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NOTES AND COMMENTS.

Reports from Ainsworth, the Sandon Mining Standard states, indicate the brightest winter for mining that has been experienced since the fall of 1897. A number of properties are being operated that have been idle for years and the list of men employed continually being swelled, while the ore shipments of the silver-lead are the largest around here.

A Boston report for the week ending November 16 shows the range for Granby Co's shares to have been "Low \$9. high \$9⁷/₈; last sale at \$9¹/₄; sales for week, 2,110 shares." The range for 1905 is given as "Lowest, March 8, \$5; highest, November 6, \$9³/₄." Prices in 1904 are stated to have ranged from \$2⁵/₈ to \$5⁷/₈.

At the Berry Creek Mining Co's placer gold mine on Thibert Creek, Cassiar, the season just closed has been another period of steady and expensive development (now fortunately completed). The little hydraulic it was found practicable to do at the close of the season gave excellent and profitable returns, even from the top gravels of a slide hitherto considered valueless.

The sale of the Bentley group of iron claims, situated in the south-west part of Vancouver Island, is reported. The development of this property on a large scale is looked forward to with confidence that the occurrence of an enormous quantity of iron ore of good quality will be proved and the commercial value of the deposit established.

The London Mining Journal of November 4 states: "Mr. T. A. Rickard, A.R.S.M., M.I.M.M., has, as we announced in our issue of August 26, bought the Mining and Scientific Press of San Francisco, California, U.S.A., and will, we understand, assume the editorship from January 1 next. In the unfettered control of this important paper Mr. Rickard has an opportunity worthy of his character and attainments. We heartily wish him success." The MINING RECORD fully concurs in these appreciative sentiments.

The Rossland Miner has changed hands. We congratulate Rossland and the mining industry in being

rid of an editor whose policy was "every man for himself and the devil take the hindmost." Rossland is too good a camp to be at the mercy of "grafters," whether in connection with the press or any other institution of influence. We extend to the new management our hearty greeting, together with best wishes for a career of usefulness and profitableness for the important journal that has been acquired by it.

The Cariboo Consolidated, of Barkerville, which is an entirely different company from the Consolidated Cariboo Hydraulic Mining Co., of Bullion, Quesnel Forks, has arranged for an increase of capital. Mr. Melbourne Bailey, the manager of the Cariboo Consolidated, has done effective work in the development of the drift mining enterprises of which he has had charge for many years, and he should now be able to recover gold in sufficient quantity to bring in excellent returns to his company's plucky shareholders. May their venture soon prove an abundant success.

The first cargo of copper ore shipped from the Mamie mine, Prince of Wales Island, south-east Alaska, to the Britannia Smelting Co's works at Crofton, Vancouver Island, reached that company's smelter last week. The Mamie mine is owned by the Alaska Smelting & Refining Co., which is about to blow in the 500-ton furnace at its own smelter. An exchange of ore has been arranged between the Britannia and Alaska companies, the former needing the iron ore from Prince of Wales Island, and the latter requiring silicious ore such as the Britannia company has in abundance.

The Granby Consolidated M. S. & P. Co. has called a special meeting of shareholders for December 1 to authorise an application to the legislature of British Columbia, under the laws of which province the company is incorporated, for permission to increase the par value of its shares from \$10 to \$100 each. As the total capital is to remain unchanged the number of shares will be cut down to one-tenth of the present number. The meeting will also be asked to authorise an increase in the number of directors from 12 to 15 and to make necessary changes in details of the by-laws.

A correspondent has informed the *MINING RECORD* that the Prince Mining & Development Co's Standard mine, north of Revelstoke, is being opened up at the 400- and 500-ft. levels some 200 ft. apart on the lead. Cross-cuts made in ore show a width of 25 ft. on one level and 22½ ft. on the other. The drifts are being extended, and underground development will be continued throughout the winter. One drift is more than 300 ft. in length, and this with a depth of 550 ft. on the lead gives a large body of copper ore of good grade in sight. Preparations are being made to put in a power plant as soon as it shall be practicable to do so.

The Toronto special correspondent of the *Engineer-*

ing and Mining Journal, writing on 4th inst, stated that "Everything is almost in readiness for the electric smelting experiments at Sault Ste. Marie. Dr. Heroult was in Ottawa, October 23, making final arrangements. Dr. Eugene Haanel, superintendent of mines, states that the construction of the furnace with overhead work is complete and the bins, elevators and crusher in position. All that is lacking is the electrodes from Sweden, which are on their way from Boston, the cable for the current and the measuring instruments in the arrival of which it is hoped no delays will occur. When these are in place the experiments will immediately be proceeded with."

The reports and statements of accounts for the financial year ended June 30, 1905, of the Hall Mining & Smelting Co., operating at Nelson, B.C., show that the company is making progress—not yet to any great extent, it is true, yet it is advancing surely, if slowly, in the right direction and the outlook for better results is satisfactory. Reviewing the last three years it is to be noted that the operations of the year ended June 30, 1903, resulted in a loss of £4,760; those of the next following year returned a net profit of £1,700; while the financial year to June 30, 1905, gave a net profit of £6,013. The higher net profit is not the only good result achieved last year, for substantial betterments have been made at the company's works, and the business generally is in a more satisfactory condition than for several years. The officials at Nelson have well earned the approbation of the company, and it is hoped that their anticipations of further improvement this year may be realised to an extent even beyond their most sanguine expectations.

The Provincial Bureau of Mines has issued two mining bulletins, No. 1 on "Windy Arm Mineral Locations in the Atlin Mining Division," by Mr. Wm. Fleet Robertson, provincial mineralogist (which bulletin is re-printed in this number of the *MINING RECORD*), and No. 2 on "Mineral Locations, Big Bend District, in the Revelstoke Mining Division," by Mr. Herbert Carmichael, provincial assayer. This is a course that will be generally approved, since the reports will be of immediate service to many who will be gratified to have them now instead of having to wait until the issue of the next annual report of the bureau. As an instance of the usefulness of bulletins of this nature we cite the following, taken from a letter just received from a New York gentleman to whom we sent a copy of the bulletin on Windy Arm: "I wish to thank you for enclosing the report and map. It is an exceedingly satisfactory document and will be the means, I think, of bringing a great amount of capital from New York for the development of the district to which it refers."

Although a bill providing for a compulsory 8-hour day in the smelters of British Columbia was defeated at the last session of the provincial legislature, it was recognised by smelter owners that they would ere long have to arrange for shorter hours for those of their

employees who were on 12-hour shifts. Accordingly the Canadian Smelting Works, at Trail, a few weeks ago, arranged for 8-hour shifts for all its smelter men previously working longer hours. Next the Hall Mining & Smelting Co., Nelson, announced its arrangements in a similar direction. Now the Granby Consolidated Mining, Smelting & Power Co., operating the largest copper smelter in Canada, with works at Grand Forks, has come to an understanding with its men on this question. The final agreement, the result of negotiations between the local management and the men, is to the effect that there will be three shifts of 8 hours each per diem, and that all smelter employees receiving more than \$2.50 per day (the amount paid labourers for a 10-hour day) shall submit to a reduction of 10 per cent in wages. Mechanics who have been working 10-hour shifts will continue to do so, except on Saturdays, when 8 hours will constitute their day's work. Other smelters in the province will, no doubt, come to somewhat similar agreements with their employees, and a question that was at one time regarded as likely to lead to labour difficulties will thus have been amicably settled.

The treatment of the low-grade copper ores of the Graham mine, at Massey, Ontario, Canada, by the Elmore oil process of concentrating has proved a great success. The plant was installed at this mine to treat the tailings from the usual water concentration plant, and has given such excellent results that the water concentration plant has been abandoned altogether, and the Elmore oil plant is now being doubled in capacity. The Massey Station Copper Co., which has been operating the mine for the last three years, has expended £60,000 upon it during the experimental stage, and the venture is now on a sound commercial basis. From a 3 per cent. ore a concentrate of 20 per cent standard is turned out.

The directors of the Vancouver Island Mining & Development Co., have decided to make a further issue of shares for the purpose of purchasing and opening up a group of mineral claims the local director, Mr. Clermont Livingston, has acquired on behalf of the company. These shares are being first offered at par (£1) to present shareholders in the company on the following terms: 5s. per share on application, 5s. on allotment, and two instalments of 5s. each to be called up as and when required. A report of the proceedings at the third annual meeting of the company is printed elsewhere in this issue. It is pleasing to note that the competence and zealous services of the local director and manager are much appreciated by the shareholders in England, who have full confidence in Mr. Livingston as a man who, in the words of the chairman, "is fully alive to the local situation and quite capable of looking after the interests of the company." The capitalisation of the company is moderate—£50,000, of which only a portion has been issued. The company owns a large group of mineral claims on Mount Sicker, all paid for, and it has not had its resources weakened by the payment of promotion profits, all its claims having been transferred to it at the prices actually paid for them by its local repre-

sentative. Further, it is carefully and economically managed, so that its chances of eventual success are correspondingly good.

The Minister of Mines for New Zealand in the course of his address to the legislature of that colony on the occasion of his presenting his Annual Mines Statement made the following reference to scheelite: "The demand for this mineral is increasing. Hitherto it has been prepared for the market almost, if not quite exclusively, by Messrs. Donaldson Bros., of Macrae's, Otago, but the demand being now more than they can supply, action is being taken by other mine-owners in the same locality with a view to meeting requirements. Inquiries for scheelite containing a fairly high percentage of tungstic acid have reached the colony from England and elsewhere. It is evident that a ready market is available for a steady supply of this mineral." Reports of the occurrence of scheelite in both Cariboo and Slocan districts have been published during the two years last past, but it does not appear that development work of sufficient importance to turn the discoveries to profitable account has yet been done. It may be that capital is not available for opening up the claims on which the mineral is known to occur, or, in the case of the Cariboo property, the absence of cheap transportation facilities may be a serious obstacle, but whatever the difficulty it is to be hoped that it may soon be overcome so that the scheelite, if it occur in commercial quantities, may be added to the mineral products of British Columbia.

The description of the Britannia mines and concentrating works at Howe Sound, B.C., we publish this month will, we have no doubt, be of interest to many of our readers. The somewhat lengthy geological observations of Mr. Ellis Mallery, for the use of which we are indebted to the courtesy of that gentleman, although made in 1903 and in part previously published, are included in our descriptive article for the reason that we have assurances from men qualified to express an opinion of value that Mr. Mallery's conclusions are in many respects reasonable and well grounded. This being so, we have pleasure in making them readily accessible to all interested in this subject. Concerning the practical side of the Britannia Copper Syndicate's undertakings—the visitor cannot but be strongly impressed with its importance. The opening up of the enormous masses of ore occurring on the company's property has necessarily been delayed until ample provision had been made for power for operating the mine on a comparatively large scale, transporting the ore to deep water, and concentrating and smelting a tonnage that may be expected to steadily increase until it shall reach big proportions. The fact that Mr. Geo. H. Robinson, who is the executive head of this enterprise, has given the Britannia property much attention for years and, consequently, is operating it along lines that are the outcome of careful testing and mature deliberation, suggest a profitable future for the company. We earnestly hope that in due time we shall have the pleasure of chronicling

the abundant realisation of such well-merited return for enterprise of so substantial a character. *En passant* we desire to acknowledge the obligation we are under to the B. C. Photo-Engraving Co., of Victoria, for the excellent half-tone blocks it has for the illustration of our article executed to our order.

Some newspaper editors apparently believe that the public prefers fiction to fact, otherwise they would scarcely give space in the columns of their journals to the fairy tales of so utterly untruthful a writer as P. A. O'Farrell. Among other taradiddles recently published over the name of that notorious fabricator was the following: "The Marcus Daly estate has a gold mine called the Nickel Plate that turns out about \$2,000,000 a year and makes a profit of \$1,000,000. As soon as the railroads reach the mines and enable them to increase their plant and equipment they will be able to treble their output and increase their profits fourfold." Now both Mr. M. K. Rodgers, general manager of the company owning the Nickel Plate group, and Mr. W. F. Robertson, provincial mineralogist, have stated for publication that the general average value of Nickel Plate ore is \$12 to \$15. Assuming that the Daly Reduction Co's 40-stamp mill treats 160 tons of Nickel Plate ore per diem for 313 days in a year (one idle day a week the year through)—which, by the way, is, we think, an extreme assumption, both in regard to tonnage milled and number of days in the year all the stamps drop—a total tonnage treated of about 50,000 tons is arrived at. Calculated at the highest average price above quoted this gives a total value of \$750,000, or only three-eighths of the total given by Mr. O'Farrell. There is just this satisfactory reflection, though—few people who know that romancer take any stock in his airy flights of imagination. Still it is not desirable that his gross misstatements relative to our prominent mines pass unchallenged.

Mr. C. M. Raymond, of Chicago, Illinois, was a recent visitor to Howe Sound, B.C., where, on Britannia Mountain, is situated the Empress group of mineral claims which he purchased a short time ago. It is stated that an arrangement has been made to drive a tunnel through the mountain from a point near the entrance to the tunnel into the Britannia Copper Syndicate's Mammoth Bluff property. The length of this proposed tunnel is given as about 4,000 ft., and driving will be done from both ends, work having already been commenced from the South Valley side of the mountain. The Britannia Copper Syndicate will, it is understood, co-operate with the owners of the Empress group in carrying out this undertaking, which arrangement will be mutually advantageous, since the former will thus secure the ore won in development from the Mammoth Bluff end of the tunnel for the smelter of its allied company—the Britannia Smelting Co.—and the latter will be able to ship ore over the syndicate's aerial tramway to Britannia Beach and thence to the smelter at Crofton, and thus obtain prompt returns for that part of its mine product. The late Mr. Howard C. Walters,

when, several years ago, promoting the interests of the Britannia group, reported as follows: "That the Britannia lode is continuous, going eastward from the Clifton, through the Jane, Edith fraction and Fairview claims, and that the high-grade ore disclosures in the Fairview surface openings are not only permanent but of great importance, is underwritten, as it were, by the fact that the owners of the Empress group, adjoining the Fairview on the east, near the close of the season—the lode being covered in the Empress—succeeded in tracing the lode from the Fairview showings over the divide and down the opposite slope to a point 800 to 1,000 ft. below the Fairview east end line, where they uncovered a section of the Mammoth Britannia lode and drove a 20-ft. cross-cut tunnel in splendid copper ore, a duplicate of the Fairview product."

Goerge W. Howe was this week convicted by a jury in the United States District Court on an indictment charging him with having used the mails in furtherance of a scheme to defraud the gullible by means of several gold mines in British Columbia, to which mines Howe has no title. He had been selling stock in the so-called Yale Gold Mining Co., offering 36% interest, through the Stock Guaranty & Surety Co., of San Francisco. That company was organized to finance the mining company. The Government contended that neither the Yale Mining Co., nor the defendant owned any interest whatever in the mines mentioned in the circulars and letters, and that the dividends were paid out of the money received from the stock sold. In a pamphlet issued by the Yale Gold Mining Co. appears what purports to be a report signed by "Lucien M. Turner, C.E., M.E., F.G.S. and Sc. B.," to the effect that Turner had experted certain properties of the Yale Gold Mining Co., assayed some of the ore and found them to be valuable mining properties. Mr. Turner explained that he had been interested with Howe some years ago in the proposed purchase of mines in Napa county, California, and that purely as a matter of friendship he had formulated into a report, which he signed, certain data furnished him by Howe. He confessed that he had never seen the mines and that his report was made up from clippings furnished by Howe. In connection with this scheme Howe had used the names of several prominent men of San Francisco as directors, some of whom deny owning any stock or having given permission to use their names. It was by this means he was enabled to sell stock. He had sent these men certificates of stock, which they had declined to accept, yet he used their names nevertheless. The State Mineralogist is now hunting up the records of several similar companies, intending to prosecute them under the State law providing for the punishment of men issuing untruthful prospectuses concerning mining properties.

