are we not also interested in this matter of exchanges?

The threat of a railway strike in the United States recently revealed that dependence of Ontario and Quebec on United States coal. If this calamity had occurred Nova Scotia could not have raised a finger to help, because the production of coal is already fallen far below the needs of the Maritime Provinces and the bunker business. It is no secret that war munitions of various kinds are being manufactured from the Atlantic Coast to Ontario. Is it wise to have all these industries dependent on the coal supplied us by a friendly, but nevertheless neutral neighbor?

What would the people of Canada say were the acreage of Canadian wheatfields reduced by fifty per cent.? Would there not be an immediate protest and strenuous endeavors to increase the acreage and the harvest yield? Yet it seems to be forgotten that without coal the wheat will stay in the West, and will never reach the hungry mouths across the seas. Without coal we could not have sent one man to France, nor shipped a pound of steel or a pint of toluene. The idea of a declining production of bituminous coal at the present time would be farcical in its utter ineptitude were not the reality so grave, and actually with us.

FIRST AID WORK AT METAL MINES.

The experience in connection with efforts made to arouse general interest among metal miners in British Columbia in matters relating to instruction in first aid to the injured has not been as favorable thus far as could be desired. Nevertheless the officials directly charged with the duty of encouraging men engaged in and about metalliferous mines in the Province to attend classes for instruction and to become competent to render first aid in cases of emergency are steadfastly persisting in this important and beneficent work, looking forward with confidence to increasingly good results as time passes and more of those who should be chiefly concerned come to a realization of the necessity rather than the mere desirability of their taking upon themselves personally this duty to their fellow-workers as well as to themselves. Only recently was the report of the British Columbia Department of Mines for the calendar year 1915 published, which accounts for this apparently tardy reference to the information given by the Department's instructor in first aid, Dudley Michell, of Victoria, of the results of his work during the year.

As Mr. Michell's report for 1915 covers only his second year's official work in giving attention to first aid and the use of mine rescue apparatus, it may be of interest to first recall what he accomplished in 1914, and then briefly review what was done in 1915. It should be premised, though, that Mr. Michell is not generally called upon to instruct those who attend classes in first aid, that duty falling to duly qualified surgeons, the policy of the Department of Mines being to encourage men to endeavor to obtain first aid certificates of competency from a recognized Ambulance Association, which can only be secured by passing the examination under the auspices of such an association after the prescribed number of lectures, given by an approved surgeon instructor, shall have been attended, and the requisite percentage of marks have been earned at an examination held by an authorized surgeon examiner.

Mr. Michell entered upon his duties in May, 1914, and about the end of that month he met several mine managers at a meeting of the Western Branch of the Canadian Mining Institute at Nelson, West Kootenay, and placed before them the proposed policy of the Department of Mines with the object of inducing miners to take first aid instruction. Directly afterward he set about organizing St. John Ambulance Association "centres," and forming first aid classes. The immediate result was that two classes were formed at Rosstand, followed by three in Boundary district, and afterward by five in various parts of West Kootenay. Then the European war was commenced, and, as a result of the consequent demoralization of the markets for metals, many of the metalliferous mines were closed for the time, and most of those who had been employed at them scattered far and wide. Rosstand mines, only, escaped the general disorganization, so that the first aid work commenced in that camp was continued without interruption, until to-day it is established with little likelihood of the larger mines in the camp ever again being content to go along without having among the mine employees a considerable number of men trained in first aid or mine rescue work, or both.

In the cases of the mines employing comparatively large numbers of men and having the services of a resident surgeon available for purposes of instruction,

there was, in important instances, not much difficulty, but as Mr. Michell reported, "it has been proven that in the small mines situated long distances from town successful results are not obtained by an instructor, owing in most part to the large proportion of men employed at these mines being unable to properly speak and understand English, while the remaining men do not seem to care to have their leisure hours taken up by instruction in first aid, especially in the only place they have for recreation—the bunk-house—where they wish to read, write, etc."

It is noteworthy that during Mr. Michell's first year of office 405 men attended first aid instruction classes in Kootenay and Boundary districts, and 76 in the Coast district, together 481. These figures relate only to metalliferous mines. For 1915 Mr. Michell's report included the following:

"More than 700 miners attended first aid lectures at the various mines of the Province. The net results show that 301 men (from coal mines 242 and from metal mines 59) passed a final examination in first aid work and were awarded various grades of certificates by the St. John Ambulance Association. The actual number of men finishing this course may be placed at 450. The difference between the total number of men attending the lectures and the number passing final examinations is due to various causes, some of which are: Failure to pass examinations, class completing lectures but not examined, class disbanded, and lack of interest; all of which causes have unfavorably affected results. I regret to say that the results obtained from the metal mines are not as good as were to be expected."

Classes were conducted in coal mining districts of Crowsnest in Southeast Kootenay, Nicola valley, and Vancouver island, and in metal mining camps at Kimberley, East Kootenay; Rossland, West Kootenay; Greenwood, Boundary; and Van Anda, Texada island.

Mr. Michell reported, further: "The largest number of men trained in first aid in one year and at one company's mines was at the mines of the Crow's Nest Pass Coal Co., where 139 men passed first aid examinations. This number shows approximately one trained man for every fourteen persons employed above and below ground at those mines, which result is highly satisfactory for one year's undertaking. All the classes were taught and examined by duly qualified medical practitioners, and were conducted in accordance with the prescribed rules of the St. John Ambulance Association.

"At the Le Roi gold-copper mine, Rossland, a very systematic method of training was adopted. The afternoon shift was divided into three sections; each section reported at the mine once a week, an hour before the shift commenced, and received practical instruction, by a trained first aid man, in the work of bandaging, etc. There has also been established at this mine a safety department, a safety committee, and a safety engineer; their duties are the systematic inspection of the mine and the headworks with regard to safety, encouragement of first aid instruction, and 'safety first' teachings in general."

It may be added that this year interest in first aid work is being well maintained at the Consolidated Mining and Smelting Co.'s Centre Star and Le Roi mines, Rossland; attention is being given to it at the Britannia Mining and Smelting Co.'s copper mines in Vancouver mining division, Coast district; and a Mine

Safety committee has been organized and is doing good work, including arranging for giving instruction in first aid, at the Granby Consolidated Col.'s Hiddet Creek copper mines near Observatory inlet, also in the Coast district.

A NEW FELDSPAR DISCOVERY

By A. G. Morrison.

An interesting find has recently been made six miles north of Webbwood, on the Sault Ste. Marie branch of the Canadian Pacific Railway, in Northern Ontario, on S. W. part of S. part Lot 3, Con. 5, S.E.-40 Ac. Lot 4, Con. 5, and N.E. $\frac{1}{4}$ of N $\frac{1}{2}$ Lot 4, Con. 4, Township of Shakespeare, on the south bank of the Spanish River, an enormous deposit of orthoclase feldspar has been found.

The dyke of feldspar has been traced for a distance of 1,400 feet. It has a minimum width of 25 ft., and at many places is several times this width. It runs in a general direction from northeast to southwest, and is situated at a contact between greenstone schist (probably Keewatin) and granite or gneiss (probably Laurentian). The identification of the country rock is due to Doctor Smith of the Nicholls Smelting and Chemical Company.

The find is an extremely interesting one from a geological point of view, as numerous orthoclase crystals can be found. One or more crystals were observed that were a foot or more in diameter. At one point the greenish tint of microcline was observed, at another point the dyke was composed of pure quartz, but this was a comparatively small area.

Considerable difficulty was at first experienced in finding true orthoclase crystals with the required 60 and 89 degree angles and true cleavage faces, but after searching they were found in abundance. The rock on each side of the dyke is very much schisted.

A road from Webbwood leads to within half a mile of this interesting find. It is in good condition with the exception of the last half mile. The Spanish River runs through the property, but can hardly be said to be navigable, owing to the numerous shoals.

CUBAN POTASH.

Boston, October 3.—Experts for one of the leading American fertilizer companies have just completed a short examination of the Cuban potash discovery, have collected samples and are on their way back to the United States. By cable these experts state that they are not particularly impressed by what they find, and that the degree of solubility in the potash-bearing ore is very low.

Judging by the brief data obtainable thus far and at this distance, good judges incline to the opinion that this Cuban ore is either felspar or some mineral of this same family group. That potash salts should outcrop is almost unbelievable, because potash salts are extremely soluble in water. Unless the Cuban potash discovery is potash salts it will have little importance, in the opinion of large potash users in this country. The Cuban cables speak of this potash as soluble in acid. This is not the desideratum. What is wanted is potash salts soluble in water. Until this is found, no serious competitor of German potash will have been created.

THE LABOR DISPUTE AT COBALT

The majority and minority reports of the Commission which recently investigated labor conditions at Cobalt are as follows:

FINDING OF MAJORITY

To the Hon. T. W. Crothers, K.C., M.P., Minister of Labor, Ottawa:

Report of Royal Commission consisting of Emerson Coatsworth, Junior Judge of the County Court of the County of York, in the Province of Ontario; Edward Thomas Corkill, of Copper Cliff, in the said Province, Esquire, Safety Officer of the Canadian Copper Co., and Joseph Gibbons, Esquire, of the said City of Toronto, Business Agent for the Amalgamated Street and Electric Railway Employees of America; appointed to investigate the unrest in the mining industry at Cobalt, in the Province of Ontario; and the nature and causes thereof, the appointment of the said Commissioners being dated the 28th day of August, A. D. 1916.

Your Commissioners immediately upon their appointment arranged to meet in the Town Hall at Cobalt, Ontario, at 2 o'clock p.m. on the 31st day of August, 1916, and held 15 sittings in the Town of Cobalt, and one sitting in the Town of Haileybury. Generally speaking the meetings were held at 10 a.m. and 2 p.m., but on one occasion, in order to accommodate some of the witnesses, an evening sitting was held. At the first meeting, held as above stated on the 31st day of August, Messrs. Davidson, Joyce and Gorman appeared as representatives for the employees of the mines. No person appearing on behalf of the employers, to represent them, your Commissioners ordered that a notice be sent to each of the mine managers, between 35 and 40 in number, notifying them of the dates and hours of meetings, and inviting them to attend and hear the case presented on behalf of the men, and to give such evidence as they thought fit in reply, and a further notice to all persons concerned was inserted by advertisement in "The Cobalt Daily Nugget" on the 2nd, 5th, 6th and 7th days of September, notifying any person interested to attend the meetings and give evidence, or take such other part as they might see fit. No person, however, appeared for or on behalf of the employers or Mine Owners' Association until the 7th September, when Mr. Bateman, the general manager of the La Rose mine, appeared and gave his evidence, and on the following day, by appointment, a number of the mine managers came forward and testified for your Commissioners, giving their statements as to the right of the employees to have their demands recognized.

There were in all 79 witnesses produced and examined on behalf of the employees and eight witnesses produced and examined on behalf of the mine owners and managers in reply.

With regard to the grievances of the men, they were limited to two; one, a demand for increased wages; two, a demand that the employers recognize and confer with a committee appointed by the men.

Your Commissioners are very pleased to be able to report that so far as all other conditions of working the mine are concerned, the miners were united in expressing their satisfaction, and except for the two matters above specified, no complaints whatever were made, though one or two matters of small importance were brought forward by individuals, not affecting the miners generally.

As to the two matters brought forward on behalf of the miners, it is desirable to deal with them separately, giving the report of the investigation, together with the evidence taken before the Commissioners, and their opinion thereon.

Claim for Increased Wages.

The matter of increased wages was urged very strongly by all the witnesses brought before your Commissioners on behalf of the employees, and just as strongly resisted by the mine managers. The agitation for increased wages began in the early part of the present year, 1916, and was based, as the employees claim, on the increased cost of living. The agitation began probably in March or April, 1916. The Local Union, called the Cobalt Miners' Union, No. 146, took the matter up, and held several meetings. On the 1st day of May, 1916, the managers anticipated any action by granting an increase of 25 cents a day to all underground workers, and also some of the surface workers, representing in all probably three-quarters of the total employees, who would number in the neighborhood of 2,800 men, and also giving a bonus of another 25 cents a day to all the employees when the price of silver should be 70 cents or upwards per ounce. The complaint of the men with regard to this was that the direct increase of 25 cents a day should be extended to the whole of the employees, because the lower paid men were the most needy, and it was they who did not receive the increase, and also so far as the bonus was concerned, that the price of silver, on which it was based, was so high, that they have only since received the bonus for one or two months, and, consequently, it has proved of trifling advantage to them.

Very much evidence was brought forward by and on behalf of the men to prove the increased cost of living, particularly within the last two or three years, some complaining that the increase was as high as 30 per cent. or 40 per cent., and others running from 20 per cent. to 30 per cent. The employers, in their answer to this part of the claim of the employees, admitted the increase in the cost of living, but claimed that from figures gathered by them from the reports of the Labor Department, the increased cost of living for the last two or three years was only about 10 per cent., and this was adequately met by the increase made in wages and the bonus above mentioned. It will therefore be seen that the fact of the increased cost of living was not in dispute between the employers and the employees, but only the percentage of increase, and your Commissioners are bound to say that the evidence adduced on both sides was very strong on behalf of the employees to show the increase up to 30 per cent. and of the employers keeping it down to about 10 per cent., and it is somewhat difficult in view of the conflicting evidence, to determine exactly what the percentage of the increased cost of living may be. The mine managers also claimed that the conditions under which they are operating, and the prospects for the future are such as did not justify them in granting any further increase in wages.

Your Commissioners, upon reviewing the whole of the evidence and the statements made to them, and weighing the same carefully, and having in mind all the conditions bearing upon the claim for increased wages, have concluded that they are not prepared at the present time to recommend an increase in the rate of wages, but they confirm what the mine managers

have already done, including the bonus to the employees, but in their opinion the bonus should be based on silver at 65 cents an ounce instead of silver at 70 cents an ounce, as this will more fully meet what the mine managers intended in the way of advantage to the employees.

Recognition of Committee.

The other grievance laid before your Commissioners was that the mine managers refused to pay any attention to or hold a conference with the Committee appointed for the purpose of interviewing them in regard to the matter of wages. The recent history of this matter is as follows: In the month of April the Local Union of Miners, which then consisted of between 400 and 500 miners and has gone up since the agitation to about 1,500 members, held several meetings to consider the question of the rate of wages and to take some steps to have them increased, and after holding two or three meetings on or about the 14th May, they called an open meeting in the Grand Theatre for all mine employees for the purpose of discussing the matter and at this meeting there were present between 700 and 800 miners and other employees of the mines, and the matter of the demand for increased wages was fully and freely discussed, and a Committee appointed to meet with and interview the mine managers, or the Mine Managers' Association, with a view to bringing about some satisfactory arrangement with regard to wages, and at this meeting the following were appointed as the Committee: Joseph Gorman, secretary of the Local Union, chairman; Wesley Morrison, carpenter; Patrick Redmond, assistant secretary Local Union; J. M. Gillis, pipe fitter; Lyman McFadden, blacksmith's helper, and Jas. Wilson, mill worker. A few days after the appointment of this Committee, the following notification was sent to Mr. Robert Livermore, the president of the Mine Managers' Association; and also to each of the mine managers:

Cobalt Miners' Union No. 146 of the Western Federation of Miners.

Cobalt, May 22nd, 1916.

Mr. Robert Livermore,

Manager, Kerr Lake Mining Co., Cobalt.

