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### SCIENCE AND INDUSTRY

In view of the fact that the Canadian public now looks with favor on proposals to encourage scientific and industrial research, it is probable that the services of scientists will be utilized in our industries to a greater extent than heretofore. That the Dominion Government is alive to the need of more closely linking science and industry is a source of satisfaction. We are also pleased to see that some scientists who have had little to do with the application of science to industry are now convinced that they have been out of touch with those who utilize the results of research. We are also pleased that the general public is awake to the fact that there is need for organization to direct research along useful lines and to make the results readily available.

Sir George Foster, Minister of Trade and Commerce, recognizing the demand for such organization, has appointed an Advisory Council in Industrial and Scientific Research. The announcement was deservedly well received. It appeared that Sir George, who has done much for Canada during the war and who seems to have an unusually clear vision, had taken a step that should help Canada to prepare for the industrial struggle that everyone tells us is to follow the war. A Council composed of properly qualified men would undoubtedly be of great use to our industries.

Our hopes were, however, dashed when we were advised of the personnel of the Council. In their respective spheres these men have attained prominence and we are as ready as anyone to congratulate them on receiving some recognition for their work. We are not convinced, however, that they are the right men for this job. And we cannot help concluding that their appointment has resulted from a lack of appreciation of what the nature of the job is.

In our last issue we commented on these appointments. It has been suggested that we might withhold criticism until the Council has a chance to prove its usefulness. We believe, however, that the matter is too important for such treatment. The mining industry, like other Canadian industries, could be helped by such an organization as the Minister of Trade and Commerce thinks he is furnishing. We are not content to wait for a few years so that he may find out that he has not given what the country needs. We could, after the manner of several of our daily newspapers, dismiss the subject by congratulating Sir George and the men whom he has chosen, and hope for the best. We do not intend to follow such a course, as we do not believe it in the best interest of the mining industry or of other Canadian industries.

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GEOLOGICAL SURVEY

That we were warranted in our criticism has been impressed on us by the address of Dr. A. B. Macallum, Chairman of the Council, to the Empire Club in Toronto last week.

Dr. Macallum said, in referring to the appointment of the Council: "It is a new regime when the Government calls in scientific men to advise us." In view of the facts the statement is of course absurd. It might be overlooked if it did not indicate clearly the kind of scientist that has been chosen.

Dr. Macallum shows by this statement that he is not familiar with what has been done or is being done in the field which he is entering. Can we expect such a man to give useful advice as to what should be done? It is no great discredit to Dr. Macallum as a scientist in a special field that he is not familiar with what is being accomplished in some other fields. He has achieved an international reputation in his own subject without devoting attention to what has been done and is being done by scientists, permanently or temporarily in the employ of our Dominion and Provincial Governments. But does his statement convince anyone that he is qualified for the position of Chairman of the Advisory Council?

We cannot agree with Dr. Macallum that the right men have been selected. Referring to the appointment he said: "This new movement is one of the most enlightened things which the Government of Canada has done for a long time." Apparently the light failed before the men were selected.

### ONTARIO'S BIG YEAR

Ontario set a new record in mineral production in 1916. The final figures are of course not yet available; but preliminary estimates show large increase.

Nickel matte produced in the Sudbury district during 1916 contained about 42,000 tons nickel, far exceeding the output of 1915, which was 34,039 tons.

Gold production of Ontario in 1916 amounted to about \$10,000,000 as compared with \$8,501,391 in 1915.

Silver production was less by 2,000,000 ounces than in 1915; but owing to the high prices prevailing the value was greater, amounting to about \$13,500,000 as compared with \$11,742,463 for 1915.

The value of the mineral production of Ontario for 1916 is estimated at about \$65,000,000. That of 1915 was valued at \$57,532,844.

The output of Cobalt silver mines up to the end of 1916 totals about \$136,000,000.

### IRON-ORE MINING.

A large bulletin on iron mining in the United States, work on which has been intermittently progressing for several years, is being completed by D. E. Woodbridge, consulting engineer, and is expected to be ready for publication within a few months.

### TO OPERATE TYEE SMELTER.

Victoria, B.C., Dec. 6.—The Ladysmith smelter, owned and formerly operated by the Tyee Copper Company, an English concern, has been purchased by New York capitalists and as soon as extensions and improvements involving an outlay of \$100,000 can be made the plant will be put in operation. Negotiations for the purchase have been under way for some months, Mr. Gardiner, representative of the Tyee Company having come out from England to complete them. Who are the purchasers or at what figure they acquired the plant is not announced, but it is admitted that they are "big people" in a financial and mining way. This will be their first entrance into the British Columbia field, and hence their acquisition of the property will prove welcome news to those interested in the development of the mining and smelting industry of the island.

For some time past efforts have been made by local organizations interested in the development of Vancouver Island's mineral resources to induce the Government to take steps to bring about the opening of the Ladysmith smelter, and only yesterday a deputation waited upon the Premier and Minister of Mines with that end in view.

The fact that the plant will soon be in full operation again giving employment to over 100 men and, by virtue of its extensions, will be in a position to produce blister copper whereas, when formerly in operation, it could produce only the copper matte, will mean a decided impetus to the industry on this Island. It will obviate the necessity hitherto experienced by the small operators of sending their ores outside of the Province to be refined. The Tacoma smelter, which is said to be owned by the Guggenheims, and in which considerable German capital is interested, has hitherto been tied up with large producers and latterly the amount of ore being treated there practically precluded the small producer on this coast from securing smelter facilities.

It is proposed by the new purchasers to render the plant thoroughly modern and install converters. The blister copper, instead of being sent out of the Province to be refined, will probably be treated at the big interior refineries. The present capacity of the plant is 700 tons daily, but after the additions are made this will be materially increased.

Mr. W. J. Watson, manager of the plant since 1906, leaves for Ladysmith to-morrow morning and will immediately start preparing for the improvements.

Of late rumors of the sale of the property have been rife. First it was reported that the Guggenheims, owners of the Tacoma smelter, had bought it, and then the Consolidated company of Trail was said to have acquired it. Mr. Gardiner states that neither interest is involved in the present transaction. The purchasers, it is said, have already acquired considerable holdings of valuable mineral bearing properties on this coast.

All the employes of the Cobalt mines will receive a bonus of 25 cents per shift as a result of silver having averaged over 70 cents per ounce for the month of November. Approximately two thousand six hundred men are affected, and about \$17,000 added to the monthly pay roll.

# COUNTERCURRENT DECANTATION AT THE HOLLINGER

By Luther B. Eames.

The recovery of dissolved gold from slime pulp in the cyanide process was first accomplished by intermittent decantation. This simple process consists in mixing with the pulp containing the values in solution, a solution of lower gold content, settling the mixture in a tank and decanting the clear supernatant fluid. The thick pulp remaining in the tank is pumped to a second tank together with more barren solution and again settled and decanted. After several repetitions of this operation, values are so far reduced that further washing is not profitable. The gold recovery of this process is high, but the plant required is bulky, labor cost is high and the amount of solution to be precipitated is excessive.

As early as 1901, a plant was built in the Black Hills of South Dakota by John Randall, employing the same principles but attempting to make the process continuous by substituting for flat-bottomed tanks, cones which operated continuously, receiving a constant feed and discharging a steady stream of thickened pulp. These cones were operated in series, the thick underflow of the first one, forming, with a stream of diluting solution, the feed to the second cone of the series. Barren solution was added to the tank immediately preceding the discharge tank and, after being slightly enriched by the low-grade pulp in this tank, overflowed to form a diluting solution again for the richer feed entering the third tank from the end of the series, and so on back to the richest tank of the series. Clear water was used for the wash in the final tank. This is the principle on which all successful countercurrent decantation plants operate at the present time, but Randall's plant was not successful because of mechanical difficulties in getting a continuous thick discharge from his cone tanks. A similar plant was built in South Africa although there the washes were not repeatedly used, as in Randall's case, but were precipitated after each contact with the ore. This also was abandoned because of mechanical difficulties and the cost of precipitating the large quantities of solution that had to be used. For a number of years the process was not used, and it was not until the introduction of the Dorr thickener that the minds of metallurgists began to turn again to the continuous decantation principle.

In 1910, two decantation plants were built making use of flow sheets similar to that used by Randall 9 years before, but substituting Dorr thickeners for the cones. One of these was at Mocorito in Sinaloa, Mexico, and was installed under the direction of C. Dupre Smith, while the other was designed by J. V. N. Dorr, assisted by the writer, for the Vulture Mines Co. of Wickenburg, Ariz. While perhaps not perfect at first, both of these pioneer plants were so successful as to encourage further installations, few and scattering at first but in considerable numbers during the past three years.

## The Hollinger Decantation Plant.

The Hollinger decantation plant consists at present of five rows of 40-ft. tanks, four tanks to a row, forming a plant of five units. The tanks are arranged with a difference in elevation of 2 ft. 6 in. between steps with the final tanks of the series the highest, so that all solutions gravitate through and out of the plant to precipitation. The Barret specification roof is supported on flat trusses, the lower chords of which pass

just above the tank and rims. These trusses also serve to support the thickener mechanisms and the walks between the tanks.

The diaphragm pumps used were designed by the Company's staff, and have been very reliable and economical. They are all three-throw or triple pumps so that in spite of the large tonnage handled the duty on each diaphragm is light. It is not uncommon for diaphragms to last 300 days while the life of the present type of valves and seats has yet to be determined.

The pumps are used not only for pulp transferral, but also for the final discharge. This makes regulation of the final discharge for moisture much easier, more reliable, keeps the work of the operator all on the upper floor and allows the tailing to be discharged at a considerably greater elevation than would otherwise be the case.

The barren solution and water wash added to each row are measured by separate float-reading weir boxes assuring uniform results from the various units.

The plant is operated by one man per shift who oils all machinery, watches and adjusts the pumps and records their performance. The solution man makes titrations and regulates the addition of water solution but has no other duties in the decantation plant. A repair man on day shift makes all repairs and has time for other work.

The power for each tank including motor and line-shaft losses is under 1 h.p., while each three-throw pump consumes about the same amount.

The costs for the 12 weeks from Jan. 28, to April 21, 1916, have been taken as typical of what is done by this plant at its present capacity. During this time 85,854 tons were decanted at a cost of \$599 for supplies, including power, and \$1,194 for labor, or \$0.007 per ton for power and supplies, and \$0.0139 for labor, making a total of \$0.0209 per ton for decantation. Labor is no doubt higher here than it will be in the future, as a greatly increased tonnage is to be treated while supplies and power should remain nearly the same. The cost as it stands is about 40 per cent. of the cost of filtering on leaf filters at about the same daily tonnage.

In the ores of the Porcupine district the recovery, by dilution seems to be almost the theoretical maximum. Adsorption does not seem to have any appreciable effect. There is a slight dissolving during decantation which, while it adds to the recovery, makes the soluble loss somewhat greater than it would otherwise be.

The figures quoted below on chemical consumption and recovery refer to only two units of the Hollinger plant. The figures of these units are given because the other units of the mill share their feed with the original Moore filter plant, and likewise their barren solution, while for commercial reasons the two units in question have been given a separate solution system and separate precipitation presses. These two units are therefore the only ones upon which all the figures are available.

In comparing the results quoted, however, it should be borne in mind that the flow sheet has been modified in this plant somewhat because of limitations of space, so that the overflow of T 2 instead of that of T 1 goes to precipitation. The effect of this is to raise the theo-

\* Extract from a paper to be read at the New York Meeting, A. I. M. E., February, 1917.

retical value of the overflow of the last tank 3 c. at 3 to 1 precipitation.

A statement of results follows:

Period covered, same as that for which costs were given—from Jan. 28, 1916, to April 21, 1916.

Tons of ore treated.....	38,885
Value per ton of ore treated.....	\$8.92
Ratio of ore to solution precipitated, 100 to 285	
Tons solution precipitated .....	110,604
Strength of cyanide used, 0.9 lb. per ton, or .....	0.0045 per cent.
Cyanide added per ton of ore.....	0.46 lb.
Difference between pulp feed and pulp discharge for first tank after agitators..	25 c.
Average moisture in tails.....	45 per cent.
Average value of barren solution.....	3.2 c.
Dissolved gold per ton of solution discharged .....	11.71 c.
Dissolved gold per ton of ore discharged	9.57 c.

It is theoretically possible, taking into consideration the flow sheet, the grade of ore treated, the barren solution used and the thickness of pulp attained, to have reduced the overflow of the last tank to 7.6 c., leaving a difference of 4.1 c. to be accounted for by continued dissolving adsorption, etc.

Viewed in one way it may be said that actual losses are 54 per cent. higher than theoretical, but where one is dealing with samples so easily affected by faulty manipulation and where any error except losses in assaying tends to raise the results, a check to 4 c. does not seem bad. The average loss would have been somewhat less if the occasional high results had been omitted, but this was not done.

From the foregoing, I believe one is warranted in concluding that a reasonably accurate forecast can be made of the results to be expected from a decantation plant and that these results may compare very favorably with the results obtained from filter plants.

#### STRAIGHT CYANIDATION FOR HEDLEY.

In his annual report Mr. E. E. Merrill, president of the Hedley Gold Mining Co., B.C., said:

"The increased baseness of the ore with depth, which increases concentrate tonnage and lowers the grade of same, necessitates a change in our milling system. We have carefully tested out straight cyanidation of all our ore with fairly good results and we plan to install the necessary machinery for this treatment during the early part of 1916, which we believe will be some improvement over present method of shipping concentrates to smelter."

"Conditions in the lower levels of the mine have, within the last two years, changed considerably. While the orebodies are larger than in the upper levels, and stronger in every way, and, contrary to the rule in most gold mines, maintain at least the same grade per ton; the specific gravity of the ore has increased so that it requires only 10 cubic feet of ore to the ton, where formerly it required more than 12 feet to make a ton. This is caused by the increase in arsenopyrite and adds considerably to the cost per ton of ore milled, as the concentrate tonnage has increased from 3,831 tons in 1913 to 6,218 tons in 1915. This condition, together with war prices and miners' wage increase, all tend to reduce the profits. For this reason tests have been made to determine the most profitable method of treating this ore. For two months 25 per cent. has been treated by total cyanidation with very satisfactory results.

\*From Commencement Address, Colorado School of Mines, 1916.

## THE PROBLEM OF EFFICIENCY.\*

James R. Finlay.