The London *Mining Journal* of November 11 contains an editorial on "British Columbian Mining in 1904." Its opening sentence reads "The report on mining in British Columbia last year, though sub-

mitted to the Minister of Mines as early as February 13 in the current year, has just reached us, so that though among the last of official reports to make its appearance it has not the compensation which late comers sometimes possess of more complete statistics due to increased length of time for obtaining them." We shall not now follow the *Mining Journal* through its lengthy comments, our present object being simply to point out that the delay in receipt of our London contemporary of a copy of the annual report referred to was not the fault of the B. C. Department of Mines, a copy having been mailed, so we have been officially assured, last May. Certain it is that the *MINING RECORD* reviewed this particular report in its May number, and that on June 8, the *Engineering and Mining Journal*, of New York, published extracts from a copy of the report it had received. We commend to the attention of the London *Mining Journal* the following excerpt from a letter of Mr. Horace J. Stevens, editor and publisher of *The Copper Handbook*, which we had the pleasure of publishing last month: "In my work on *The Copper Handbook* I have to keep in touch with the mining bureaus of the entire globe, and I wish to go on record as stating that for some years past, without exception, the annual report of the British Columbia Bureau of Mines has been the first to reach me from any official bureau, division or department, dealing with mining matters. I consider that Mr. W. F. Robertson, provincial mineralogist, is entitled to great credit for the remarkable promptness with which his reports are issued, as well as for the vast amount of territory covered in a fairly complete manner by a very small force." In view of the fact that a copy of the report was mailed to the *Mining Journal* last May and that it most likely either miscarried or was inadvertently mislaid, we respectfully suggest to our London contemporary that it now do the Bureau of Mines of British Columbia the simple justice of stating that other journals received and reviewed the report five or six months earlier, so that the delay in its receipt by the *Mining Journal* was evidently accidental.

RAILROADS FOR NEW MINING CAMPS.

GOVERNMENT ownership of Railroads is the subject of an article contributed to *Success* by Mr. William Jennings Bryan. In his outlined plan for such ownership, Mr. Bryan would have the federal government own the trunk lines, and the state own the branch lines. In this way, he urges, all the advantages of government ownership would be obtained, while through the distribution of burden the danger of over-centralization would be avoided.

"While Mr. Bryan's plan has advantages," observes the *Denver Daily Mining Record*, "it will not be adopted probably until the people are convinced that government regulation is ineffective; and if the reforms proposed by the president fail, the railroads will have their own short-sighted policy to blame. In that case, there will very likely be recourse to the plan advocated by the Nebraskan reformer.

"In the meantime, there is an opportunity for a government ownership experiment in a practical way that will go far in promoting the development of isolated mining districts. In many sections, mines have been developed to a point where shipments of a few carloads daily could easily be maintained. If they could begin shipping and get the money for their ore, they could go on with development. Without an outlet for their product, progress is halted. They need more than a wagon road, but they cannot guarantee traffic enough to warrant the building and operation of an expensive railroad.

"For such a problem the construction of an automobile railway seems to be the best solution, and it could be undertaken to an advantage by any mining district authorized to levy special assessments or issue bonds. The building of such a road would not, as a rule, be as difficult or expensive as the construction of some of the reservoirs and canals undertaken by irrigation districts, and the benefits it would confer would be as marked in adding to the value of the property affected. The light railway, as well as the tunnel, may properly be an object in the organization of a mining district, and it is an object that should be considered in the framing of mining district legislation. For the mining district or the irrigation district, government ownership affords a practical method for effective co-operation in enterprises of common interest. In addition, districts of this kind would be excellent training schools for state ownership or federal ownership should the latter ever become necessary."

A NEW SOURCE OF NICKEL.

SOUESITE, says *Engineering*, of London, England, is the name given to a native nickel-iron alloy recently found in British Columbia. It is very similar in composition to the awarnite of New Zealand, the josephinite of Oregon, and to the iron-nickel alloy of Piedmont. It is a grey metallic sand, forming the heavy residue from the gold washings on the Fraser river, near Lillooet, in British Columbia. Of the whole sand 47 per cent consists of an iron-nickel alloy, which is in the form of small very irregularly-shaped rounded grains of a faint yellowish steel-grey colour, with sub-metallic lustre: it is strongly magnetic and is malleable. Its specific gravity is 8.215, and the percentage composition of it was found by Mr. F. G. Wait's analysis to be as follows:

Nickel	75.50
Cobalt	nil
Iron	22.02
Copper	1.20
Silicious matter	1.16
	99.88

Dr. G. Christian Hoffmann, also of the Canadian Geological Survey, states that found with the alloy are scales of platinum (43 per cent composition), together with flattened grains of iridosmine and gold, and grains of magnetite, ilmenite, quartz, and garnet.

THE ZINC ORES OF SLOCAN DISTRICT.

CONCERNING the zinc ores of the Slocan, the *Sandon Mining Standard* remarks: The territory along the Canadian Pacific railway from Sandon to New Denver, and also along the entire Slocan lake, is where zinc ores abound which are high grade in silver and low in zinc. The ore is quite intimately mixed with lead and is a hard concentration proposition.

The country along the K. & S. line from Cody down to the South Fork, abounds in zinc ore of high grade, but contains low values in silver. The average silver content for the aggregate production will probably not exceed from 5 to 8 oz. to the ton.

The grades of ore on the Canadian Pacific are fit only for plants making a specialty of their treatment; such plants as the United States Zinc Co. at Pueblo, Colorado; the Canadian Metal Co. at Frank, Alberta; the Cherokee-Lanyon Zinc Co. at Iola, Kansas, and, possibly, the Prime Western Co. at Gas, Kansas. One or two plants in Europe make a specialty of such ore and one plant in England. The extraction heat cannot be pushed because of the resultant losses in lead and silver. The losses in zinc are therefore high.

The ores along the Kaslo and Slocan railway are strictly spelter ores, and can be competed for by the smelters for spelter in the United States, the list of which is quite extensive. The above is the fundamental difference between the zinc ore production of the territory along both lines of railway.

CHANGES IN YUKON MINING REGULATIONS.

IN the course of his speech at a banquet given to him at Dawson, Yukon Territory, on August 30, Hon. Frank Oliver, minister of the interior in the government of Canada, stated that, "in accordance with representations made by Dr. Alfred Thompson, M.P., for Yukon, certain changes had been made in the mining regulations which, it is hoped, will meet with the approval of the people and be to the general advantage of the country.

"It was felt that as this country had been so much occupied, the size of the mining claims might very well be increased, so provision had been made to increase it from 250 to 500 ft.

"It had also been felt that as conditions had changed in the Yukon and as profits had decreased, it was desirable that the burden on the miners should be decreased accordingly. A reduction had, therefore, been made in the miner's licences from \$7.50 to \$5.00, and the requirement on the part of the miner, that he bring in two other miners to the recorder's office to give evidence of representation, had been rescinded. The affidavit of the miner himself as to this work had been accepted, subject to revision on inspection by the mining inspector.

"A number of other changes had been made, all with a view of lightening the burden on the miner."

THE HUNTER PROSPECTING DRILLS.

STANLEY HUNTER, of the Department of Mines, Victoria, Australia, has designed a combined percussion and rotary drill, which weighs only a quarter as much as the percussion drills hitherto employed by the department in prospecting auriferous deep leads, and is reported to effect a saving of 20 to 25 per cent. in drilling costs.

The machine comprises a three-legged derrick, two legs of which are made of steel. The mechanism for operating the drills is at the lower end of the base of the steel legs. The percussion motion is given to the rods by a revolving cam, the stroke varying from 1 to 13 in. There are three-speed winding drums for heavy rods, and a high-speed sand-pump drum is connected with the percussion mechanism. When a core of rock is required rotary motion is imparted to the rods by a worm wheel. The whole mechanism is driven by a portable 5-h.p. oil engine. A principal feature in the machine is that the derrick carrying the apparatus can be lowered upon wheels for transport. The driving engine has also been fitted on wheels, and in this way is used for traction purposes. With the ordinary machine the time occupied in dismantling, transporting, and re-erecting, usually occupies from six to eight days; but Mr. Hunter claims that his machine can be lowered, shifted to another boring site, re-erected, and boring recommenced in one day. The plant is capable of boring to about 500 ft., and the total weight of the mechanism and complete outfit is about six tons. It will bore to any size up to a diameter of 8 in.

COST OF TREATMENT OF BLACK SAND.

FROM the number of press notices published lately concerning concentration experiments made recently at Portland, Oregon, it would appear that the recovery of values contained in black sand is a subject of interest to numerous readers. The investigations and experiments were conducted under the directions of Dr. David T. Day, chief of the United States Geological Survey, who is stated to be enthusiastic over the results obtained.

Regarding the cost of treating black sand, Dr. Day, it is understood, is not yet at liberty to give information for publication, but, says the *Portland Telegram*, Mr. George E. Woodbury inventor of the Woodbury concentrator, on one of whose machines much of the experimenting was done, has furnished the following particulars:

"A portable or moving foundation or plant for working material could be built for about \$2,000, probably less. The plant would consist of an engine run by gasoline, to pump water; an elevator to raise the material, screens, and a concentrator. Probably 30 tons a day, to make a conservative estimate, could be worked. The cost of handling the material is very light. For power for 30 tons, from 30 cents to \$1, say 3 cents a ton, might be allowed. The cost of

handling would be about 10 cents a ton, and with all extra expenses, 30 cents a ton should be a big allowance.

"By the methods employed from 90 to 98 per cent of values can be saved, which is a great advance on the way in which ore is handled. The difficulty heretofore has lain in the fact that all apparatus used in saving the material has been crude in method of separating. Riffles and excessive amounts of water have been employed. Too much water carries off the fine values. In the apparatus now used a very little water in a thin sheet is thrown across the concentrator table, there is no current, and consequently no agitation.

"To separate the different metals after they have been concentrated is also very easy. The concentrates, with the values obtained, can be treated by smelter, or, better, by a cyanide process, thus saving the gold, at the cost of about 40 cents a ton."

THE ZINC COMMISSION AND ITS WORK IN BRITISH COLUMBIA.

THE field work of the zinc commission, appointed by the Canadian government, with Mr. W. R. Ingalls, of New York, at its head, has been completed for this year. From Mr. Ingalls, who recently visited British Columbia, it has been ascertained that the purpose of the commission is to promote the zinc mining industry of British Columbia. Under the direction of Dr. Haanel, Dominion Superintendent of Mines, it has been aimed to make a thorough, scientific investigation of the ore deposits, the character of the ores, and the best methods of putting them in marketable form, together with the prospects of establishing metallurgical treatment in the province. The subject of zinc ores with high silver content is to receive special consideration. The field work was placed in the charge of Mr. Philip Argall, of Denver, Colorado, who was assisted by Mr. A. C. Garde, of Nelson. Mr. Argall was especially commissioned to examine the producing and developed mines. Dr. A. E. Barlow, of the Dominion Geological Survey, was subsequently detailed to investigate the "prospects" and undeveloped occurrences of zinc ore. He was assisted by Mr. Joseph Keele, also of the Survey Department. Mr. Argall began his work in the field about Sept. 1 and completed it about Nov. 15. Most of his time was spent in West Kootenay district. He also examined the chief silver-lead-zinc mines of East Kootenay. At the same time Dr. Barlow visited properties on the coast and adjacent islands, and later on certain others in the Boundary district. Mr. Ingalls spent the latter part of October and the early part of November in the field going over the ground that had been covered in detail by Mr. Argall. The work in the field was designed to establish the conditions under which zinc ore occurs: the conditions of mining, milling and transportation, and the character of the various ores that are, or can be, produced. This work has been preliminary to experimentation upon methods of ore-treatment which is to be conducted at Denver during the ensuing winter, and numerous

large samples of ore have been sent to Denver for that purpose. The experiments will be made under the general direction of Mr. Ingalls, and the immediate supervision of Mr. Argall and Mr. Henry E. Wood. It is intended to determine by these experiments the most efficient method for the treatment of the British Columbia zinc ores. Various types of magnetic and electrostatic separators will be tested, and plans and specifications for carrying out the recommendations of the commission will afterwards be prepared. The report of the commission will be published at the earliest possible date. Dr. Haanel is thoroughly appreciative of the value of prompt information, so has given instructions that no effort be spared to consummate the work as rapidly as is consistent with thoroughness.

A GLANCE AT BRITISH COLUMBIA'S MINING INDUSTRY.

READERS of the London *Morning Post* have been given by Captain Clive Phillipps-Wolley, in the course of an excellent article on British Columbia, what he designates "a few facts such as my countrymen love." The article all through is characteristic of the writer—outspoken, forceful, and direct. His subject covered too wide a field to admit of his going into much detail, so he made a rapid survey even when giving statistics. While the whole of this well-written article is both interesting and calculated to benefit British Columbia at large, the *MINING RECORD* is most concerned in the part dealing with the mining industry of the province, which follows:

"The great assets of British Columbia are (1) her gold, silver, copper, and lead; (2) her coal and iron; (3) her fisheries; (4) her lumber; (5) her fruit and other farm products; (6) her climate, beauty and sport. To take gold first. We have told the world of the Cariboo millions. That is an old story, but although those days are past we have during the last six years averaged more than \$1,000,000 per annum in placer gold, whilst the production of Atlin and Cassiar has only just begun. Our annual average of lode gold for the same period has exceeded \$4,000,000. In silver, we have during the last four years produced about \$2,000,000 per annum, and though owing to the closing of the United States markets to British Columbia lead, the production of that metal fell to 18,000,000 lb. in 1903, it has since risen, thanks to the lead bounty, to 55,750,000 lb. during the fiscal year ended June 30, 1905. But our great hope is in the copper—the metal which seems likely to be in brisk demand in the future. Of this we have produced about \$4,500,000 per annum for the last four years, as against \$1,000,000 per annum for the four preceding years, whilst the production is continuously on the increase, and our known bodies of copper ore are staggering in their dimensions. No published report which has yet met my eye gives an adequate idea of the volume of copper in such districts as the Boundary and Howe Sound respectively, whilst the fact that the two most energetic

of the great companies are paying for their extensive development and equipment from their ore proceeds prevents that present declaration of dividends which is the only thing to wake up the investor.

"It is not easy to lay my hand upon reliable statistics as to the area of our coalfields; I mean such coalfields as those of Queen Charlotte Islands and others remote from the present centres of civilization, but it may serve for illustration if I point out that the Vancouver Island coal measures alone extend for 130 miles, whilst the Crow's Nest Pass has a known area of 200 sq. miles, in which it was roughly estimated by the late Dr. Selwyn, of the Geological Survey of Canada, that certain portions contained about 50,000,000 tons to the square mile. Perhaps we can never use all our wealth in coal, but we may remember that the Canadian Pacific and Great Northern railways are in existence and the Grand Trunk Pacific and Canada Northern under construction, that the smelters of British Columbia and the Northwestern States take our coke, and that the demand for our coal for the big steamships of the Pacific and domestic consumption will absorb all that we can mine for many years to come. Our total output of coal for last year was 1,685,000 tons."

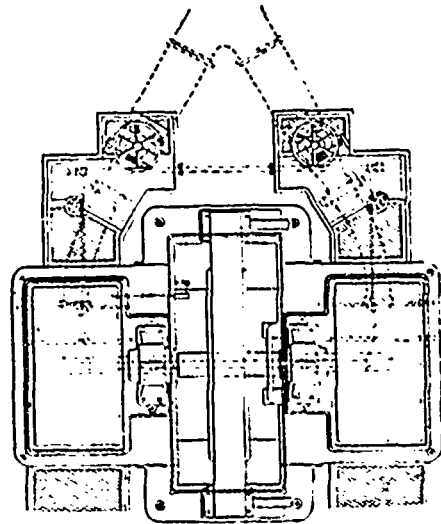
ADDITION TO VANCOUVER POWER CO'S HYDRAULIC PLANT.