Dear Sir,—On behalf of the members of Cobalt Miners' Union No. 146, W.F.M., we are writing you to request a conference at the earliest convenience, between the Mine Managers' Association and a committee of the Miners' Union, to discuss and if possible to arrange an increase of wages for underground and surface men in this camp. We are writing you as President, and Mr. Thompson as Secretary of the Mine Managers' Association. Hoping for an early reply, we are,

Yours truly,
(Sgd.) JOSEPH GORMAN,

Cobalt Miners' Union, No. 146, W.F.M.

Generally speaking there was no answer made by any of the 35 or 40 mine managers, but two replies were received, stating that the managers declined to have anything whatever to do with the Union. The matter remained in this position until your Commissioners were appointed. When the employers came before your Commissioners and were asked why they objected to a conference with the above committee, they stated their reason to be that they regarded this committee as a committee of the Western Federation of Miners, and that they objected to having anything to do with that Federation. They stated distinctly and positively that they had no objection whatever to

meeting with their own men, and that in their judgment it was a perfectly proper thing for the miners and mine workers to organize, and their sole objection to meeting was as above stated, that they considered such a meeting would be a recognition of the Western Federation of Miners, and this they desired to avoid. It should be pointed out that there was at this juncture, evidently some misunderstanding, because the Committee above mentioned consisted of local miners and mine workers, and was apparently just such a committee as the mine managers were prepared to meet, and there was evidently misunderstanding of the nature and scope of this Committee.

Your Commissioners are therefore of the opinion, that in view of the fact that the Committee in question consists entirely of local men, miners and mine workers, it would have been in the interest of all parties concerned to have conferred with the men as to the possibility of making any change in the rate of wages.

All of which is respectfully submitted.

(Sgd.) E. COATSWORTH, Chairman.

(Sgd.) E. T. CORKILL.

Toronto, 12th September, 1916.

MINORITY REPORT

To the Hon. Thomas W. Crothers,

Minister of Labor, Ottawa, Ont.

I herewith submit to you my report as a member of the Royal Commission appointed to investigate the grievances of the Mines in Cobalt district. I differ materially with my colleagues as you will perceive, and submit a minority report.

I am in accord with the report made by the majority of the Commissioners, His Hon. Judge Coatsworth, and E. T. Corkill, Esq., as far as page 3, and ending with the words: "Their opinion thereon." I am not in accord with their findings as expressed under the caption, claims for increased wages. I submit in place thereof the following:

The employees, both underground and surface, should have received an increase of 50 cents per day, owing to the large increase that has taken place in the cost of living since their present rate of wages was established, and the fact that the large increase in the price of silver would have enabled the mine owners to have paid the increase and still have a larger profit than at former prices.

The employees claim that the cost of living has increased 30 to 40 per cent. since their present standard of wages was fixed, and in support of their claim presented a cost of living for family of five, and in support of their claim brought forward a number of the leading merchants of Cobalt, who submitted invoices in some cases as far back as 1908 (the time that the present rate of wages was established). A few comparisons might be interesting to the public:

Beef—1914, \$11 per hundred, now \$17 per hundred; pork—1914, \$12 per hundred, now \$18. Canned and cured meats increased in proportion. Cheese—1914, 14½c. per lb., now 21c. Butter—28c., now 38c. Lard—13c., now 18c. Sugar—1914, \$4.50 per hundred, now \$7.85. Flour—1913, \$2.82, now \$4.20. Beans—\$1.95 per bushel, now \$5. Potatoes—\$1, now \$2.25. Invoices were also submitted showing that furniture, carpets, oilcloths, etc., had increased 25 per cent.; boots and shoes 25, and woollens 40 per cent.

The mine managers admitted an increase, but contended the increase was only 10 per cent., citing figures from the Labor Gazette as their authority, and

claimed that the 25 cents per day granted covered this increase.

I desire to point out here that the 25 cents per day increase was not given to the surface men, who are the low paid men, and consequently the most in need of the increase, as it takes as much to maintain the family of the man who works overground as it does to maintain the family of the man who works underground, and overground men are just as necessary for the carrying on of the work as the underground men.

The fact that the mine owners paid a bonus of 25 cents per day to all men in addition to the 25 cents per day, making an increase of 50 cents for underground employees, demonstrates the fact that the 50 cents per day increase was a just request. The bonus was paid when silver was 70 cents per ounce or over. The men only received the bonus for one month when silver went below the 70 mark. The majority report recommends that the bonus be paid when silver is 65 cents or over. I contend that the wages of the employee necessary for his maintenance should not be dependent upon the fluctuating price of any product, especially when that product has no bearing on the cost of living.

(Sgd.) JOSEPH GIBBONS.

MINE MANAGERS' EVIDENCE.

Several mine managers submitted evidence to the Commission. Following are extracts:

R. B. Watson.

Mr. R. B. Watson, general manager of Nipissing Mines, said in part: I submit a table showing the Cobalt wage scale compared with the wages paid for the same class of work at four mines in Porcupine, two in Sudbury, three in Quebec and two in Nova Scotia. From this it will be seen that the Cobalt scale is higher in every case than the average of these eleven mines; it is practically the same as the Porcupine scale; is higher than the average paid in Sudbury and very much higher than the wages paid in Quebec or Nova Scotia. The Cobalt scale is as follows:

Underground workers—Machine runners, \$3.50; machine helpers, \$3; muckers, \$2.75.

Surface workers—Carpenters, \$3.50; carpenter helpers, \$2.50 to \$2.75; teamsters, \$2.75; teamster helpers, \$2.50; common laborers, \$2.50 to \$2.75.

When Cobalt started, the wage scale was much higher than in other mining camps in Ontario, Quebec or Nova Scotia. It was a new country; the cost of supplies was high; they were boom times. Sudbury was paying \$2.75 for miners; the Cobalt scale was \$3.25.

While Sudbury has since raised wages several times, it is now only equal to the Cobalt scale.

Hours of labor have decreased from 10 to 9 and then to 8 hours for the same wage.

This is an abnormal time; it would be unfair to take for granted that these conditions will continue; if wages were increased now it would be difficult to lower them when conditions become normal again.

The production of Cobalt has been getting less every year since 1911; some of the mines are worked out; the rest are working leaner ores and trying to lower the working costs in every direction.

When silver dropped to 46 cents in 1914, there was no reduction of wages; for a time there was no market for silver, but the mines continued work.

In May the mines voluntarily agreed to raise all underground men 25 cents per day; to raise such surface men as the individual manager thought advisable and to give a bonus of 25 cents to all in addition to the

above in case silver averaged 70 cents for the month. This bonus was paid by most companies for two months although it was only earned for one.

Before the May change, the surface men on the Nipissing were getting an average wage almost exactly the same as the average wage paid to the underground men. There were two main reasons why the underground men got a flat raise all around while the surface men were raised or not at the discretion of the manager. The first reason was that owing to the high price of metals there was great activity in the mining camps of the United States and Canada; this made a scarcity of miners, and it was necessary to increase our schedule in order to keep the miners from going elsewhere. The other main reason was that it has always been the custom to pay the underground men more than is paid the surface man for doing the same class of work. Thus, a common laborer gets \$2.50 on the surface, while the mucker, who does the common labor underground, gets \$2.75. The 25-cent raise gave him this advantage. The miner's occupation is skilled work, and because of this skill he honestly came by his increase in wages, through force of circumstances. There was no similar reason why all the surface men should get a flat raise. The mechanics are already well paid; they work the year around at less hazardous occupations than the miners. The balance of the men on the surface are mostly unskilled; while there are a few mill men holding jobs requiring a certain amount of skill and proficiency, the greatest majority of men working in the mills have never had any previous experience in this work.

The Custom mills working on a per ton basis and those low grade properties wavering between a profit and a loss, objected strongly to a flat raise on all surface men, on the ground that they could not afford it. It was, therefore, thought better that each individual manager should determine what surface men should have increases.

The war has taken a large proportion of the young and vigorous among the unmarried men; this has created a shortage of labor, and it has been necessary to fill their places with unskilled men; drill runners' helpers are now drill runners, and laborers have been made helpers on drills; the result is that the efficiency of the total force is much lower than two years ago. While the wages of some classes have not been increased, many of the men have been promoted from an inferior job to one commanding more pay.

Complaint has been made before this commission as to high ground rents charged, and to the possibility that the tenant may be given notice to move. The rent paid on the regular-sized lot on the Nipissing, LaRose, and Chambers Ferland varies from \$1.35 to \$4 per month. The average on all the 390 lots outside of Lang street—the business section—is \$2.70 per month. The clause that a tenant must move on 30 days' notice is necessary, as his house may be located directly on top of a vein, or the ground may be absolutely necessary for mining purposes. It has not been necessary to give such notice to more than half-a-dozen tenants in the last half-dozen years.

In July, 1916, the savings account in all the banks in Canada amounted to 789 million, or about \$100 per capita. In Cobalt the total of the savings account is estimated by bank managers at \$1,500,000. This is about \$250 per capita. This estimate of total in savings account does not include deposits by mining companies, but is the actual savings of individuals of the camp. One bank alone has 1,200 savings accounts, allowing

only 1,200 more for the other three banks together; it appears that two out of every three men has a bank account.

B. Neilly.

Mr. B. Neilly, superintendent Penn-Canadian Mining Co., said in part: Until two weeks or so ago we maintained a boarding camp and lodging-house at a cost to the men of 70 cents per day, although the actual cost to the company was about 83 cents per day. Immediately following the outbreak of war, there was a surplus of labor, and I advised our surface and underground superintendents to engage in future, as far as possible, only married men and those with dependents. In this way the number boarding on the property gradually decreased from about 80 to about 26. Finding it impossible to decrease the cost of labor in the cook camp proportionately, a raise to 75 cents per day was posted. However, prior to the raise taking effect, and for the first time in two years, complaints were made concerning the preparation of the food and the statements of the men that superior board could be obtained in town at a more satisfactory price, we reluctantly decided to close down the boarding-house.

If, as is claimed, there is a feeling of unrest in the camp, and emphasizing the fact that there is no man in our employ, as far as I know, dissatisfied with his job, I submit that that feeling of unrest has been engineered by those other than the men actively engaged in mining here. The statement has been made often just lately that a man is entitled to all the money he can get, even if forced by strike measures. If this were a true condition, then the companies on the same basis would be justified in obtaining labor at the lowest possible rate. No reasonable man can subscribe to the above statements, and that this company and the others in camp have proven their good faith with the men during the fall of 1914 and the year 1915, when in face of the greatest difficulties they made no move or expressed no desire to decrease the scale of wages prevailing prior to the outbreak of war. 1914 conditions may be repeated after the war.

When the war was declared, our company, with no free balance in our treasury, and with no quotation for silver, being unable to arrive at a settlement with the smelters, called a board meeting to discuss the advisability of continuing operations. General opinion tended to the feeling that silver quotations would not recover until after the war, and general conditions were most perplexing. On the request of the board for advice, I described local conditions and urged that while from a strictly business standpoint we were taking grave chances, that we were morally bound to continue operations if in any way possible. To make a long story short, one director asked the question: "What will the men do if we close down?" I said, "I do not know." Then said he: "We will borrow the necessary money and continue for the present at least."

Since the war broke out our physically fit, our bravest and best, have gone to the front, and while we have still a large proportion of splendid miners, nevertheless the absence of the enlisted men has made itself felt and efficiency underground has dropped accordingly. We are not getting the work done to-day that we were getting a year ago.

Finally, I assert that there is still a feeling of mutual confidence between our men and the company. If later on the men of Cobalt should insist upon higher scale of wages than at present in force, this company will be forced to suspend operations. The whole question before us now is one of ordinary business. When

the price asked and offered cannot be made mutually satisfactory the deal is dropped, and there is no reason for ill-feeling on this account, the parties interested having agreed to disagree.

E. Steindler.

Mr. E. Steindler, manager Dominion Reduction Co., said in part:

In none of the custom mills have the managers been approached by their men with respect to an increase in wages, or with any other complaints. All of the managers are willing at any time to meet their men, either individually or collectively, to head grievances of any nature.

One of the main arguments urged for an increase in wages centres around the advance in the price of silver. The customs mills do not participate in any profits derived from variations in the price of silver. On the contrary, the increased cost of materials has affected the profits of the mills. The ore treated by the mills is treated at prices contracted before the war, and no increase in tariff is possible.

Below will be found a partial list of the more important commodities, showing the cost before the war and the present minimum cost:

Material.	Cost prior to war.	Present cost.
Cyanide, per lb.....	.15	.21
Al. dust, per lb.....	.34	.90
Lead acetate, per lb.....	.08½	.11¼
Shoes and dies, per lb.....	.05	.06
Mercury, per flask.....	37.50	80.00

The wages paid in the mills in the camp have been steadily advancing since 1907. At that time common labor was paid \$1.75 per day of 10 hours. At the present time \$2.70 is the prevailing rate, with a minimum of \$2.50, all on a nine-hour basis.

It is a fact, established by the experience of all the managers of the camp, that labor to-day is less efficient than formerly. Less work is obtained from the men getting 30 cents per hour now than was obtained from the men paid \$1.75 for a ten-hour day, or 17½ cents per hour.

It is the honest conviction of the mill managers that the present wage scale is adequate, fair and all that the character of the work is worth. The managers are confident that their men are satisfied with wages and other conditions; that no spirit of unrest exists except that agitated by a radical minority of the Western Federation of Miners.

H. Park.

Mr. H. Park, superintendent Nipissing mines, said in part:

I wish to present a statement containing various tables and information bearing directly on the cost of food in Cobalt and in several other localities in the Dominion. All of my figures are taken from Dominion reports as published monthly in the Labor Gazette, the official magazine of the Department of Labor at Ottawa. The statements made in the Gazette are obtained from reliable reports from sixty representative cities of the Dominion, situated so as to cover as completely as possible all parts of the Dominion. So far as it is possible to make them, these reports are accurate, and there can be no argument or doubt cast on the figures I will present. They are cold, accurate facts, and can be verified by anyone who wishes to take the trouble and time to do so.

My statements cover the years 1913, 1914 and 1915. No statistics were kept by the Department on the cost of foods in Cobalt prior to January, 1913. The Gazette

publishes monthly two tables dealing with prices of foodstuffs in the Dominion. One table shows the prices in each one of the sixty cities of thirty-one articles which are termed "Staple Foods." The second table is called the "Family Budget," and shows the price of twenty-nine varieties of food necessary to support a family of five. From these tables, direct and positive facts can be obtained as to the actual cost of living in Cobalt since January, 1913.

In the following table I give actual costs of "family budgets" in Cobalt, the Dominion, and the Provinces of Ontario and Nova Scotia. Nova Scotia is given for the reason that it is the only other province in Eastern Canada that compares with Ontario in the production of mine products.

	1913	1914	1915
Cobalt	\$7.56	\$8.10	\$8.08
Dominion	7.34	7.73	7.87
Ontario	7.20	7.48	7.68
Nova Scotia	7.29	7.48	7.83

The outstanding fact of actual conditions is that the cost of food in Cobalt has increased in three years only seven per cent. Equally outstanding is the fact that the cost of food in Cobalt was the same in 1915 as it was in 1914. These figures are actual facts, and any wild and unsupported statements that food has gone up 50 per cent., or any other amount different than that shown in this table, are made without any knowledge of actual cold facts.

The figure that counts and is of value is that which shows the average result. The method of finding that out is the same method that applies to all manner of business or estimates of any kind. It is not a question of what happens to-day or to-morrow or next week. It is the "law of average" that counts. The Department of Labor gets this average by proper application of proper and innumerable details, announces the average, and that figure is accepted by governments the world over. The impossibility of attempting a comparison between the Department's average results and a few individual invoices covering no period, is obvious.