If I were to try to do what I fear you may expect me to do—discuss the various technical improvements in the art of mining which have come forward in the past few years—I could do little more than borrow and recite a long list of them; read a catalog, so to speak. Moreover, I should probably be trying to talk about something that your graduating students know better than I do. Nevertheless, I shall try to be technical. Perhaps I may succeed in drawing your attention to some of the most practical of subjects which your graduates will face at once and will continue to face all their lives.

My friend, Mr. Saunders, who was lately President of the A. I. M. E., has introduced me to various people as a "philosopher." I don't know whether he means to accuse me of it or merely to say it; that is, I have never been quite sure whether he meant that I was a philosopher instead of a mining engineer, or whether he meant that I was a philosopher besides being a mining engineer. I mention this as a warning to you and an apology for myself. Even the appellation of "philosopher" you see has its uses and even its privileges. The privileges I am depending on as a philosopher are to talk platitudes, to tell you what you already know and expect to have it pass for wisdom. One of Mr. Roosevelt's great achievements, you know, if not his greatest, was to rediscover the Decalogue. At any rate I mean to talk on the well-worn subject of efficiency.

It occurs to me that it may be interesting, even valuable, to pass in review some of the major conditions under which an industrial career is carried on. I wish to call your attention to the proportion of things in the world's affairs—how important power-driven industry is, how it gives rise to industrial corporations, and how large a part these corporations play in our every-day life, and particularly in the mining business, and how success in the business of mining depends so very largely upon knowing how to deal with them. And through all this I should like to convey the impression that after all there is nothing so great and so valuable as a good mind properly trained.

The essence of modern industry is just this:

A man equipped with his muscles and his brain develops about one-twelfth of a horse-power, and he can use it for perhaps eight hours a day. You pay him for doing this, say \$3. The same amount of mechanical energy (we will take it a conventional rate of, say, one cent per horse-power hour) can be purchased in industrial communities for less than one cent. Therefore, it is perfectly plain that in these days when you hire a man you are paying not particularly for his muscular energy, because if you were buying energy you could buy four hundred times as much in another form for the price you pay your laborer. What you pay your laborer for is using his brain to direct not only his own muscular energy but the mechanical energy, so vastly cheap, which can be supplied to him through machines. This I take to be a clear statement and a comprehensive statement of the whole problem of modern industry of any former time in the history of the world.

I see in mining nothing which separates it very widely from other forms of industry. The mere fact that the miner digs material out of the crust of the earth does not make the methods which he pursues essen-

tially different from those of the man who makes use of materials which are already lying on the surface. The problem of mining industry to-day is the problem of applying the greatest amount of mechanical energy that can be used effectively by a unit of human energy.

Having stated the thing this way we come at once to the very important fact that this problem is the problem of corporate effort and not of individual effort. The energy from a power plant cannot possibly be utilized by a single person; nor can it be built, or the machines in it manufactured, by individuals. Power-driven industry, even in its crudest form, implies collective effort. To take an example from the history of mining: when the gold hunters first came to Colorado, or more certainly when they first went to California, they used no machinery. They used tools, picks, shovels, pans, rockers and wheelbarrows, but not steam engines. So long as they worked that way each man could work effectively by himself; and in the placer days of California nothing was heard of corporations. The gold was produced by a nameless swarm of independent workers. But when they began to undertake to operate quartz mines, in which steam engines must be employed for pumping, hoisting and stamping, that was an enterprise calling for a number of employees, it took collective effort, it produced the corporation immediately. The same kind of illustration can be found in any other industry that uses mechanical power. Thus in transportation, so long as it was a question merely of pack animals or wagons the individual unit was nearly, if not quite, as effective as a corporate unit. One man with his team could haul as cheaply as a company managing ten men with ten teams. Not so when they came to use steam, or any other form of power for transportation. Your locomotive needed a road-bed and rails; it must have cars. The thing needed collective effort and capital.

It seems to me that the development of mechanical industry is greatly widening the exercise of human intelligence. There is exercise for great ability in directing the innumerable business corporations, manufacturing concerns, transportation concerns, mining concerns—in every one of which there is a distinct reward for the man who can make a little better mixture of the ingredients of efficiency. It is not only the managers but practically all of the employees who have a widened scope for the exercise of the brains. Anyone who exercises powers beyond those of his own body is using his intelligence more than he would be if he did not. Thus the man who drives a locomotive must have experience and knowledge above that of the man who simply walks. These are facts which no intelligent man can deny. I believe it to be an absolute fact that those regions and those races which have developed industry best have developed mentality best. They have developed industry because they have had the mentality; and while this is true, I think it is also true that a prosperous industry attracts good human material to it. A man does not think highly who is content with stupid and unproductive labor. Of course people without high intelligence may move a lot of coal and iron; but which is the more intelligent man, he who insists on moving coal and iron with his bare hands or he who wishes to do it with a steam shovel? I think the question needs no answer. Moreover, I fully believe that the man who wishes to use a steam shovel and make it work is the more likely to have valuable ideas about art, literature, science and government or whatever manifestation of mentality is desired.

The proof of the pudding is in the eating! Where are the seats of learning to-day? Where do you go to learn art, literature, science, music—anything you can think of? You do not any longer go to Italy or to Greece or to Egypt to learn these things. You go to the great industrial countries, the United States, England and Germany, and to those portions of France which are more particularly industrial. It should be pointed out that power-driven machinery is made of metals, particularly of iron, and driven by coal. It is natural, therefore, that industry should be most active in those regions where iron can be successfully manufactured. This is the case to a greater extent than most people realize. The areas of the world in which iron is successfully manufactured are relatively small. There are two great areas. A belt bordering the Great Lakes from the upper Mississippi to the Atlantic coast in the neighborhood of New York, and another belt extending from the Irish Sea across England and into Germany, including Belgium and Northern France. These are the areas in which at least 90 per cent of the iron of the world is manufactured, and a very large percentage of the machinery operated. And what do you find there? You find the six greatest cities of the world, one after the other.

The more you examine into it the more you will be impressed by the fact that these areas have become the market and the clearing house of the world's commerce, the centres to which all other metals, including gold, must go to be utilized. You will notice further that these areas hold the reins of power in human affairs. You find there the financial, political, military, intellectual, social and artistic capitals of the modern world to which not only every article of trade, but human intelligence itself, goes for cultivation and development.

It seems to me worth while to lay stress on this situation because a great many people would like to believe that what I have said is not all true. There are those who would have us believe that we are focusing our attention too much on the pursuit of industry and wealth; that by so doing we miss the chance to develop higher and better things. You will be told, for instance, that the growth of corporations is turning us into a nation of employees—another name for slaves; that after all only a few can be leaders, the rest must be followers; and the opportunities for personal initiative and independent action are being swallowed up in a flood of corporation routine which will end by giving human life the monotony of machine-made goods. There may be some truth in this, but whether it is true or not, I believe that we are in an age where the tendency is irresistibly in the direction of the continued growth of corporations. Whether we like it or not, we shall have to accept it. It is an element of common sense to accept the inevitable, not only with resignation but with cordiality.

But I do not look upon this development as undesirable. We are living in a great age, which will be called by future historians the "age of the conquest of natural forces by the human mind." There was a similar age thousands of years ago in prehistoric times when men domesticated animals and plants; when they exchanged the free life of mere hunters for the exacting and settled life of agriculture and trade.

By giving up a portion of their freedom those old people found that they were repaid by a great expansion of the possibilities of life. We are doing the same thing in a different way. The old hunter was persuaded to give up his freedom to wander in order to enjoy

freedom from hunger. Our people are being persuaded to give up a portion of their freedom of individual effort and undergo the discipline of collective effort, for the privilege of having a lot of things and of doing a lot of things which they could not have or do otherwise.

## BRITANNIA COPPER MINES, B.C.

Last summer Mr. T. A. Rickard, editor of Mining and Scientific Press, San Francisco, visited British Columbia. Recently he has been publishing a series of articles descriptive of some of the mines and reduction works he saw in that Province. The following excerpts from his account of the Britannia copper mine and concentrating mill gives authoritative information relative to the mine, which Mr. Rickard designates "the biggest copper mine in the British Empire:

"The joint tramway and railroad terminal is level with Adit 27, so-called because it is 2,700 ft. below the summit of the mountain. This will become eventually the base entry of the mine. Behind the mill is the entry of Adit 41, similarly 4,100 ft. below datum. This adit will become the base exit for ore; it is only 1,400 ft. long as yet, but it will be extended three miles to the ore-belt, and at a mile from daylight it will connect by a raise, or shaft, with the upper adits, called 31, 27, and the present main entry, called The Tunnel, which is 1,900 ft. above 41, and 2,100 ft. above sea-level. The sizes of these new adits are:

41 .....	9 by 13 ft.
31 .....	8 by 8 ft.
27 .....	9 by 13 ft.

"We went to Adit 27, a short distance south of the incline-terminal. This level was 900 ft. long, and is expected to tap ore at a distance of 10,000 ft., but it will get under the old Daisy workings at a distance of only 2,000 ft. from daylight. The cost of the work is \$13 a foot, the contractor paying for supplies and laying a temporary track. The ground breaks well, but is hard enough to stand without timbering. Two Ingersoll-Rand drills 43 $\frac{1}{4}$ B, with 3 $\frac{1}{4}$ -in. cylinder, are used on a 12-ft. bar, which is steadied by right-angle bars against the face.

"The electric train took us up the mountain, along two sharp curves and one switch-back, past the powder magazine, to the Tunnel Camp, as the upper settlement is called. The settlement stands in a clearing made in a dense forest of young pine, overlooked by high peaks. The tunnel, or present haulage adit, is 2,100 ft. above sea-level, 9 by 13 ft. in cross-section, and 4,336 ft. long. Eventually it will be extended through the mountain, right across the Fairview ore-belt. Alongside the track I noted the 12-in. air-pipe, and the high-tension transmission line carrying 6,600 volts. At 4,100 ft. this adit connects with the main ore-chute, 8 by 12 ft., extending for 1,272 ft. between levels. We watched the loading of four cars, of 20 tons each, in four minutes. Ordinary arc-gates, 39 in. wide, are used. There are two gates, so that one can be in service when the other happens to be blocked. A vertical board levels the load in the car and prevents contact with the trolley wire. The ore is broken by gyratory crusher in a chamber 400 ft. above the adit, and the chute is fed 800 ft. higher above the crusher, so that a storage capacity of 2,000 tons of crushed ore is obtained, besides 4,000 tons uncrushed ore between the 1,800 and 1,000 ft. levels. Above the top of this chute, on the 1,000-ft. level, there is 4,000 tons more ore stored in similar raises.

"On the 1,800-ft. level, 400 ft. above the haulage-adit, is the gyratory crusher, where the ore is by-passed

from the main chute over a grizzly made of wedge-shaped manganese-steel bars 3 $\frac{1}{2}$  in. apart. The ore passing through the grizzly joins the crushed product and falls back into the chute.

"Ascending on the cage of the interior shaft, 10 by 20 ft., we reached the 1,600-ft. level, which is 600 ft. above the haulage adit. This shaft was made by raising 1,275 ft. from top to bottom, 75 ft. being required for headroom above the hoist. This level will be connected with an adit advancing from Furry creek, which parallels Britannia creek in the next valley southward. On the 1,200-ft. level I saw a crosscut that was intersecting the Third vein, and then rising to the 1,000-ft. level. I saw the hoisting-engine and the top of the big chute. The seven side-dumping cars emptied themselves automatically as they passed the opening, the wheels on one side running over a dumping-bar so as to tilt the car. These cars are modeled on the design originated at the Phoenix mines of the Granby Consolidated. Listening to the ore as it fell down the chute there came the suggestion that the drop must shatter the ore to pieces so that half of it passes through the grizzly above the crusher.

"From the top of the chute it is only 1,300 ft. to daylight, so we made our exit and saw the old camp. At the portal is the outcrop called the Bluff, which has been photographed often to suggest the bigness of the lode-channel, here fully 300 ft. wide of 1.8 per cent. copper. On the west side of the ravine is a glory-hole on the Jane claim, and the entrance of an adit 1,000 ft. long, all part of the work originally done under Mr. Geo. H. Robinson's direction. But none of this early development sufficed to expose the real dimensions of the ore-belt. It is not a single vein, nor even a series of them, but a big width of schist enriched by seams of chalcopryite. As yet eleven veins have been labeled in a belt 800 ft. wide; the average stoping-width of each vein is put at 30 ft., and the maximum at 80 ft.; but such measurements are only suggestive; the actual width of ground to be stoped is yet to be determined by further operations. In length the separate ore bodies have been proved for 1,000 ft., and in depth for 1,600 ft.

"The chalcopryite is confined mainly to fissured channels in a silicified sericitic schist, adjacent to a diorite porphyry. Near the ore the schist is spotted with chlorite. Any rock broken in the course of exploratory work is sent to the mill if it contains one-half per cent. copper. At the existing price (28c) of copper such material can be treated as 'ore.' The run-of-mine contains about 2 $\frac{1}{2}$  per cent. copper.

"Re-entering the mine at the 1,000 level, we ascended in the skip to the 500-ft. level. . . . Thence we walked to the other portal of the level truly a 'tunnel,' which is 1,500 ft. long, to the Furry creek side of the mountain. The southern portal, called the Barbara, gave us a new outlook. . . . Examining the rock of the portal, I could see the fresh face of Fairview schist streaked with pyrite and chalcopryite, but not rich enough to be 'ore.' The 500-ft. tunnel is in ore for 1,000 out of its 1,500 ft.; it intersects all the 'veins' from the Second to the Tenth, but it is not at right-angles to the ore-belt, so that the real width of ore traversed is 800 ft. The crosscuts run due magnetic north and south; the veins run S 80 deg. E and dip 70 deg. S with general uniformity.

"On the 500-ft. tunnel horse-traction is employed. It is planned to replace this method with a storage-battery locomotive, also on the 600, 850, 1,000, 1,200, and 1,600-ft. levels; in fact, wherever the present elec-

tric railway does not serve as a means of transport. A 3-ton Westinghouse locomotive with 'exide' (litharge) cells will pull six cars of two tons each. In breaking 2,000 tons of ore daily, 2,000 bits are blunted, and 1½ tons of powder is consumed.

"In the mine a reserve of 700,000 tons of ore broken by shrinkage is maintained. As for the total reserves, the mine is too young and undeveloped for a precise estimate, but 17,000,000 tons is said to be reasonably assured already. The total cost of producing copper is 7.3 cents a pound."