ADDITIONAL plant and machinery is to be installed at the Vancouver Power Co's generating station, situated 16 miles from Vancouver City, on the North Arm of Burrard Inlet. As was stated in a specially contributed article, describing this company's hydro-electro transmission plant, published in the *MINING RECORD* for July, 1903, the hydraulic end of the plant was being developed for 30,000 h.p. but the initial installation of machinery was only equal to the generation of 9,000 h.p.. Now a fourth unit of 3,000 h.p. is to be installed, and a contract for supplying the necessary plant and machinery has been awarded to the Canadian Westinghouse Co., of Hamilton, Ontario.

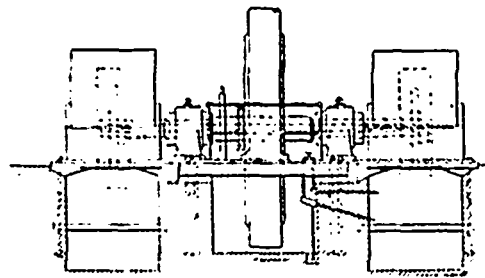
The arrangement of the water wheels and generators for each unit here is extremely simple. It consists of a hollow shaft with the generator set in the centre and a Pelton water wheel at each end, the whole revolving on two ring oiling bearings kept cool by a water jacket and by a stream of water passing through the hollow space in the shaft. The new unit, which is similar to the three units previously installed, consists of a pair of overhanging impulse wheels capable of developing 3,000 h.p. at 200 r.p.m. under the effective head of 390 ft.; a Westinghouse 1,500-kw. revolving field alternating current generator, 2,000 volts 3-phase 60 cycles; a Lombard governor, type Q, motor controlled and operating deflecting and needle regulating nozzles; and three 500-kw. step-up transformers, these to increase the capacity of the transformer house by 1,500 kw.

In connection with the new unit another pipe line is to be built from the Trout Lake dam to the power house. This will be of similar construction to the

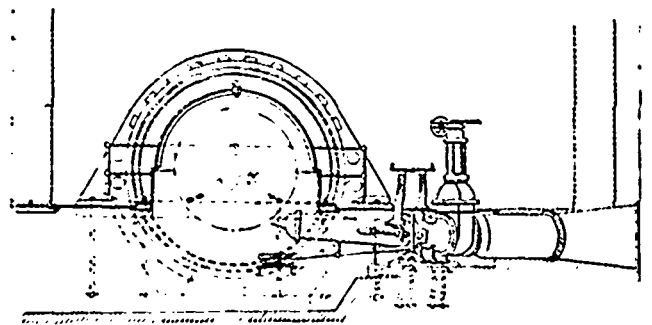
three forming part of the original installation, viz., the upper part 800 ft. in length—of wooden stave pipe of 54-in. diameter, and the lower part—1,000 ft.—of rivetted steel varying in diameter from 48 in. down to 42 in. at the lower end.



No. 1.—Plan.



No. 2.—End Elevation.



No. 3.—Side Elevation.

Plan and Elevations of Water Wheels and Generators at Vancouver Power Co's Power Station.

At Vancouver the capacity of the railway sub-station is to be doubled by the installation of a 1,000-kw. rotary with three 500-kw. transformers, and that of the lighting and commercial power sub-station is to be increased by two 500-kw. transformers. Contracts have been let and all other arrangements made for the above-mentioned increase, and it is expected that the installation will be complete and the new plant in operation by June, 1906.

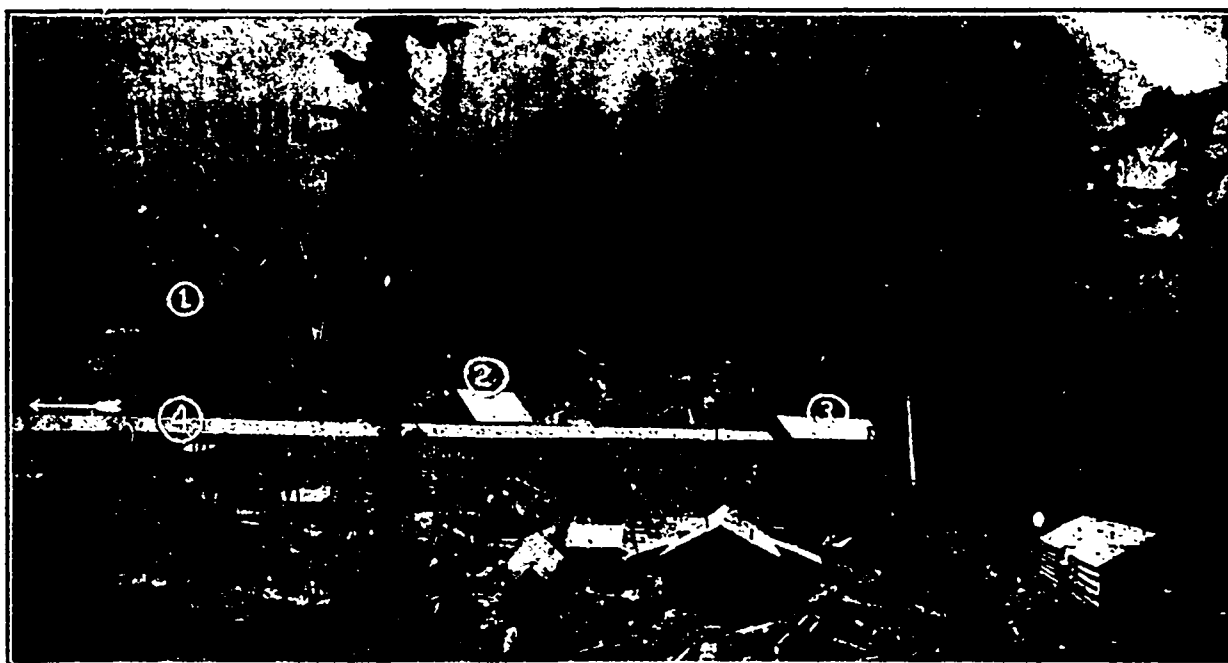
BRITANNIA COPPER SYNDICATE'S MINES AND CONCENTRATING WORKS AT HOWE SOUND, B.C.

By E. Jacobs.

PROMINENT among the mining and smelting enterprises of the Canadian Pacific coast are the mines, concentrating plant, and smelting works of the two companies known respectively as the Britannia Copper Syndicate, Ltd., and the Britannia Smelting Co., Ltd. Although separate incorporations their interests are identical to a large extent, the capital for both mine and smelter undertakings having been supplied by United States capitalists having large stock holdings in both organisations. The MINING RECORD last month published an

Britannia Beach, Howe Sound, which is distant 28 miles from the city of Vancouver, by water. The steamer Britannia makes daily trips (Sundays excepted) from Vancouver to Britannia Beach and return, so that there are frequent and convenient means of communication.

The Britannia group is situated at an elevation of about 3,500 ft. above and 3.8 miles from deep salt water, on the eastern shore of Howe Sound. There are in the group seven claims, viz., the Fairview, Edith fraction, Jane, Clifton, Heather fraction, William and Mineral Creek, containing 297.04 acres and covering over 8,500 ft. of the lode, on its strike. These claims are traversed by a lode, or zone, of schistose silicious ore, 300 to 600 ft. wide impregnated with copper and iron pyrites, and enclosed by a green, porphyritic rock on the south, and black



AT MINES.—VIEW SHOWING SURFACE WORKS.

1—Ore Bin at Entrance to Jane Mine. 2—Air Compressor House. 3—Crusher House, Ore Bins and Upper Terminal of Aerial Tramway. 4—Tramway to Mammoth Bluff Mine.

illustrated description of the Britannia Smelting Co's smelting works, situated at Crofton, Vancouver Island, B.C. This month the Britannia Copper Syndicate's mines, concentrating plant, etc., which were lately visited by the writer, are described, and some interesting expert opinions regarding the geology and mineralogy of the mineral zone or belt in which the mines are situated are also given.

COMPANY ORGANIZATION AND PROPERTY.

The Britannia Copper Syndicate, Ltd., is capitalised at \$937,500 in 3,000 shares of \$312.50 each. Its directors and officers are: Hon. Edgar Dewdney, president; Mr. Chas. W. McMeekin, vice-president; Mr. Geo. H. Robinson, managing director; Mr. J. W. Lee, secretary; Mr. H. C. Bellinger and Mr. Chas. M. Dull. The executive office of the company is at

slate on the north, the general strike being north-west and south-east, with dip to the south. Locally, this feature is known as the "Britannia mineral zone," and it has been definitely traced for several miles in either direction from the Britannia group, which appears to occupy the central position.

EARLY HISTORY.

The early history of the Britannia mines has been told by Mr. W. M. Brewer, M.E., in the following words:—

"These properties have a history, the parallel of which has not been often met with in many of the older mining camps. Although so comparatively close to the city of Vancouver, it was not until the autumn of 1899 that the occurrence of the ore bodies was generally known, but some years previously

pieces of peacock copper ore had been picked up by men engaged in trapping in the neighbourhood, which, however, excited but little interest, except in the minds of a few prospectors.

"During 1898, when the first serious interest was being shown in lode mining on the coast of British Columbia, some trappers staked the Jane and Fairview mineral claims, which to-day are included in the group of claims which comprises the Britannia property.

"The locators showed some of the samples they took from the outcroppings to Mr. Turner, the fur buyer for Boscowitz & Sons, of Victoria, when they were selling him their season's catch. This gentleman in turn interested Mr. Leo Boscowitz to such an

erty and carry on the prospecting work which had previously been commenced.

"Each one of the original members of this syndicate subscribed for shares at the rate of \$125 for each share. Each member originally subscribed for ten of these shares. A little later, more money was required, when each member doubled his subscription, which brought the actual paid-up capital of the syndicate to \$25,000. As work progressed and the possibilities of the property were fully realized, it became apparent that instead of its being a proposition of ordinary extent, carrying high or medium grade ore, it was a proposition of extraordinary extent, but carrying low-grade ore. The working capital necessary to equip and thoroughly open up a proposition of



Winter View of Camp on Britannia Group in 1900.

extent that a visit was paid to the prospects, and an option obtained. Later several men were put to work to cut a trail, and do some preliminary prospecting work. An open cut was made on the mountain-side on the Jane mineral claim, which exposed a body of bornite ore, carrying quite high values in copper. As a result of this work, several mining men visited the locations, but it was not until the late autumn of 1899 that any deal could be made to sell the property. At that time, though, Mr. Howard C. Walters, a well-known mining promoter, who had just previously successfully carried through the negotiations by which the Snowshoe mine, near Libby, Montana, had been sold, had his attention called to the prospects on Howe Sound, and succeeded in securing a bond from Mr. Boscowitz for seven-tenths of the property, that gentleman retaining a three-tenths interest.

"Mr. Walters interested several Montana mining men, who together with two or three British Columbians, organised a syndicate to take over the prop-

erty, such extent, was estimated at about half a million dollars, and as the carrying on of the prospecting work alone together with paying Mr. Boscowitz for the property was costing a considerable amount, it was decided by the members of the syndicate to organize a company, capitalised at \$250,000, divided into 400 shares each having a par value of \$625, and to open up the mine sufficiently to negotiate a sale to some company possessed of ample capital to properly equip and develop it. The stock of this company was issued to the original members of the syndicate on a basis of one share of new stock for one share of old stock, which required 200 shares. Of the other 200 shares of the stock of the new company, some 20 or 30 were sold at par, and the remainder retained in the treasury for future use.

"So successful had been Mr. Walters' management, that there was a strong demand for Britannia stock, and within a short time after the new company was

organised, the shares could be readily sold for from \$800 to \$1,000 each.

"During 1900, representatives of nearly all the

several times it appeared that negotiations would be closed, and the property sold, such did not occur until in the winter of 1901-02, when Mr. George H. Rob-



Mammoth Bluff, as it appeared in 1900: Showing Entrance to Prospect

leading copper companies in England and the United States visited the group of mineral claims and attempted to secure bonds on them. The purchase price named by the directors was \$1,250,000. But although

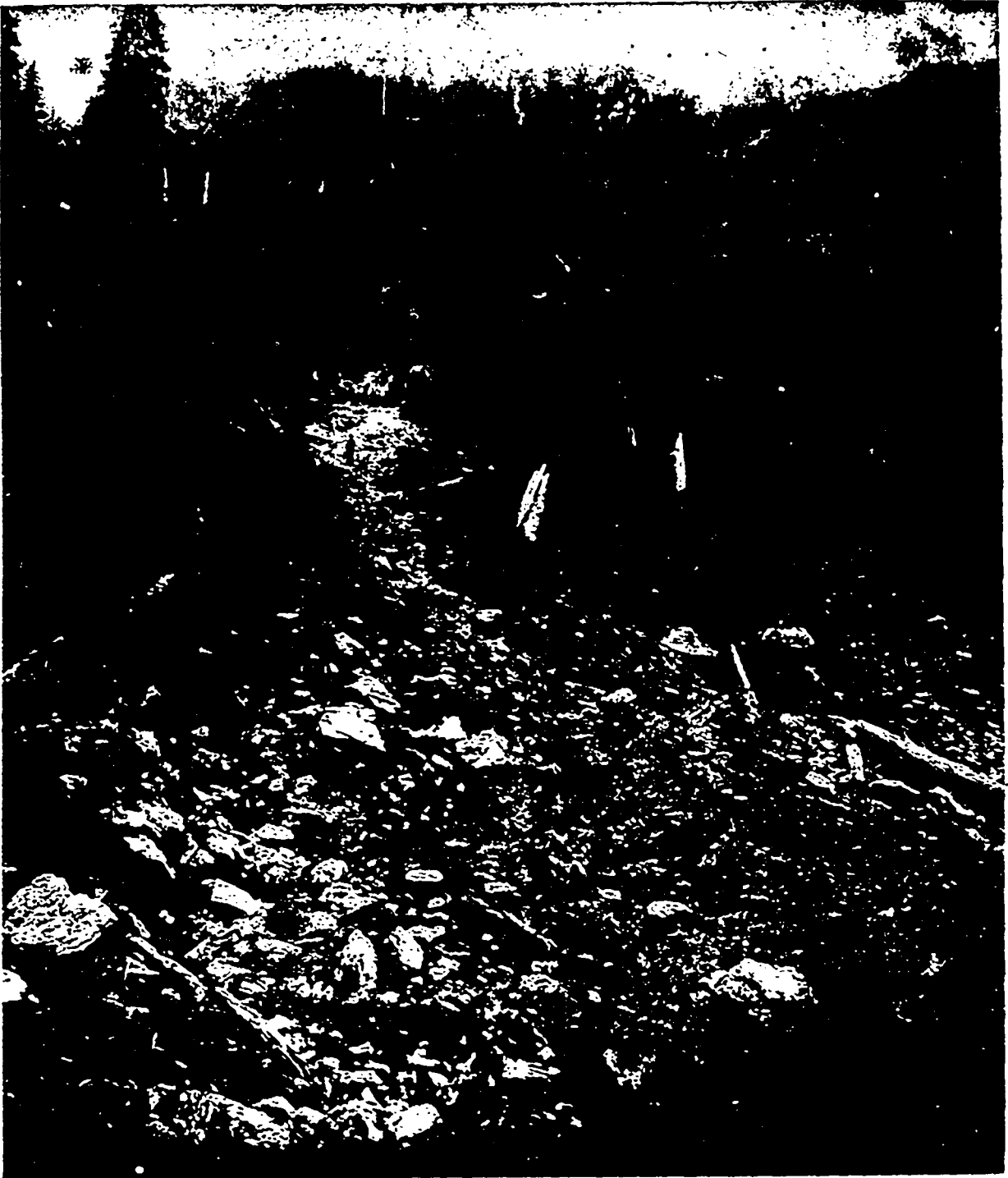
in 1901, the present managing director of the company, carried through a deal for the property, through securing a majority of the issued stock, for which he paid at the rate of \$1,500 per share. Later, this gen-

tleman purchased the three-tenths interest which Mr. Boscowitz had retained, and the entire property came under the control of the one company."