S. W. Cohen.

Mr. S. W. Cohen, general manager Crown Reserve, said in part:

We do not feel that a serious situation or that considerable unrest exists in the mining industry of Cobalt. We feel there is nothing whatever to warrant the investigation by Royal Commission, although now that the Royal Commission has been appointed, we freely welcome them to Cobalt and to the strictest investigation that they can possibly make.

We do not feel that the majority of the employees are in any way dissatisfied with either working conditions or their salaries. We realize, of course, that any employee would like a raise in pay, but we consider this fact is a universal one, and cannot be considered as specially affecting the situation in Cobalt. We know that the rate of payment is as great as that of any other mining camp in Eastern Canada, and much greater than most.

We know that the working conditions are good. There are no poisonous gases. No extreme heat. No very dusty places. No miners' consumption. In fact, living conditions in the camp and working conditions underground are as good as the industry affords.

The Cobalt mines are not dangerous to workers. Provincial laws and inspection provide protection and safety for the employees, with which the mine managers of the district heartily co-operate.

We feel that the whole situation is due to a small radical minority, who for selfish or ambitious reasons, have tried to make it appear that a serious difference exists between the managers and the employees, when no such difference does actually exist, and that these men have taken advantage of the scarcity of labor, due to the fact that a great many of our finest employees have taken up arms for their country and have gone overseas to fight for the flag.

Between the managers and employees there has always been a general feeling of respect and goodwill, and we are at all times open to arbitration between ourselves and our employees, but we wish it to be absolutely understood that we will not submit to the dictation of a few men who do not actually represent our employees, and who have only their own selfish ambitions at stake. They neither go to war to fight for their country nor try to keep the industries of the nation going at home, but at this critical period attempt to stab it in the back by stirring up strife and turmoil, when all classes should unite for the main welfare of the Empire.

When the war started, two years ago, very uncertain conditions existed in the silver mining industry. The price of silver dropped very materially at once, and for several weeks there was no market whatever. The Privy Council of the Dominion Government recognized the seriousness of the situation and offered to advance the mines of Cobalt certain moneys against bullion shipments. In spite of these facts, that the companies did not know what the outcome would be, they all responded as loyally as possible to the conditions and most of the mines were kept going. At that time labor in Cobalt was a drug on the market, but the wages were in no way effected and everything possible was done by the companies to provide work for their employees.

On May 1st, last, a voluntary increase of 25 cents per day was given all underground employees, and a large number of surface employees, and, in addition, a further 25 cents per day was promised, and later given to all employees, surface, mill and underground, when the price of silver was 70 cents per ounce for an average of any month. To-day, the minimum wage of practically the whole camp is \$2.50 per day, and this for common surface labor.

When the eight-hour day went into effect, and the working time of underground employees was reduced from nine to eight hours, the pay was not reduced.

The Township of Coleman has a good revenue under the Supplementary Revenue Act, which is a tax directly on the mines, so that schooling for the families of the employees is provided without any cost to them.

The employees pay 50 cents per month for hospital and 50 cents per month for doctor. When this amount was found to be insufficient to run the hospital, the mines contributed the moneys, amounting to practically \$30,000 to put the hospital on its feet. In fact, the whole attitude of the mine managers (and I feel absolutely certain the majority of the employees in the camp will bear me out in this statement) has always been sympathy, goodwill and fraternity.

I myself have been a miner. Most of the mine managers in the camp have worked underground, and I assure you, under much worse and much more trying conditions than exist in Cobalt. We understand absolutely what the miner is up against, and we have honestly tried to do for them whatever was in our power.

As far as the special mine of which I am general manager is concerned (the Crown Reserve), from the year 1908 (the beginning of the mine) to 1915 we paid our employees a bonus each Christmas, based on the earnings of the company, which averaged over 10 per cent. of their gross earnings for each year, and in one year was as high as 15 per cent.

Besides this, we carried an accident insurance for the men, towards which the men did not contribute a penny, which entitled them to half pay in case of accident. Both this and the bonus were unsolicited and were voluntary gifts by the mine. The total amount of this expenditure on a comparatively small mine like the Crown Reserve amounted to over \$75,000.

At this time the Crown Reserve Co. is operating its mine at a loss, and while it is true, of course, that this is in hope of striking new ore bodies, it is also true that we are trying to give employment to our old and faithful employees as long as we possibly can.

Taking the Crown Reserve, therefore, for an example, and the past history on which we stand, is it not stupid on the face of it to assume, after we have voluntarily paid in bonuses to the men more than three times as much per year as the present 25 cents increase would amount to, that we refuse this for any reason whatsoever except that we honestly think that the increase is not justified?

Of course, the men of Cobalt want an increase in pay, but everybody wants an increase in pay. This not only applies to the mining industry of Cobalt, but to every other industry throughout the whole world, and is by far too big a question for us either to argue here or to particularly consider in this case.

All we can say is that wages paid to workers cannot be regulated by their desires. It depends mainly on two facts:

- (1) The amount of wage necessary for a fair livelihood, the education of workmen's children, his protection in case of sickness; and
- (2) The prevailing rate of wages for the same kind of labor in other portions of the country, under similar conditions.

Our answer to this is: "We claim the men of Cobalt earn as much money and are as comfortable and happy as any mine workers in Eastern Canada. In fact, we go further than that: we claim Cobalt is the best working place of any mining camp in Canada." We feel, as I have already said, most of the men are satisfied, do not wish to embarrass their country by calling a strike at this critical time; in fact, the managers have not had a direct request from a committee of their own employees either for a raise in pay or a change in conditions. Most of the men are patriotic citizens. A large proportion of those present working are married. They are trying to earn a livelihood for their families and at the same time do the best they can for their country, but we also feel that there is a small minority who, with the lure of higher wages during this time of stress in the history of the Empire, are attempting to stir up dissatisfaction and discontent amongst our employees, for the purely selfish aggrandisement of the W. F. of M.

We wish it fully understood, that while we are at all times prepared and ready to discuss any grievances, to consider any complaints, to honestly try and meet our employees more than half way, we will not be taken by the throat by the W. F. of M. with the threat of a strike, and our answer is that if these trouble-makers do succeed in forcing a strike, we will absolutely close down the mines until our men are prepared to go back to work.

NIPISSING.

A bonus of 5 per cent. along with the regular quarterly distribution of 5 per cent. was declared by the directors of the Nipissing Mines Co. last week.

The extra payment is the first to be made by Nipissing in nearly three years. From October, 1909, until the end of 1913 the company paid 5 per cent. plus 2½ per cent. extra every quarter, but the extra payment was dropped at the dividend meeting for the first quarter of 1914. Since then payments have been confined to the 5 per cent. quarterly.

Recent reports on the company's outlook have been encouraging and some time ago it was predicted that an extra disbursement would be made this quarter. The company has benefited by the higher price of silver, new development work has been satisfactory, and a new method of treating mill tailings is said to have been productive of satisfactory results. With the dividends declared October 2nd, Nipissing will have paid next month a total of 249 per cent. on its \$6,000,000 capital.

CANADA COPPER CO., LTD.

Developments at the Copper Mountain property of Canada Copper Co., Ltd., are understood to be proceeding satisfactorily. At Greenwood, B.C., the smelter has been in continuous operation during the entire year, and up to September there have been produced 3,455,578 lb. of copper, 8,555 oz. of gold and 33,096 oz. of silver.

THE FLOTATION DECISION.

The following statement has been issued by Miami Copper Co. in regard to suit of Minerals Separation Co. for infringement of patents on the flotation process, which suit was decided against the Miami Co.:

"The bulk of our recovery of copper is by table concentration. Decision only affects comparatively small additional saving that is made by flotation, and our counsel are confident this decision will be reversed in higher courts."

DOME.

The monthly statement of the Dome Mines Co., Ltd., just issued gives the amount of ore treated in their mill during the month, the total tonnage being 38,300, as against 40,010 for the month of August. The production was \$179,500, about \$500 less than the previous month, which was \$180,000.

The grade of ore for September was on a par as that of August, at \$4.49 per ton. The cost of operating was \$2.59, compared with that of August of \$2.56.

The cost of treating this ore at the mill per ton is as follows:

	Per ton.
Estimated costs, mining, including hoisting	\$.76
Development	.60
Crushing and conveying	.10
Milling	.82
General expenses	.31
Total operating expenses	\$2.59

The National Chemical Copper Co. has taken over the development of the old copper mines near Dorchester, which have been closed for a number of years. A considerable number of laborers were employed, and it was expected to have the mines in operation at an early date.

SUDBURY'S NICKEL INDUSTRY

The "Sudbury Mining News" published on Sept. 29th the following account of a visit of the Ontario Nickel Commission. The members present were: Chairman G. T. Holloway, Mr. McGregor Young and Mr. T. W. Gibson.

Mayor Travers.

Mayor Travers was first called and the chairman suggested that he give from personal experience his opinion as to the extent of the deposits, developed and undeveloped, the refining of nickel, the taxation of mining companies, etc.

Mayor Travers stated that he had been connected with mining in the district continuously for 25 years, during the past seven years had been engaged in contract work. Had developed the Whistle, Murray, Levack, Blezard, Elsie, Gertrude and other properties, all of which have large quantities of proven ore bodies, amounting to roughly 70,000,000 tons, all contained within 10 miles around the rim of the 130 miles of nickel bearing contact. The percentage is from 3½ per cent. to 6 per cent. nickel-copper ratio of about two parts nickel to one of copper. In reply to a question as to what he considered a reasonable size for a working deposit, he answered from 300,000 to 9,000,000 tons, and to Mr. Young he stated the average would be about 4 per cent. The most promising surface showings only had been developed, but no doubt there was plenty more equally good. He thought in the early stages of the work that magnetic prospecting would be useful; his knowledge was based on his experience in the Levack field. He considered government reports and maps quite useful and mentioned particularly that of Dr. Coleman.

Mr. Gibson—Can you give an estimate of the quantities of ore held by people outside the large operating companies?

Mr. Travers—No. None have been proven up, except Mt. Nickel. The unproven deposits are mostly on the north range.

Mr. Holloway—What is your view as to taxation of mines and refining?

Mr. Travers—Taxation at the mouth of the pit is always preferable to taxation on ore deposits.

Mr. Gibson—Are you familiar with the conditions in Minnesota and Michigan, where the ore is taxed by proven deposits?

Mr. Travers—No, other than that it checks development of deposits and retards proper mining operations.

Mr. Gibson—Would this plan not be better than our present method?

Mr. Travers—No, the present plan is better. It is much better to tax net profits or ore at the mouth of the pit than the undeveloped property.

Mr. Gibson—Why not tax the mine as the farmer is taxed.

Mr. Travers—The farmer gets revenue even from land that is not tilled, but the mine owner gets nothing from his undeveloped lands.

J. F. Black.

Mr. J. F. Black stated that he has been in the district for 19 years, being interested in various claims as stockholder or owner. He claimed to be fairly familiar with all government reports and to have studied the geology of the district through these. Have had little or no experience in the development of deep mines, and considered the government reports reliable in a general way. With reference to taxation, Mr. Black favored taxation on net profits or at the pit head

as much better than on undeveloped property, which would greatly retard progress.

Mr. Gibson—Have you any objection to the present system?

Mr. Black—It is all right, if properly carried out.

Mr. Gibson—In what respect is this law not carried out?

Mr. Black—Some operating companies should be paying a much larger tax to the province than at present, if they were taxed according to their profits. He referred to one company paying only \$40,000 a year through special arrangements with the Government of Ontario, whereas it should pay several hundreds of thousands.

Mr. Gibson—Are you aware that the tax is on the value at the pit head, not on the matte.

Mr. Black—Yes, but as I see it the value must be at the pit head to get into the matte, for no values are added further during smelting or refining. The prospector's load should also be lightened, as at present it costs him from \$1,000 to \$1,500 to secure patent for a 40 acre claim, which was practically prohibitive. I also think the ore should be refined in Canada and that the refinery should be located at such a distance from the boundary as to permit of easy defence in time of war.

W. E. Smith.

Mr. W. E. Smith stated that he had not had much experience in nickel corporations, but was interested as an explorer. Is not in favor of taxing orebodies, as it certainly hinders development and might tend to force properties from small owners to larger ones, for the fact that the former could not pay his taxes.

J. A. Holmes.

Mr. J. A. Holmes said he came to the district as consulting engineer for the International Nickel Co. in the installation of their basic converter plant six years ago. He afterwards became connected with the Dominion Nickel Co. as manager. They had invested heavily in developed properties which they considered good. They tried to prove them by magnetometric survey, but where the highest readings were the diamond drill found the least ore, but after a year and a half they had prospects of 1,500,000 tons of ore. Magnetic surveys are all right in certain cases, if you can interpret them correctly. The British America Nickel Corporation took over the holdings of the Dominion Co., and have now 17,500 acres of land in the district. The company bought and developed the Lake Superior Copper Co.'s claims and also that of the Viviano. These consist of 50 or 60 claims, of which we have developed 18. The Murray-Elsie is the largest, and we were proving up from 1,000,000 to 1,600,000 tons per month. The development work costs 2c. per ton. As to reserve supply and undeveloped ore, I think this district is only in its infancy. More producing companies will cheapen the product, so that it will become extensively used in nickel steel and in cooking utensils, which can be made directly from the matte like Monel metal, and in heat conducting qualities are far superior to aluminum, having the same cleanly appearance, are as easily cleaned, are quite as sanitary and much cheaper. The cry now is greater production and cheaper cost.

Mr. Gibson—Are you acquainted with the taxation conditions in Minnesota and Michigan?

Mr. Holmes—Yes. Taxation on unproved ore in the ground hinders development. A number of friends of mine in these districts, since that law came into force, have abandoned development work until necessity de-

mands it. The present Ontario method is the just one to all concerned.

Russell Cryderman.

Mr. Russell Cryderman, one of the veteran prospectors of the district, said he had been prospecting the nickel fields for the past 20 years. His experience had been almost entirely as a surface prospector.

Mr. Holloway—What is your opinion as to the opportunities for large undeveloped deposits?

Mr. Cryderman—There are good deposits all along the Eastern range in Capreol and Norman townships.

Mr. Young—These in your opinion would justify diamond drilling?

Mr. Cryderman—Yes.

Mr. Gibson—Are all prospects taken up?

Mr. Cryderman—Yes.

Mr. Gibson—Why are these not being developed?

Mr. Cryderman—Because the large companies have sufficient ore for present needs.

Mr. Gibson—What market would you have?

Mr. Cryderman—I don't know of any.

GRANBY.

For the first time in its history Granby Consolidated did a gross business exceeding \$10,000,000 in the year ended June 30 last. Of the \$10,034,017 total, \$9,299,337 came from the sale of its own copper, the balance, approximating \$734,000, being derived from custom ores treated. Cost of producing copper at all properties rose from an average of 10.66 cents in the previous year to 12.30 cents in the past 12 months. This was due very largely to higher wages and greater cost of materials and supplies, although treatment of 330,000 tons of very low grade ore was a factor.

A feature of the past year's operations was the low recovery of copper from the ore treated, the average being 22.36 pounds per ton against 23.99 pounds in the 12 months ended June 30, 1915. The greater loss was at the old Phoenix mines, from which the recovery was two pounds less per ton than in the previous year, while that at Hidden Creek dropped a little more than a pound. There was a new factor in the production as Granby's Alaska mines entered the producing ranks and contributed an average of 32.90 pounds of copper per ton, as well as high precious metal values from 66,617 tons of ore milled at the Anyox plant.