In the course of his article Mr. Rickard gives much other information including the following: The ore consists of copper pyrite in chloritic schist. The ore picked from the sorting belt in the mill contains from 10 to 18 per cent. copper and represents about one-tenth of the entire mill output, which averages 15 to 16 per cent. as shipped, ore and concentrate, to the smelter at Tacoma. The ore is of medium hardness and breaks readily, loosening the chalcopyrite; it is of simple type; with the chalcopyrite there is twice as much iron pyrite, beside a little zinc-blende and galena. Associated with these sulphides is quartz. A composite analysis of the mill-feed in September showed 2.74 per cent. copper, 7.95 per cent. iron, 1.5 per cent. zinc, 6 per cent. sulphur, and 71.25 per cent. silica, besides a trace of gold and 25 cents worth of silver a ton. The proportion of picked ore varies in accordance with the smelter requirement of siliceous material.

Particulars of the company's production in 1915, as printed in the Minister of Mines Report, are as follows: Ore milled in 1915, 212,158 tons; product shipped to smelter 30,123 tons, containing: Copper, 9,058,045 lbs.; silver, 50,306 oz.; gold, 398 oz.

The area of the Britannia company's property in the mountains above Howe Sound is approximately 20,000 acres. The company's general manager is Mr. J. W. D. Moodie; its mine superintendent is Mr. W. A. Wylie, and its mill superintendent Mr. C. P. Brown. At the time of Mr. Rickard's visit the payroll showed 1,225 employees, of 20 different nationalities.

#### METALLURGY OF LEAD IN NORTHWESTERN STATES.

In his General Report on "Lead in 1915" Mineral Resources of the United States, 1915, Part 1, pp. 187-205 lately published, Mr. C. E. Siebenthal, of the United States Geological Survey, includes the following information under the head of "Metallurgy":

##### Concentration and Separation.

Ore flotation is extensively employed in treating the lead and lead-zinc ores of the Coeur d'Alene district in Idaho. J. M. Callow has stated that a certain flotation process is used at the Gold Hunter, Morning, Hercules, Bunker Hill and Sullivan, Caledonia, Last Chance, Hecla, and Standard mines; that it employs 50 flotation cells and treats daily from 1,500 to 2,000 tons of fines and slimes. Other processes are in operation at the Interstate-Callahan, Greenhill-Cleveland, and other mills in the district.

Ore flotation is employed in the treatment of lead and zinc ores at many places in Colorado and at some places in other Western States. A fair estimate of the additional recovery of lead in 1915, due to the flotation process, is 50,000 tons of metal.

#### SMELTERY CHANGES.

The Northport Smelting and Refining Co. composed of persons interested in the Hercules, the Tamarack, and other mining companies of the Coeur d'Alene region of Idaho, has purchased the old copper smeltery at Northport, Washington, remodelled it thoroughly, and given it an equipment of labor-saving devices. Two 250-ton lead furnaces, 42 by 192 inches in size, with an 18-foot smelting column, were added and blown in early in March, 1916, and the construction of a third lead furnace was begun. Three of the six copper furnaces of the old plant were renovated and will eventually be operated. Four Dwight & Lloyd sintering machines will roast the concentrates received at the smeltery. Furnace and roaster gases will be treated by the Cottrell fume precipitation process. The lead bullion will be treated at the affiliated refinery of the Pennsylvania Smelting Co., at Carnegie, near Pittsburgh, Pa.

The Bunker Hill & Sullivan Mining and Concentrating Co. decided in 1915 to build a complete lead smeltery and refinery. Kellogg, Idaho, was finally selected as the place and construction has been begun on a site a mile west of the Bunker Hill mine. The roasting department will consist of a 26-foot Wedge roaster and four 42-inch Dwight & Lloyd sintering machines. There will be three lead furnaces 48 by 180 inches in size, each having a 20-foot 6 inch smelting column. The capacity of each will be 300 tons a day. The bullion will be drawn hot from the blast furnaces by an electric crane to the refinery, which will use the Parkes process of zinc desilveration and will be equipped with two softening furnaces for desilverizing kettles, two refining furnaces, four merchant kettles, a hard lead furnace, and a drossing furnace. The silver refinery will have four Faber-du-Faur retorts, two coupling furnaces, a fine-silver furnace, and a crucible furnace for gold smelting. Dore bars will be parted by the sulphuric acid process, the silver precipitated by copper and the resulting copper sulphate crystallized and sold. The gases from the blast furnaces, roasters and refinery furnaces will be passed through a bag-house and the filtered gases will escape from a 12-foot concrete stack 200 feet in height.

##### Lead Ores Sent to Canada.

Small quantities of domestic lead ores have been exported to smelteries in Canada. In 1912 soft lead amounting to 63 tons was smelted from Wisconsin ores at Canadian smelteries, and in 1913 soft lead amounting to 37 tons from Wisconsin ores and desilverized lead to 98 tons from Idaho and Washington ores were smelted in Canada. In 1914 desilverized lead 31 tons and in 1915 137 tons was smelted in Canada from Washington ores.

#### HARGRAVES.

After remaining idle for several years the Hargraves Silver Mines has resumed work on its properties adjoining the Kerr Lake mine.

In the previous operations several promising looking veins were found but aside from the finding of several small pockets of ore, no body of any importance was located. The property is alongside the Kerr Lake mine, one of the most productive mines in the camp.

## FELDSPAR MINING IN ONTARIO.

Ontario, largely owing to the product of one mine, has the reputation of producing the best feldspar in America. Increased activity in the pottery industry, and the possibility of extracting feldspar from potash, have recently drawn more attention to feldspar mines and prospects. The Ontario deposits are therefore receiving more attention than for some time.

Feldspar is not a high-priced article, even under present conditions. The mineral is a very common one; but the buyers want only high grade material. Coarse aggregates of feldspar and other minerals in the form of pegmatite dikes are the chief source of merchantable 'spar.' Of such deposits many are worthless on account of the minerals occurring with the feldspar, many are of doubtful value and only a few of economic importance.

Of Canadian deposits the best known is the Richardson, in Frontenac County, near Verona, Ontario. This is a large deposit of exceptionally clean feldspar which has been worked for several years. It was recently sold by Mr. Richardson, of Kingston, to the Pennsylvania Feldspar Co. This company has long used the Richardson spar in its mills in the United States, and is now producing raw material not only for its own mills but for others also.

The president of the Pennsylvania Feldspar Co. is Mr. S. Harry Worth, who is known to Ontario mining men as the president of the rich Seneca-Superior Silver Mines, Ltd. Mr. W. E. Segsworth, of Toronto, is managing director, and Mr. R. F. Segsworth is secretary. Mr. Ralph Scott, formerly of the Dome Mines staff has been appointed mine manager.

Since the mine was purchased a few months ago, production has been increased and preparations are now being made for mining on a more extensive scale. New mining and transportation equipment will be provided.

The Richardson mine is at present being operated under many disadvantages. The new owners believe that by changing the mining method, putting in new machinery and installing an aerial tramway for transporting the feldspar from the mine to the railway better results can be obtained.

The mining is now being done in the open. The rock is raised partly by an inclined skipway and partly in flat-bottomed boxes by means of derricks. The latter method resembles that in use at the Quebec asbestos mines.

At the surface the feldspar is loaded into small cars and hauled by horses to the edge of the lake. The cars are run onto a barge, which is ferried across to a portage. The cars are hauled across and loaded onto another barge. After crossing this second lake, the feldspar is drawn to a loading pocket at the railway siding at Godfrey.

Using the present equipment, the new owners have increased production very considerably. They are, however, confronted with the problem of maintaining shipments during the late fall and early spring months when the lakes are impassable. It is the intention therefore to construct an aerial tramway from the mine to the railway. At the mine the method of hoisting will probably be abandoned in favor of hoisting by a shaft which will be sunk to the east of the deposit.

## COAL MINING ON VANCOUVER ISLAND.

With the specific purpose of promoting the commercial and industrial interests of the various parts of Vancouver island, and bringing about increase in trade between the several cities and the producing districts; also to consider the best means of uniting on all matters affecting the general welfare of the Island, members of the Victoria, British Columbia, Board of Trade, and other business men, arranged an excursion to Duncan, Ladysmith, Nanaimo, Alberni, Courtenay, and Cumberland. A large number of prominent merchants, manufacturers, and others concerned, made the trip on November 14-16, and in the course of their travels learned much about the agricultural, lumbering, mining, and other industries of the parts visited.

Included in the published accounts of the trip were the following statements relating to coal-mining on Vancouver island:

### Canadian Collieries (Dunsmuir) Limited.

The visitors were taken on the company's train to Cumberland, where the general manager, Mr. J. R. Lockard, and other officials gave them every attention.

That the Canadian Collieries has spent recently in development alone approximately \$3,540,000; that 2,000 tons of coal are being taken out every day at present, and that a power plant has been installed at Comox Lake of 11,000 horsepower, are some of the facts learned en route. Thus the operations at No. 7 mine were inspected with more than usual attention. Under the guidance of officials, among whom were Mr. Joseph Hunter, chief engineer, all saw actual coal mining under way. Before their eyes the huge electrically driven drum around which winds 7,500 feet of steel rope, was put in motion, and from the bowels of the earth appeared coal-laden cars. The coal was screened, especially for the benefit of the visitors, to show them the stages through which the raw material goes before it is ready for the consumer. The company also is operating at the mine known as No. 8 shaft, a new development. In addition there are No. 4 slope at Comox lake, from which the coal is hauled 1½ miles by electricity to the tippel, No. 6 shaft, 400 feet deep in Cumberland, and No. 5 shaft with a depth of 300 feet.

### Western Fuel Company.

On the homeward trip, a largely attended meeting followed dinner at Nanaimo. After other industries had been dealt with, mining came under notice. Mr. H. B. Thompson, of Victoria, urged that something should be done to utilize the iron ore deposits of Vancouver island. One difficulty in this connection is that of a supply of fuel. He suggested that coal by-products, such as aniline dyes, might be manufactured at such a profit as to make coke cheap and plentiful. If this should be found practicable the fuel problem would be solved and future prosperity be assured.

Mr. Thos. R. Sockett, manager of the Western Fuel Co., said that those at home were doing their bit by trying to keep the wheels of industry moving. The Nanaimo mines were producing to their capacity. The old No. 1 mine is better to-day after thirty years' operation, than ever, and would be going as strong in the next similar period, barring unavoidable mishaps. Four or five miles to the south there were mining developments which promised results. The preliminary work was hard and expensive, and the advance expected had not been made, but it was coming soon. It would mean much to the community and to the island.



His company, he was proud to say, would have taken out 600,000 tons of coal from the two openings this year. This would make it the best in his thirteen years' experience. Next year it was expected to mine 800,000 tons and then 1,000,000 in the twelve months. When the latter figure was reached the ambition with which he had started would be realized. As to Mr. Thomson's suggestion, he said that there was some coal which would not coke. Scientists have been unable to discover the reason or to find the missing link in the composition of the mineral. The coal at the company's new Reserve mine was amenable but the coke would be high in price as the time had not yet arrived when there was a sufficiently large market for the by-products on the Pacific Coast to bring it within the limits of an industrial fuel, but the day was coming when it would be, and then there would be no doubt of the island's future, because rolling mills would be assured. Mr. Stockett also referred to the company's experiment in agriculture which had been carried out on land near Nanaimo, scientifically and systematically, on the basis of a 9-hour day with satisfactory results.

#### DOMINION STEEL.

Montreal, Dec. 8.—Mark Workman, who returned to-day from Pittsburg, stated that it was true that large sums of money would have to be spent from time to time on betterments by the Dominion Steel Corporation, but he added that this expenditure would be fully met by revenue and not taken from capital.

Asked as to his mission to Pittsburg the president of the Steel Corporation replied that he had improvements in mind at the Sydney plant, and that with such an end in view he and several officials had gone to the Iron City to get pointers. He explained that the changes at the Sydney works were intended to increase the annual output as well as to decrease the cost of steel productions. Word from Sydney was to the effect that everything is going well, that the coal situation is better and that the outlook generally is exceedingly favorable.

#### IMPROVEMENT TO PARRAL AGITATOR.

An improvement in the type of slime agitator commonly known as that of the Parral Tank System of Agitation has been patented by Mr. Bernard McDonald, of South Pasadena, California. The improvement consists in providing the circular tank with a bottom in which is placed a central cone, inverted, and to which the sides of the tank are sloped. This construction forms a trough into which the settling solids are directed and again drawn up to the top of the tank through the air-lifts. The latter discharge tangentially and cause a swirling motion of the slime contents of the tank, thereby keeping them in suspension and affording opportunity for the cyanide solution to dissolve the precious metals in the slime under treatment.

Mr. MacDonald will be remembered as having been prominent in Rossland mining camp, British Columbia, in the early nineties, where he had charge of very important mining operations. Afterward, for some years, he was active in mining in Mexico until the fighting proclivities of the Mexicans made it advisable for mining men from other countries to seek safety elsewhere. Since that time he has had his headquarters in Southern California.

#### OCCUPATIONS FOR CRIPPLED SOLDIERS.

By Sir Edmund Walker.

The end of the war is not in sight, but the wounded and otherwise disabled soldiers are coming back, and it is not too early to come to close grips with the problem of finding employment for those who have no claims on previous employers, and of caring for those who are partly or completely disabled.

We have to consider what we owe to the man who has fought to defend our lives, our property and our liberty, and we have to consider how to prevent the disorganization of industrial society when the soldiers come back in large numbers and the making of army supplies has come to an end.

We do not wish the soldiers' home-coming to mean, except perhaps temporarily, a cause of industrial disturbance. We want, on the contrary, to find in it a great opportunity to increase the prosperity and happiness of that part of the Empire which they have fought to save.

We shall have lost forever the laboring power of our heroic dead and of those who are totally disabled. We shall have gained the labor of many women untried before the war, we shall have gained the added strength, physical and mental, of countless soldiers who through the war have "found" themselves; and we shall, in much fewer cases, have returned soldiers who are more or less wrecked physically or mentally but who are not quite useless to the community.

I presume much of the work to be done by the Military Hospitals Commission leads directly to the larger work of land and industrial settlement. For obvious reasons we shall hope that many of the returned soldiers will take up land. The manner of selecting such land so that communities of loyal men shall be planted in every province, of caring for the soldier-farmer in his early years of settlement, and of lending him money for improvements, is of prime importance.

Meantime the Hospitals Commission has, added to its other burdens, the duty of making suitable for work, by training and by the use of newly invented implements, men who would otherwise in many cases be a charge upon the country and a monument of our ingratitude.