During the current year the authorised capital of

AN EXPERT'S CONCLUSIONS.

The following deductions were made by Mr. Ellis Mallery, now of Los Angeles, California, after extended observations along the whole belt and were



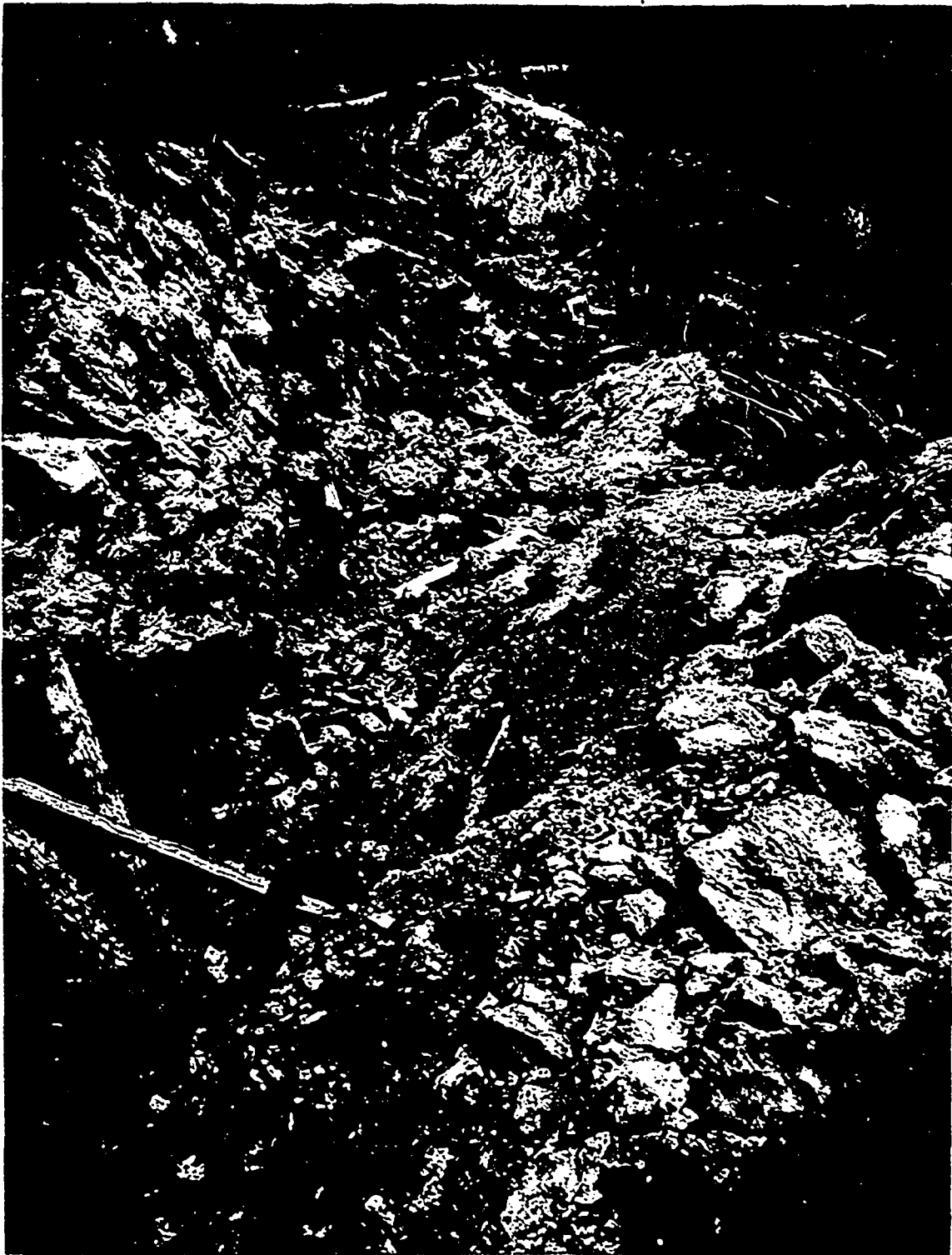
Surface Showing on Fairview Mineral Claim. View from Footwall side, taken in 1900.

the company was increased from the above-mentioned \$250,000 to \$937,500, the new stock having been, so it was stated, underwritten at par value by Mr. Henry Stern, of New York, who was already interested in the company to a considerable extent.

in 1903, submitted by him as being reasonably correct:

"Topographical.—The mineral belt in which the Britannia mines are situated is some 20 miles long and has a general trend of N. 70° W. and S. 70° E. The

eastern and western limits show decided curves and the whole presents the appearance of a rude letter S with the eastern extremity pointing south and the Sound itself, out either side, up and through the tops of the highest mountains. The part of this belt which can, and will be, profitably exploited covers six to



Open Cut in Ore on Jane Mineral Claim. From a photograph taken in 1900.

western pointing north. The present configuration of the country has but little influence on the general trend of the belt, which cuts across country regardless of elevation or depression; down under Howe eight miles of its length. The part of which this paper treats most, is situated in Britannia mountain. Along and across the crest of this mountain the ore bodies are the largest and are extensively developed over

territory comprising the length of 10 claims or nearly three miles.

Geological.—The rocks constituting the belt are much the oldest of any in the district. They are Paleozoic sediments chiefly made up of slates and quartzites. The quartzites underlie the slates and belong to the Cambrian. They may be even older, at least in parts, but it is hardly safe to make a division as yet. They are highly crystalline and very massive, as are also the overlying argillites. The slates which are still considerable in the country, are the remains of strata, the original thickness of which we have no means of knowing; subsequent erosion and the encroachment of the granite have obliterated the evidence, but their former development was much greater than the present, as they were laid down during times that extended over several geological periods, beginning in the Silurian and reaching up into the Jurassic. Several unconformities mark different stages in the times intervening, but the present state of the country is too complex to allow of much more than conjecture concerning this interesting age. The schist, which is the leader through the country and the principal horizon of the ores, is a highly altered product of these old sediments. They were formed chiefly from the upper levels of the quartzites, although in places the lower margins of the slates were sheared and sheeted, this sheeting being along, or very nearly along the original bedding planes. Slaty cleavages developed at right angles to the bedding was noted at one locality on the southern limb, but only as a local occurrence, caused by transverse compression of a subsequent period. Along the contact borders of the slates and quartzites a shear zone was developed by the earlier crustal movements. Continued stresses assisted by consequent dynamic effects caused a farther alteration of the rocks to friable felsite and sericite schists. These extended along, and were included in the south side of an anticlinal fold which has a trend approximating that of the present mineral belt, thus partly determining its present strike. The elevation of this anticline lay farther to the north and was the culmination of the same dynamic agencies that changed the sediments to schists. The strata thus inclined suffered more rapid erosion and great thicknesses were removed and carried off to the south to be re-deposited as sediments. These were times when comparative quiet reigned, but there was gradually approaching a time when the country was to suffer the greatest awakening it had ever experienced, i.e., the sudden appearance of the great granitic magmas. These granites, which are so much in evidence for miles around, are not Archaean as has been suggested, but they are comparatively recent, for they intrude and include the older sediments and are responsible for the high state of metamorphism of which they bear evidence. The enormous extent to which they have been developed is the probable cause of their being classed Archaean, but they are related to the Batholithic intrusions of Mesozoic age, which have been recognized at various localities throughout the western border ranges. In this region their ad-

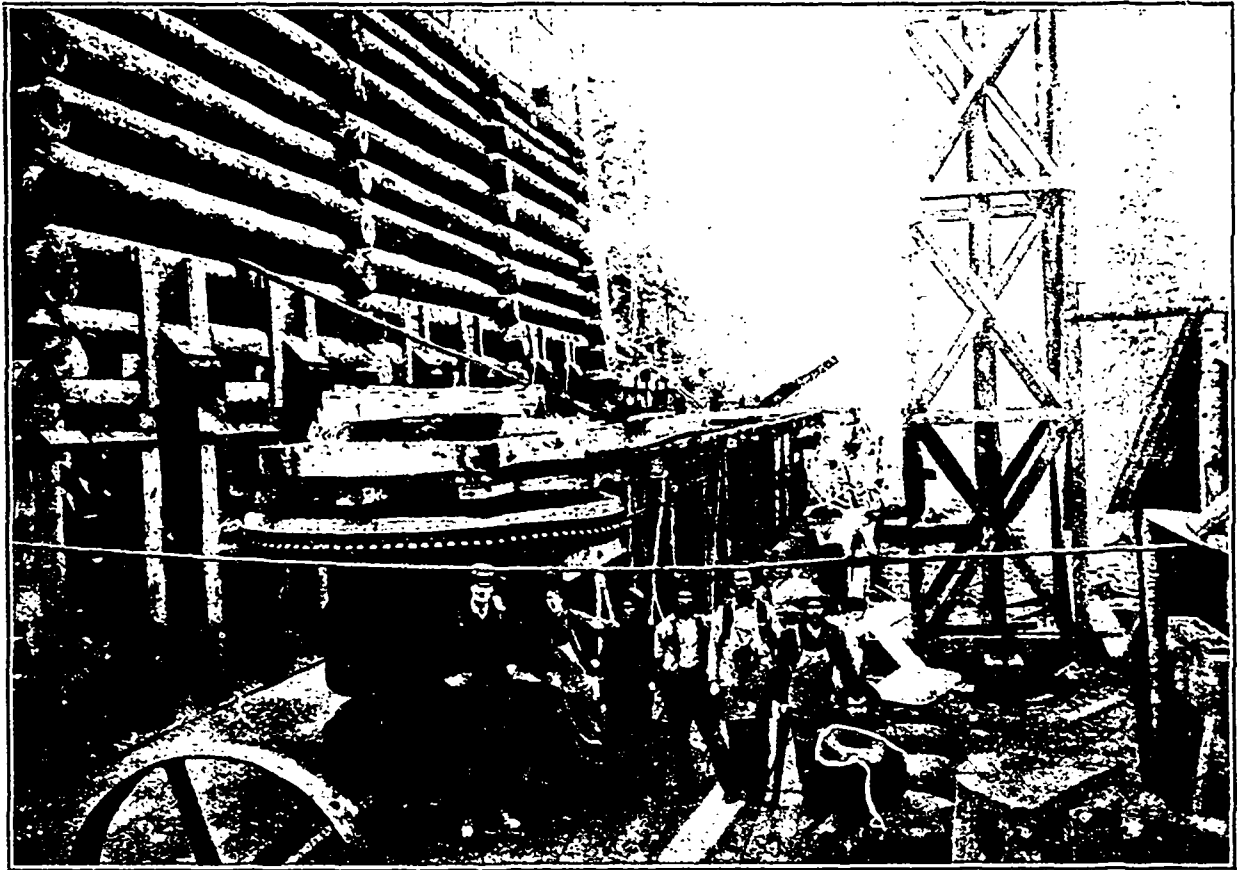
vance was irresistible and the havoc wrought stupendous. The once peaceful strata were rent, twisted and contorted into shapeless masses and actually included in their destructive embrace. At the present we find isolated patches of these old stratified rocks scattered throughout the granite hill so highly altered from the great ordeal through which they have passed that they are almost beyond recognition. It is for this reason the country is described as being 'all broken up,' a term finding expression among prospectors throughout this section. The Britannia mineral belt is one of these inclusions and the peculiarity of the situation is, that so long a strip remains intact. This mountain-making time finally subsided and the country presented somewhat its present topography, the only modifications being made by erosion and a few Tertiary volcanics. These volcanics will be mentioned later. The erosion was chiefly due to the icy grasp of the glacial epoch. The country during this period was severely scoured and sculptured. The great ice-sheet reached a thickness of thousands of feet and its southward march was hindered not by lofty elevations. Tell-tale marks testify that even the cross ranges were no impediment to its onward movement. Over 4,000 ft. high and not far from Britannia a beautiful little field of striations and perched boulders speak of the trials and tribulations of the period.

Thus suffered the heights, but there was also grief in the lowlands. The drainage systems which were shaped in the Middle Tertiary were deeply chiselled and gouged and left with precipitous walls. The submergence of the coast-line let the ocean back and now for several hundred miles along British Columbia's shores there are pretty inlets jutting far into the mountains. Howe Sound is one of these: but to continue with the chief issue of this paper a return must be made to the time of the appearance of the great magmas. The birth of the Britannia mines dates from the advance of the Batholiths, and is the direct result of their forceful existence.

Vein Structure.—A genetic classification of the ore-bodies places them under the head of contact-metamorphic, although the exact type is unprecedented. They are not contact deposits of the orthodox sort which require the ore to be in the contact planes, but are adjacent to the contact and occupy positions in the schists, conforming with them both in strike and dip, i.e., strike 70 to 75° east, dip 65° to the south. This is only approximately correct, as post-fracturing and faulting has localized differences. They are pyritic deposits, i.e., iron pyrite and chalcopyrite with gold and silver in association. They are low-grade, commercially speaking, yet they carry the precious metals in sufficient quantities to make their exploitation profitable. The sulphides usually occur in a quartz matrix, although not infrequently the schist is so heavily mineralised that it constitutes pay ore. Also, the ore frequently occurs in clean shoots free from gangue. Their development is very very extensive even unto gigantic. In no other known part of the world have such enormous exposures of copper ore been laid bare by natural pro-

cesses. The Mammoth Bluff, usually termed 'a mountain' of ore, is really the foot-wall side of a true fissure vein exposed for 600 ft. along its strike and with an average perpendicular height approaching 200 ft. Cross-cut tunnels at the base level have failed to reach the hanging wall in near 100 ft. and it will later be shown that the vertical extent below ground is many times that of the visible exposure. The reason for the localisation of the largest ore-bodies in Britannia mountain is quite easily understood when on the ground, but difficult to convey to the reader. The economically mineralised part of the belt begins low down on the south side of the

zones which became important factors as directors of circulating mineralisers. This faulting in places cut the planes of schistosity, but, generally speaking, the present ore-bodies are true fissure veins, conforming with the schist both in strike and dip. It is borne in mind that these old strata stand at high angles and are bound on both sides with the granite; further, that their surface length necessitates a vertical extension to considerable depth, and that, as a result of the intrusion, there were all stages of heat and metamorphism in the sediments, which were surrounded on sides and bottom by the intrusives. Allowing that increasing fissility meant lessen-



At Mines.—Ore Bins and Upper Terminal or Loading Station of Riblet Aerial Tramway.

mountain: as it bears westward it rises, crosses, and recedes, forming a strike diagonally along the mountain. As the belt gains elevation the ore bodies gain strength and richness, poverty setting in as it descends on the other side, completely disappearing by the time salt water is reached. This does not mean that the ore gives out with depth, but that it is under and confined to that part of the belt along and across the break of the mountain, where shearing and crushing developed a more fissile structure of the schist. During and after the great 'disturbance' the schist owing to the position it held in the mountain was the plane along which all strains were adjusted; thus resulted innumerable conforming faults of small displacements, causing compound fracture

ing resistance to circulating mediums, the way was prepared for the introduction of the minerals. The schist with its nearly vertical position furnished easy means of escape for emanations; the freer the escape the stronger the circulation. Along and across Britannia mountain the belt was particularly well-situated for vigorous circulation, in fact a grand trunk system located here with its many branches searching all openings down to the smallest and deepest. Mineral vapours from the magmas themselves, starting out, first under pneumatolytic conditions penetrated and united with the minerals originally contained in the sediments; all moved toward places of least resistance, through sub-capillary openings into the smallest branches, thence into

larger ones, and finally into the main trunk channels. Continuing heavy-laden upwards, lessening pressure and temperature caused the precipitation of their burdens at different levels along the route. It is quite conclusive that the minerals and the solutions, principally evolved as emanations from the magmas, which set free their occluded gasses at the time of intrusion. It is unlikely that the sediments contributed to the circulation to any appreciable extent, for the water stored-up in them during sedimentation must have been largely driven off during the regional metamorphism produced by the earlier dynamic effects. The action of the ore building was metasomatic in the extreme, the schists for great lengths and breadths having been completely replaced by sulphides and quartz. Mass action of silica and the migration of potash-alumina silicates, with substitution of sulphides, were the chief features of interchange. By this concentration resulted great bodies of primary ore, and the maintenance of both size and value should continue with depth. Usually deposits occurring in planes of fissility have a tendency toward lens structure, but here the action was on so large a scale and so intensely vigorous that to a great extent this lenticular habit was overcome, or at least the lenses formed are of uncommonly large proportions. Thus, considering the mode of origin, the even tenor of the ore along the lateral axis of Mammoth Bluff is assurance for its vertical extent. During deposition, diminishing pressure and temperature had influence on distribution of the minerals along the vertical axis, but this being gradual it required considerable distance to mark a change. Farther, that difference here is in favour of the copper as determined by erosion and exposure of lower vein-sections. Again, uniformity in deposition by the influence of country rock, speaks for continuity here, as these bodies conform both in strike and dip with one kind of rock. Still another contention might be raised by claiming that erosion has removed so much of the upper parts of the ore bodies that only the stumps of veins are left. But even this objection is overruled for there is positive proof of ore still underneath, viz., post mineral fractures cutting the bodies of first-concentration, are filled with secondary sulphides, deposited by ascending hot waters that were set in motion by the later Tertiary eruptions, previously mentioned.