The following sets forth some production comparisons:

	1915-16.		
	Tons ore.	Lb. rec.	Lb. cop.
Phoenix.	1,097,299	14.6	15,992,476
Hidden Creek	722,630	33.23	24,012,838
Alaska mines	66,617	32.90	2,192,796
Total company's mines	*1,897,251	22.36	42,198,083
	1914-15.		
	Tons ore.	Lb. rec.	Lb. cop.
Phoenix.	611,097	16.12	9,850,302
Hidden Creek	462,340	34.58	15,895,757
Alaska mines			
Total company's mines	1,073,437	23.99	25,746,059

*Including 10,705 tons from quartz mines which yielded an average of \$7.24 per ton in gold and silver.

From custom ores purchased by the company and treated at its two smelters there was recovered over 3,000,000 lb. of copper, which brought the total of that metal turned out to 45,631,673 lb. Precious metal yield was 579,520 oz. of silver and 49,971 oz. of gold which realized over \$1,200,000.

Ore reserves were increased from 18,000,000 to 23,000,000 tons. Phoenix mines did not replace with new ore the amount shipped by 721,409 tons, while at Anyox tonnage mined during the period exceeded new ore reserves to the extent of 182,833 tons.

J. P. Graves, one of the pioneers in Granby affairs, and for years its general manager and one of the largest stockholders, has completely severed his connection with the company. Through the choice of Henry Bruere, former city chamberlain of New York, as his successor, the American Metal Co., representation on the board of directors was increased to two members.

WINDY ARM DISTRICT, BRITISH COLUMBIA.

Reports coming from the operators of the Conrad mining properties, in Windy Arm district, are most promising, says the "Daily Alaskan," Skagway. Already 1,200 sacks of ore from the Venus mine have been shipped to the Granby Co.'s smelting works at Anyox. This makes the third shipment of ore from the Venus, which is now being worked with energy and promises to prove a profitable property. Other shipments are to follow.

Mr. Jas. McFarland, superintendent for the Harper interests, who have taken over the chain of mines in the Conrad properties, states that development work is also being done on the M. and M. claim, which is situated in Polley gulch, and three men are breaking and sacking high grade silver ore for shipment from this mine. The minimum price obtained for ore under the Conrad management was \$165 a ton; that now being got ready for shipment should bring in \$180 a ton.

Preparations are being made, too, for active work at the Montana mine, where men have been engaged in clearing the workings of ice and water. In past years the Montana produced considerable ore of good grade, and it was known as one of the best mining properties in the district.

The outlook is most encouraging. Assays are showing that there is much valuable ore, and the manager is enthusiastic concerning the prospects. Work will be pushed throughout the winter at practically all the mines now being opened under Mr. McFarland's direction. A good force of men are working on the various properties, and it is expected shipment of ore will be continued through the winter as well as during the remainder of the autumn.

ATLIN MINING DIVISION, BRITISH COLUMBIA.

The "Empire," published at Juneau, Alaska, says: The developments by the New York and Gloucester, Mass., capitalists on the Ruby Silver and Silver Queen mines on Lake Bennett, B.C., have demonstrated the property to be good. It is now shipping ore and will be extensively developed.

In addition to Lake Bennett development, mining properties on Windy Arm, near Carcross, are being developed. The Venus mine is already shipping ore and the Big Thing mine is being opened again. These are properties that were exploited several years ago by Col. J. H. Conrad.

The Engineer gold mine, on Atlin lake, has been producing for several years, and will continue to do so. It is now a rich property and has been opened in a manner that will insure its life for many years. It is claimed that ore to the value of \$2,500,000 is blocked out in it, and development is being kept well ahead of mining.

ZINC DEPOSITS OF MONTAUBAN TOWNSHIP, QUEBEC*

By J. A. Bancroft.

At Batiscan, about twenty miles below Three Rivers, the Batiscan river enters the St. Lawrence river from the north. On the banks of this tributary and forty-two miles from its mouth, the little village of Notre Dame des Anges is situated in Portneuf county, and on the Canadian Northern railway, 125 miles north of Montreal. In a straight line, this village is 51 miles slightly north of west of the city of Quebec, from which by the C. N. R. via Garneau Junction, it is 106 miles distant, or via Riviere a Pierre Junction, 68 miles.

In the autumn of 1910, Mr. Elzear Gauthier discovered zinc blends and galena on lots 39 and 40, range I., Montauban, about four miles south of the village of Notre Dame des Anges. Since that date the area has attracted the attention of a small group of mining men.

In 1911, Mr. Pierre Tetreault acquired that portion of the mineralized zone crossing lots 322-327, range I., Price, and lots 39-42, range I., S.W. Montauban. In 1912, Mr. Tetreault erected a concentrating mill on lot 40, with the hope of treating the complex ore of this area by the methods that are adopted in concentrating the zinc and lead ores of the Joplin district, Missouri. In 1913 and 1914, about 1,300 tons of high grade ore was shipped from rich pockets that were encountered in shafts 3 and 4, but the mill failed to produce a marketable grade of concentrates.

The mineralized zone was found to extend north-eastward across lots 45, 44, 43 and into Block C, range I., S.W., Montauban, and other deposits of zinc blende were discovered on lots 7 and 8, range IV., S.W., Montauban. In 1914, the Laurentide Mining Co. began prospecting operations on lots 7 and 8, range IV., S.W., and the Montauban Mining Syndicate started work on lot 43, range I., S.W.

In October, 1914, the Weedon Mining Co., who own and operate the large deposit of cupriferous pyrite in the Eastern Townships, P.Q., leased from Mr. Tetreault a portion of the mineralized zone, 900 ft. in length, immediately south of the small lake on lot 40, and including shaft No. 3, which was then about 90 ft. deep. Aply directed by Mr. L. D. Adams, the superintendent of the Weedon Mining Co., development work was vigorously carried on, the concentrating mill was remodelled, and, as a result of numerous experiments, a method was devised whereby the ore can now be economically concentrated. In 1915, a separate company, the Zinc Company, Limited, was incorporated to operate this property. Up to June 1st, 1916, they had shipped 300 tons of high-grade zinc ore, and had passed 6,958 tons of ore through the mill.

The Tetreault Property.

A small lake on lot 40, range I., S.W., Montauban township, southward from the margin of the mineralization is practically confined to a band of metamorphosed magnesian limestone, whose position is plainly marked by a depression. For about 400 ft. from the lake, the altered limestones vary from 35 to 60 ft. in width when, including a band of quartzites up to 15 ft. in width, they fork into two bands which gradually become narrower as they are followed along the strike. Judging from surface exposures, it would appear that

for a distance of about 500 ft. southward from the lake, the altered limestones can be successfully worked for their irregularly distributed content of zinc blende and galena; farther southward only a few widely scattered grains of these minerals have been found.

In the southwestern corner of lot 40, at the hanging wall of the band of altered limestones, Mr. Tetreault sank a shaft (No. 3) to a depth of about 90 feet on a slope of about 60 degrees toward the southeast, on a large pocket of very rich zinc ore carrying a small percentage of lead. At a depth of 33 ft., drifting was extended for about 145 ft. toward the southwest. Seven or eight feet from the shaft a stope was developed, which attained a maximum height of about 20 ft. Fifty-five feet southwest of the shaft a raise was extended to the surface. Between 1,200 and 1,300 tons of high grade zinc ore were shipped by Mr. Tetreault from this shaft.

The Zinc Company, Limited.

In October, 1914, the Zinc Co., Limited, leased shaft No. 3 from Mr. Tetreault and that portion of the mineralized zone extending 100 ft. northward and 800 ft. southward from this shaft. The shaft has been extended to a depth of 175 ft.

At a depth of 85 ft. drifting has been carried about 325 ft. towards the south. For about 160 ft. from the shaft, the drift is crooked and lies toward the hanging wall of the altered limestones where they are almost completely altered to tremolite, diopside, etc., within which the zinc blende and galena are disseminated in an extremely irregular manner; beyond this, the drift followed the footwall where the ore is less irregularly distributed. At a distance of about 160 ft. from the shaft, while raising to the surface, a rich pocket of ore was encountered, from which about 300 tons of an excellent grade of ore were obtained.

At a depth of 170 ft. drifts have been extended toward the north for 100 ft. and toward the south for about 225 ft. In the latter direction, the drift has followed quite close to the foot-wall, where the crystalline limestone is almost completely free from tremolite, diopside, etc., but is heavily mineralized with zinc blende, galena, pyrrhotite and a very few grains of chalcopyrite. Undoubtedly, some pockets of rich ore will be found to be very irregularly distributed within the more tremolite-rich portion towards the hanging wall. Northward from the shaft, the band of altered limestones is narrower and more irregularly mineralized.

In the course of this development work, 6,958 tons of ore, with an average content of 13 per cent. of zinc, 9 per cent. of iron and 3 per cent. of lead have been passed through the remodelled mill that originally had been erected by Mr. Tetreault. This ore yielded 1,225 tons of zinc concentrates carrying 42 per cent. of zinc, 10 per cent. of iron and 4 per cent. of lead; also 270 tons of lead concentrates with an average content of 63 per cent. of lead, 10 per cent. of iron, 8 per cent. of zinc, and carrying 60 oz. of silver, and about \$10 in gold per ton of 2,000 lbs. It would seem to be a conservative estimate that on June 1st, 1916, about 50,000 tons of ore of similar average grade to that milled has been blocked out in the mine.

* Extracts from a report published by the Department of Mines, Quebec.

The Montauban Mining Syndicate.

That portion of the mineralized zone which crosses the southeastern corner of lot 45 and the southern portions of lots 44 and 43 is controlled by a group of men from Massachusetts, who have organized the Montauban Mining Syndicate, with Mr. E. J. Thibault as manager. They began work on the property in August, 1914.

The Montauban Mining Syndicate has not shipped any ore. For the most part, rock and ore have been accumulated together in the dump, while they have been looking forward to the construction of a concentrating mill. By handpicking the dump and including the ore that has been placed in sacks and on the floor of the shaft-house, it is probable that about 25 tons of high grade zinc ore, carrying a few per cent. of lead, could be sent to market. Sufficient ore has not been developed to warrant the erection of a mill.

Mode of Occurrence of Ore.

The occurrences of zinc blende and galena within this area are chiefly confined to a portion of a zone of highly altered sedimentary rocks, which, with a length of nearly two miles and with a strike that varies from N. 10 deg. to 35 deg. E, dips steeply toward the southeast, and extends across lots 322-327, range I., Price, and lots 39-45, range I., S.W., and into Block C, range II., S.W., of Montauban township.

From lot 322, range I., Price, into lot 41, range II., S.W., Montauban, the mineralization is confined to a band of altered limestones that varies from a few feet to 60 ft. in width, and locally includes certain narrow bands of quartzites and mica schists. In general, the limestone has lost all semblance of its original character, since it has been changed chiefly into tremolite together with diopside, phylloporite, biotite, actinolite, scapolite, wilsonite, anorthite, apatite, epidote, garnet, titanite, quartz and recrystallized calcite and dolomite; a little chlorite and talc have been developed locally, because of the alteration of the micas. This band is irregularly mineralized with zinc blende, galena and pyrrhotite, and a few scattered grains of pyrite and chalcopryrite; in some places, small crystals of arsenopyrite and a few small flakes of molybdenite and of graphite have also been found.

In a very few places and especially in a small opening close to the boundary between lots 323 and 324, range I., Price, the crystalline limestone contains a relatively small proportion of the minerals that have been developed through processes of contact metamorphism. Where the band locally widens, it is more completely changed to these minerals towards its hanging-wall than in its lower portions. In general, however, the altered band of impure dolomitic limestones now consists of a closely matted aggregate of fibrous tremolite within which the other minerals mentioned are irregularly distributed.

Suggestions to Prospectors.

The discovery of these deposits of zinc blende and argentiferous galena in the vicinity of Notre Dame des Anges should stimulate prospecting in adjacent districts. Experience has taught that it is useless to prospect for ore deposits of value within the widespread areas occupied by the gneissoid granites and granodiorites. Attention should be devoted to those areas underlain by rocks into which the granites and granodiorites are intrusive. Undoubtedly, within widespread areas adjacent to the ore described in this report, there

are numerous small, and possibly some extensive, areas where remnants of the highly metamorphosed stratified rocks of the Grenville Series are present. These rocks, and especially any altered limestone bands that they may include, should be carefully examined in the hope of discovering valuable minerals. Prospecting endeavor should not be restricted to a search for zinc blende and galena, because from analogy with other areas farther southward, where the Grenville Series has been more thoroughly prospected, it is possible that deposits of graphite, magnetite, pyrite, apatite, "amber" mica, barytes, magnesite, talc and possibly some quartz veins carrying gold may be found.

NEEDS OF MINING CAMPS.

Timmins, Oct. 4.—The meeting of the Ontario Nickel Commission, under the supervision of Prof. MacGregor Young, K.C., and Mr. Gibson, Deputy Minister of Mines, met in the Empire Theatre on Monday afternoon, Oct. 2, at 2 p.m. The representatives present to look after the interests of the district were Mr. R. W. Robbins, of the Hollinger Gold Mines; A. R. Globe, J. P. McLaughlin and Mayor Wilsof, of the City Council; and G. H. Gauthier and W. H. Wilson, of Tisdale Township.

Mr. Robbins' claim laid before the Commission was that the taxes derived from the mines should be spent in the building up of the district. "The town," he stated, "in 1912, only had about four houses in it, and it had made wonderful strides since that time, but more money was needed to cope with the ever-growing population to provide necessities for their welfare, such as waterworks, sewers, sidewalks, schools, etc."

His base of argument to the Commission was that whereas the camps only were receiving one per cent. of the tax from the mines they should be receiving at least one and a half per cent.

Mr. A. R. Globe, who was present on behalf of the Town Council, told the Commission that the municipality needed immediately about \$300,000 to build an addition to the water works, to build a new school, fire hall, more sidewalks, the clearing up of the bush around the town for the safety of its citizens, and that in the course of another year there would be money needed for sewerage disposal plant, and various other items were needed. He also stated that debentures could be issued for some of these, but people would not buy them, because of the dangers from forest fires, unless the Government would guarantee the bonds.

J. P. McLaughlin and Mayor Wilson were much the same opinion as A. R. Globe.

Clerk W. H. Wilson, of Tisdale Township, submitted a statement of taxation and assessment system as worked by that township. The clerk stated that the township was badly in need of money to make improvements that were necessary, such as schools, etc.

G. H. Gauthier, of Porcupine, also a representative for Tisdale Township, was of practically the same opinion as Mr. Robbins, except that he claimed the township should be allowed to assess at a rate of from 20 to 30 mills on the dollar if necessary, whereas the Mining Act only allows for an assessment of 10 mills. He also thought that mining claims held by prospectors who started operations and failed to carry them through and were holding up the property, thereby preventing other prospectors from buying and working them should be taxed heavier in order to induce the workings of those claims.