In my younger days the one-legged and one-armed soldier was always present, eloquent of war, and not without a meaning to the community,—“lest we forget.” We were used to seeing a bank-messenger with one sleeve pinned to his breast and his handsome commissionaire coat covered with medals.

To-day, every employer of labor, should be considering how he can employ a few partly disabled men, and thus do something more in carrying the burdens of the war.

What the peaceful communities at home must bear in mind is that these men are not rendered unfit for useful work but that they are handicapped or forced by the loss of one limb or sense to put more energy into their remaining abilities.

When everything that human skill and sympathy can do is done, we shall still have some men to be entirely taken care of by the state. I hope that in creating Soldiers' Homes for these, as well as in finding good work for all not totally disabled, we shall completely revolutionize the past and make the name of Canada shine brightly for its wisdom and its humanity in caring for its crippled heroes.



Bonanza Basin, Yukon.



Ground sluicing, Yukon.



Whitehorse, Yukon.



Looking up the Klondike River from Ogilvie Bridge, showing dredge Canadian No. 4.

## THE OLIVER AUTOMATIC SAFETY SKIP

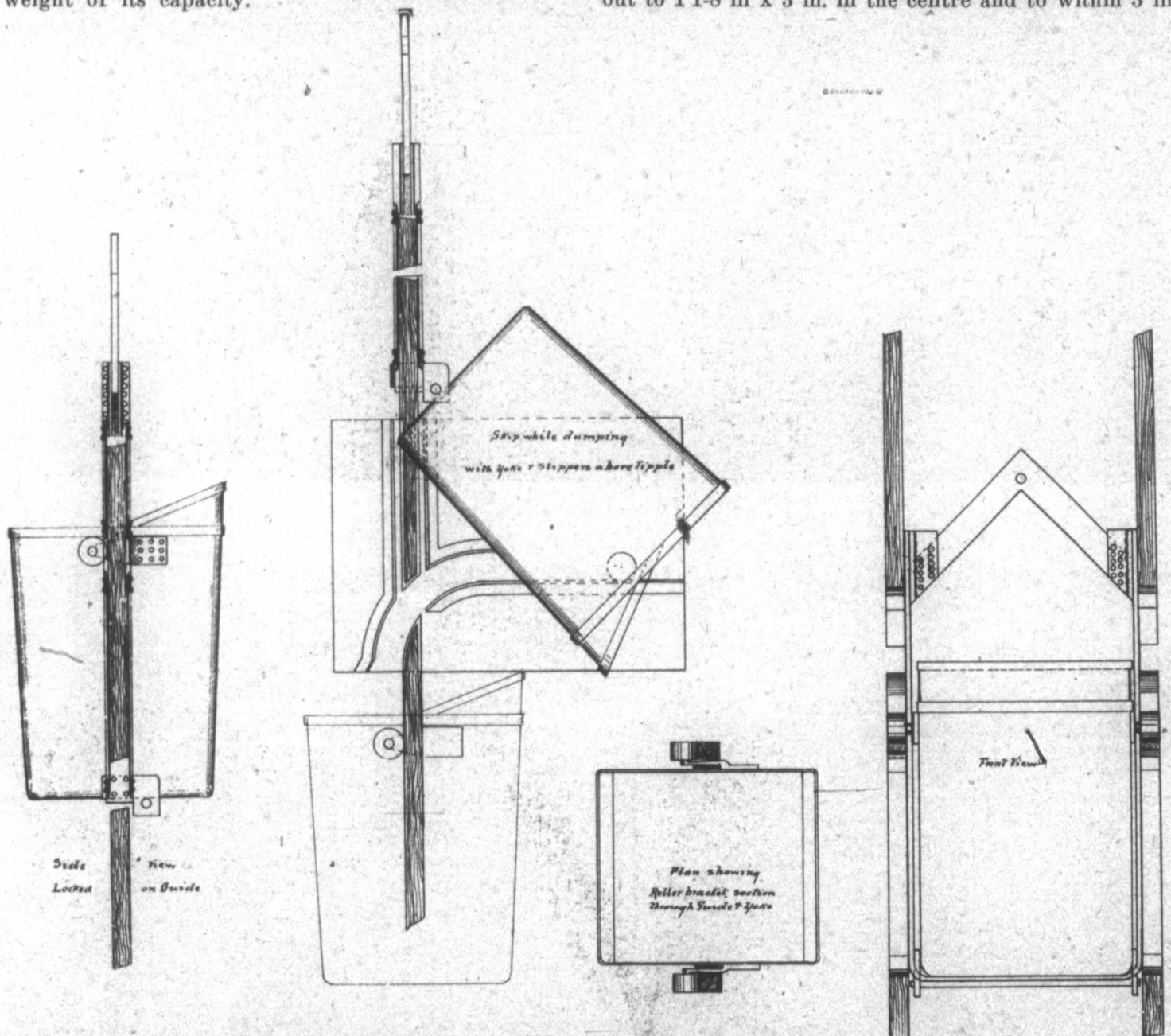
Mr. Frank Oliver, M.E., a member of the Canadian Mining Institute, is the designer of a safety automatic skip for use in vertical shafts, patent for which is being applied for. These skips are now being installed at the McIntyre-Porcupine Mine, South Porcupine.

The advantages claimed for this skip are: 1. The skip when in motion is absolutely locked so that it cannot tip, however loaded, while in motion until it reaches the tippel. 2. The cost of construction on skips of one ton capacity and over is much less than other designs. 3. Low weight of skip compared with weight of its capacity.

which is set at right angles and turned down to 1 1/2-1 3/4 in. The roller is made of cast steel 6 in. in diameter, and the width of guide. It is bored out to 1 1/2-1 3/4 in. to fit the axle of the roller bracket.

The body of the skip is made, as most well built skips are, of 1-4 in. plate for sides and 5-16 in. bottom plate, with 1 in. wood false bottom, with 1-4 in. plate above the false bottom.

The axle on bottom of the skip is made also of mild steel, out of 2 in. square, turned down to 1 1/2-1 3/4 in. ends, where it engages with the brackets or lugs on the bottom corners of the yoke, and is flattened out to 1 1/8 in x 3 in. in the centre and to within 3 in.



The yoke for this skip, shown in the accompanying figure, is made of 3-4 in. x 6 in. soft steel which is carried round the bottom of skip, being rivetted only to a 1 in. x 6 in. soft steel head piece, between angle irons.

The slippers, which stride the guides, are rivetted to the sides of the yoke through U plates holding slipper side plates, the side plates being made of 1-2 in. spring steel. The depth is governed by the size of guides used.

The roller brackets, which act as locks on the sides of guides, straddle the yoke and engage with the guide by means of a roller, the bracket being made of soft steel drawn or forged down from 3-4 in. x 6 in. to 2 in. which is the diameter of the base of the axle,

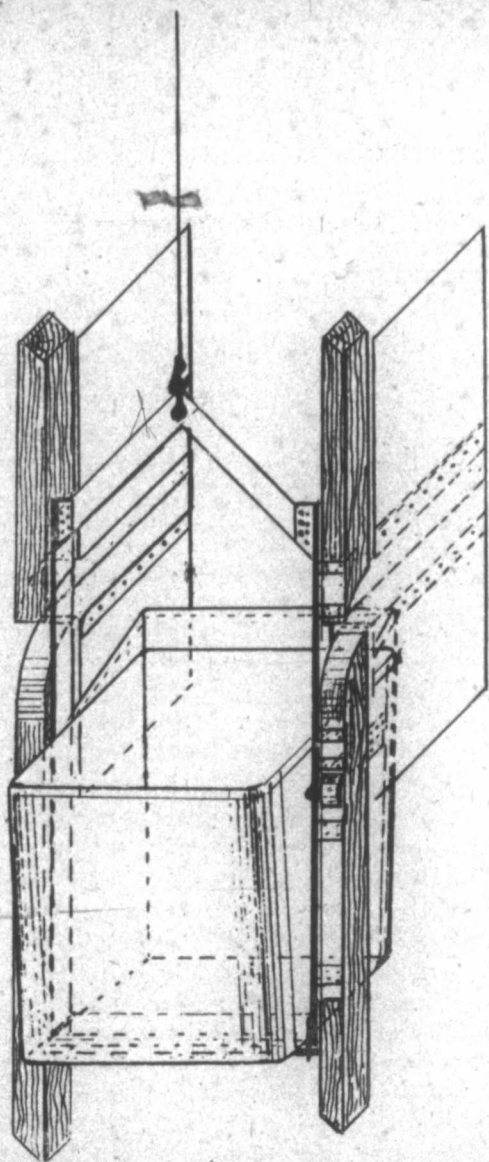
of the ends, where a collar is shrunk on to the turned portion.

The brackets or lugs on the bottom corners of the yoke which act as bearings for the axle to turn in, are made out of 1 in. x 6 in. mild steel set at right angles on edge, carried through the 6 in. the width of the yoke with a lug turned over to catch the other edge. These brackets are then rivetted to the yoke.

The entire weight of the skip is carried on the yoke and only when the skip is in the act of dumping does any weight come on the axle.

The tippel is constructed of angle irons rivetted to 3-4 in. plates, which plates are bolted to the head frame on each side of the shaft at a point for discharge.

The general construction is such that the skip can be installed in short time. It does away with any extra rail in the shaft to hold the skip from tilting



while in motion. It helps prevention of accidents in the shaft due to upsetting.

On account of the advantages already mentioned, it should meet with a ready demand where companies are installing hoisting plant.

#### CANADIAN MINING INSTITUTE.

A meeting of the Toronto branch of the Canadian Mining Institute was held at the Engineers' Club on Saturday, December 16th. Dr. A. P. Coleman gave an interesting account of a visit to Western Australia. The wonderfully rich mines are thought to be pretty nearly exhausted, but are still yielding a large production. The country is almost a desert, the so-called lakes being merely empty basins in the sand. Water is therefore very costly in the mining districts and the supply is one of the most important items in operating the mines. Dr. Coleman gave an interesting account of the Australian people, whom he found to resemble Londoners much more closely than do Canadians.

Mr. Geo. R. Rogers, a native of Australia, who is now resident in Toronto, and Mr. S. B. Wright of Deloro, Ont., who resided at one time in Australia, spoke briefly after Dr. Coleman and confirmed the accuracy of his observations.

Following the discussion on Australian mines and people, Mr. T. W. Gibson stated briefly the results of metal mining during 1916 in Ontario. He showed that great increases had been made and estimated

that the total mineral output of Ontario for the year would reach a value of \$65,000,000.

#### INTERNATIONAL NICKEL.

The following news item has been published in several American and Canadian newspapers. The authority is not given, and we cannot confirm the statements made, though they agree with other unofficial statements:

"When its proposed construction and improvement work in Canada has been completed, the International Nickel Co. will have increased its capacity approximately 40 per cent., or from an annual output of 60,000,000 pounds of nickel to between 80,000,000 and 90,000,000 pounds. Original plans called for the expenditure of \$2,000,000 on a Canadian refinery. The management, however, decided later to increase facilities all along the line through a single appropriation of \$5,000,000. Smelting facilities at the Canadian Copper works will be enlarged and water power capacity increased.

"International Nickel Co. has between \$8,000,000 and \$9,000,000 cash and securities, including \$2,000,000 Anglo-French bonds. International Nickel handles about 850,000 tons of ore annually, running consistently about 4 1-2 per cent. nickel. Copper values average about one-half nickel content, or 2 1-4 per cent. The company saves about 92 per cent. of its nickel. The nickel to be turned out in the Canadian plant will amount to from 20,000,000 to 30,000,000 pounds a year. With an increase in nickel output, copper production is expected to increase from about 30,000,000 pounds to better than 40,000,000 pounds per annum."

#### THE PRICE OF COPPER.

While spot copper is now quoted at over 30 cents a pound, the average price for Lake Superior copper during the year 1916 will not net the mines quite 25 cents. In fact the average will likely be closer to 24 than to 25 cents. Any mine that can show an average price for its metal for 1916 better than 25 cents will be over the average for the district.

It must be remembered that a full year ago a large number of the mines of the Lake Superior district contracted for their entire output away long into 1916—until May and June—in many cases, at approximately 21 cents. It was good business at the time. Later they contracted for the remainder of the year at 27 and 28 cents for the bulk of the product. Of course the U. S. domestic sales averaged somewhat in between 21 and 28 and 29 cents. And now those that have been able to turn out more copper than their contracts called for are getting 33, 34 and even higher bids for their ready-to-ship copper.

The Daily Alaskan, published at Skagway, Alaska, recently printed the following: High prices are simply killing the prospectors at Nome. With powder fuse and caps away up; coal so high, and provisions out of sight, since the men with the money won't venture, the time is coming when the working man will not be able to. The high rates and higher prices which excuse themselves by reason of the rates are simply killing the camp. Prospectors realize that the time is coming when they must get out of it unless something is done to remedy matters. All the prospecting miners advance the same story and say they knew when they are up against it. It was for this reason, to take care of their little stakes, that so many left on the steamers Umatilla and Victoria. Can you blame them?

## BOOK REVIEWS.

**MINES HANDBOOK.** By Weed. Price \$10. For sale by Book Department, Canadian Mining Journal.

This is volume XII. of Stevens' Copper Handbook. Previous volumes covered the copper mining companies of the world. This volume is not confined to copper mines. In it is much information concerning mining companies producing gold, silver, lead, zinc, etc. It is particularly complete with regard to the metal mines, other than iron, of the United States.

The volume has 11 chapters, compared with 5 in the previous issue. Chapter I, Glossary of Mining Terms, and Chapter II, Mineralogy, The Important Ore Minerals, will be especially valuable to readers unversed in technical and mining terms. Chapter III, a Description of All Known Copper Bearing Minerals, is the only complete list of copper minerals published. Chapter IV has 1162 pages of detailed descriptions of mines in the United States, Canada and Mexico, including amount and location of holdings, finances, profit and loss, geology, nature of ore, output, methods of mining, milling and smelting, probable future, successful or otherwise. Chapter V, the Metal Mining Industry, is particularly interesting as it gives the occurrence, demand for and uses of the different metals, together with production and prices for years back. Chapter VI, A Resume of the Copper Industry, covers this field in a most thorough manner. Chapter VII gives a table of Dividend Paying Companies, also a table of mining stocks listed on the New York Stock Exchange and on the Curb. Chapter VIII includes Data of the World's Principal Mines and a tabular comparison of operations and costs of the "Porphyry Coppers." Chapter IX, List of Obsolete Securities of Dead, Merged, Liquidated or Bankrupt Mining Companies, with references to former volumes in which they are described. A striking innovation is a list of several thousand mining company officials in Chapter X including the name and address of a large number of men connected with the mining industry of North America. The geographical index, Chapter XI, includes the names of the properties described in the book arranged by states, districts or towns for handy reference.