"These volcanics performed an important part in the history of the ore bodies, destroying the orderly arrangement of the primary deposits, and, by setting up a regenerated circulation, caused the formation of new ones. From two to three miles north and for twelve miles along the strike, the mineral belt is rudely paralleled by a line of these vents. That the igneous hearth extended toward Britannia mountain is evinced by dykes cutting the belt. These dykes are well developed towards the east. Near the divide at the head of South Valley a number of large ones cut the belt at various angles. While speaking of

this district it is well to note that a strike-fault has caused a repeating of the outcrop to the eastward, leading some to believe that there are two distinct belts; but the one to the south called the Sotuh Valley lead, is the true continuation of the schist. Dykes are not so numerous in the high part of the mountain, but the deep-seated presence of intrusives is appreciated, they being responsible for the fracturing and dip-faulting of the primary ore, and also stimulating circulation, causing a filling of the fractures with secondary products. Their intrusion marked the dying phase of the former disquietous times, and as heat and pressure diminished, ascending meteoric waters appeared to complete the final work of a grand process. The country being situated in the rainy belt, precipitation is large and erosion rapid; oxidation of ore is limited to the first few feet of the surface, below which exists the unaltered sulphides. The dissolved mineral is carried away with the run-off, hence there is no evidence of secondary ores formed by descending meteoric agencies. The foregoing leads to the following conclusions:

"1. That the largest ore bodies in Britannia mountain are the result of general eruptive after-action, and were deposited as first concentrations by ascending mediums bearing metallic salts in solution.

"2. That by metasomatic processes the schist for great lengths and widths was completely replaced by ore, thus necessitating a very strong and deep-seated circulation.

3. That such ascending mediums under lessening temperature and pressure deposit their burdens at different levels along the route and that here, copper sulphides seek the lower horizons, because where erosion has exposed lower vein-sections it is seen that iron gives place to copper.

"These three deductions speak for the continuance in depth of the present size and tenor of the ore bodies with a gradual change in favour of the copper. As farther proof of copper below post-fractures in the ores of first concentration have been filled with sulphides of a second concentration, the latter caused by rising hot waters set in motion by the near approach of igneous rocks. These waters leached the lower bodies of some of their contents, and carrying them upward re-deposited them on the unaltered sulphides above as secondary enrichments. Thus were the processes that have concentrated in Britannia mountain, ore bodies that rank with the largest and best in the world. The practical man has measured up 2,000,000 tons of workable ore; the theoretical man sees 10,000,000 tons and feels very sure of his ground. With the natural facilities at hand, and the proper equipment, a conservative estimate of the profit per ton of this ore is \$3 or \$30,000,000 for the whole. The profit represents less than one-third the actual value of the ore, or in other words, \$100,000,000 as it stands in the mountain. It is sufficient to say that the extraction of this great wealth means the centring here of a copper camp unequalled on the Pacific slope.

ORE EXPOSURES.

The ore exposures are all located in the bluffs which surround a basin at the head of Jane creek. Extracts from a report by the then managing director of the Britannia Copper Syndicate (the late Mr. Howard C. Walters) were published in the Report of the Minister of Mines for British Columbia, for the year 1900, as follows:

"No. 1, Jane Outcrop and Open-cut.—Near the western end of the Jane claim are the Jane original workings. At this point the leached, silicious outcrop has been broken into by occasional shots and surface trenches for over 80 ft. in width by 250 ft. in length, revealing copper and iron pyrites in the schistose-quartz; also massive yellow copper (chalcopyrite); samples of this outcrop yielding 4 to 13% copper, with \$1.50 to \$2 in gold and silver per ton. On the

treated when the property is equipped on a scale proportionate with its known large ore bodies, but to which no attention has yet been given. Continued to the hanging side of the lode, this tunnel will open large bodies of ore visible on the surface. At 150 ft. from the mouth of this cross-cut a drift has been run west, turning gradually to the south until, at 100 ft. from the initial point, the ore body was encountered and a 26-ft. cross-cut was driven, entirely in massive ore, 20 ft. of which will average better than 5% copper with \$1.75 gold and silver, the remainder averaging 8%, much clean chalcopyrite occurring on the hanging side in a continuous streak of 2½ to 4 ft., clean blocks of which carry 15 to 25% copper, with the accustomed amount of gold and silver per ton. East and west drifts having been run from the 26-ft. cross-cut on this ore body a combined distance of 130 ft., its



AT BRITANNIA BEACH.—General View of Buildings Containing Machinery and Plant, etc

1—Derricks supporting Aerial Tramway from Mines. 2—Receiving Ore Bins and Crusher Building. 3—Concentrating Building. 4—Hydro-Electric Power House. 5—Company's General Offices.

north or footwall slope of this outcrop an open-cut, 15 ft. wide by 20 ft. high on the upper side, has been driven 60 ft., following the strike, entirely in copper-gold ore averaging by careful, repeated, independent sampling, over 5% copper, with \$1.75 in gold and silver per ton, while much of the ore exposed on the hanging side of the cut, where chalcopyrite occurs most generously, will average 8% copper, and may readily be graded by rough-hand selection to 15%. The highest copper results obtained in the open cut referred to range from 15 to 25%, large blocks of the massive yellow copper being tried.

"No. 2, Jane Cross-cutting and Drifting.—About 100 ft. (vertically) below the Jane open-cut, a cross-cut prospecting tunnel has been driven 275 ft. entirely in low-grade mineralised vein matter, which may be

continuity has been proven for that length, at an average depth of 130 ft. from the surface, and despite the fact that at this level the evidences of local disturbances are plentiful, permanence of the ore body is well assured. Although these workings were started in the Jane ground, the west drift has penetrated the Clifton over 100 ft., and stands at present for the only development, aside from a short open surface-cut, on the Clifton claim.

"No. 3, Mammoth Bluff Outcrop.—East of the Jane workings previously described, a small basin of erosive origin occurs, about 900 ft. across, at the eastern extremity of which a great body of silicious ore is visible in the form of perpendicular bluffs, shaped like a huge recumbent letter Z, 600 ft. long and having an average visible height of 200 ft. from

the exposed base, and an average visible width of 150 ft., all of which has been very conclusively proven to be pay ore of most remarkably uniform general character, this having been determined by a 91-ft. tunnel, driven crossing the ore body at about 45°; a 17-ft. cross-cut, and by 24 shots, exposing a 45-ft. vertical face of live ore; also a succession of shots, intended to be 20 ft. apart, along the entire length of the great outcropping at its visible base, all of the workings and every effort of investigation of this phenomenal ore body being entirely in ore, no bands of waste or intrusion of any character having thus far been encountered. Sampled and re-sampled by independent examiners, a fair exhibit of values present in this great ore body, as indicated by the average results obtained from the working exposures, viz., the 91- and 17-ft. tunnels and the 45-ft. vertical face, is: Gold 0.095 oz., silver 0.53 oz., and copper 3.84%. This ore being very silicious, the pyrites finely distributed, will require water concentration, with fine grinding, and tests made indicate 6 to 1 as a satisfactory basis, if the concentrates were to be sold at a custom smelter, or 4 to 5 tons of crude ore to 1 ton of concentrates, if the product were smelted on the ground.

"The visible tonnage in this body of ground, 600 ft. long by 200 ft. high by 150 ft. wide, has been variously estimated by different examiners at 1,800,000 to 3,000,000 tons. . . . As this ore body may be worked as an open quarry for many years, since from the eastern end of the Mammoth ore outcrop the vein matter forms a huge 'hogback' over 400 ft. through at the base, and extends, continually rising, over 1,700 ft., to the eastern end of the Britannia group, the mining costs may be reduced to the very minimum, and the daily tonnage output will from the start be limited only by the will of the operator and the capacity of the equipment provided.

"No. 4—*Fairview Showings*.—From the Mammoth bluff outcrop, through the Edith fraction and cutting the Fairview from end to end, is the huge ridge or 'hogback' of outcropping vein matter referred to in the preceding paragraph. Leached and weathered on the surface, often to great depth, investigation of this claim has thus far been confined to surface prospecting, with most satisfactory results: on and along both slopes of the outcrop good ore has been broken into in numerous places, across over 100 ft. in width, a continuous shoot of high-grade ore coming to the surface for some 300 ft. along the northern slope."

DEVELOPMENT AND EQUIPMENT OF THE MINES.

Present operations at the mines consist chiefly of the opening up for ore production, on an increasingly large scale, of the Jane and Mammoth Bluff mines. Underground development is not yet very extensive, efforts having been from the time ample capital was provided until a few months ago, largely concentrated on the work of erecting buildings and installing plant and machinery for development, production, transportation and ore reduction on a scale to some extent in keeping with the extensive producing capabilities of the property after it shall have been adequately opened up and provided with the

facilities requisite for the regular maintenance of a large output of ore.

Unfortunately it was not practicable for the writer, on the occasion of his visit to the mines in the absence of the mine superintendent to obtain particulars of the extent of development work done since the completion of the surface works necessary to admit of the employment of more than a few men. It was seen, though in the course of a cursory examination of the work done or in progress, that in both mines what were previously small prospecting tunnels had been enlarged to double-tracked main working tunnels, while cross-cuts and drifts were being run in different parts of the mines with the object of opening a number of faces of ore from which a comparatively large output could be secured. It was evident that there is an abundance of ore of a shipping grade, and that ere long the mines will be equal to a much larger daily production than their present output of about 200 tons per diem. Double this quantity should soon be sent out daily, and it may reasonably be expected that a further increase will have been provided for before many months. The Jane workings must now be in about 400 ft. from the portal of the tunnel, while the main tunnel in the Mammoth was in 210 ft., with two drifts run diagonally, one on each side of it, showing the ore to be about 140 ft. in width, that being the distance across the ore body lying between the faces of these drifts. As this ore body is known to have a width of at least 200 ft., it is apparent that a considerably larger output of ore from this mine will soon be practicable, particularly as a big raise is to be made in ore near the portal of the tunnel. At the Jane, too, a larger output is being secured, not only from the big stopes being opened, but as well from a surface quarry in which masses of ore, with much solid chalcopyrite to be seen, were being broken down.

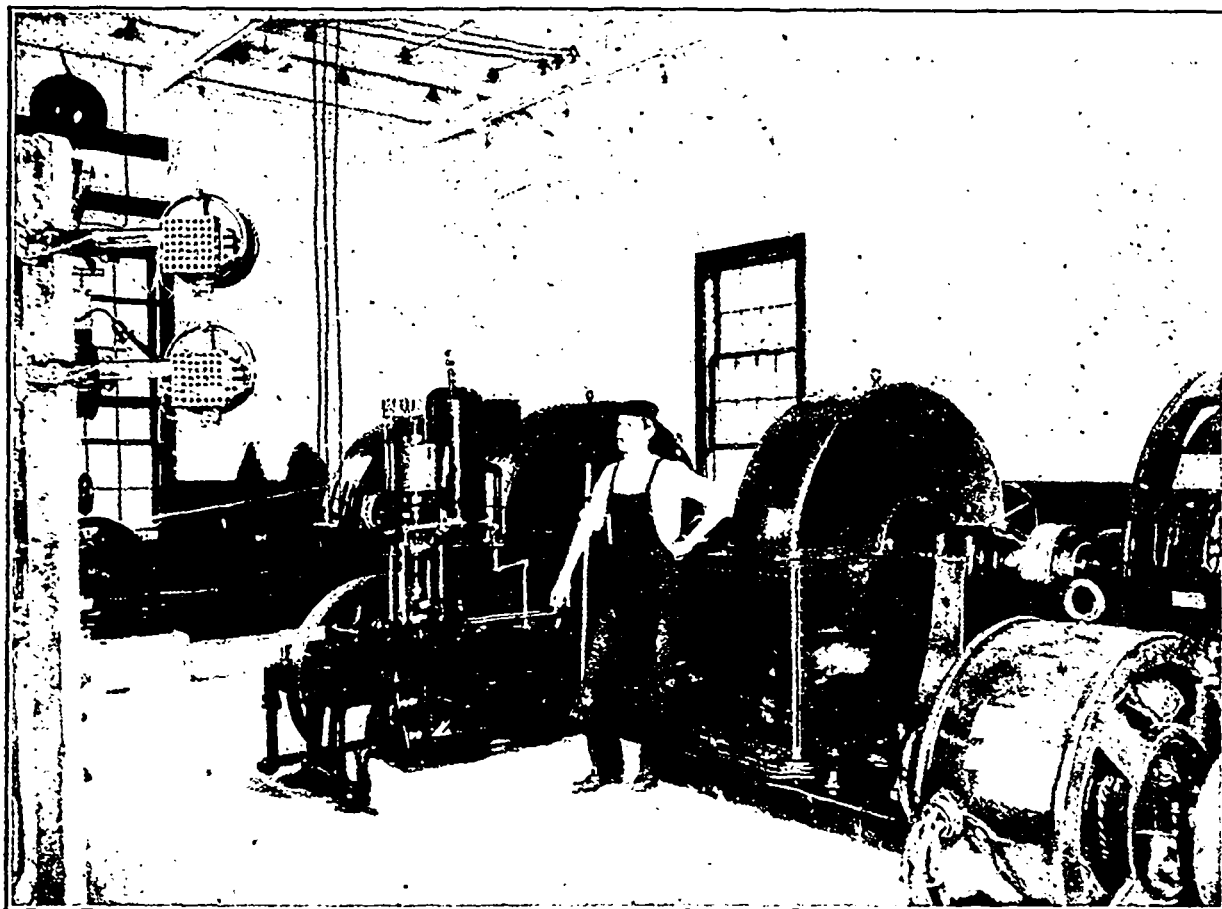
The upper terminal of the aerial tramway forms a central receiving station, with two tramways on trestles running at right angles from it to the mines. The Jane tramway is about 600 ft. long, with a down grade of 8½% to the receiving bin. That from the Mammoth is nearer 700 ft., with only a slight grade. Large self-dumping cars are used on these elevated tramways, those from the Jane being operated by wire rope haulage from an engine, with compressed air for motive power, while those from the Mammoth are hauled by horses. A cable is to be substituted for horses on the latter.