SULPHUR IN STEEL

That sulphur is not harmful as a constituent of low-carbon steel is the contention of Mr. C. R. Hayward in a paper prepared for the next annual meeting of the American Institute of Mining Engineers. Mr. Hayward writes in part:

Sulphur has long been one of the banes of the steel manufacturer and often no effort and expense have been spared in order to reduce it to a small per cent. in the finished product. This condition is due to a general conviction that in many cases where steels have failed in service, sulphur has been the cause. But there has been a growing feeling in recent years that the verdict against sulphur has been unnecessarily severe. In cases of segregation it was present in augmented amounts along with other impurities, but it had not caused the segregation. High sulphur in pig iron is caused by poor furnace conditions and the sulphur is merely one indication of an iron that has not been properly reduced. No amount of subsequent treatment under oxidizing conditions in the openhearth furnace can remedy the defects, although the per cent. of sulphur may be considerably reduced. In other words, the causes of bad steel can frequently be traced back to bad pig iron, and sulphur is merely one indication that the pig iron is bad. The writer recently visited a steel plant where a mass of evidence had been accumulated which substantiated this fact, and the superintendent was emphatic in stating that high sulphur was not harmful provided the steel was not otherwise poor due to insufficient reduction in the blast furnace.

The presence of a moderate amount of sulphur is desirable from the standpoint of the man who machines the steel. The low sulphur material drags and the production of a smooth surface is very difficult. A slight increase in sulphur enables the machinist to produce a smooth surface without difficulty.

Since, therefore, such large quantities of steel are subjected to machining, it becomes highly important that the sulphur controversy should be settled, and if its presence is proved to be harmless the ban on it should be lifted.

Among the recent papers on the effect of sulphur on steel is one by Dr. J. S. Unger, manager of the Central Research Bureau, Carnegie Steel Co. The results of an exhaustive series of tests are given and the conclusion states: "The author does not advocate paying no attention whatever to sulphur content in steel, but believes firmly that a steel containing less than 0.100 per cent. is not necessarily bad, and that it will show little, if any, difference in quality when compared with the same steel of much lower sulphur, other conditions being the same."

Mr. Hayward carried out a series of tests on steels of different sulphur content. The steels finally selected were in the form of 3/4-in. round bars. Two bars of each grade were required to furnish sufficient specimens. The analyses below show the percentage content of sulphur, phosphates, etc.:

Mark	Carbon	Total Manganese	Excess Manganese	Phosphorus	Silicon	Sulphur
1	0.18	0.55	0.48	0.007	0.01	0.038
1A	0.18	0.57	0.50	0.009	0.02	0.041
2	0.17	0.67	0.52	0.008	0.01	0.086
2A	0.18	0.70	0.55	0.010	0.03	0.087
3	0.18	0.80	0.54	0.006	0.02	0.152
3A	0.17	0.80	0.55	0.011	0.03	0.148

From the results of tests on these steels, Mr. Hayward concludes:

"The summary of the tensile tests shows that the high-sulphur steel has for each treatment the highest breaking load, while the yield point ranks first for two treatments, second for three and third for two. From this we may conclude that the sulphur does not lower the tensile strength.

"The figures for elongation and reduction of area show that there is little difference in ductility between the low- and medium-sulphur steels, but the ductility of the high-sulphur steel is slightly lower than the other two for most of the treatments.

"The average figures for the shock tests, except for the air- and furnace-cooled specimens, are highest for each treatment in the case of the sulphur steels and lowest for each treatment for the high-sulphur steels. The widest difference appears in the steels which have been quenched and reheated.

"It is difficult to draw definite conclusions from the results because of the newness of the shock test and the difference of opinion among engineers regarding its value. The tensile tests are not unfavorable to steels with moderate amounts of sulphur, while the shock tests show a decided falling off in strength as the sulphur increases. Until the interpretation of the results from the Charpy machine is more fully understood, it is impossible to say to which set of tests the most importance should be attached."

NOVA SCOTIA STEEL.

Boston, September 25.—It is expected that Nova Scotia Steel shares will be introduced on the New York board some time next month. This is the earliest that the listing committee can rule on the subject. The listing notices will contain some interesting items of information. They are expected to show for one thing that the company is earning between 50 and 60 per cent. on its \$7,500,000 common without including any net from the Eastern Car Co. and without any income from its immense ore reserves.

STEEL CO. OF CANADA.

The August statement presented at the monthly meeting of the Steel Co. of Canada held in Toronto last week is said to have reflected the largest production in history and with the orders on hand the outlook was excellent, according to directors.

The question of a dividend on the common stock was not considered. The suggestion that the directors should take the shareholders into their confidence regarding the progress of the company did not meet with favor, and it was decided that there was no satisfactory reason for departing from the ordinary practice of withholding all reference to the affairs of the company until the results were definitely known at the close of the year.

The regular preferred dividend of 1 3/4 per cent. was declared.

The Sullivan Machinery Co. announces that Mr. Burt B. Brewster, for the past two years manager in Alaska, with headquarters at Juneau, has been transferred to Salt Lake City, to become manager at the company's branch office at that point, succeeding Mr. H. E. Moon, resigned. Mr. Walter F. O'Brien, for some time past associated with Mr. Brewster at Juneau, will take his place as local manager for Alaska.

THE BROWNIAN MOVEMENT.

Our readers will recall the article on "Canada's Future," by Mr. David H. Browne, which was published in the July issue of The Canadian Mining Institute Bulletin, and reprinted in this journal. Mr. Gilbert Rigg has written to Mr. Browne the following letter for publication in the Bulletin. It appears in the October number:

My dear Browne,—I have received the Canadian Mining Institute Bulletin for July and your letter, for both of which my best thanks. I am immensely pleased with your paper. I feel that we are on the right track.

There has been an enormous amount of stuff published on these lines, but by men who for the most part are outside the industry and who approach the subject from an ethical standpoint without regarding the necessity for keeping the wheels turning. Our aim must be to land the subject where it belongs—in the hands of the men who have been accustomed to do big things in a big way.

There ought to be one or more first class men in every concern, reporting to the general manager, and charged with the question of the co-ordination of the productive classes. We have all sorts of engineers in America; mining engineers and milling engineers; metallurgical engineers, engineers of sales and of methods; why not an engineer of industrial relations whose duty it would be, to study the legitimate needs and demands of all who are interested in this company from the stockholders to the laborers. His duty would be the equalization of the claims of each, as far as the facts of the case would permit.

Really Browne, it's surprising that this thing should not have been done long ago. Look at the conditions to-day. Outside of the beautifully co-ordinated organization of general manager, superintendents, department heads, engineers and so forth is the great formless mass of labor, regarded for most part with suspicion, tinged not infrequently with apprehension, and articulate only, for the most part, through men whose principal claim to the position of spokesman is greater strength of character, force of lung, and recklessness. Its main argument is the strike and more recently the ugly threat of sabotage. This standing for a base ideal, that it is not well for a man to do his best, is their reply to the co-called efficiency engineer with his stop watch and his demand for speeding up all along the line.

Look at the railroads to-day with their backs to the wall, plastering every station with appeals to their passengers concerning the demands of their workmen. It is absolutely pathetic in its helplessness. Railroad-ing in America appealed to me during my ten years' sojourn in the States as an achievement bordering on the marvellous. Yet, with all the excellence of organization and equipment that men of genius have built up, it has been no man's job to see that the men who handled the trains were built into the organization and were made to feel that they were a part thereof, and that their prosperity rose and fell with the whole prosperity of the company.

Assuming for the moment that we can, and will, attempt the solution of this problem, where, as practical men, should we begin?

In the first place we need facts. We should have before us statistics showing the respective earnings of capital and labor over many years. What is and what has been the relation between wages paid and divi-

dends declared in various industries? What again has been the relation between wages earned and the cost of living as shown by the price of necessities?

We must use the historic method, inquiring into the real causes of strikes and "lockouts," getting not only the facts, but the mental attitudes produced by those facts. We must lay out the problem before we can seek for the answer.

It cannot be too strongly emphasized that this is a job for the strongest men in the nation; unless big business takes a hand in this thing it is not going through. Look at England. Our friend Riordan was over there at the outbreak of the war, hoping to get distressed Americans home, and he told me of the astonishing disaffection of the laboring classes as it was illustrated by men with whom he had talked. Yet out of this material Kitchener built an army and Lloyd George established a common purpose. We all know of the strikes and labor troubles that arose at first. The common danger was not enough, to consolidate clashing interests. It needed the right men to take the lead.

And we must somehow or other get the co-operation of the labor leaders. Whatever may be their shortcomings they understand the psychology of their followers far better than we do. They have solved the problem of getting men to sacrifice their immediate interests for a common aim.

One of the most important points you have brought up is the use of men's leisure. The eight hour laws leave much spare time to be utilized; many of the proposals to make use of this have failed because they were simply recreative. This time must be made profitable. That is why farming, gardening and poultry keeping are so popular. The results are tangible and personal. There isn't a man breathing who is not the better for a hobby.

When I started to write this letter I intended to make it a brief acknowledgment of yours and to write a reply to your paper later. I am going to make this letter my reply, and the essence of it is this: The hour for a thorough re-establishment of these relations is now; the place is here. Can we find the man?

And so, once more, I make you my executor; take what you will of this and my previous epistles and send it to the Bulletin as my contribution to the "Brownian Movement."

GILBERT RIGG.

Associated Smelters Proprietary, Limited,
Melbourne, Aust., August 20, 1916.

KERR LAKE.

The annual report of the Kerr Lake Mining Co., made public this week, shows net profits of \$813,702 for the year ended August 31st, comparing with a net of \$550,774 in the previous year. The balance sheet shows a profit and loss surplus of \$1,033,570, the cash item showing an increase from \$265,777 on August 31st, 1915, to \$545,059 on August 31st, 1916. Production during the year was 2,433,793 oz., yet at the close of 1916 ore reserves were estimated at 3,827,000 oz. of silver, comparing with 4,172,400 oz. at the close of the previous year.

The statement indicates that Kerr Lake, in spite of a year of heavy production, has brought into sight nearly an ounce of silver for every ounce extracted. Costs during the year were 25¼ cents per ounce.

THE OCCURRENCE OF NICKEL ORES*

Nickel is one of the metals that are of especial interest at the present time in connection with the manufacture of alloys, notably steel alloys. Nickel finds its chief use in the production of nickel steel, which is one of the most valuable of the special steels. Its use as an alloy with copper and zinc in imitation of silver, under various names, has long been known.

Nickel was discovered by Cronstedt in 1751 in a cobalt ore from Helsingland, Sweden. The element was found later by Cronstedt in the mineral niccolite (nickeline, nickelite or copper nickel), an arsenide of nickel, and it was presumably in the form of this mineral that nickel was present in the Swedish cobalt ore in which Cronstedt discovered the element. By German miners the mineral niccolite was known as kupfernickel (false or worthless copper), from its fancied resemblance to copper, and it was from this name that the name nickel was derived.

Formerly the amount of nickel ore required was small, and the supply was obtained from European deposits, notably those of Scandinavia, and from certain deposits in the United States.

The discovery of nickel ore in New Caledonia was made in 1865 by M. Jules Garnier, after whom garnierite, the chief nickel mineral found there, was named. Little mining was done in New Caledonia before 1875, however, though this locality soon after became the chief source of supply.

It was at a later date than this that the importance of the copper ores of Ontario came to be recognized as a source of nickel. Nickel was reported to occur in the Sudbury district of Ontario as early as 1856, but it was not until this region came to be opened up by the Canadian Pacific Railway in 1883 that important deposits were discovered. The copper ore originally mined at Copper Cliff, where mining commenced in 1886, was not suspected to contain nickel, and it was not until 1888 that the production of copper-nickel matte commenced. The Canadian output grew rapidly from that date, and Ontario soon took first place in the world's nickel production. This place it has since held, and its only serious competitor at present is New Caledonia.

Nickel Minerals.

The chief nickel minerals are nickeliferous pyrrhotite (iron sulphide), pentlandite (sulphide of iron and nickel), and garnierite (hydrated nickeliferous magnesium silicate). Other nickel minerals of some note include millerite and polydymite (nickel sulphides), niccolite and chloanthite (nickel arsenides), gersdorffite (sulpharsenide of nickel), and annabergite (hydrated arsenate of nickel).

Pyrrhotite, also known as magnetic pyrites, is a sulphide of iron approximating in composition to the protosulphide (FeS), but with a slight excess of sulphur over the amount required by this formula. The mineral frequently contains nickel, usually in the form of pentlandite. It is occasionally found in the form of tabular hexagonal crystals, but is usually massive. It is an opaque mineral, pale bronze-yellow to brown in color, with a metallic lustre, and is highly magnetic. Its hardness is about 4, and specific gravity 4.6.

Pentlandite is a sulphide of iron and nickel of variable composition, but usually corresponding to the formula (Fe,Ni)S. It occurs as inclusions in pyrrhotite, and is the chief nickel mineral of the Sudbury de-

posits. It crystallizes in the cubic system, and shows an octahedral cleavage. The mineral is opaque, pale bronze-yellow in color, with a metallic lustre. When free from pyrrhotite it is only weakly magnetic.

Garnierite, sometimes called noumeite or genthite, is, as already mentioned, the nickel mineral of the New Caledonia deposits. It is a hydrated silicate of magnesium, containing a variable amount of nickel, which ranges from 2 or 3 per cent. up to 30 per cent. or more. The mineral occurs as a compact earthy material in the form of veins traversing serpentine. It varies in color from pale green to dark green, whilst the hardness and specific gravity are also variable, the former ranging up to 3, and the latter from 2.27 to 2.87.

Niccolite, or kupfernickel, is an arsenide of nickel (NiAs), belonging to the hexagonal system, but is usually found massive. It is an opaque mineral, of pale copper-red color, with a metallic lustre. The hardness is about 5½, and specific gravity 7.5. Weathered specimens turn green owing to the formation of annabergite.

Millerite is a sulphide of nickel (NiS). It crystallizes in the rhombohedral system, but is usually found in the form of hair-like growths. It is opaque, brass-yellow in color, with a metallic lustre. The hardness is about 3½, and specific gravity 5.65.

Gersdorffite is a sulpharsenide of nickel (NiAsS) belonging to the cubic system. The mineral is opaque, white in color, often with a grey tarnish, and has a metallic lustre. Its hardness is about 5½ and its specific gravity varies from 5.8 to 6.2. As in the case of niccolite, weathered specimens turn green through the formation of annabergite.

Chloanthite is a nickel diarsenide (NiAs₂) usually with appreciable amounts of cobalt and iron replacing the nickel. It crystallizes in the cubic system. It is an opaque mineral, tin-white in color, with a metallic lustre. The hardness is about 6, and the specific gravity varies from 6.4 to 6.8. Weathered specimens of this mineral turn green owing to the formation of annabergite.

Annabergite is a hydrated arsenate of nickel (Ni₃As₂O₈·8H₂O). It usually occurs as an apple-green, earthy alteration product on weathered specimens of nickel arsenide minerals, and is of importance as an indicator of the presence of these minerals.

Nickel Ores in Europe.

United Kingdom.—Nickel minerals occur in veins of copper ore in Cornwall, and niccolite was formerly worked to some extent at the Pengelly mine, St. Ewe; whilst pentlandite is stated to have been found in some quantity at the Wheal Jane lead mine near Truro. Millerite is reported to occur in certain clay ironstones of the South Wales Coal Measures, notably those about Merthyr Tydvil.

According to the Home Office Mines and Quarries Report (Part III.), nickeliferous asbolan was formerly obtained in small amounts in Flintshire. The Report also states that nickel mining was started in Kirkeudbrightshire in 1897, and that 300 tons of ore, valued at £300, was raised.