The mine descriptions proper have been more conveniently arranged than heretofore. Black face type has been used to denote the address, capitalization, property, geology, equipment, etc., in each company description. Tabulating has been used freely; this is of especial advantage when making comparisons of operating statement and yearly production.

The vast amount of new data contained in the Handbook makes the work valuable to the mining world.

The annual Northwest Mining Convention, in which numbers of men prominent in mining matters in the Northwestern States are interesting themselves in the expectation of there being a larger attendance than at former annual gatherings under the same auspices, is to be held in Spokane, Washington, during the week of February 19-25, proximo. It is stated that Mr. J. F. Callbreath, of Denver, Colorado, secretary of the American Mining Congress, has promised to be present, and that Dr. George Otis Smith, director of the United States Geological Survey, has expressed his intention to attend if his official duties will permit. The belief is that the gathering will be the largest in the history of the Northwest Mining Convention.

## THE APPEAL OF SIR ROBERT BORDEN FOR NATIONAL SERVICE

The world-wide struggle in which our Empire is fighting for its rights, its liberties and its very existence, has continued for more than two years. Every effort that could honorably be made on our part to avert war was put forth with the deepest earnestness and sincerity. There was no escape from the contest save in dishonor and ultimate disaster. The wonderful extent and thoroughness of the enemy's long and careful preparation was imperfectly understood at first, and the magnitude of the struggle has surpassed all anticipation. Great Britain's first expeditionary force has been increased more than twenty fold and that of Canada more than twelve fold. The climax of the war is rapidly approaching. The last hundred thousand men that Canada will place in the fighting line may be the deciding factor in a struggle the issue of which will determine the destiny of this Dominion, of our Empire, and of the whole world.

The most eloquent tribute would fail to do fitting honor to the youth of Canada who have already rallied so splendidly to the colors and whose heroic valor and glorious achievements have crowned this Dominion with imperishable distinction before the world. Remembering the sacrifice by which that distinction was won, we recall with solemn pride the undying memory of those who have fallen.

In the history of every people there may come such a challenge to the spirit of its citizens as must be answered in service and devotion if the nation is to have an abiding place in the future. The events of this war bring that challenge to-day to the manhood of Canada.

Since the war began more than three hundred and seventy thousand men have enlisted in this Dominion. Two hundred and fifty-eight thousand have gone overseas and more than one hundred thousand are now in the battle line. During the first ten months of 1916, the number sent forward will aggregate one hundred and forty-one thousand. From 1st January to April 15 of 1916 the enlistments were at the rate of nearly one thousand per day. Up to the present our forces have been enlisted and organized more rapidly than facilities of transportation and accommodation in Great Britain could be provided. During the past four months the number of enlistments has greatly decreased, and having regard to future needs the time has come for this appeal.

Notwithstanding the success of the allied forces in various theatres during the past summer, there is reason to know that the enemy is still strong and determined. A mightier effort than may be imagined is necessary to secure a conclusive victory. This war must have so decisive a result that lasting peace can be secured. We are fighting not for a truce but for victory.

In all mechanical appliances which have played so great a part in this war the allied nations have almost if not quite overtaken the enemy's standard of preparation. Therefore the result will depend upon the organization of the man power of the allied nations. Canada must be strong and resolute in that great endeavor.

Our strength can be most effectively thrown into this conflict by utilizing, in all our national activities for sustaining the agricultural, industrial and

commercial stability of Canada, those who through age or by reason of physical conditions are not available for service at the front; to the end that we may place in the battle line the greatest possible proportion of those fit for military service. With this view the government has asked the Director General and the Directors of National Service to undertake duties of the highest importance and urgency. It is imperative that the men and women of Canada, individually and through their various organizations, shall serve the nation in those capacities in which their services may be of the most value. Thus, it is the urgent duty of the Canadian people to join with the government in organizing the full power of the nation in terms of human energy.

Under the responsibilities with which I am invested and in the name of the State which we are all bound to serve, it is my duty to appeal and I do now appeal most earnestly to the people of Canada that they assist and co-operate with the government and the Directors of National Service in the endeavor for this purpose. To men of military age I make appeal that they place themselves at the service of the State for military duty. To all others I make appeal that they place themselves freely at the disposition of their country for such service as they are deemed best fitted to perform.

And to the women of Canada, whose spirit has been so splendid and so inspiring in this hour of devotion and sacrifice, I bid God-speed in the manifold works of beneficence in which they are now engaged, and I pray them to aid still more in every field of national service for which they may feel themselves fitted.

Let us never forget the solemn truth that the nation is not constituted of the living alone. There are those as well who have passed away and those yet to be born. So this great responsibility comes to us as heirs of the past and trustees of the future. But with that responsibility there has come something greater still, the opportunity of proving ourselves worthy of it; and I pray that this may not be lost.

#### THE IMPORTANCE OF CANADA'S MINING INDUSTRY.

The wonderful possibilities of northern Ontario were indicated by Mr. Arthur A. Cole, mining engineer for the Canadian Government, and president of the Canadian Mining Institute, in an address to the Empire Club of Canada recently. He said in part:

Canada is a country of large railway development when we consider it on a per capita basis. Most Canadians, if asked why we have so much railway development, will answer that it is primarily with the object of opening up our vast agricultural areas, and likely they would be right.

Now I do not wish for a moment to minimize the importance of the agricultural industry. It is our most important basic industry, but we should try to see things in their true perspective. Now that we have the railways, who supplies the business for them?

Let us take for example, our own little railway, the Timiskaming and Northern Ontario Railway. The T. & N. O. was projected as a colonization railroad to open up the large agricultural areas to the north of Lake Timiskaming, known as the "Clay Belt" of northern Ontario; now let us see who provides the freight for this railway.

During the last five years the mining industry has

been accountable for 47 per cent. of the total freight revenue, while agriculture gave only 13 per cent. or a little over one-quarter that of the mining industry. Let us consider the figures covering the whole of Canada. In the report for the fiscal year, 1913, the department of railways and canals of Canada publishes the following. For the year 1913, the products of agriculture handled by the Canadian railways formed 16 per cent. of the total and during the same period the products of the mines was 38 per cent. of the total, or more than twice as much and these percentages are practically the same for the six years previous. The manufacturer need not think that he makes a better showing than that, for manufacturers came one per cent. less than agriculture.

These are facts that we can not get away from and must show us that from a railway standpoint, at least the mineral industry is of immense importance.

#### Canada's Mineral Production.

"Our total mineral production now amounts to 150 million dollars annually, of which our own province of Ontario produces nearly one-half. In the list of our mineral resources you will find that there are very few of the important ones missing and in some of those we have the lead of the world.

Our coal resources are among the greatest in the world.

Our asbestos deposits in the eastern townships of Quebec supply most of the asbestos of commerce.

The greatest nickel deposits of the world are located at Sudbury.

Ontario has the largest body of high grade talc on the continent at Madoc; the largest body of high grade feldspar on the continent in the Richardson Mine near Verona; the greatest mica mine on the continent at Sydenham and the greatest graphite mine at Calabogie.

A recent molybdenite find within 35 miles of Ottawa may soon outstrip all rivals.

We have one of the richest silver mines in the world at Cobalt.

We have the most promising of the younger gold camps on the continent at Porcupine.

Our smelters at Deloro and Thorold produce more refined cobalt than all other refineries in the world put together.

With such a magnificent heritage we would be very delinquent if we did not give the mineral industry the careful attention that it deserves.

#### A Promising Feature.

Forecasts for the future may be considered superfluous, but I think in this case that they may help us in a campaign of better preparedness for the future. Again, let us turn to our northland for inspiration. Anyone who looked over the unbroken forests of northern Ontario a dozen years ago and predicted that this district would soon be producing twenty millions in gold and silver annually would have been put down as a fantastic dreamer. But that is a fact to-day, and the output is continually increasing.

Only a small portion of the country has been prospected. Running northeast and northwest from Cobalt and extending to the Arctic Ocean is the greatest Canadian pre-Cambrian shield, the basement formation of the continent. It contains thousands of square miles and offers to prospectors better chances of locating valuable mineral deposits than can be found in any other country of the world.

## THE FREEZE-UP

By J. Harmon Patterson.

My instructions were very definite. I was to proceed to D——, Northern Ontario, where I would meet a gentleman named Byers, outfit and escort him to the company's property at Turtle Lake, which I was to show to him. A postscript further explained that the gentleman aforesaid was entirely unaccustomed to bush travel and that no pains were to be spared to make him as comfortable as possible on the trip.

Now all this would have been natural and right in the proper time and season, but it was now the middle of November. By great good luck the streams and lakes might remain open and passable for two weeks, so I wired Tom Carter, an old prospector of long experience, promising him double pay and advising him where to meet me. I also sent the same instructions to Fred, an Indian whom I had frequently employed and on whom I knew I could rely.

With my employers I knew well by past experience that it was no use to object to any order received. They accepted no excuse for failure. They paid well and never objected to a heavy expense account, if the end warranted it. Results they wanted and results they got. But I had grave misgivings as I shook hands at D—— with a mild and spectacled gentleman, who informed me that he was Mr. Byers.

"I am afraid we are rather late in the season," he remarked, "but I am informed that if I do not see that property now I will not have another opportunity for six months, and though there may be some hardship attending the trip I think I am quite equal to it.

It was plain that he had no idea of the situation.

"It may be that you may have to walk," I replied, "still I think with luck we can get out before the freeze-up. I have with me two of the best men in the whole north country and I can assure you that come what may you will be well cared for."

"So be it," he said. "I am ready."

I was taking a grave chance and I knew it well, but at the same time my instructions were definite, and I knew that under any conditions which we might encounter we could make our charge comfortable and that counted for much. The warmest clothing that the place afforded was procured for him.

We took two canoes, one small and light for Byers and Tom. Fred and I took a very much larger one which from its build I judged would be safe in rough water. There were several large lakes to be crossed and the small canoe, while easier for travelling in, might have to be abandoned if the weather proved unfavorable.

Our trip to Turtle Lake was rapid and uneventful. Byers enjoyed it very much and he lost no time in making his examination of the property.

When we awoke on the fifth day after our arrival we found the ground covered with snow. A cold wind was blowing and it was freezing hard.

"We are sure up against it now," said Byers, "for winter is here in earnest."

"How much time will you require to complete your work?" I asked.

"I am quite satisfied," he replied, "and do not think it is necessary to remain longer."

I was glad to hear this and in less than an hour we were on our way. A strong wind was blowing and the snow began to sift down through the trees. The water froze on our paddles and our hands were numbed with the cold, but we pushed on as rapidly as possible.

We started out next morning in the midst of a blinding snowstorm. It was very cold and the ice was taking rapidly.

Early in the afternoon we reached the mouth of the river. The wind was still blowing a gale, driving the snow in horizontal sheets down the lake. It was seven miles to the portage. The white capped waves were rolling high and Byers declared that it was sheer madness to attempt to cross. He said he would rather walk all the way around than venture out on that angry water in such a frail craft. But we had no alternative.

Byers and Tom took the large canoe and the outfit while Fred and I took the other and most of the provisions. Byers insisted that he be given a paddle and we set out.

We had to cut the waves at an angle and while the large canoe rode the seas like a gull we soon found that our only chance was to run straight before the wind.

Fiercer and stronger came the angry gusts of snow laden wind and higher and higher rose the waves. The other canoe had drawn far to our left and the point which we hoped to reach was yet three miles distant when a cross sea caught us and half filled the canoe. It took some careful work on the part of Fred to hold it on its course while I bailed. We were now wet to the skin.

"Don't think we'll make it," said my companion, "Better tie that line around you, then you can get canoe if we upset."

I did as directed, but I had no hope of reaching shore. Once in the icy water we would soon be chilled. But still we kept on, now balancing on top of some huge wave, now plunging down to what seemed certain destruction, then up again and ready for another plunge.

Still we were afloat and still the dim outline of the point grew ever nearer. A few minutes more and we would be safe. "To the right, to the right," called my companion I tried to turn quickly to meet another cross sea, but it was useless and in the angry turmoil of waters we were overturned.

By the aid of the line I drew myself up to the canoe. We succeeded in righting it and I clasped my hands across the bow, while my companion did the same at the stern.

The pitiless snow and spray drove on my face while the chill from the icy waters seemed to reach my bones. I could not see the shore as my back was towards it.

Suddenly I saw Fred's shoulders rise above the water. He was on the bottom. I tried to stand but could not bend my knees. Without a word my companion proceeded to drag the canoe ashore and me along with it. Fortunately the shallow water extended all the way.

In a few minutes Fred had a fire burning. To this he dragged me as though I were a log. He then took off my shoepacks and socks and beat and chafed my feet and legs till, aided by the heat of the fire, I was able to move them. Then a quick run around the fire restored circulation.

We crossed the point but we could not pass beyond it, so we made up a fire and did our best to dry some of our clothes.

A mile away we could see the portage and the comfortable cabin which was there and in which we knew was a stove. But across that mile of angry water we could not pass. The snow ceased to fall but the gale continued.

We saw smoke coming from the chimney and knew that our friends were safe and we also knew that they were dry and warm. I could picture them standing beside the stove drinking hot tea while we shivered in the icy wind beside a fire which failed to even thaw our frozen clothing.

With the setting sun the wind fell and as soon as the water calmed somewhat we made the crossing.

They had hot tea ready for us and wrapped in warm blankets we sat beside the red hot stove and told them of our experience.

"Boys," remarked Byers as we sat around the supper table, "I would not have missed this trip for twice the



value of the property I came to see. Whether we get out by canoe or on foot is immaterial to me. Henceforth count me in as one of yourselves."

"It took him only about twenty minutes to learn to handle a paddle," said Tom.

From a dry cedar log Tom and Fred split out four flat pieces, each about six feet long by six inches wide. These they proceeded to make smooth and to the middle of each they fastened thongs to tie to their feet. "These are ice skis," said Tom, in answer to Byers' question. "By the use of these we can walk on very thin ice. We just slide along and we can pull the canoes after us."

"But what will we do?" he next inquired.

"You will walk around," was the reply.