At the end of the tramways the ore is dumped into a Sturtevant roll-jaw crusher, which takes rocks as large as 13 by 26 in. and crushes to a size not exceeding 3 in. A 30-h.p. induction motor drives the crusher. The crushed ore falls on to a conveyor which serves as a sorting belt, the first class shipping ore and waste being both picked off as the belt moves past the three or four ore-sorters, the selected ore going to a special bin and the waste to the dump. The bulk of the ore falls into the big receiving bin for transmission thence by the aerial tramway to the concentrating plant at Britannia Beach. This

bin is built of heavy logs; its dimensions are 60 ft. long by 17 ft. wide by 20 ft. high; its holding capacity is about 1,000 tons of crushed ore.

The Rand 12-drill air compressor is operated by a Westinghouse 150-h.p. induction motor. Ten Rand and two "Baby" Rix machine drills are used. The electric current is transmitted over a 3-phase transmission line from the power house at Britannia Beach and is stepped down at the mine by three Westinghouse 50-kw. oil-cooled transformers. This line was constructed by the Hinton Electrical Co. The machinery for a sawmill is stored on the intended site of the mill, near the entrance to the Mammoth

16,800 ft. in length, with an intermediate dumping and re-loading or transfer station at a point where an angle in the line was unavoidable. The upper section is 5,800 ft. in length and in that distance it drops 1,400 ft., while the lower section is about 11,000 ft. long with a drop of about 1,800 ft. The track or carrying cable for supporting the loaded buckets is $1\frac{3}{8}$ in., while the traction cable—that on the unloaded side—is 1 in. There are from 50 to 100 buckets on each section, these carrying about 1,000 lb. each. The capacity of the tramway as now equipped is about 500 tons in 10 hours; an increase to 100 tons an hour can be made by putting



At Britannia Beach.—Interior View of Power House, showing Pelton Wheels, Lombard Governor, Westinghouse Generators and Excitors, Switchboard, etc.

mine. When erected this plant will also be operated by an induction motor.

There is bunk and boarding-house accommodation at the mines for 70 to 80 men, which is about the number now employed there. A new bunk-house to accommodate 40 men has just been completed. Travel between the mines and Britannia Beach is by trail. Supplies are sent up in buckets or carriers on the aerial tramway.

THE AERIAL TRAMWAY SYSTEM.

The Riblet patent automatic aerial tramway from the mine to the concentrating works and shipping dock at Britannia Beach is in two sections, together

on sufficient buckets, the tramway being easily equal to the work of carrying that quantity. Automatic loaders are installed at the upper terminal and angle station, and ore-bin gates at both places are opened and closed by compressed air appliances. There is a donkey engine and winch at each of these stations, for use in starting the cables in case of need, and for working the elevators. At the lower terminal there are arrangements for dumping the ore either into the big bins at the crusher house or into the shipping bins, as required. The tramway is supplied with all the latest improvements that experience has suggested to the builders, and it works effec-

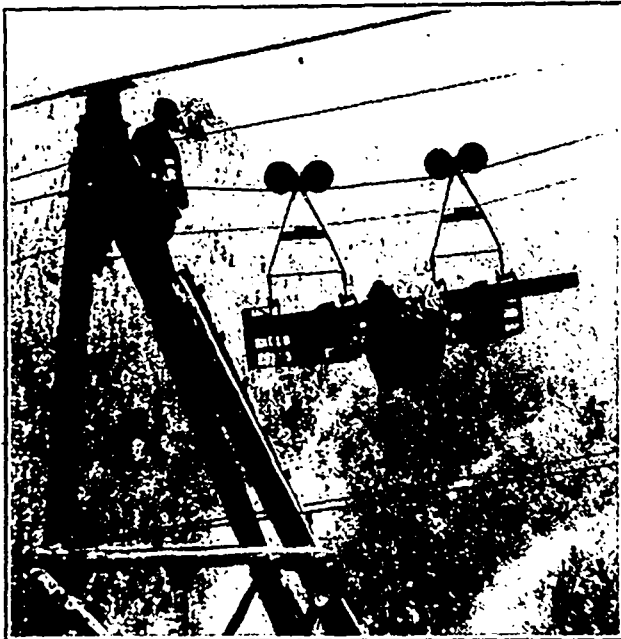
tively and satisfactorily. Its serviceableness, under even exceptionally severe conditions, was fully demonstrated when the heavy parts of a rock crusher and an induction motor—the latter weighing 3,800 lb.—were taken up to the mine on it without great difficulty.

WATER POWER AND ELECTRIC MACHINERY.

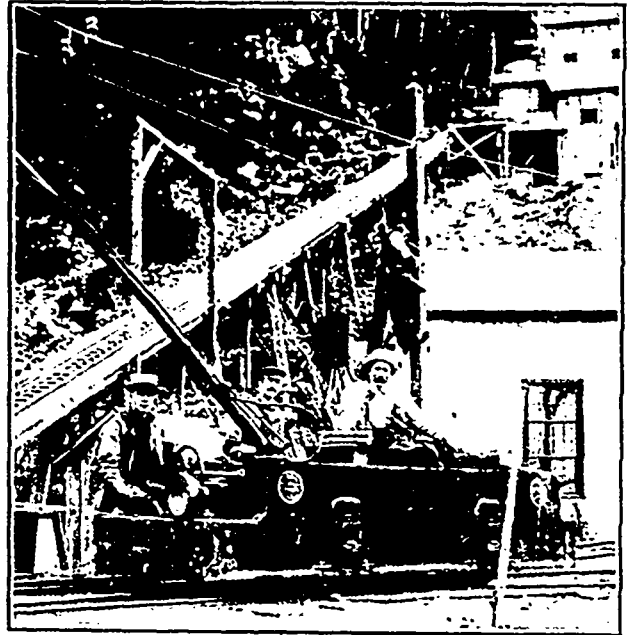
Water for power and other purposes is obtained from Britannia creek, which is dammed at a favourable place distant about $2\frac{3}{4}$ miles from Britannia Beach and at an elevation giving a fall of about 1,950 ft. and running ordinarily at 750-770 lb. pressure. It is conveyed in 18-in. wire-wound wood pipe some 4,500 ft. and in 12 and 10-in. steel pipe the remaining

there are six o.i.s.c. step-down transformers, 6,600-110-220-440 volts. Various used in connection with the crushing and concentrating plants or at the mine, there are seven constant speed induction motors, type "C" 200 volts 3-phase 60 cycles, in the following sizes: one 150-h.p., two 40-h.p., three 30-h.p. and one 20-h.p. The locomotive employed here is a Baldwin-Westinghouse mining locomotive, 4-2-15 C. There are ten a.c. multiple enclosed arc lamps, 110 volts about the works.

The building in which the hydro-electric plant is housed is 30 by 40 ft., framed of lumber, with walls and roof covered with corrugated galvanised iron, wood lined and cement floored.



Transporting Machinery by Aerial Tramway. Man with portable telephone watching load pass derrick.



Baldwin-Westinghouse Electric Locomotive used for hauling to and from Dock at Britannia Beach.

9,000 ft. or thereabouts. This high-pressure line is tapped at the crusher house for water to operate the Pelton wheel that drives the main part of the crushing plant. (The waste water from this wheel runs to the concentrating building where it is used for wash water on the tables.)

The machinery and plant in the power house consist of two 4-ft. Pelton wheels, the flow to which is controlled by a Lombard governor, type "F" fixed on coupling adjustable to either generator and which is working satisfactorily with varying load on either Pelton wheel; two Westinghouse 200-kw. revolving field alternating current generators, 6,600 volts 3-phase 60 cycles 600 r.p.m.; two $17\frac{1}{2}$ -kw. direct current generators, two-bearing type "S", 220 volts, for exciting the 200-kw. machines; one 40-kw. direct current generator, two-bearing type "S" 220 volts 675 r.p.m., for supplying power for the electric locomotive which does the hauling from and to the docks; and one 3-panel blue Vermont marble switchboard, for controlling exciters and generators. In the transformer house

THE CRUSHING PLANT.

The building for the crushing plant, at the lower terminal of the aerial tramway, is situated on a site excavated up the hillside from the flat forming the townsite. The extreme dimensions of this building, which is irregular in shape, are about 80 by 85 ft. It is distant about 300 ft. from the concentrating building and its floor is about 100 ft. above sea-level. The receiving ore bins forming part of this structure are strongly constructed, being framed with 12 by 16 in. sawn timbers and double-lined with 2-in. planking, the whole trussed and rodded for additional strength. The holding capacity of the bins is, approximately, 1,500 tons.

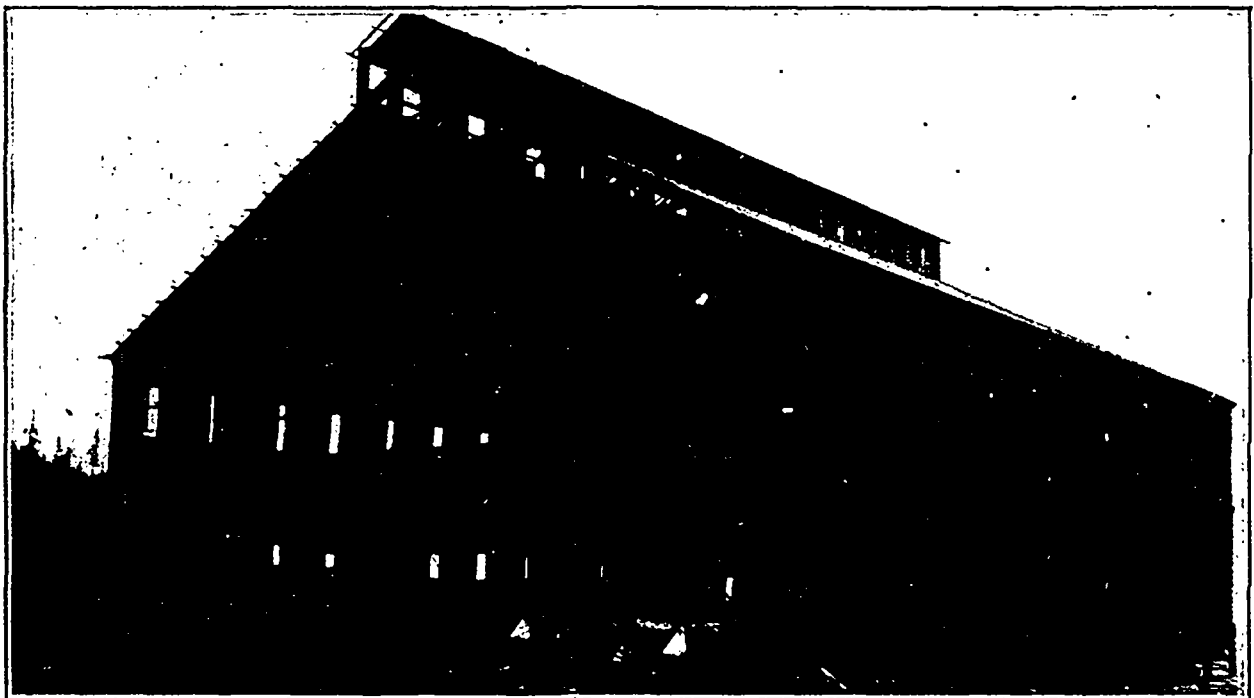
The ore passes from the receiving bins to Blake type rock breakers, of which there are three, each 20 by 10. These are fed by automatic plunger feeders, and crush to a size not exceeding $\frac{3}{4}$ in. From the crushers the ore drops into bins below; these having a holding capacity of about 1,000 tons. The ore is next fed automatically into 15 by 36 Gates rolls—the

heaviest rolls made—there being two of these machines, which further reduce the material to a size not exceeding $\frac{1}{4}$ in. Two bucket elevators having 7 by 16 in. buckets on an 18-in. rubber belt elevate the finely crushed ore and discharge it into two sets of trommels with 8 mm. screens, the undersize from which goes to a Hancock patent jig and the oversize to a set of rigid rolls through which it passes and is then again elevated and conveyed to the jig. This jig is an Australian invention fast coming into favour on the American continent owing to its unusually large capacity, combined with simplicity of construction, minimum of wear and tear, and the little trouble it is to operate. The mineral from the Hancock jig goes to the mineral bins, while the tailings are re-

material overflows, running in smaller launders to two sets each of six graduated round tanks or settlers which constitute a series of classifiers and regulate and distribute the pulp for delivery to the vanners. The coarser and heavier stuff is carried by water from the first-mentioned tanks on to two sets of Richards' classifiers which separate it into four different grades, the finest passing on and re-charging the tanks over the Frue vanners and the remaining grades going to the Willey and Overstrom tables.

Although new and in operation only a short time the concentrating plant is stated to run very smoothly, the machines effecting a clean separation and making a close saving of all mineral.

The mineral or concentrates from the vanners and



At Britannia Beach.—Building for Concentrating Tables, etc., before completion.

ground, for which latter purpose there are two 6-ft. Huntington and two 6-ft. Chilian mills.

The power for driving most of the crushing plant is derived from a 9-ft. Pelton wheel direct-connected to the high-pressure water line, but the Hancock jig and the rigid rolls are driven by a 30-h.p. electric motor.

THE CONCENTRATING PLANT.

The pulp from the crushing plant is conveyed in wooden launders, having a fall of 1 in 12 in., to the vanner building, in which there are 2 Cammett tables, 11 Willeys, 12 Overstroms, 38 Frue vanners, and 2 Sperry slimers. Two 40-h.p. induction motors operate the concentrating tables and vanners, and one 20-h.p. motor runs a 5-ft. Huntington mill for re-grinding the "middlings."

The pulp passes from the main launders into two long, shallow settling tanks from which the finer

tables discharges into mineral bins which largely occupy the lower floor space of the building. Seventon cars are run under these bins and from them loaded with concentrates. The cars are then drawn by the electric locomotive to the track scales for weighing and thence up an inclined trestle having a 4 per cent grade, over the shipping bins on the dock, whence shipments are made to the Britannia Smelting Co's smelter at Crofton, Vancouver Island, distant 58 miles from Britannia Beach.

The concentrator or vanner building is a fine structure, clean-framed, well-trussed, and of excellent construction—a general characteristic, by the way, of the building work done here. Its dimensions are 133 by 125 ft. and 75 ft. to peak. It is framed with 12 by 12-in. and 10 by 10-in. sawn timbers, close-boarded, and roofed with corrugated galvanized iron. It is

lighted by numerous windows by day and electric light at night.

OTHER EQUIPMENT—EXECUTIVE OFFICERS.

The machine and blacksmith shops are well equipped for renewal and repair work, of which there is much to be done for both mine and concentrating plant. The power tools here include lathe, drill press, pipe and bolt threading machines, steam hammer, etc.

Ample dock accommodation has been provided, including shipping bins for both ore and concentrates. There are three separate sets of bins, each 20 by 30 ft. and divided into two compartments, which gives three bins for ore and a like number for concentrates, though of course all may be used for one or other of these products if so required.