Austria-Hungary.—At Schweidrich, near Schluckenu in Bohemia, there is an occurrence of nickeliferous pyrrhotite impregnating a basic dyke that tra-

* Extracts from an article published in the Bulletin of the Imperial Institute, London.

verses granite. The deposit, however, is of no economic importance.

Nickeliferous cobalt ore was formerly worked at Dobschau in Hungary.

Germany.—Nickel mines were formerly worked at St. Blasien in the southern Black Forest. The ore here is nickeliferous pyrrhotite associated with pyrite and chalcopyrite, occurring in association with basic intrusive rocks of the gabbro type.

Nickeliferous copper ores containing on the average 12 to 15 per cent. of copper and about 3 per cent. of nickel were formerly worked at the Hulfe-Gottes mine, Nanzenbach.

Nickeliferous cobalt ores occur in the Harz and the Saxon Erzgebirge.

A notable German deposit of nickeliferous pyrrhotite is that of Sohland in Lausitz, Saxony. Here the occurrence resembles that already mentioned at Schweidrich in Bohemia. The ore occurs in a basic dyke, and as mined it contained from 5½ to 6 per cent. of nickel, together with some copper. The ore occurs at the margin of the dyke in contact with the enclosing granite.

Nickel ores have been worked at mines situated to the north of Frankenstein in Silesia. The ore occurs as a fissure-filling in serpentine and usually contains from 0.5 to 3 per cent. of nickel. Less commonly, ore containing from 4 to 18 per cent. has been obtained.

Greece.—A deposit of nickel ore of some importance is stated to occur on the Greek island of Locris, east of Athens. The mine commenced operations as one of iron-ore. Below the iron ore a deposit of nickel ore, consisting of earthy brown material, with patches resembling garnierite, was obtained. A sample of the ore was found to contain 7.22 per cent. of nickel. The nature of the deposit suggests that it has probably been formed by the weathering of nickeliferous serpentine. Material from this deposit has been smelted at Evje in Norway.

Italy.—At Varallo in Piedmont a basic intrusion consisting partly of norite contains nickeliferous pyrrhotite. Mines were formerly worked at this locality.

Norway.—Nickeliferous pyrrhotite deposits similar in character and mode of origin to those at Sudbury in Canada occur in various parts of Norway. The pyrrhotite occurs as a segregation product in norites that are intrusive in gneisses and schists. A notable occurrence is that of the Flaad mine (Evje mine) near Evje, where a large amount of nickel ore has been mined. The ore deposit here occurs partly within and partly at the margin of an intrusive mass of gabbro and norite. The ore contains a high percentage of pyrrhotite associated with chalcopyrite. Selected ore contains 4.6 per cent. of nickel and 1.5 per cent. of copper; but the average values are stated to be 2.3 per cent. of nickel and 1.2 per cent. of copper. Another notable productive deposit of pyrrhotite in norite is that of the Erteli mine, near Ringerike.

The ore from the Flaad mine is smelted to a matte at Evje, and that from Erteli mine at the Ringerike nickel works. The matte is refined at Christiansand by a special electrolytic process known as the Hybinette process, from its inventor, N. V. Hybinette.

In this process the matte is first roasted and converted into oxides. It is then leached with weak sulphuric acid to extract copper sulphate, after which the residue is heated with sulphuric acid to a temperature at which hydrous sulphates do not exist. It is then again leached with weak sulphuric acid to extract copper sulphate. Afterwards it is heated with hydrochloric acid to a temperature sufficiently high to cause

partial decomposition of the anhydrous chlorides, and again leached with weak acid, the heating being repeated if necessary. The ultimate residue thus obtained contains nickel oxide which can be refined by ordinary means.

According to the Diplomatic and Consular Report on Norway for 1913, the output of ore at the Flaad mine for that year was 28,000 tons. A small amount of ore was obtained also from the Faeo mine near Haugesund. A quantity of ore, amounting to 19,000 tons, from the Erteli mine was smelted at the Ringerike nickel works, which are now leased by the Christiansand nickel refining company. The amount of imported ore smelted at Evje and Ringerike during 1913 was 3,000 tons. The Hybinette refining process at Christiansand produced 600 tons of nickel and 350 tons of copper during 1913, as compared with 400 tons of nickel and 200 tons of copper in 1912. Some platinum, palladium, gold and silver were obtained as by-products.

Russia.—A deposit of nickel ore of the garnierite type occurs at Rewdinsk in the Urals, south-west of Ekaterinburg. It occurs in an almost vertical quartz vein, about 6 ft. thick, which traverses serpentine rocks. The ore contains from 4.8 to 19.2 per cent. of nickel oxide, but the deposit is small. Several attempts have been made to work the deposit.

In the Verkhne-Ufalei district to the south-east of Rewdinsk, H. W. Turner reports the occurrence of nickeliferous pyrite in the Nijni-Kardadinsk mine (Bull. Amer. Inst. Min. Eng., 1914, p. 191), in a black carbonaceous deposit. This carbonaceous material contained 14.85 per cent. of fixed carbon, 26.55 of volatile matter, 35.65 of moisture, and 1.69 of nickel and cobalt. The ash obtained by burning the carbonaceous matter constituted 22.9 per cent. of the sample and contained 7.2 per cent. of nickel.

The orebodies at this and other mines in the district are iron ore consisting of a mixture of chalybite and limonite and are associated with deposits of nickeliferous serpentine. Nickeliferous pyrite occurs in the limonite-chalybite deposit. The deposit has been tested by boring and an average sample of the iron ore, representing about 40,000 tons of ore, was found to contain 0.75 per cent. of nickel. A sample of pyrite obtained by concentrating the crushed ore was found to contain 6.28 per cent. of nickel.

Spain.—Nicolite associated with chromite occurs in a mass of serpentinized peridotite at Los Jarales, 35 km. northwest of Malaga. At and near the surface the ore is altered to garnierite. The deposits are stated to be small in extent.

Sweden.—At various localities in Sweden, notably at Klefva in Smaland, nickel ores occur, and were formerly worked to a small extent. These Swedish occurrences resemble those of Norway.

Switzerland.—Nickel ore occurs in the Gollyre and Grand Praz mines, near Ayer, in the Val d'Anniviers. An ore averaging 3 to 4 per cent. nickel, 7 to 8 per cent. cobalt, and 2 to 3 per cent. bismuth is stated to occur at Kaltenberg in Turtmanntal.

Nickel Ores in Africa.

Union of South Africa.—A promising deposit of nickeliferous pyrrhotite, closely similar to that at Sudbury in Canada, occurs at Insizwa, Cape Province. Here, as at Sudbury, there is a basin-shaped mass of intrusive norite, from 2,000 to 3,000 ft. thick, lying in the shales and sandstones of the Beaufort series of the Karroo system.

The ore when fresh consists chiefly of pyrrhotite, pentlandite and chalcopyrite. There are two different

kinds of ore, one rich in chalcopyrite with only a small amount of nickel, the other rich in pyrrhotite and pentlandite, with a larger proportion of nickel. Bornite and niccolite also occur in the ore. The ore contains platinum, probably in the form of sperrylite.

The following is a summary of the values yielded by material obtained from the adits of the Insizwa mining area:

Maximum—Copper, 19.3 per cent.; nickel 7.3 per cent.; platinum, per ton of 2,000 lb., 4 oz. 19 dwt.

Minimum—Copper, 1.2 per cent.; nickel, 0.6 per cent.; platinum, per ton of 2,000 lb., 12 grains.

Average of fourteen analyses—Copper, 4.1 per cent.; nickel, 3.8 per cent.; platinum, 2 dwt. 15 grains.

Cobalt, silver, gold and osmiridium are present in traces.

Two trial shipments of about 5 tons each were sent to England. Samples from these, on analysis, gave the following results:

Copper—1, 3.4 per cent.; 2, 3.5 per cent.

Nickel and cobalt—1, 4.9 per cent.; 2, 5.25 per cent.

Gold—1, 6 grains per ton; 2, 6 grains per ton.

Platinum—1, 2 dwt. 12 grains per ton; 2, 12 dwt. per ton.

Silver—1, 10 dwt. per ton; 2, 12 dwt. per ton.

There appears to be no doubt that these ores of the Insizwa range are genetically connected with the intrusion of norite, and that they segregated from the norite magma in the same way as the Sudbury ore. (See Report by A. L. Du Toit in the Fifteenth Ann. Rep. of the Geol. Commission, Cape of Good Hope Dept. of Mines, 1910).

A basic laccolitic intrusion, including some norite, occurs in the Tugeli mountains of Natal under geological conditions resembling those at Insizwa. In this intrusive rock occurs a deposit of nickel ore, consisting of nickeliferous pyrrhotite associated with chalcopyrite.

Nyasaland.—Nickeliferous pyrrhotite, similar to that of Insizwa and Sudbury, occurs in the Blantyre district of Nyasaland, where it is found in masses of norite. A sample examined at the Imperial Institute some years ago was found to contain pyrrhotite, chalcopyrite and possibly pentlandite. It contained 41.28 per cent. of iron (present as sulphide), 3.96 per cent. of nickel, 0.28 per cent. of cobalt, and 0.99 per cent. of copper. A trace of platinum also was present.

Madagascar.—Madagascar possesses deposits of garnierite in serpentine similar to those of New Caledonia (see below). Such a deposit is found at Valojoro, near Ambatofanghana. A sample of garnierite at this locality was found to contain 26 per cent. of nickel oxide (NiO).

A deposit containing ore, with an average of from 3 to 4 per cent. of nickel, is stated to have been opened up near Ambositra, not far from a waterfall capable of supplying power for mining and smelting the ore.

Nickel in Australasia.

Tasmania.—Nickel minerals are reported to occur in several of the western districts of Tasmania. In the Zeehan tin-field veins of the nickel-silver-cobalt type occur, and the mineral niccolite occurs in some abundance in the veins. At Trial Bay deposits of the garnierite type occur in serpentine, associated with pentlandite and niccolite. In the Zeehan district the mining of nickel ore has been carried on recently by the Dundas Currie Mining Co., Ltd., and by the Copper-Nickel Prospecting Syndicate; but mining was stopped at the outbreak of the war owing, it is stated, to their

inability to dispose of the ore. During 1914 the Copper-Nickel Prospecting Syndicate sold 3,089 tons 4 cwt. of copper-nickel ore for £15,815. The metal contents of the ore were about 10 per cent. nickel and 4½ per cent. copper.

New South Wales.—Nickel ore occurs at Port Macquarie in New South Wales. This occurrence resembles that in New Caledonia. The nickel ore occurs in nests and pockets scattered irregularly through a mass of serpentine and the clayey material resulting from the decomposition of the serpentine. The most promising deposits occur at the base of red ferruginous clays and in the upper layer of the decomposing serpentine. The ore is a nickeliferous asbolan. An analysis of an average sample gave 31.05 per cent. of manganese dioxide, 7.48 cobalt oxide (CoO), 1.36 nickel oxide (NiO), 0.41 chromic oxide (Cr₂O₃), and 0.05 per cent. copper oxide (CuO). A picked sample contained 7.03 per cent. cobalt oxide and 2.39 per cent. nickel oxide. The ore appears to be too irregular and uncertain to make its working profitable, and none has been mined at this locality since 1904.

New Caledonia.—The only nickel ores of the world comparable in commercial importance at the present time with those of the Sudbury district of Ontario are the garnierite ores of the island of New Caledonia, a French colony in the Pacific in latitude 22 deg. S., and some 800 or 900 miles east of the Queensland coast of Australia. The ore has been mined chiefly in the Thio district on the east side of the island.

Geologically, New Caledonia is made up of ancient schists and Mesozoic sedimentary rocks and an extensive series of intrusive igneous rocks. Included in the igneous rocks are large masses of peridotite (olivine rock), which have suffered hydration to a large extent and become converted into serpentine. The serpentinized peridotites stretch along a mountain chain from the southeastern portion of the island towards the northwest end. It is in these serpentines that the garnierite deposits occur, in the form of veins and concretionary masses. The unaltered olivine rock contains nickel, sometimes in considerable quantity, and certain samples of peridotite are reported to contain as much as 2½ per cent. of nickel.

It is, however, in the garnierite veins traversing the serpentine that the rich deposits occur. The richer garnierite contains from 20 to 45 per cent. of nickel oxide (NiO), and there is a vast amount of poorer silicate containing a lower but still considerable percentage of nickel. The ore grades from rich garnierite vein-like deposits to poor nickeliferous earth containing only a small amount of nickel. The extreme result of decomposition of the peridotite is the formation of a red clayey material, much of which is associated with the nickel ore.

The rich ore is found at and near the surface, where it occurs in the form of weathered sheets up to 20 ft. in thickness, and is worked in open quarries. Formerly a fairly rich ore, containing up to 12 per cent. of nickel, was produced. Latterly it has been the practice to mix poorer material with the richer ore, to produce an ore containing some 5½ per cent. of nickel in the condition of a hydrated silicate, the percentage being raised to an average of from 6½ to 7 per cent. on drying at 100 deg. C.

Nickel is exported from New Caledonia partly in the form of ore and partly in the form of matte. There has been an increase in the amount of matte produced in recent years. The production during 1913 amount-

ed to 91,694 tons of ore valued at £114,345, and 5,799 tons of matte valued at £150,152. This represents an increase in value of £13,288 for ore and £6,150 for matte as compared with 1912. The output of nickel during 1914 is stated to show an increase of 4 per cent. as compared with 1913.

For further details respecting the nickel deposits of New Caledonia, reference should be made to a report on these deposits by M. E. Glasser (Ann. des Mines, 1903, pp. 299 and 397).

Nickel in Asia.

India.—Rocks of the norite type occur in some abundance in various parts of India, and pyrrhotite is abundant at some localities, as in Travancore. A sample of Travancore pyrrhotite examined at the Imperial Institute some years ago was found to contain some chalcopyrite and molybdenite. An analysis showed the presence of 0.63 per cent. of nickel oxide (NiO), 0.15 per cent. of cobalt oxide (CoO), and 0.39 per cent. of copper oxide (CuO). A small amount of gold and probably also a trace of platinum were present.

Nickeliferous pyrrhotite occurs also at various localities in Rajputana, as at Khetri, and in the Kolar gold reefs, associated with chalcopyrite.

PROPOSED DEPARTMENT OF MINERALS AND METALS.

The following letter was addressed to Sir William S. McCormick, Chairman, Advisory Council for Scientific and Industrial Research, London: On behalf and by authority of the Councils of the following institutions: The Iron and Steel Institute (incorporated by Royal charter as representing the iron and steel industries); the Institute of Metals (incorporated as representing the users and manufacturers of non-ferrous metals and alloys); the Institution of Mining Engineers (incorporated by Royal charter as representing coal and iron ore mining and allied industries); and the Institution of Mining and Metallurgy (incorporated by Royal charter as representing the mining of minerals other than coal and iron ores and the production of metals other than iron and steel.

We, the undersigned, have the honor to submit the following considerations and recommendations in the hope that through the intervention of the Committee of the Privy Council for Scientific and Industrial Research, measures may be taken to provide the necessary machinery for the protection and advancement of the economic welfare of the mineral and metal industries of the Empire.

The absence of effective co-ordination of the organizations of these vital industries has been demonstrated and brought into prominence by the war, in many directions. The grave results to the national interests are generally admitted.

There are highly organized geological surveys and departments of mines in nearly all foreign countries, and their influence in the development of mineral resources is a factor of the first importance. There are similar well organized departments in some of the British Dominions, but there is no connecting link or central "clearing house" in the Metropolis of the Empire to co-ordinate information on its mineral resources, to stimulate their development and to safeguard Imperial interests.