The snow was a foot deep on the portage next morning and the small lake was completely covered with ice. By the aid of the skis Tom and Fred easily crossed with the canoes while Byers and I walked around.

The next lake was also frozen and the boys proceeded to cross in the same way. But the ice in the middle was too thin and Tom, who was in the lead went through. Though he was able to support himself on the ice in front he was in a critical situation for he was unable to crawl out and the boards on his feet kept them well afloat. If he lost his hold on the ice he would have no chance whatever. Fred at last got an axe and proceeded to break the ice behind so that Tom was rescued from his perilous position with the canoe. They were then compelled to break the ice for a considerable distance before it became solid enough to bear their weight. When at last they reached the shore we had a fire going. Tom changed his clothes and after a good drink of hot tea declared that he was none the worse for his plunge.

The next portage was long and the snow made the traveling bad. The short winter day had closed when we reached the river at the far end. Here we camped. We had only enough provisions for another day as most of our supplies were lost in the lake.

The route now lay down the river till we reached a large lake at the far end of which was the railway. The distance was about fifty miles with twelve portages, most of which however were short. The cold was still severe and if we were frozen in now we would have nothing to eat.

Byers had turned in so we talked the matter over and decided to make a dash to the railway. We would leave the small canoe as the large one would hold us all. Though our charge might not be as comfortable as usual he could stand it for one day at least.

"What's the matter boys?" inquired Byers, as we awoke him about four o'clock next morning.

I told him breakfast was ready.

"Breakfast," he said sleepily, "why I only lay down a few minutes ago."

"I hope you will sleep in a real bed tonight," I remarked. "We mean to try and get through to-day."

"Why I thought you told me that it was fifty miles?" he said in surprise.

"Nevertheless I think we will succeed bar accidents," I replied.

"I won't make it a bet," he said laughing, "for the odds are too great against you, but I will give each of you a ten-spot if you get there."

On the crooked river in the darkness we could not go quickly. At last it opened into a long narrow lake, and then we began to make time.

After passing the lake the river was larger. There were many rapids and we ran them nearly all. On the short portages Tom and Fred picked up the canoe, one at each end, and carried it over. On none was any time lost.

It was about five o'clock when we reached the lake. The next four miles were made in the teeth of a gale, but

it soon subsided and we made the other shore and coasted along in the shelter. As the wind died away the cold became more intense. The sides of the canoe and our paddles were coated with ice. Once Byers became so chilled that we had to land and make some hot tea to warm him up.

Out of the darkness ahead came a distant rumble. It grew louder, then died away. Again it came and this time accompanied by a shrill whistle.

"A train, by all the Gods!" exclaimed Byers.

At ten o'clock we arrived at the hotel, very weary and very cold. I was informed that we were too late for anything except a cold lunch, but Byers knew a way and in a few minutes all the help which the proprietor could muster were busy.

Next morning when we looked out over the lake it was a sheet of smooth ice as far as the eye could reach.

### SIR SAM VISITS BOURKES.

Cobalt, Dec. 12. A large crowd gathered at Cobalt Station this morning to meet Sir Sam Hughes who was on his way north in company with some Toronto men to Bourke's where he has some mining interests. At Cobalt Sir Sam renewed old acquaintances and spoke to those who had gathered there to greet him. Representatives of the Cobalt Town Council were present, also members of the Temiskaming Conservative Association. At Bourke's the party visited the Murray Mcgridge mine and were shown over the property by the manager, Mr. George C. Thomas, formerly manager of the Dome Lake Mine at Porcupine and of the Hudson Bay Mine at Cobalt. The party were taken down one of the shafts.

### REPORT PRODUCTION OF SPELTER IN CANADA.

The Mines Branch, Ottawa, has just issued a report, by Dr. A. W. G. Wilson, on the production of spelter in Canada. This report contains the results of an investigation into the costs of the various raw materials required by the zinc smelting industry, made during the months of May, June, and July, 1916, and supplies estimates as to the probable cost of these materials at certain points in Canada. The conditions under which Canadian zinc ores are now sold to a foreign market are discussed, and the terms of a number of contracts for these and similar ores are stated. The report is concluded with a statement of the author's personal opinions in regard to certain matters in connection with the home treatment of British Columbia zinc ores.

### CANADIAN ZINC.

The greater part of the production of zinc ore in Canada is from British Columbia. The ore shipped contains also a varying silver content, for which payment is made by the smelters, and without which, on account of the import duty to the United States and the long rail haul, it would not in many cases pay to ship. The Slocan mining division produced about one-third of the total output in 1915—Nelson about one-fifth, and the balance came principally from the Ainsworth and Fort Steele divisions.

In Quebec, the property at Notre Dame des Anges, Portneuf county, which is being operated by the Weedon Mining Company, has shipped several hundred tons of ore.

### ON THE FEASIBILITY OF SMELTING ORES IN BRITISH COLUMBIA.

In a report on the production of spelter in Canada, Dr. A. W. G. Wilson summarizes his opinions as follows:

1. So far as the actual operations of a smelter are concerned, the cost of smelting in the Crowsnest Pass area or on the Pacific Coast would not be much greater than in the middle Western States where coal is used for fuel, and with co-operation between all the interests concerned, it could be carried on here as cheaply or cheaper than elsewhere. The cost in the natural gas areas in Canada would be greater than in corresponding areas in the United States, but not at all prohibitive. The author considers that it is not in the public interest to permit natural gas to be used for zinc smelting. The difficulties of obtaining skilled labor and trained supervision are not insuperable, most of the raw materials apart from ores, could probably be obtained locally. If suitable ores were available for treatment, spelter could be produced at a cost which would compare favorably with the cost of production by these methods elsewhere.

2. The author is in accord with all previous investigators in concluding that it has not been demonstrated that British Columbia silver-lead-zinc mines are capable of producing enough high grade zinc ore concentrates to support a smelter operating on the Belgian or any similar process. There is not a sufficient tonnage of high grade ores known to be available without importing foreign ores; the silver-zinc concentrates now produced are of too low a grade to be treated commercially in a smelting plant whose only source of supply is these ores; the tonnage produced is too small; the output is too irregular; the methods of concentration now in use, with two exceptions, are inefficient and wasteful; there is a great lack of co-operation among the various producers.

3. An independent zinc smelting plant would be handicapped for lack of a silver refinery. It would have to consign all lead and silver residues to the smelter at Trail, or to Helena, Montana, entailing additional freight charges against the ore and curtailing the possible profits to the smelter. The alternative would be to establish its own refinery, which would necessitate entering a limited market on a competitive basis for lead ores. The operation of silver refineries to treat retort residues only has not proven to be a profitable operation for the zinc smelters. Such a plant would probably be unable to secure any revenue from sulphuric acid, made as a by-product at most United States plants.

4. It would have been commercially feasible to have established a zinc smelter on the Pacific Coast any time during the first half of the year 1915, to treat British Columbia zinc ores, and ores from Australia. The product from such a plant would have found a ready market for certain classes of munition work, but would not have been suitable for making brass for cartridges and shell cases. Owing to the prevailing high prices of zinc this plant would have easily paid for itself during the first year of operation, the production of zinc ores in British Columbia would have been greatly stimulated, a better knowledge of the possibilities of zinc mining in British Columbia would have been obtained, and the returns to producers would have been greater than they have been.

5. As an alternative, it would have been commercially feasible to have established a zinc smelter in the Crowsnest Pass area, or to have rehabilitated the old Frank smelter at any time during the first half of the year 1915, to treat zinc ores from the Kootenays. The supply of ore available would not have been adequate for a large plant, but foreign ores could have been imported. The conditions of the zinc market and the preference that would have been given in the home market, would have made such a venture profitable for a time. The quantity of zinc that could have been produced would have been less than if such a plant had been established on the coast, because the ores available are of a lower grade than the Australian ores, are more difficult to treat and are limited in quantity.

6. There is a notable lack of co-operation among the independent zinc producers. The organization of a Zinc Producers Association to supervise all matters of common interest, and to enable the various producers to co-operate more closely with each other, in matters of mutual concern, would tend to improve conditions in the zinc industry.

7. The majority of the coal producers in the west do not appear at any time to have been willing to make any serious effort to assist in the establishment of a zinc smelting industry. The prices quoted, so far as they have come under my observation, with one exception, are higher than are usually demanded in other fields for products of similar grade. When one considers that there is a considerable quantity of material, now a waste product, that could be utilized by the zinc smelter, it would seem that more encouragement might have been given.

8. The establishment of the new electrolytic plant at Trail, and the proposed establishment of the plant at Nelson by the French Complex Ore Reduction Company have materially altered the situation with respect to a market for British Columbia zinc ores. The process being used at Trail is still undergoing development, and the Consolidated Mining and Smelting Company is not in the market to purchase zinc ores, having an ample supply of their own. As soon, however, as the initial difficulties are overcome it is their intention to purchase ores suitable for treatment in their plant, and subject to the market demands for spelter. The capacity of the plant will be such that they should be able to treat a large percentage of the zinc output of the Kootenays.

9. The establishment of a zinc smelting plant in British Columbia at the present time does not appear feasible for the following reasons:—

- a. Inadequate supply of suitable ores.
- b. Inadequate supply of suitable labor.
- c. Lack of knowledge of suitability of local clays for retort purposes.
- d. High cost of structural materials, including fire brick.
- e. The retorting process is not especially adapted to treat the complex silver-lead-zinc ores which comprise the bulk of the British Columbia output, whereas developments now going on in electrolytic processes give promise of a solution of this problem.
- f. The electrolytic processes also give promise of a greater adaptability to the peculiar needs of British Columbia ores. If these processes are successful it may prove to be possible to treat some ores locally in plants of smaller unit size than are practicable in smelting by a retort process.

## SPECIAL CORRESPONDENCE

## BRITISH COLUMBIA.

Ore receipts at the Consolidated Mining and Smelting Co.'s smelting works at Trail, West Kootenay, in 1916, up to the week commencing December 8, totaled 465,230 tons as compared with 441,085 tons during the whole of the calendar year 1915. These figures show an increase in the expired portion of 1916 as compared with the full year 1915 of 27,145 tons. Unless there shall be a considerable decrease in receipts for the remainder of December, it may be expected that the total increase for the year will be about 50,000 tons. As there has also been an appreciably large increase in the output of ore from the respective mines of the several large copper mining companies, without any considerable decreases in output from other mines as a whole, it is believed the total of ore produced in 1916 will be found, when the revised returns of production shall be available, that the year has been a record one in this particular as well as in output of some of the lode metals. A rough estimate of the value of the mineral production of 1915 indicates that the total will be approximately \$45,000,000, but this may not be stated definitely, since returns of metal recoveries by some of the larger companies have not yet been received.

## East Kootenay.

It is stated that ore will be shipped during the winter from the Park mine, situated one mile and a half northeast of Marysville. A trial shipment of 12 tons was made to the smeltery at Trail last April. Supplies for the winter's requirements have been taken from Fort Steele to the Victor mine, at which ten men are working, and, having seen everything in shape for the season's operations, the owner, Mr. A. B. Abernethy, has gone to Spokane, Washington. Preparations are being made to ship ore from the Dexter property, Wildhorse creek. Throughout the winter ore is to be raw-hided from the Lead Queen mine to Brisco; a contract has also been entered into for raw-hiding ore from the Isaac mine to Brisco, which is a station on the Kootenay Central railway 48 miles south of Golden. During the first quarter of 1916 137 tons of ore from the Lead Queen mine was received at Trail. In his report for 1915 the mining recorder for Windemere division described the Lead Queen property as a group of five claims on Frances creek, on which considerable work had been done. The group was bonded and work started in August of that year; twelve miles of wagon road was constructed at a cost of \$10,000, and a similar sum was spent in development work. The Isaac is in the same part of the division, and the work done on it in 1915 included building cabins, beside constructing a wagon road and taking in material for an aerial tramway.

## Boundary.

At the Granby Consolidated Co.'s smelting works at Grand Forks, states the Gazette, a fifth blast furnace was blown in on December 7, four furnaces only having been running for a short time. There had been a temporary suspension of work at the company's mines at Phoenix, for two days, owing to coke shortage at the smeltery having necessitated curtailment of smelting. From the same source it is learned that there were then 16 miners working on Wallace mountain, near Beaverdell, which is in the western part of Greenwood mining division. The King Solomon copper mine, in

Copper camp, west of Greenwood, will be worked throughout the winter, with Mr. J. Wilson in charge. Ore hauling by motor truck from the Union mine, in Franklin camp, some 50 miles north of Grand Forks, has been abandoned and now ten horses are employed hauling ore to the rail head at Lynch creek.

## Kamloops.

In a special issue of the Kamloops "Standard-Sentinel," information relative to the Iron Mask mine, situated at Coal Hill, a few miles from the town of Kamloops, is given as follows: The Iron Mask has, with very short periods of inactivity, been steadily developed and has at times shipped large quantities of ore, concentrates and matte to Coast smelters. On this property, which consists of some ten claims, there has been done underground work to the extent of 16,500 ft., of which 1,200 ft. is shaft sinking and the remainder drifts, cross-cuts, and raises. The main shaft on the Iron Mask claim itself is a three-compartment shaft 780 ft. in depth. The greater part of the development work has been done on this claim and on the Erin lying directly east of it. The surface equipment is modern in every respect and is being added to as requirements demand. Power for operating it is derived from the Kamloops City hydro-electric power system; the owners of the mine have constructed their own transmission line from the municipal power house to the mine, a distance of six miles. The Iron Mask concentrator is of unit construction, operating on the gravity system; its present capacity is 600 tons of ore per 24 hours. It will be practicable to double the capacity at minimum cost without interfering with operation of existing unit, and if such increase be made present mine hoisting equipment will suffice to hoist the additional quantity of ore. Experiments are being made with a flotation concentrating process, which promises an increased percentage of recovery of metals. During the past year extensive development work has been done with the object of determining the extent of the orebodies occurring in the mine.

A first shipment of 33 tons of ore from the Windpass claim, Chu Chua, was received at Trail early in December. Eight months earlier 52 tons of ore reached Trail from the Foghorn property, also in the northern part of Kamloops mining division. The Canadian Northern railway passes through the district. The cost of getting ore to the smelting works from this outlying region must be considerable, for first it has to be packed or hauled to the railway; then there is the rail haul to Kamloops, and afterward a long rail and steamer distance to be covered between Kamloops and Trail. However, there is no other way of ascertaining the value of the ore in quantity, so claim owners adopt this means of satisfying themselves as to the metal contents of their ores in bulk.