Mr. P. H. Carmichael is general superintendent and the extensive erection of buildings and installation of machinery and plant has all been done under his direction. Until recently Mr. G. W. Kesler has been in charge at the mine, but Mr. James H. Henley this month commenced his duties as mine superintendent. Mr. Chas. M. Dull is in charge of the company's executive offices. At the assay office an assayer and assistant are regularly employed.

The managing director, Mr. Geo. H. Robinson, has a commodious residence here, though his varied interests necessitate his travelling a great deal. The Britannia Copper Syndicate's important enterprise owes its present activity and promise of early success to his energetic promotion of the undertaking, which is steadily developing into one of considerable magnitude, with every indication of permanence and prosperity.

WINDY ARM MINERAL LOCATIONS.

Report by Wm. Fleet Robertson, Provincial Mineralogist.

BULLETIN No. 1, lately issued by the Provincial Bureau of Mines of British Columbia, contains the following notes by Mr. Wm. Fleet Robertson, provincial mineralogist:—

The attention of the provincial government was drawn during the past summer to the reports of very successful prospecting on Windy Arm, a branch of Tagish lake, the claims being situated very near the boundary line between British Columbia and Yukon territory the 60th parallel of north latitude. In consequence, the provincial mineralogist, on his return from the Bulkley valley on October 10, was requested to proceed to investigate these reports and to determine as to the location of the claims. He, therefore, left Victoria by the next boat, sailing on October 16, arriving at Skagway on the 22nd and at Conrad City on the 24th.

Routes of Access.—The district in question is reached from southern British Columbia by steamer to Skagway, Alaska, thence over the White Pass and Yukon railway to Carcross—formerly called Caribou Crossing or Narrows. Steamers from Victoria and Vancouver to Skagway run every week, with addi-

tional steamers from Puget Sound ports, on which the first class fare is \$30. From Skagway to Carcross, the White Pass railway runs a passenger train every day, except Sunday, the year round. The railway fare is \$12.25. From Carcross to Conrad City, the terminus on Windy Arm of the aerial tramway from the Conrad Consolidated Mines, is a distance of about 14 miles by navigable water. During the summer season transportation is provided here by the steamer Gleaner, which makes two trips a week, or by row boat; while after the ice forms travel is by sleigh over the ice.

Anticipating the necessity for direct railway connection into this new camp, the White Pass railway has caused two surveys to be made for a branch from its main line. One line starts from Carcross and follows the shore line of Windy Arm to Conrad City, while a second survey leaves the main line at Log Cabin, following down the watershed to Tutshi lake; thence over a very low divide, only a few hundred feet high, to the south end of Windy Arm, the west shore of which it follows up to Conrad City. This latter route, although much longer, is said to be favoured by the railway, as it approaches the summit of the pass by an easier grade and is reported to admit of cheap construction, while from the southern end of Windy Arm a spur could be run along the east side of the arm to Conrad mountain, should the mineral claims there located upon development fulfill the promise of the present surface showings.

The Lewes river, the most important tributary of the Yukon river, has its source immediately to the north of the Chilkoot and White passes, which mark the dividing line between Alaska on the south and the British possessions on the north. Through these passes and by this waterway has been the course of travel to the Yukon gold fields. The river may be said to begin in Tagish lake, which receives the waters of Bennett, Atlin and a number of smaller lakes of the district. These lakes are all cut by the 60th parallel of north latitude—the boundary line between British Columbia and the Yukon territory—and are, consequently, partly in each territory. In longitude they lie between the 134th and 135th west of Greenwich. Windy Arm is an arm of Tagish lake extending in a southerly direction for nearly ten miles from a point about five miles east of the Caribou narrows where Bennett lake flows in. About one and a half miles of the southern portion of the arm is in British Columbia.

The general course of the arm is parallel with that of Bennett lake—the two bodies of water being separated by a mountain ridge which attains an elevation of some 4,500 ft. above the lakes, which are themselves 2,200 ft. above sea level. The separating ridge is about six or seven miles across in a direct east and west line.

The first of the mineral discoveries already referred to, were made on the Windy Arm slope of this mountain ridge about two to three miles north of the 60th parallel, and in this vicinity only has there been any extensive development of the surface prospects. Such development, however, as time has permitted

to be made at this point, has proved so eminently satisfactory as to stimulate prospecting over the entire district, with the result that, during the past summer and autumn, a large number of claims have been recorded along the range and on a parallel range lying to the east of Windy Arm. As most of these new prospects were discovered only late in the season, no very definite information as to them is obtainable, further than that the samples from surface croppings brought in by the prospectors give very encouraging assays and seem to indicate that from the vicinity of the more developed claims there is a mineral belt perhaps three miles broad and extending southward into British Columbia for some distance.

Mineral Developments.—As has already been noted, the older, and, in fact, the majority of the mineral locations, together with all the material development at present accomplished, is in the Yukon territory, and, consequently, outside the jurisdiction of the province of British Columbia. It was, therefore, by the courtesy of the owners—particularly of Mr. J. H. Conrad—that the provincial mineralogist was permitted to inspect the workings and see the results so far obtained.

From the shores of Windy Arm the hills rise rapidly, their lower levels being so covered with wash and slide as to have confined all prospecting to the upper levels—that is from 1,500 to 4,000 ft. above lake level. Timber line in this part of the country is found to be at an altitude of from 4,500 to 5,000 ft. above sea level, or about 2,500 ft. above the lake.

When the provincial mineralogist visited the camp in the last week of October, snow completely covered the hills down to 1,500 ft. above the lake, so that none of the surface workings were visible, and as work in winter could only be carried on underground, only those properties sufficiently far advanced to permit of this were found in operation.

The property upon which the most important development has been done is that held by the Conrad Consolidated Mines, an organization of which Mr. J. H. Conrad is president. This company holds a group of 8 or 10 claims, situated at an elevation of from 3,000 to 4,000 ft. above the lake, in a comparatively level basin among the higher peaks some four miles in a direct line back from the arm. The surface here is covered with heavy wash or slide, in which rich float was found in such a well-defined line as to induce pits and cross-trenches to be dug until the vein was eventually struck in the solid formation upon the Montana, one of the central claims of the group. On this lead a drift had been driven for from 200 to 300 ft., attaining a depth estimated at about 100 ft. From this level stoping had been carried up in places for about 30 ft.

As seen in these workings, the vein was found to be a clearly defined quartz fissure vein between two distinct walls. The hanging wall is the general country rock of the vicinity—a fine-grained, basic, volcanic rock, too much altered to admit of closer determination—while the footwall is a very much decomposed, rusty, coarsely crystalline, igneous rock, probably a diabase. The vein, as exposed, had a

thickness of from 2 to 5 ft., averaging about 3 ft. The strike of the vein was found to be N.W. and S. E., with a dip to the S.W., into the hill, averaging about 25°. On the foot-wall was found a layer from 3 to 12 in. thick of galena embedded in carbonates, or iron oxides, from which astonishingly high assays have been reported, not infrequently running as high as 800 oz. in silver, with \$20 in gold, to the ton.

Above this is the quartz proper, from 12 to 30 in. thick, mineralized sometimes more and sometimes less, with iron pyrites and silver and antimony sulphides, from which the management report assays higher in gold but lower in silver, the whole, however, averaging well. The manager estimated the entire vein to run over \$25 to the ton, which estimate seemed reasonable. Shipments of sorted ore were being made down the hill by the pack train which brought up supplies, and these shipments were reported as running over \$100 to the ton in gold and silver.

The provincial mineralogist took samples from the upper and lower portions of the vein, representing the two classes of ore rather than the average. These he brought to Victoria, where they were assayed by the government assayer. The results obtained were as follows:

No. 1.—Galena from the lower portions of the vein—Gold, \$13.60; silver, 442 oz. to the ton.

No. 2.—The vein quartz well mineralised—Gold, \$7.60; silver, 113 oz. to the ton.

No. 3.—The "fines" broken in sorting the ore from both portions of vein—Gold, \$17.60; silver, 163 oz. to the ton.

On the strike of the vein, as indicated by the Montana workings, a tunnel was driven in on the Mountain Hero, the adjoining claim, through wash for 80 ft., when the solid formation was struck, in which a 50-ft. raise was made, when the vein was found containing similar quartz ore, seemingly proving the vein and ore body for 1,800 ft. along its strike. The management reports the vein as distinctly traced through at least seven claims by float and occasional croppings, upon which some work has been done.

The company has a Riblet aerial tramway $3\frac{3}{4}$ miles long, almost completed from the Montana group to the shore of Windy Arm at Conrad City, and has constructed at the mine a stone bunk- and cook-house for the workmen, and will, consequently, be able to continue development work all winter with a small force of men.

An allied syndicate, the J. H. Conrad Bonanza, has done considerable development in the way of open cuts on the Venus vein, which lies about half a mile south of the Montana.

The country here is cut by the deep canyon of Pooley creek, apparently a fault line, which has enabled the vein to be prospected at a depth of over 1,000 ft. The strike of this vein appears to be about S.W., with a dip to the W. In the same vicinity this syndicate is also developing a parallel vein on the Uranus claims, on which it is reported some 600 ft. of work has been done, developing good ore.

From both of these properties tram lines have

been surveyed and the right of way cleared down to Windy Arm, at a point some $2\frac{1}{2}$ miles to the south of Conrad City.

There are probably 100 more claims located on this slope, on which, as yet, only slight surface development has been done, but in many instances most encouraging results are reported.

From the plans seen of the various properties, it would appear that there are at least two main series of veins, an east and west series and a north and south series, which latter series, to the north of the Pooley canyon, bears to the northwest, and south of the canyon to the southwest. It could not be learned that as yet any development had been done on any claims on the west side of Windy Arm south of the 60th parallel. On the east side of the arm, on Conrad mountain, which is cut by the 60th parallel, a large number of claims were staked late this past summer, but these have not yet received much development, being difficult of access and at an elevation high above the lake.

These locations, however, indicate that the mineralised belt will be found to pass into British Columbia, and that on such extension there is a promising field for the prospector.

The shore of the arm was followed down to its southern end and the ridge to the west was found to continue unbroken, save where cut into by a couple of creeks.

The geological conditions existing in the vicinity of the Montana claim, appeared to continue to the southward into British Columbia territory and past the southern end of the arm. The only exception to this was that within half a mile of the south end of the arm, a bed of hard, dark slate cropped out on the west shore, its contact with the overlying igneous rocks being masked by the surface soil.

A prospector reported that this same slate is cut at an elevation of several hundred feet above the lake by Boundary creek, a creek that flows into the arm from the west almost exactly on the 60th parallel. This contact, when traced out, should prove a profitable field for prospecting and is worthy of serious investigation. On the east side of the arm the mountains are even more precipitous than on the west and seem to consist for the most part of the same class of igneous rocks seen on the west side of the arm.

In the vicinity of the British Columbia boundary, about a mile to the east of Windy Arm, a mass of limestone was noted on the mountain side, and from float seen near by, it is probable that a band of slate will also be found on this side of the arm, although its location is as not been fixed. The contact of these sedimentaries with the igneous rocks, so prominent in the district, must be looked upon as likely to contain mineral, and is a section well worthy of the attention of the prospector.

On the west side of Windy Arm, just south of the British Columbia-Yukon boundary, a townsite has been laid out on a gravelly point formed in the arm by Boundary creek. Should the railway branch be built in from Log Cabin, it would pass through or near the townsite.

Accompanying this report is a map of the Atlin district, upon which is shown in red, as accurately as possible, the location of the claims and points herein referred to.

MINING THE BASIS OF CIVILIZATION.

SPEAKING at the annual dinner of the Australasian Institute of Mining Engineers recently, the president, Mr. Robert Sticht, dwelt at length upon the important part played by mining. Taking it as an axiom that mining was the basis of all civilization, he said two characteristics of Australians have impressed him greatly. One was that the Australian was a singularly happy person and the other that he placed singular dependence on mining. In no other part of the world was this feeling so developed. In Germany, mining was an industry unto itself, and in the United States, amid the general wealth of the community, it did not achieve an equal prominence. An Australian always hankered after mining, and seemed at some time in his career to have been connected with it in one way or another. It could not be denied, Mr. Sticht added, that at the present time mining in the Commonwealth was not progressing fast. What was wanted was a little stronger effort to disclose the vast undeveloped resources of Australia. There seemed to be a certain coyness on the part of capitalists. He hoped that feeling would pass away.

This is from the *Mining Journal*, of London, England. The paragraph, observes the *Los Angeles Mining Review*, contains two remarkable statements, both of them worthy of profound consideration. One is that "mining is the basis of all civilization;" the other, "In Germany mining is an industry unto itself, but in the United States, amid the general wealth of the community, it did not achieve an equal prominence."

The first, that "mining is the basis of all civilization," is so true a statement that it is beyond discussion. Were at any time the test applied, the truth of it would be fully demonstrated. Mining, particularly of the precious metals, creates not only new, but permanent wealth. If such creation were stopped progress in every line would stop, and civilization retrograde. This is so axiomatic a proposition that it is needless to further insist upon it.

It is the second statement of Mr. Sticht that is debatable; yet at the start, one is forced to admit that he can, at best, debate it but in a half-hearted way. While the United States is far and away the greatest mineral producer of the world, there remains the fact, deny it if you will, that mining in this country is not accorded the prominence that it is entitled to. Were it otherwise we would not be pleading congress year after year to create a Department of Mines charged with the supervision of the mineral production and resources of the country.

The truth of Mr. Sticht's assertion cannot be denied; and should it be the means of making those placed in authority over us realize its truth, and cause them to take measures that will give it the prominence it deserves, Mr. Sticht will not have spoken in vain.

RIBLET PATENT AUTOMATIC AERIAL
TRAMWAYS IN NORTHERN LARDEAU,
BRITISH COLUMBIA.

BEFORE the Institution of Civil Engineers, England, Mr. George Attwood, who was consulting engineer for the Silver Cup Mines, Ltd., owning the Silver Cup group, and the Great Western Mines, Ltd., owning the Nettie L. group, read a paper in which the plant for handling and treatment of ores from those mines was dealt with in considerable detail. The following is an abstract of that paper, which appears in *Proceedings* of the institution, Vol. CLIX, 1905. It describes the system of automatic aerial tramways constructed by the Riblet Tramway Co., of Nelson, B. C., and Spokane, Washington, U. S. A. Similar tramways have been installed by the Riblet Co. at a number of mines in British Columbia, and they give general satisfaction. The following description of them will, doubtless interest many readers of the MINING RECORD:

In the plant for handling and treatment of ores, at the Silver Cup and Nettie L. mines, British Columbia, four aerial tramways have been constructed for conveying the minerals from the mines to the works; these are also used for conveying mining and food supplies, mining timbers and firewood, as well as passengers, to the mines. They are called tramways No. 1, 2, 3, and 4; they are shown in the illustration, Fig. 1, in plan.

They are of the double-rope type, consisting of two track cables, securely anchored at the upper (or loading) terminal, and sustained by supports at proper intervals; the necessary tension is maintained by means of suspended weights at the lower terminal. The buckets are suspended on travellers running on the track cables (see Fig. 2), being attached at regular intervals to an endless traction rope, which passes around a horizontal sheave at the discharge terminal, and is supported at a fixed distance from the track cables by sheaves on the supports. The speed of the tramway is controlled by a system of brakes on the grip-wheel at the loading terminal (see Fig. 3). The brake and loading levers are so arranged that any one of the tramways can be operated by one man, and no attention is required at the discharge terminal unless material has to be sent to the mine.