Various departments of the Home Government, such as the Geological Surveys and Museum of Practical Geology, the Board of Trade, the Home Office, the Imperial Institute, and, since the outbreak of the present

war, the Foreign Office, the Admiralty, the War Office and the Ministry of Munitions, have all been concerned with the collection of information bearing on the sources of minerals and the production of metals. There does not appear, however, to have been any serious attempt to co-ordinate and render available even such information as has been collected by these departments, and it is certain that there has been considerable overlapping and duplication of effort with corresponding waste and confusion.

It is, we submit, obvious that the overlapping and confusion will be seriously increased if the various Technical Committees appointed by the Advisory Council attempt to collect the information which is essential to enable the beneficent object of the Committee of the Privy Council to be attained in its wider aspects, in regard to the mineral and metal industries.

We respectfully urge this view upon the serious attention of the Advisory Council, as already there are evidences of increasing overlapping and consequent waste of time and energy, which we believe it is one of the main purposes of the Committee of the Privy Council to eliminate as far as possible.

In the opinion of the institutions represented by us the organization of a central Department of Minerals and Metals is imperatively necessary in the public interest, and the work of organization, which will necessarily take much time to complete, should be commenced at the earliest possible moment.

It cannot be doubted that if a properly organized and efficiently conducted Department of Minerals and Metals had been in existence, much valuable time, many lives and vast sums of money would have been saved to the nation in the conduct of the present war, and much of the cost and inconvenience to British industries depending largely for their raw materials on mineral products would have been saved, with corresponding advantages to the prosecution of the war and to many industries.

A Department of Minerals and Metals should not only be in intimate relationship with the Geological Surveys and Mines Departments of the Dominions, but also with the organizations representing the different branches of the mining and metallurgical industries, whose co-operation in the work of the department should form a vital part of its machinery.

The Geological Surveys of Great Britain and Ireland and the Museum of Practical Geology should also form an integral part of the department.

The functions of the department should be active and constructive. All overlapping by other Home Government departments, and also by the institutions representing the industries, should be absolutely prevented.

The duties of a Department of Minerals and Metals would include:

1. Arrangements for expediting the completion of Mineral Surveys of the United Kingdom and of the Crown Colonies and other British possessions.

2. The systematic collection and co-ordination of information bearing on the occurrence, uses and economic value of minerals and their products; special attention being devoted to securing industrial applications for newly-discovered minerals or metallurgical products and to finding mineral materials required for new metallurgical products or inventions. Some of this information should be promptly and widely disseminated in summarized form to those interested in the industries, through the medium of the existing publications of the institutions directly concerned.

3. The investigation of all questions and problems relating to the utilization of the mineral or metallurgical resources of the Empire.

4. The co-ordination and dissemination of information on mining laws, development of mineral areas, output, processes of extraction, plant, capital employed, markets, etc., etc.

5. A general review from time to time of the developed and undeveloped mineral resources and of the position of each mineral or metal, to ensure that the mineral wealth of the Empire is being exploited with due regard to Imperial interests.

6. Generally, to advise the Imperial Government on all questions bearing on the mining and metallurgical industries. To perform this function efficiently, it is essential that complete information should be available, and also that the industries concerned should be consulted through their respective organizations.

We feel sure that the Advisory Council will fully appreciate the urgency of the question and the necessity for prompt action, so that the process of co-ordination may be inaugurated at once.

We are, sir, your obedient servants, Wm. Beardmore, G. C. Lloyd, George Beilby, G. Shaw Scott, W. Thorneycroft, L. T. O'Shea, P. Strzelecki, Edgar Taylor, C. McDermid.

PERSONAL AND GENERAL

Mr. J. B. Tyrrell was at Herb lake, in The Pas mining district, last week.

Mr. E. L. Bruce, of the Geological Survey of Canada, is mapping the Herb lake district.

Dr. W. G. Miller, Provincial Geologist, and T. F. Sutherland, Chief Inspector of Mines, have returned to Toronto from Australia, after visiting the nickel deposits of New Caledonia and Tasmania.

Mr. Geo. T. Holloway, Mr. McGregor Young and Mr. T. W. Gibson have been holding sittings of the Nickel Commission at Sudbury, Porcupine and Cobalt.

Mr. Geo. Armstrong has resigned as manager of the Grafton mine, in Whitehorse copper camp, Southern Yukon, and has been succeeded by Mr. J. P. Whitney.

Mr. O. Lachmund, of Greenwood, Boundary district of British Columbia, late in September was a Coleman, Alberta, endeavoring to secure more coke for the company's smelting works.

Mr. F. J. Murphy, of Sandon, Slocan, B.C., assistant superintendent of the Surprise silver-lead-zinc mine and concentrating mill, was married on September 28 at New Denver, Slocan lake, to Miss Rubie LaNoir Rowland, of Kellogg, Coeur d'Alene district of Idaho.

Mr. Wm. Fleet Robertson, of Victoria, B.C., Provincial Mineralogist, visited the Consolidated Mining & Smelting Co.'s works at Trail late in September with Dr. Wm. Lorimer, the member of the Dominion Royal Commission, who gave especial attention to mining and mineral resources when in British Columbia. Mr. Robertson also went to the Boundary district.

The Western Branch of the Canadian Mining Institute will hold its twenty-third general meeting at Trail, British Columbia, on Thursday, October 26. It is proposed to next day visit Rossland.

Mr. Chas. M. Campbell, superintendent of the Granby Consolidated M., S. & P. Co.'s big copper mines near Phoenix, Boundary district of British Columbia, is on a trip through the eastern provinces of Canada. He left Phoenix on September 15th.

Mr. Barclay Bonthron, of Vancouver, B. C., has been looking over a number of mineral claims situated in northeast Kootenay.

Mr. J. C. Murray, who now holds a commission with the Canadian Engineers as a tunneling officer, was in Toronto last week.

Mr. Miles Barrett, foreman at the Granby Consolidated Co.'s copper smeltery at Grand Forks, B. C., has gone to Chicago, Illinois, on a holiday trip. He left Grand Forks on September 14th.

Mr. F. H. Shepherd, M.P. for Nanaimo, Vancouver island, B. C., who several years ago was chief inspector of mines for British Columbia, has returned from Europe, where he was a member of a Parliamentary party that visited British and French soldiers behind the battle lines in France and Belgium.

Mr. Sidney Norman, editor of Northwest Mining Truth, published in Spokane, Washington, has been making a tour of the Slocan district of British Columbia, where he visited a number of operating mines and concentrating mills.

Mr. Joseph Lancaster, of Spokane, Washington, has been examining mineral claims in the Lardeau district, British Columbia.

Mr. James Cronin, of Spokane, Washington, after having had a busy summer and autumn season opening his silver-lead mine in the Babine section of Omineca mining division, British Columbia, is having supplies taken in from Hazelton by pack train, so that development work may be continued throughout the winter.

Hon. Lorne A. Campbell, of Rossland, B. C., Minister of Mines for British Columbia, failed to secure reelection at the recent Provincial election, so will shortly relinquish the portfolio of Mines in the Government of British Columbia, nearly all the other members of which were also defeated at the polls in September.

COAST COPPER CO., BRITISH COLUMBIA.

The Coast Copper Co. is a company recently incorporated and gazetted in British Columbia, to acquire 31 mineral claims in Quatsino mining division, Vancouver island. The directors are stated to be Messrs. J. J. Warren, R. H. Stewart and S. G. Blaylock (respectively, managing director, general manager and assistant general manager of the Consolidated Mining & Smelting Co. of Canada, Ltd.), and Maurice W. Bacon and W. E. Cullen of Spokane, Washington.

The claims include what have long been known as the Merry Widow and Old Sport groups. In the British Columbia "Preliminary Review, 1915," reference was made to these properties, as follows: "Some further development has been done on the Merry Widow and Old Sport claims, where a large amount of very fair ore has been developed by diamond drilling. The property is some 20 miles from navigable water, and is consequently without much value until a railway can be constructed to salt water."

The mining recorder for Quatsino division reported for 1915: "The work done this year at the Old Sport mine, owned by the Quatsino Copper Co., Ltd., consisted of driving a 500 ft. tunnel, which cut through a 25 ft. lode of low grade copper ore at a depth of 135 ft. Stripping and crosscutting on the surface exposes the lode for more than 3,000 ft. The property shows up well under development, but, owing to some financial troubles, the company decided in August to suspend work."

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA

Another dividend payment declaration has been made, namely, that of the Granby Consolidated Mining, Smelting and Power Co., which will pay on November 1st \$2 a share, or a total for this profit distribution of \$299,970. Other dividend payments this year were \$1.50 a share in February, \$1.50 a share in May, and \$2 a share in August; in all \$7 a share for the current calendar year. Dividends paid in 1915 totalled \$3 a share; in 1914, \$3; in 1913, \$6; and in 1912, nil; so that the total for 1916 will be the highest in the five years just mentioned.

The shortage of labor at Crow's Nest collieries continues to adversely affect the smelting works of West Kootenay and Boundary districts. While the Granby Consolidated Co., which has a considerable holding in the Crow's Nest Pass Coal Co., has been getting more coke lately than about two months ago, and as a consequence has been able to increase the number of furnaces in blast at its works at Grand Forks to seven out of a total of eight, conditions have lately become less favorable at Trail, where the Consolidated M. and S. Co. had two of its copper furnaces idle during the third week of September. The British Columbia Copper Co. also finds its smelting operations restricted; it has only one furnace in blast.

East Kootenay.

The resumption of mining at the Paradise mine, in Windermere division of East Kootenay, is a result of the construction and operation of the Kootenay Central railway from Golden on the main line of the Canadian Pacific Railway system southward up the valley of the Columbia river, and thence down the valley of the Kootenay river to the railway company's Crow's Nest railway. A newspaper correspondent writing from Invermere, on Windermere lake, through which the Columbia river passes, states that the first car of ore from the Paradise since work was resumed at the mine was shipped on September 5th. Eight heavy teams were hauling ore from the mine about 30 miles to the railway. Twenty-one men were employed at the mine and more were to be put on.

Mr. J. D. Galloway, Assistant Mineralogist, visited the property in the summer of 1915. He reported that the mine is situated near the head of Spring creek basin, at an elevation of from 8,400 to 8,800 ft., well above the timber-line. The mine camp, consisting of bunkhouses, cookhouse, office, storehouse, etc., is on level ground in the basin, and the mine-workings are on the sloping hillside to the north. Camp buildings were also erected at Pinehurst, about halfway between the mine and the Columbia, when ore was hauled in former years. During six years, 1901-1906, 1,996 tons of ore were shipped; metal contents were 2,368,972 lb. of lead and 102,784 oz. of silver, the average metallic content having been 51.4 oz. of silver to the ton and 59.3 per cent. lead.

West Kootenay.

Ainsworth—Shipments of ore to Trail from mines in this division during three weeks ended September 21st totalled 925 tons. The mines and their shipment totals were as follows: Bluebell, 140 tons; Comfort, 76 tons; Highland, 523 tons; and Utica, 186 tons. The Bluebell was on the Trail list for the week ended September 21st for the first time in nine weeks, flood waters having caused damage to water-supply lines in the latter half

of June, and a consequent suspension of mining and concentrating operations for about two months.

Slocan—Ore received at Trail from Slocan mines during three weeks ended September 21st was as follows: From Black Prince, 29 tons; Enterprise, 36 tons; Galena Farm, 119 tons; Hewitt, 43 tons; Idaho-Alamo, 41 tons; Lucky Thought, 82 tons; Rambler-Cariboo, 104 tons; Ruth, 56 tons; Slocan-Payne, 23 tons; Standard, 348 tons; Wonderful, 40 tons; total, 921 tons.

Rossland—Rossland mines shipped 16,410 tons of ore to Trail during three weeks ended September 21st, as follows: Centre Star group, 9,630 tons; Le Roi, 5,674 tons; Le Roi o.N 2 Co.'s Josie group, 1,106 tons. With the exception of 71 tons shipped some months ago, no other mine in Rossland camp than those mentioned above has been on the producing list.

Nelson—It has been reported from Salmo that the low-level adit being driven at the Hudson Bay mine, on Deer creek, has cut stringers of zinc sulphide ore at about 1,650 ft. in from its portal. Much zinc carbonate ore has been mined on the main level driven at a depth of 200 ft. below the outcrop of the ore, and in the 300-ft. level opened from the bottom of a winze sunk 100 ft. deep from the main level. Last year's shipments from the Hudson Bay and adjoining Zincton mines totalled 5,171 tons of ore, containing 3,127,209 lb. of zinc; this year also, much ore has been shipped, but figures showing the total quantity are not available. With the object of cutting the ore at greater depth, a commencement was made last spring to drive a crosscut adit at nearly 600 ft. below the 300-ft. level, and it was calculated that 1,750 ft. would have to be driven to get under the orebody being worked in the 300 and 200-ft. levels. Now, at about 100 ft. short of that distance, as already stated, stringers of zinc sulphide ore have been cut, which is regarded as a most favorable indication that the vein will be found ahead. If a strong body of zinc sulphide ore shall be opened at the depth the low-level tunnel is being driven, it will be one of the most important developments made in recent years in connection with mining in Nelson division.

Omineca Division.

Information published at New Hazelton makes it appear that mining prospects are good in the Nine-Mile Mountain region of Omineca mining division. Several mining properties in Silver Cup basin have been examined lately for the purpose of ascertaining whether there is much ore in that neighborhood suitable for milling should a concentrating mill be established there. The properties examined were the Silver Bell, Silver Cup, Barber group, Sunrise, and others. The examining engineer was Mr. W. G. Norrie, superintendent of the Silver Standard mine, on Glen mountain. While his report had not been prepared when the account of his trip was made public, it was understood that he was well pleased with what he saw. The last official report of the district Gold Commissioner that has been published gives the following particulars: "From the Silver Cup group 70 tons of ore have been shipped to the smeltery, the predominating mineral being galena containing silver. Shipments from the Sunrise group have been about 74 tons of argentiferous galena. From the Barber group, 16 tons of ore taken from open-cuts at the surface has been sent to Trail. Ten tons of galena ore shipped from the Silver Bell assayed 110 oz. silver to the ton and 70 per cent. lead, with a little zinc. The American Boy property, owned by the Harris Brothers, of Hazelton, shipped to Trail

15 tons of ore which assayed gold 0.04 oz. and silver 98 oz. to the ton, lead 30 per cent., and zinc 14 per cent. There is on the dump about 600 tons of ore worth \$35 a ton, and 3,000 tons of ore of a similar class developed in the mine and ready for stoping whenever capital shall be obtained to provide milling facilities. The Provincial Government wagon-road to the Nine-Mile basin, that has been in course of construction for several years, was completed last year, thereby facilitating the development of mining properties in the basin.