## Coast District.

A shipment of 41 tons of copper ore has been made from the Monitor mine, situated in Alberni mining division, on the west coast of Vancouver island. The resumption of work at this property recalls the fact that fifteen to sixteen years ago it was regarded as likely to become an important mine. In his official report for the year 1900, the district Gold Commissioner gave some particulars as follows: "The Monitor Mining Co.'s property, situated on the Alberni canal, and distant from the town of Alberni about 18 miles, comprises

a group of five claims, namely, the Nahwhitka, John Bull, Uncle Sam, Monitor No. 2 and Monitor No. 1. All the development work has been done on the Uncle Sam claim, which is distant from deep water a distance of 2,200 ft., and is connected by a double rope aerial tramway with the company's wharf. At the lower terminal of this tramway there has been erected an ore bunker with a capacity of 400 tons, and from this terminal to the wharf a trestle tramway has been constructed, fitted with a turn-table and tippie, so as to admit of the loading ore on to steamships with a 4-ton car. At the upper terminal of the tramway there is a 50 ton bunker, which is connected with the mine by a part drift and part incline tramway. Development consists of a tunnel 170 ft. in length and a shaft 35 ft. in depth, together with some stoping work. On the dump and stored in the bunkers there is 500 tons of ore. During December, 1900, 178 tons was shipped to the smeltery at Tacoma, Puget sound, Washington, which ore, after deduction of freight and smelting charges yielded a profit of \$12 to \$15 a ton. The official report for 1901, after stating that toward the end of the summer operations had been suspended at the mine pending re-organization of the company, gave the following information: "In 1901 there was done 240 ft. of work. The ore is chalcopryrite mixed with magnetic iron. From seven shipments to the Tacoma smeltery, amounting in all to 992 tons of ore, an average value of \$30 a ton was obtained. On the property there is an aerial tramway, a hoisting plant and the necessary skips, pumps, etc. A manager's office and quarters, bunkhouse and storerooms, men's sitting rooms, dining rooms, kitchen and messhouse at the mine, with blacksmith shop and hoisting house have been erected, while on the water front there has been constructed a good shipping wharf. There are some 60 tons of ore on the dump, and the face of the two drifts, where work was discontinued, showed a shoot of ore 6 ft. by 4 ft." In 1913 the property was visited Mr. D. G. Forbes, mining engineer, whose report to the Provincial Department of Mines included the statement that the aerial tramway had been wrecked; the hoist, vertical boiler and horizontal plunger pump, still at the mine, had been ruined by exposure, and that the mine workings were full of water. However, the property has been leased by Mr. J. A. Skene, who last summer did development work in it, employing ten men, and he now plans to continue shipping ore to Trail if the results of the first shipment shall warrant his doing so.

#### General Notes.

Nine tons of ore was recently shipped from a molybdenum property in Lillooet mining division.

Boring operations in the neighborhood of Barkerville, Cariboo district, have been suspended and the drill stored for the winter.

It is reported that the dam on Swift river, constructed six or seven years ago in connection with the Quesnelle Hydraulic Gold Mining Co.'s water supply system, has broken and that the resulting flood has done damage down the Cottonwood river.

Short course classes in mining and associated subjects are to be commenced at the University of British Columbia early in January. Geology, mineralogy, assaying, metallurgy and other subjects will be included in the courses, which are designed especially for prospectors and miners.

It has been announced in Vancouver Island newspapers that the Canadian Collieries (Dunsmuir) Limited will grant to all miners and day wagemen in its

employ at its collieries at Cumberland and Extension a war bonus of five per cent. as from the first day of 1917. It is stated that this action was taken spontaneously by the company, no application for it having been made by its numerous employees. The output of coal from the company's mines in 1916 was more than 50 per cent. greater than for the year 1915, and its production of coke was also much larger.

#### MINING IN YALE DISTRICT, B.C.

There are five or six mining divisions in Yale district of British Columbia, but, generally speaking there has not yet been much metalliferous mining done in them on an important scale, at least not as regards ore production. The largest shipper of ore in recent years has been the Iron Mask group, in Kamloops division, but as no information has been supplied when written for, particulars are not available for use at this time. In the Highland Valley region of Ashcroft division ore has been shipped from two properties, namely, the Snowstorm and the Chataway groups, respectively. Smeltery returns from 96 tons from the former, published in the Annual Report of the Minister of Mines for 1915, show about 3 oz. gold and 200 oz. silver to the ton and 30 per cent. copper; this, however was hand-sorted ore.

Leaving out of present account numerous other properties in the big district of Yale, some particulars follow relative to the Chataway and Tamarac groups, in Ashcroft division, and the Aberdeen group, in Nicola division. In the former a large interest is held by Spokane men; the latter is understood to be a Seattle, Washington, enterprise.

#### Highland Valley Co.'s Property, Ashcroft Division.

The Highland Valley Mining and Development Co. was organized under the laws of the State of Washington and registered as an Extra-Provincial Company under the Companies' Act of the Province of British Columbia. The first work to be undertaken by the company was the development of the Chataway and the Tamarac groups of mineral claims held under bond and situated in Highland valley, south of the town of Ashcroft, B.C., from which town they are distant about 30 miles by wagon road. In response to a request for particulars of progress made, Mr. Frederic Keffer, of Spokane, Washington, president and general manager of the company, has been good enough to supply the following notes:

The year has been taken up with development of the mine, road building and construction of a mine camp, and erection and equipment of a concentration mill.

Development consisted of 438 ft. of drifting on the vein (nearly 300 ft.) cross-cutting and raising on the Chataway group, and driving a tunnel 175 ft. on the Tamarac group; total footage of development work, 613 ft. On the Chataway group practically all the work was in good ore, save for about 20 ft.; on the Tamarac it has been in waste to date.

A first-class wagon road was constructed from the main Ashcroft-Merritt road up to the mines, a distance of six and one-half miles. The Provincial Government defrayed nearly one-half of the cost of this road.

Buildings erected in camp were a bunk-house, boarding-house, office, assay office, blacksmith shops, powder house, root house, big barns and some minor buildings.

**Concentrating Mill.**—On December 9 operation of the entire mill was commenced, the crushing section having been tested some days earlier. It is expected

that in the latter part of December the mill will be operating with three shifts employed and that thereafter product will be turned out regularly. The concentrate produced is very good, both in appearance and grade. Having been running only two days, there has not yet been time to make assays, but it is expected the concentrate will contain about 25 per cent. copper.

The mill has three main floors, arranged as under:

On the first floor are two Robb-Mumford-Brady boilers, together 100 h.p.; one 50 h.p. engine, one Hardinge conical mill with Challenge ore-feeder, one Union Ironworks (Spokane) crusher with jaw opening 9 by 16, and one pair of the same company's Reliance rolls; also elevator to fine ore bins and trommel screen.

On the second floor are one 35 h.p. engine, two Butchart concentrating tables, four cone slime tanks, one Anaconda de-slimmer, an 8 kw. dynamo, a Roots blowing engine, and a small compressor.

On the lowest floor are tanks for concentrate, an Oliver filter, and a flotation concentration machine built by the Nelson (B.C.) Ironworks according to patterns from the Minerals Separation Syndicate; also a Roots vacuum pump for the Oliver filter, and a Fairbanks-Morse Typhoon pump.

At the lake below the mill there is a second Typhoon pump with an electric motor to drive it. There is one 12,000 gal. tank below the mill, another of similar capacity above the mill, and a 2,000 gal. feed-water tank.

Between the mine and the mill there is a gravity tramway 950 ft. long for conveyance of ore to mill bin, the capacity of which bin is 300 tons.

The ore is crushed to 1.4th inch size and then passes to rolls from which it is elevated to trommel over fine ore bin, the oversize passing back to rolls. The ore, screened to 3.16th inch size, next goes through feeder to Hardinge mill, and thence to de-slimmer, which removes the slimes, these going to the cone settling tanks. The coarse sands pass to the Butchart concentrators and the tailing runs to waste. The slimes and middling go to the flotation machine, the concentrate from which is dried on the Oliver filter. It has not yet been decided whether or not to submit the tailing to the flotation process, but it is thought probable that its metal content will be insufficient to make it worth while doing so.

The ore mined averages 4 to 5 per cent. copper. Capacity of the mill has been planned for 50 tons daily, but in operation it may be found somewhat greater. Concentrate from tables is expected to run from 20 to 25 per cent. copper, and from flotation machine a higher percentage. Part of the flotation plant has been received at the mill; the machine will be set up soon after the whole of it shall have been received.

During the summer and fall about 115 tons of ore was shipped, the teams that hauled the machinery and material for mill having taken to the railway that quantity as return freight. That ore contained approximately 17,000 lb. of copper.

#### Aberdeen Group, Nicola Division.

In his official report for the year 1915, the mining recorder for the Nicola mining division briefly mentions the Aberdeen group, thus: Some satisfaction has been expressed on the bonding of several mineral claims situated on Ten-mile creek, known as the Aberdeen group, to a syndicate headed by T. J. Corwin, of Seattle, Washington, U. S. A. On this property a force of twelve men is now employed; a shaft has been sunk

to 40 ft. in depth, and drifts run on the ore for 35 ft. at the 33ft. level. Drifting is also in progress, both ways from the shaft at the 50 ft. level, the vein extending for 5 ft. between walls, and being apparently continuous. Assay returns show that the average of the ore yields about 4 per cent. copper, 2 oz. in silver and a trace of gold."

A recent account of the property and the work done on it, supplied by the manager, Mr. T. J. Corwin, on request, follows: The Aberdeen group is situated on Ten-mile creek, eleven and one-half miles north of Coyle, the nearest station on the Kettle Valley railway. During the summer of 1916 we built a wagon road seven and one-half miles long at a cost of \$6,000; over this road the ore is hauled to the railroad.

Work was commenced on the property on January 4, 1916. Since that time we have sunk a working shaft to a depth of 150 ft., and a man-way shaft to 100 ft.; the latter would probably be classed as stoping. There has also been done 120 ft. of drifting on the 50 ft. level, 150 ft. on the 100 ft. level, and 100 ft. on the 150 ft. level.

Since June 1 we have erected a dining room and cook-house, to accommodate 40 men; an office and commissary building; boiler house, hoist house, ore hopper and bin, and at the Coyle railway station an ore bin and loading platform.

We have installed a compressor, a 50 h.p. steam boiler and two pumps, with 1,200 ft. of a pipe-line for water supply.

We have shipped 1,374 tons of ore, from which has been produced 200,153 lb. of copper and 460 oz. of silver. We have on the dump approximately 3,500 tons of concentrating ore.

Northwest Mining Truth, published in Spokane, Washington, said early last month: Standard Silver-Lead Mining Co. has recently closed a contract to supply Anaconda Copper Co. with 2,000 tons of zinc concentrate running about 43 per cent. zinc and 20 oz. silver to the ton. The shipments will be consigned to Great Falls, Montana, where the new electrolytic plant is now in successful operation. Mining Truth understands that the contract will net the Standard company between \$40 and \$45 a ton, thus insuring additional profit of from \$80,000 to \$90,000 within the next few weeks. Contract calls for immediate delivery, therefore consignments will be rushed.

At a meeting of the Columbia Section, American Institute of Mining Engineers, held in Spokane, Washington, on November 25, the retiring chairman of the section, Mr. Stanly A. Easton, general manager for the Bunker Hill and Sullivan Mining and Concentrating Co. of Kellogg, Idaho, in concluding an address to the members present, directed attention to an article by Dr. Elliott, formerly president of Harvard University, in a recent issue of the Atlantic Monthly, in which that writer referred to "miners and other adventurers." Mr. Easton deplored such a classification of mining men, and especially by one of such high standing as Dr. Elliott.

The Consolidated Mining and Smelting Co. of Canada, Ltd., with head office in Toronto and mines and reduction works in British Columbia, has declared a quarterly dividend of 2½ per cent., or at the rate of 10 per cent. per annum, payable on January 2, inst.

## PERSONAL

Mr. A. A. Cole, president of the Canadian Mining Institute, has been nominated for re-election.

Mr. Frank Oliver is in Toronto.

Mr. H. H. Lavery, formerly of the Dome Mine staff, is now superintendent of the St. Anthony Gold Mine.

Mr. R. E. Hore of Toronto is in the Michigan copper district.

Mr. Harry Sparks, lately of the Dome Mine staff, is now at the Croesus Gold Mine assisting Mr. Julius Cohen.

Mr. Ralph Scott, manager of the Pennsylvania Feldspar Company's feldspar mine at Verona, Ontario, is visiting in Calumet, Mich.

Prof. A. P. Coleman addressed a meeting of the Toronto branch of the Canadian Mining Institute on Saturday, Dec. 16, his subject being "Gold Mining in Western Australia."

Mr. John B. Ryan, a native of the Michigan copper district, who has attained a position of great prominence in the copper world, has recently purchased a \$600,000 estate near New York City.

Hon. Wm. Sloan, Minister of Mines for British Columbia, was married on December 11 at the First Baptist Church, Vancouver, B.C., to Miss Catherine Fiske McDougall, daughter of Mr. and Mrs. D. McDougall, of 1149 Beach avenue, Vancouver. After a short honeymoon trip to the South, Mr. and Mrs. Sloan are occupying rooms at the Empress hotel, Victoria, B.C.

Mr. F. M. Sylvester, vice-president and managing director of the Granby Consolidated Mining, Smelting and Power Co., when at Prince Rupert, B.C., recently on his way to the company's smelting works and Hidden Creek mine at Anyox, Observatory inlet, was reported to have told a representative of a local newspaper that the big copper companies had been keeping the price of copper within reason. They could have sold their copper to the Allied Governments at a higher price than what had been charged, but did not feel disposed to do so. The Granby company had made contracts for one-half of its output of copper for the next seven months at 25 cents a pound.

Mr. I. I. Felker, who for five or six years has been prospecting gold-bearing gravels on Perkins gulch, a tributary of Lightning creek, Cariboo, B.C., left that district at the end of November with his family, to spend the winter in New Hampshire and Maine.

Mr. A. F. Noel has returned to the Lorne gold mine, Cadyallader creek, Lillooet district, B.C., for the winter, after having for a while sojourned on the Coast.

Mr. J. B. White, of Spokane, Washington, was at the Slocan Star mine, near Sandon, Slocan, B.C., last month, on one of his periodical visits to that property. Besides being a director of the Slocan Star Mines, Ltd., he represents the estate of his father, the late Byron N. White, who held a large interest in the Slocan Star company.