Owing to delay in completing the wagon-road to the Babine-Bonanza Mining and Milling Co.'s group of mineral claims, situated at the head of the Tuchi river in the Babine range of mountains, shipment of ore will not be undertaken as soon as had been intended. The mine is at an elevation of about 5,300 ft.; it is just over the divide from the head of Driftwood creek, and is distant about 22 miles by trail from Smithers on the Grand Trunk Pacific railway. The company is controlled by Mr. James Cronin, of Spokane, for many years largely interested in the St. Eugene lead-silver mine, in East Kootenay, which big mine made its greatest production during the period of Mr. Cronin's management. From an official report, by Mr. J. D. Galloway, Assistant Mineralogist, it is learned that the orebodies on the property of the Babine-Bonanza Co. occur at and near the contact of a granite porphyry with a series of highly altered sediments of the Hazelton group. Two types of orebodies are found, and the dominant minerals in them are galena and zinc-blende, together with lesser amounts of pyrite, arsenopyrite, and copper pyrites. The value is chiefly in silver and lead, although certain shoots of the ore contain a high percentage of zinc. Assay returns from samples taken by Mr. Galloway include one of ore from the bottom of a shaft then 105 ft. deep, an average of a 30-in. vein having been gold 0.02 oz., and silver 59.6 oz. to the ton, lead 54.6 per cent., and zinc 11.8 per cent. Since the visit of that official much more development work has been done, including an adit to cut the ore at greater depth. Mr. Cronin has been interested in this property ever since 1909, to which mining plant has been taken under considerable difficulties owing to lack of wagon-road communication, but it now seems as if transportation conditions will be greatly bettered by the time the winter shall set in.

General Notes.

The Provincial Government Agent at Golden, in Northeast Kootenay, has received a request from Prof. T. L. Walker, of the Royal Ontario Museum of Mineralogy, for specimens representing the different types of ores from the chief mines and prospects in the district.

The establishment of smelting works at or near Prince Rupert, which is the western terminus of the Grand Trunk Pacific railway, is being advocated there and in the country about Hazelton, from which ore is being shipped, but delays take place in getting it conveyed to and treated at existing smelting works. Meanwhile the Tye Copper Co.'s smeltery at Ladysmith, Vancouver island, is idle for lack of an assured regular supply of ore to warrant its being again operated.

A new discovery of copper ore is reported to have been made in the Nicola district, within seven miles of Merritt. Mr. Wm. Voght, who made the discovery, has recorded the location of the White Wing mineral claim; he states that preliminary surface work has shown the occurrence of bornite and copper carbonate ore.

A contract has been let for driving 200 ft. on the vein of the La Rose group, situated between seven and eight miles from the head of Alice arm of Observatory inlet, and six miles in on the Dolly Varden trail. The ore occurring here contains silver to the average value, it is stated, of about \$100 to the ton. The Dolly Varden and Wolf groups of mineral claims, also in Skeena mining division, are under bond and option of purchase to Mr. R. B. McInnis, of San Francisco, California, while the Monarch group of four claims is under bond to Mr. T. F. Hopkins, of Seattle, Washington.

At the annual Inter-State fair, held at Spokane, Washington, early in September, awards were made in the mineral department for British Columbia mining exhibits, as follows: Of the British Columbia Copper, Consolidated Mining and Smelting, Florence, Granby Consolidated, and Standard Silver-Lead companies, and of several individual mines.

Certificates of competency in mine-rescue work were lately granted to eleven men employed at Nicola Valley collieries—four at the Middlesboro and seven at the Coal Hill colliery. Several weeks ago Mr. Dudley Michell, of the British Columbia Department of Mines, conducted an examination of Nicola Valley men who had taken the mine-rescue training course, and most of them succeeded in passing. At the end of 1915 there were in British Columbia 256 persons holding similar certificates of competency.

GOLD AT BOURKES.

Cobalt, Oct. 7.—Some say all the romance has gone out of mining. At times that would seem to be true of Northern Ontario particularly, as its mining camps develop more or less into the same humdrum as an ordinary factory town. Occasionally there comes along an incident like the latest discovery at Bourkes that makes mining, particularly prospecting, as romantic as ever.

Oscar Anderson, a stalwart Norwegian, gradually made a clearing on his homestead butting onto the station grounds at Bourkes. During his clearing operations he uncovered some rock a short distance northwest of the station. Last week he decided to take a day off from farming work to prospect. He had only been looking around for a few minutes when he uncovered a vein. In the rotten stuff was some yellow metal. Oscar was not quite sure what it was, so started out with some to Albert Wickstead, the Postmaster, to get his advice. On his way to Albert's store he passed some men at the station, among them John J. Burns, who has been prospecting east of Bourkes. Oscar never got to the post office with the gold, for his farm was bought at the station by Burns. A half day's work with the pick brought him more return than all the work with the plow to date.

The discovery is one of the most spectacular in the north country. The vein is about four feet wide and has been stripped about forty feet. The Anderson find is the first west of the railway in that locality and quite a number of prospectors are in the field already. Their operations are handicapped because of the Anderson farm being surrounded on three sides by homesteads and on the south by railway land.—Northern Miner.

BOSTON CREEK.

Development work on the Benny Hollinger claims at Boston creek is being carried on successfully. A shaft is being sunk on a quartz vein which shows some free gold.

THE GROUND HOG DISTRICT.

Cyril Q. Young, manager of the eastern lands of the C. N. R., has issued an interesting article on the mining possibilities along their line from West Shining Tree to Nipigon from a traffic point of view. He says in part:

The continuance of the rich Porcupine belt unquestionably extends west across our line at Ground Hog river and Foleyet divisional point, and as far as our exploration goes continues west and quite probably is the same gold formation as outcrops at Hobon on the C. P. R. north of Michipicoten harbor.

The Ground Hog section in the vicinity of Flying Post gives some evidence of silver formation. Calcite occurs close to the contact of the diabase and Keewatin at the extreme end of the eastern arm of Lake Mata-gama, and the altered diabase carries some silver values on the eastern shore of the same arm of the lake. I am told that some conglomerate has been found on the point between Flying Post and the eastern arm of the aforesaid lake, but my men or myself did not meet it when cruising for land and timber, as we were seldom on this township.

Magnetic iron ore bodies occur at several points along the line of railway, the first of importance north of Ruel being 14 miles to the west of Stackpool at milage 105 at Sagatosh lake. Here Minneapolis and St. Paul capital has proved up millions of tons by diamond drilling within the past four years, the diamond drilling outfit having gone in from Bisco on the C. P. R. They are well satisfied with their results.

At Sagatosh lake 16 miles west of Stackpool, reached from Ground Hog (Kukatush), American interests have diamond drilled a strong lead-zinc vein to 500 ft. depth. They are seriously considering taking out ore and hauling it 14 miles to our rail, due to the continued advance in spelter these war times.

A few hundred men could not prospect the 600 miles of country adjacent to the line between Ruel and Port Arthur, even in a number of seasons, for in Temiskaming not only hundreds of thousands of dollars but millions of dollars were expended in prospecting and development on the 150 miles on the T. & N. O. railway between Cobalt and Cochrane. There are too many flying trips made, which do not remove any moss. Men are too content to stand with their paddles in their hands on the shore of the same routes and say there is nothing to it, but good prospectors and persistent mining men find camps with new tonnage after the "fly-by-night" staker departs.

Our trains will endeavor to accommodate groups of mining men who want to get off at river crossings instead of at the stations or crossing sidings, which could not always be placed at the river banks, due to engineering difficulties. A good through service exists from Toronto westward, trains leaving at 10.45 in the evening and reaching such points as Ground Hog river (Kukatush siding) at noon the next day.

The Ground Hog mining area can be better looked over from the river than elsewhere, and the stop will be made at the river instead of Kukatush siding, one and a-half miles east, if a mining party having tickets from southern points request the conductor in time to do so.

The mining recorder's office for the eastern section at Sudbury, for the section west of Missanabie river to Obakami siding, is at Sault Ste. Marie, and from Obakami, on west to Port Arthur, at Port Arthur.

BRUNNER MOND CO.

Brunner Mond Canada, Ltd., Toronto, has been incorporated with a capital of \$3,000,000. This company is empowered to recover and deal in soda, potash and chlorine and its compounds, and to engage in various works for the carrying on of its business, including the development of electric power, the surplus of which may be sold.

IN SOUTH LORRAIN.

It is reported that good ore has been encountered at a depth of 285 ft. at the Belle Ellen mine in South Lorrain.

MUNRO TOWNSHIP.

A quartz vein showing free gold has been uncovered on the Burton property, which lies west of the Croesus. This area was burned over in the big fire.

At Port Colborne the International Nickel Co. obtained options on 340 acres of land on the lake shore, and it was expected that ground would be broken at an early date for the erection of a \$4,000,000 refining plant.

TORONTO MARKETS.

- Cobalt oxide, black, \$1.05 per lb.
- Cobalt oxide, grey, \$1.15 per lb.
- Cobalt metal, \$1.25 to \$1.50 per lb.
- Cobalt anodes, \$1.50 to \$1.75 per lb.
- Nickel metal, 45 to 50 cents per lb.
- White arsenic, 5½ to 6 cents per lb.
- Oct. 11—(Quotations from Canada Metal Co., Toronto)—
- Spelter, 15 cents per lb.
- Lead, 9 cents per lb.
- Tin, 47 cents per lb.
- Antimony, 18 cents per lb.
- Copper, casting, 29 cents per lb.
- Electrolytic, 31½ cents per lb.
- Ingot brass, yellow, 17½ cents; red, 20½ cents per lb.
- Oct. 11—(Quotations from Elias Rogers Co., Toronto)—
- Coal, anthracite, \$8.50 per ton.
- Coal, bituminous, \$5.85 per ton.

SILVER PRICES.

	New York, cents.	London, pence.
September—		
25th.	69¼	32½
26th.	69¼	32½
27th.	69¼	32½
28th.	69¼	32¾
29th.	69¼	32½
October—		
3rd.	68¾	32¾
4th.	68¾	32½
5th.	67½	32½

MOLYBDENITE PRICES.

- Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.
- Ores carrying between 2% and 3% MoS₂, \$13.00 per unit.
 - Ores carrying between 3% and 5% MoS₂, \$14.50 per unit.
 - Ores carrying between 5% and 10% MoS₂, \$16.00 per unit.
 - Ores carrying between 10% and 15% MoS₂, \$17.00 per unit.
 - Ores carrying between 15% and 20% MoS₂, \$18.00 per unit.
 - 80% concentrates \$1.00 lb. of MoS₂.
 - Penalties imposed for copper and bismuth.

MARKETS

NEW YORK MARKETS.

Oct. 11, 1916—Connellsville Coke—

Furnace, spot, \$3.75 to \$4.00

Contract, \$3.25.

First half, \$2.75.

Foundry, prompt, \$3.75 to \$4.00.

Contract, \$3.50 to \$3.75.

Oct. 11, 1916—Straits Tin, f.o.b., 39.87½ cents.

Copper—

Prime Lake, nominal, 28.25 to 28.50 cents.

Electrolytic, nominal, 28.50 to 28.75 cents.

Casting, nominal, 27.25 to 27.50 cents.

Lead, Trust price, 7.00 cents.

Lead, outside price, 7.00 to 7.12½ cents.

Spelter, prompt western shipment, nominal, 1\$17½ cts.

Antimony—

Chinese and Japanese, 11.25 to 11.50 cents.

American, nominal.

Aluminum—nominal—

No. 1 Virgin, 98-99 per cent., 62.00 to 63.00 cents.

Pure 98-99 per cent. remelt, 61.00 to 62.00 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.

Nickel—Shot and ingot, \$45.00.

Electrolytic, \$50.00.

Cadmium, nominal, \$1.45 to \$1.50.

Quicksilver, \$78.00.

Platinum, \$90.00.

Cobalt (metallic), \$1.25.

Silver (official), 67½ cents.

Metal Products—Following base prices represent the outside market except where otherwise specified and are entirely nominal except in the case of lead sheets and sheet zinc:

Sheet copper—

Hot rolled (f.o.b. mill), 37.50 cents.

Cold rolled (f.o.b. mill), 38.50 cents.

Copper in rods, 43.00 cents.

Copper in rolls, 40.00 cents.

Copper wire (f.o.b. mill), 33.00 cents.

Copper wire (f.o.b. mill), Nov., 32.25 cents.

High brass—

Sheets, 42.00 to 46.00 cents.

Wire and light rods, 45.00 to 48.00 cents.

Heavy rods, 41.00 to 45.00 cents.

Tubing—

Brazed brass, 45.00 to 50.00 cents.

Brazed brass (f.o.b. mill), 43.75 cents.

Seamless copper, 47.00 to 49.00 cents.

Seamless brass (f.o.b. mill), 46.00 to 48.00 cents.

Naval bronze—

Rods (f.o.b. mill), 40.00 cents.

Sheets (f.o.b. mill), 41.50 cents.

Muntz metal—

Rods, 38.50 cents.

Rods (f.o.b. mill), 36.50 cents.

Sheets, 42.00 cents.

Sheets (f.o.b. mill), 40.00 cents.

Full lead sheets (f.o.b. mill), 8.50 cents.

Cut lead sheets (f.o.b. mill), 8.75 cents.

Sheet zinc (f.o.b. smelter), 15.00 cents.

STOCK QUOTATIONS.

New York Stocks.

	Open.	Close.
Anaconda	93.75	91.75
Beth. Steel	535.00	....
Chino.	53.62½	....
Dome.	24.62½	....
Granby.	90.00	....
Int. Nickel	51.62½	50.25
Miami.	37.75	....
Nevada Cons.	21.62½	21.37½
Ray Cons.	24.50	25.00

Porcupine Stocks.

As of Close Oct. 11, 1916.

	Bid.	Asked.
Apex. . . . .	.08¼	.08
Dome Extension . . . . .	.34	.33½
Dome Lake . . . . .	.62	.61
Dome Mines . . . . .	....	.24¾
Dome Consolidated M. . . . .	....	.09
Foley. . . . .	.81	.70
Gold Reef. . . . .	.01¼	.01
Hollinger Con.	6.99	6.95
Homestake. . . . .	....	.61
Jupiter. . . . .	.27	.26
McIntyre.	1.40	1.39
McIntyre Extension . . . . .	.41½	.43½
Moneta. . . . .	.17	.16
Pearl Lake . . . . .	.00¼	....
Porcupine Crown . . . . .	.69	.67
Porcupine Imperial . . . . .	.04	.03¾
Porcupine Bonanza . . . . .	.15½	.45
Porcupine Tisdale . . . . .	.02	.01¾
Porcupine Vipond . . . . .	.37½	.36½
Preston. . . . .	.04½	.04¼
Schumacher. . . . .	....	.45
Teck-Hughes. . . . .	.40	.37
Newray. . . . .	.69½	.69
West Dome Con. . . . .	.34	.33¾
Davidson. . . . .	.49¾	.49¼

Cobalt Stocks.

Adanac. . . . .	....	.29
Bailey. . . . .	.07½	....
Beaver. . . . .	.42½	.42
Chambers-Ferland. . . . .	.20	.17¼
Conlagas.	5.10	4.90
Crown Reserve . . . . .	.53½	.52½
Foster. . . . .	.07	....
Gifford. . . . .	....	.03¾
Gould Con. . . . .	.00½	....
Great Northern. . . . .	.08	.07½
Hargraves. . . . .	.03¾	.03
Hudson Bay	75.00	65.00
La Rose . . . . .	.64	....
McKinley-Darragh. . . . .	.63½	.63
Nipissing.	8.05	7.85
Peterson Lake . . . . .	.22½	.22¼
Right of Way . . . . .	.06	.05
Silver Leaf . . . . .	.02	.01¾
Seneca Superior . . . . .	.11	.10
Temiskaming. . . . .	.63	.62½
Trethewey. . . . .	.19	.18
Wettlaufer. . . . .	.12	.11
York, Ont. . . . .	.02	.01¼
Ophir. . . . .	.11	.10
Lorrain. . . . .	.46	.44
Vac Gas . . . . .	.48	.44