Mr. W. J. Elmendorf, of Seattle, Washington, for a number of years in charge of mining operations in the Coast district, has joined Messrs. G. M. Wells and Donald G. Campbell, the new firm to be known as Campbell, Wells and Elmendorf.

Mr. Frederic Keffer, president and general manager of the Highland Valley Mining and Development Co., returned to his home in Spokane, Washington, about Christmas time, after having been several weeks at the company's mine in Ashcroft mining division of British Columbia.

Mr. L. A. Bonner, manager of the Lightning Creek Hydraulic Mining Co., operating a property situated about two miles up Lightning creek from the town of Stanley, Cariboo district of British Columbia, left that district about November 11 to proceed to England for the winter.

Mr. Randolph R. Bruce, manager of the Paradise mine in Windermere division of East Kootenay, B.C., was in Golden on November 27, on his way to Montreal, Quebec.

Mr. E. E. Campbell, of Anyox, Observatory Inlet, B.C., superintendent of the Granby Consolidated Co.'s Hidden Creek Copper mine, went to Eastern Canada a few weeks ago. He was expected to return to British Columbia early in the New Year.

Mr. H. S. Fleming, chairman of the executive committee of the Canadian Collieries (Dunsmuir) Limited, after a trip of inspection to the company's various properties on Vancouver island, B.C., has returned to New York City.

Following the transfer of Mr. T. A. Spruston from the Canadian Collieries company's No. 7 mine, Comox colliery, to succeed Mr. J. H. Cunningham as superintendent of the company's Extension colliery, Mr. Frank Jaynes was made manager of No. 7 mine, and Mr. H. Sloan manager of Nos. 5 and 6 mines, Comox.

Mr. M. E. Purcell, Rossland, has been nominated as vice-president of the Canadian Mining Institute for the coming year. It is understood that Nova Scotia will also nominate a vice-president. Mr. T. W. Gibson of Toronto and Mr. Chas. Fergie of Montreal hold office for another year.

Mr. C. E. Smith, of South Porcupine and Toronto is being nominated as councillor for the Canadian Mining Institute for the coming year. Other probable candidates in Ontario are W. E. Segsworth, E. P. Mathewson, J. H. Stovel, Norman Fisher, M. Summerhayes, M. B. Baker and R. E. Hore. Ten are to be elected from Ontario.

Seattle, Washington, has been finally decided upon by the Secretary of the United States Department of the Interior as the site for the Northwest mine experiment station. It had previously been decided to place a similar station at Tuscon, Arizona, and another at Fairbanks, Alaska. Strong efforts were made to induce the Secretary of the Interior to choose a site near to the important mining districts of Idaho or Montana, but without avail.

The "Prospector," Valdez, Alaska, says: The season's output of gold in the Nome, Alaska, district for 1916 will have exceeded \$3,000,000, according to Jafet Lindeberg, the mine operator at Nome. "We had a good season at Nome this year," said Mr. Lindeberg, "and I am sure the clean-up will exceed that of any of the last three years. We have found a deposit of tungsten, which apparently is present in considerable quantities."

**MEETING AT ENGINEERS' CLUB**

Engineers representing practically every phase of industrial and scientific work in Canada met at the Engineers' Club, Toronto, on Thursday evening, December 28th, to talk over the possibilities in the way of formulating some plan whereby those members who are unable, for any reason, to render service to the Empire in the regular way, may still be of value in the great war by furthering at home the work of munition making, or by giving their services in some technical capacity, so that the general war work may be carried on more efficiently and expeditiously.

Discussion centered around ways and means of using the varied engineering abilities represented at the meeting and many promising suggestions were offered, which will be followed up promptly. The business of the evening culminated in the formation of a strong executive, composed, for the most part, of the chairmen of the local branches of the various engineering societies represented in Canada. Mr. Alfred Burton, who acted as chairman at Thursday evening's meeting, will continue in that capacity, with Mr. Wills MacLachlan as secretary.

The first meeting of the new executive was called for Tuesday evening, January 2nd, in the Engineers' Club. Members of the Canadian Engineering profession, wherever they may be located, or in whatever work engaged, are urged to give careful thought to this matter and send in suggestions to the secretary. There is undoubtedly much that trained engineers can do at home and there is a universally expressed eagerness to do it. Just what particular work there is that each, or any, of us can do is what this new committee will endeavor to find out.

The opinion was generally expressed on Thursday evening that as soon as the Toronto organization could determine that its existence was justified suggestions for the formation of similar committees should be made to other cities and provinces. The idea underlying this suggestion was that every engineer in Canada may have an opportunity to lend his aid. The prospect of some ten thousand trained men of the engineering profession working together to help correlate and perfect the war organization at home is fraught, we believe, with tremendous possibilities. Not the least effect would be the moral influence such action would have on our men at the front, who would hear with decided satisfaction of such a practical movement.

**MINE INSPECTOR KILLED IN SHAFT.**

Mine Inspector Thomas H. James met his death in the Red Jacket shaft of the Calumet & Hecla Mining Company, Calumet, Michigan, on Tuesday, Dec. 19. With a party of engineers of the company, he had spent the morning underground at the Red Jacket shaft. Other members of the party had ascended to the surface and the county official was coming up in the cage from the 60th level when a piece of falling pipe crashed through the top of the cage and struck him on the head bringing instant death. It is said that a pipe line two inches in diameter burst near the collar of the shaft. The Red Jacket shaft is a vertical shaft and the falling piece of pipe plunged downward close to 5,000 feet, probably striking the cage at about the fifty-seventh level. Mr. James was alone in the cage.

The deceased was born in Cornwall, England, going to the Michigan copper country 29 years ago. He was one of the best known mining men in the country. Four years ago he was elected mine inspector after serving for one year as deputy inspector under John Ashton. He was 47 years of age.

**TRADE INQUIRIES.**

The Department of Trade and Commerce has the following inquiries:

2006. **Iron Pipes.**—Correspondence with Canadian manufacturers of iron pipes, valves and other fittings is asked for by a Newfoundland dealer.

2007. **Infusorial Earth.**—A London firm wishes to get into touch with Canadian producers of infusorial earth who can offer supplies for export.

2017. **Zinc Residues.**—A firm in Landore, South Wales, wishes to obtain zinc residues from Canada.

2018. **Hard Spelter.**—A concern in South Wales operating a copper works is desirous of getting hard spelter from the Dominion.

2019. **Antimony Ore** is required by a firm in South Wales.

2042. **Bronze Powder, Talc and Mica.**—A Manchester firm wishes to enter into correspondence with Canadian exporters of bronze powder, talc and mica.

2051. **Ferro-silicon.**—A Glasgow firm wishes to import 1,200 tons 76 per cent. ferro-silicon over 1917 in approximately equal monthly quantities. Price c.i.f. United Kingdom or f.o.b. and indication of freight. Would like cable quotations. Also inquire for 50 per cent. and 25 per cent. ferro-silicon, but not so urgent as 75 per cent.

In the course of his reply to representations made to him by members of a deputation, the new Premier of British Columbia was reported in a local newspaper to have said: "Relative to alien control of mineral deposits in British Columbia, he believed that while many American interests are pro-Ally there are others not so. There appear to be retarding interests somewhere which do not wish our deposits to be utilized for Imperial purposes, but we will take drastic steps to see that this mineral and any others that are of use to the Empire are made available or else we will stand out of the way and let the Munitions Board act."

An allegation going the rounds of some of the British Columbia newspapers is that were it not for the smelting works at Trail some 25 mines in the State of Washington could not operate at all. An analysis of the ore receipts at the Trail smeltery from United States mines in 1916 to December 8 shows that these include 203 tons from one Montana mine; 900 tons from one and 129 tons from four Idaho properties; ten small shipments from Washington totaled 162 tons, and six others totaled 1,948 tons, leaving only five shippers with individual totals ranging from 2,099 to 9,237 tons.

**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.
Dec. 22.—(Quotations from Canada Metal Co., Toronto)—
Spelter, 14 cents per lb.
Lead, 9½ cents per lb.
Tin, 46 cents per lb.
Antimony, 18 cents per lb.
Copper, casting, 36½ cents per lb.
Electrolytic, 37 cents per lb.
Ingot brass, yellow, 22 cents; red, 24 cents per lb.
Dec. 22.—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, \$9.00 per ton.
Coal, bituminous, \$10.00 per ton.

# MARKETS

## NEW YORK MARKETS.

**Connellsville Coke—**  
 Furnace, spot, \$9.00 to \$9.25.  
 Furnace, contract, \$4.50 to \$5.00.  
 Foundry, prompt, \$10.00 to \$12.00.  
 Foundry, contract, \$5.50 to \$7.50.  
 Straits Tin, f.o.b., 42.62½ cents.

**Copper—**  
 Prime Lake, nominal, 33.00 to 33.50 cents.  
 Electrolytic, nominal, 34.00 to 34.50 cents.  
 Casting, nominal, 31.50 to 32.00 cents.

**Lead, Trust price, 7.50 cents.**  
 Lead, outside, 7.62½ to 7.75 cents.

**Spelter, prompt western shipment, 10.42½ to 10.92½ cents.**  
**Antimony—Chinese and Japanese, 14.37½ cents.**

**Aluminum—nominal—**  
 No. 1 Virgin, 98-99 per cent., 63.00 to 65.00 cents.  
 Pure, 98-99 per cent. remelt, 59.00 to 61.00 cents.  
 No. 12 alloy remelt, 45.00 to 47.00 cents.  
 Powdered aluminum, 92 to 95 cents.

**Metallic magnesium—99 per cent. plus, \$3.50.**

**Nickel—shot and ingot, 45.00 cents.**  
 Electrolytic, 50.00 cents.

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

**Quicksilver, \$80.00.**

**Platinum, \$105.00.**

**Cobalt (metallic), \$1.50.**

**Tungsten ore, per unit, \$20.00.**

**Silver (official), 76½ cents.**

**Metal Products—**Following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:

**Sheet Copper—**  
 Hot rolled, 42.00 cents.  
 Cold rolled, 43.00 cents.

**Copper bottoms, 50.00 cents.**

**Copper in rods (round), 41.00 cents.**  
 Square and rectangular, 42.00 cents.

**Copper wire, 40.00 to 41.00 cents.**  
 Copper wire, January, 40.25 cents.

**High brass—**  
 Sheets, 39.00 to 40.00 cents.  
 Wire and light rods, 40.00 cents.  
 Heavy rods, 38.00 to 39.00 cents.

**Low Brass—sheet wire and rods, 42.00 cents.**

**Tubing—**  
 Brazed bronze, 51.00 to 52.00 cents.  
 Brazed brass, 48.00 to 49.00 cents.  
 Seamless copper, 45.00 to 46.00 cents.  
 Seamless brass, 43.00 to 45.00 cents.  
 Seamless bronze, 52.00 cents.

**Full lead sheets, 9.25 cents.**  
**Cut lead sheets, 9.50 cents.**  
**Sheet zinc, f.o.b. smelter, 21.00 cents.**

## STOCK QUOTATIONS.

(By courtesy of J. P. Bickell & Co., Toronto.)

As of close December 21st, 1916.

### Porcupine Stocks.

	Bid.	Asked.
Apex . . . . .	.11¾	.12
Dome Extension . . . . .	.19	.20
Dome Lake . . . . .	.64	.65
Dome Mines . . . . .	...	.19
Foley O'Brien . . . . .	.70	...
Gold Reef . . . . .	.05	.05½
Hollinger . . . . .	6.25	6.30
Homestakes . . . . .	.60	...
Jupiter . . . . .	.28	.29

McIntyre . . . . .	1.70	1.71
McIntyre Extension . . . . .	.52	.53
Plenaarium . . . . .	...	.95
Porcupine Crown . . . . .	.65½	.67
Porcupine Imperial . . . . .	.05	.05½
Porcupine Tisdale . . . . .	.02½	.03
Porcupine Vipond . . . . .	...	.42
Preston East Dome . . . . .	.04¾	...
New Ray . . . . .	1.38	...
Teck Hughes . . . . .	.63	...
West Dome . . . . .	...	.30

### Cobalt Stocks.

	Bid.	Asked.
Adanac . . . . .	.22	.30
Bailey . . . . .	.06¾	.07
Buffalo . . . . .	1.10	1.40
Beaver . . . . .	.39	.40
Chambers Ferland . . . . .	.16	.17
Coniagas . . . . .	4.55	4.80
Crown Reserve . . . . .	.35	.37
Foster . . . . .	...	.05
Gifford . . . . .	.04½	.05
Gould . . . . .	...	.00¾
Great Northern . . . . .	...	.12½
Hargreaves . . . . .	.12½	.13
Hudson Bay . . . . .	72.00	75.00
Kerr Lake . . . . .	4.50	4.65
La Rose . . . . .	.54	.57½
McKinley . . . . .	...	.50
Nipissing . . . . .	8.80	9.00
Peterson Lake . . . . .	...	.15
Right of Way . . . . .	.05	.07
Rochester . . . . .	...	.05
Seneca Superior . . . . .	.02¼	.03
Shamrock Cons. . . . .	...	.17
Silver Leaf . . . . .	.02	.02½
Temiskaming . . . . .	.58	.59½
Trethewey . . . . .	.16	.17
Vacuum Gas . . . . .	.35	.56
Boston Creek . . . . .	.94	.96

### MOLYBDENITE PRICES.

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between 2% and 3% MoS<sub>2</sub>, \$14.00 per unit.  
 Ores carrying between 3% and 5% MoS<sub>2</sub>, \$16.00 per unit.  
 Ores carrying between 5% and 10% MoS<sub>2</sub>, \$17.50 per unit.  
 Ores carrying between 10% and 15% MoS<sub>2</sub>, \$18.50 per unit.  
 Ores carrying between 15% and 20% MoS<sub>2</sub>, \$19.50 per unit.

80% concentrates, \$1.09 per lb. of MoS<sub>2</sub>.

Penalties imposed for copper and bismuth.

No settlement made for any molybdc oxide in ores.

Settlement ten days after sampling.

Samples of ores to be submitted before any shipment made.

### SILVER PRICES.

	New York, cents.	London, pence.
December 8 . . . . .	75¼	35½
" 9 . . . . .	75¼	36
" 11 . . . . .	75½	36½
" 12 . . . . .	76	36¾
" 13 . . . . .	76	36¾
" 14 . . . . .	75¾	36¾
" 15 . . . . .	76¾	37
" 16 . . . . .	76¼	36½
" 18 . . . . .	76¾	36½