The country being heavily timbered, a space of 100 ft. in width was cleared for the tramway lines. The track cables for supporting the loaded buckets are 1 in. in diameter, made of the best crucible steel, in round strands, with a hemp core, and have a minimum breaking strength of 60,000 lb. The track cables for the unloaded side are $\frac{7}{8}$ in. in diameter, and have a breaking strength of 28,000 lb. The maximum working stress on the track cables is not more than one-sixth of the breaking stress.

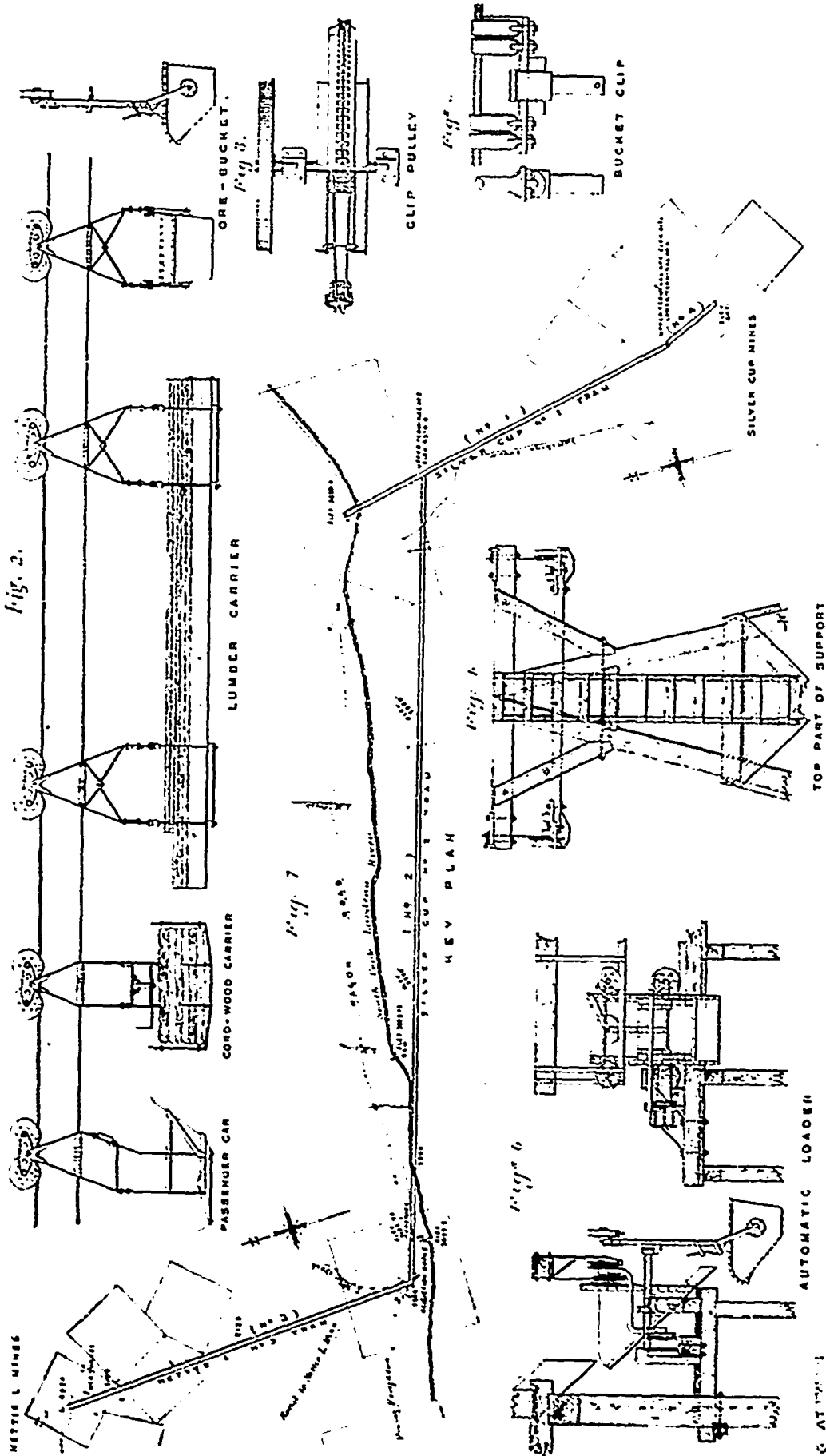
The supports are equipped with cast-iron saddles for supporting the traction ropes (see Fig 4). The device for carrying the traction-rope sheaves is supported by adjustable rods, in order to maintain the correct distance between the track rope and the trac-

tion rope. The supports are constructed of framed timbers, the legs being given a wide spread and fastened into heavy timbers laid on good earth and rock foundations, prepared by cutting into the hill-sides. Where necessary, the legs are anchored. Tension stations for equalizing the strain on the track ropes are provided where required, the tension upon each of the track cables being maintained by means of suspended weights, and the connection between the sections of the track cables being made by means of a rigid rail. The latter permits the buckets to pass without interruption from one section to another. The buckets are made of mild steel, and each has a capacity for 1,000 lb. of ore. They travel at the rate of 300 ft. per min. (or nearly $3\frac{1}{2}$ miles an hour), and are attached to the traction rope by means of Riblet bucket clips (Fig. 5), which have proved serviceable and safe.

The buckets are loaded automatically, at the upper end, by means of automatic travelling hoppers operated by the passing buckets; these receive the ore from the bins in measured loads and deliver it into the buckets as they pass along. The loaders are built of steel plates and angle bars, and are carried on four wheels grooved to run on a suspended track, (see Fig. 6). They are so arranged that they are gradually accelerated from a state of rest to the speed of the tramway, without shock to the moving parts; the operation is entirely automatic. All the buckets are returned from the lower terminals, mouth downward, unless filled with supplies, to prevent snow or rain collecting in them, and are automatically righted at the upper end. Telephones are supplied to each tramway for communication between the men in charge of the terminals, and there are also intermediate telephone boxes, so that the linemen can send messages in case of anything going wrong.

Tramway No. 1 was built in the autumn of 1902 to bring down the ore from the Silver Cup mine, and it has been running with few interruptions to the present time. Its total length is 7,887 ft., and the vertical fall between the upper and lower terminals is nearly 2,600 ft. Including the tension-station, situated near the middle of the line, there are 23 supports, the average height of which is about 35 ft., but some of them are more than 70 ft. in height. The ore-carrying capacity of the tramway is about 10 tons per hour; 20 buckets are in use. The capacity can be increased at any time by the addition of more buckets. Besides the ore buckets, two passenger-carriers, six timber-carriers, and four cordwood-carriers are used. Weights of more than 1,000 lb. have been taken up to the mine on the tramway.

The upper or loading terminal is situated just below the Sunshine tunnel, which is the deepest working in the Silver Cup mines: it is provided with an 8-ft. automatic grip-wheel and removable grip-jaws. The grip-wheel is controlled by three hand-brakes operated by levers, so arranged as to afford easy and perfect control. The brake-drums are 5 ft. in diameter, two of them being of 6-in. and one of 4-in. face. At the lower terminal there is an 8-ft. sheave set in a tension carriage equipped with four flange wheels and



THE RIBBET PATENT AUTOMATIC AERIAL TRAMWAY.

Plan of Tramway Systems at Silver Cup and Nettie L. Mines, Northern Lardent, with Construction and Equipment Details.

running on a track of tee-rails. The proper tension of the traction-rope is maintained by means of a convenient arrangement of weight-boxes attached to the tension carriage. At one part of the line it was found advisable, owing to the prevalence of snow-slides, to have a long span of 1,800 ft. In 1903, the snow-slides came down as usual, but no damage was done to the tramway. The snow in places is more than 20 ft. in depth and remains for about six or eight months in the year. The tramway has effected great economy, as the mountain trail to the mine is fully five miles in length; the length of the tramway is only $1\frac{1}{2}$ miles; the cost of carriage has been reduced from about \$4.85 to 48 cents per ton.

Tramway No. 2 (Fig. 1), is 4.4 miles in length and has a fall of 1,120 ft. The upper terminal is situated on the line of Tramway No. 1 and about 1,800 ft. south-east of the lower terminal of that tramway. By adopting this site a saving of 720 ft. in fall was effected, and a better tramway-line was obtained on the south side of Lardo creek. A large ore-bin has been erected, and as the loaded buckets on Tramway No. 1 come down from the mine their contents are emptied automatically into the bin, from which the ore is again charged by an automatic feeder into the buckets of Tramway No. 2, and sent on to the reduction-works. On account of the contour of the country it was found necessary to put in two long spans: one, over Lardo creek, near the works, being 1,050 ft. in length, and about 200 ft. above the ground at the highest point; and the other 2,020 ft. in length and about 295 ft. in height above Sunshine creek. There are altogether about 40 supports to the line, including two tension-stations. The lower terminal has an 8-ft. automatic grip-wheel with removable grip-jaws. In order to assist the working of the tramway the grip-wheel is driven by bevel-gear from a 20-h.p. electric motor; the correct speed of the traction-rope is thus maintained. Besides timber and passenger carriers, 46 ore buckets are employed on this line, the capacity of which is 10 tons per hour and may be increased by the addition of more buckets. The upper terminal has an 8-ft. sheave set on a tension carriage, equipped with four flange wheels and running on a track of tee-rails. The tension of the traction rope is maintained by means of a weight attached to the tension carriage.

Tramway No. 3 (see Fig. 1) was built for conveying the ore from the Nettie L. group of mines to the reduction works, and for taking up mining supplies. It is 7,712 ft. in length, and ascends 403 ft. in a distance of less than 1,000 ft. to the top of the hill, where it runs nearly level for some 2,800 ft., and then descends about 1,850 ft., at a sharp angle to the mill. The tramway will convey the ore down by gravity alone, but in case any difficulty should arise in taking up freights it is intended to attach a small electric motor to the tramway grip-wheel to insure steady working. The tramway is carried on 25 supports, and 20 ore buckets are in use. The upper terminal is furnished with a 10-ft. grip-wheel and three hand-brakes, and an automatic loader. The lower terminal has a 10-ft. sheave set on a tension carriage; the gen-

eral equipment is similar to that of tramways No. 1 and No. 2, except that the traction cable is $\frac{3}{4}$ in. in diameter, with a breaking strength of 36,000 lb. Tramway No. 3 has been working successfully for some months by gravity alone, and light loads are taken up to the mines without difficulty.

Tramway No. 4 (Fig. 1) is a short line, 1,300 ft. in length, extending from the upper workings of the Silver Cup mines down to the upper terminal of tramway No. 1, for which it is intended to serve as a feeder. The fall is 300 ft., the track cables are both $\frac{7}{8}$ in. in diameter, the traction cable is $1\frac{1}{2}$ in. in diameter and the tramway is carried on five supports. Eight buckets are employed, the tramway working by gravity, and the upper and lower terminals are similar to those used on the other three tramways.

THE AMERICAN COPPER MARKET.

PRODUCERS of copper in British Columbia find much satisfaction in the state of the American copper market, both as regards returns lately received for their product and the outlook for the future until, at least well into next year. Among recent reports on the situation was the following, issued early in October by Messrs. D. Houston & Co., of New York:—

Fundamental conditions in the copper situation continue extremely sound, and recent heavy sales furnish the best evidence of the confidence felt among the trade in the genuinely legitimate character of the market. The pronounced features are the continuous heavy exports and an enormous domestic consumption. These are the factors which regulate prices. During the past month the buying has been on a large scale, particularly for the balance of the year, and prices realised for a good share of the business done were $16\frac{1}{2}$ cents and upwards. Some copper sold at $16\frac{1}{4}$ and a shade under, and several million pounds of the leading brand of Lake sold at 17 cents. There were some re-sales for China purchases also at special figures. The sustained strength of the copper market is owing to the great demand for the metal. Factories and mills are operating under the pressure of a flood of orders, and there are many indications that the great activity at the leading manufacturing plants of the country will continue. Current production has to be depended upon to furnish the enormous trade requirements. Producers are well sold up, and in some cases are not in position to consider propositions of great importance for delivery any month this year. General conditions governing the copper market are essentially favourable to strength and stability. The outflow of copper to foreign countries has left the statistical situation here in excellent shape for an extended period of soundness. During the past twenty-one months the exports of copper from the United States amounted to 977,728,640 lb., or 410,536,000 lb. more than for the previous twenty-one months. The shipments abroad for the first nine months of this year were 422,802,240 lb., or a quantity equal to the product of the famous Anaconda mine for four years, or

of the great Calumet & Hecla mine for five years. Domestic consumption is estimated to be absorbing more than 20,000 tons a month, and exports for the past year and nine months average over 20,000 tons per month. It is seen, therefore, that home consumption and foreign demand must have 40,000 tons of copper a month from this country. Estimating United States production at 33,000 tons and imports at 7,000 tons per month, it is evident that the entire current supplies pass regularly into trade consumption. Notwithstanding the foregoing facts there has been a futile attempt recently to discredit the soundness of the copper situation and the actual merits of the market. Prices have been quoted in some trade papers away below what the consumers of the country were paying, and the situation has been otherwise represented absolutely at variance with the true facts. These unreliable reports go letter and thither, and are published in other papers of high standing which think they can rely on the authority they quote from for a faithful representation of the copper market. Sellers and buyers as a whole have no use for incorrect reports on the copper situation, but through misrepresentation the veracity of the copper trade is unjustly assailed. There is no fear of the actual facts regarding the copper market among the trade. No matter what the ruling price for copper may be, there is not the slightest necessity for concealing it. The law of supply and demand is the great factor in fixing the commercial value at which the metal will sell. For some time past, the limited quantity of spot copper and the remarkable expansion of trade has raised the price to the present level of 16½ cents. All will admit that this figure is high enough, and if supplies prove adequate for the demand the interests of the trade will probably be better served in having the selling basis somewhat under rather than above this price. But demand sometimes becomes inexorable and sweeps over ordinary barriers, and recent events prove that the copper market has been difficult to hold in check. Production is very large, and if the situation does not become more acute it may be possible to ward off higher figures. There is no denying, however, that consumption is engaged in a strenuous race with production, and it will be wise to keep an eye on both sides of the situation. Electric tramways, electric lighting plants, and electric energy by water power are developing rapidly on a larger scale. Other requirements are consuming great quantities of the metal, and expansion rather than contraction is to be expected. Smelters and refineries are hurrying copper forward to fill contracts, and consumers find it difficult sometimes to obtain deliveries in advance of specified dates."

Still more recent is the following from one of Mr. George A. Walker's weekly copper letters to the *Boston Commercial*:

"Copper is higher. Lake is now selling at 17 cents and electrolytic at 16¾ cents per pound for delivery in January and February. Consumers are finding it very difficult to discover any copper for sale for delivery at an earlier date than January, and report says that sales have been made at 17¾ and 17½ cents, immediate delivery. There is

a marked scarcity of spot copper and some consumers have not taken care of their full requirements up to the end of the year. It is not improbable, therefore, that very high prices may be paid for cash copper between now and the beginning of the new year. Consumers are becoming alarmed over the situation and are disposed to buy more freely for advance account. There is now every prospect that approximately the present level of prices will be maintained during the first half of 1906, and perhaps much longer.

"Amazement is expressed that metal prices can be maintained at the present level in view of the tremendous increase in production, and the question is asked, 'Will not this increased production soon cause an abrupt decline in copper prices?' The big increase in supply is already a reality, and though the mines of America are now sending an unprecedented tonnage of refined copper to market, the consumption of the metal has grown much more rapidly than production. While there is a good prospect that the consumption of copper will continue to increase in a constantly expanding ratio, it is practically certain that the world's production will not be more than 3 to 5 per cent greater in 1905 than in 1905, whereas the normal annual increase in production has heretofore been 8 to 10 per cent.

"Leading business men who have recently returned from Europe report that business is good there and that it will be better. Things are shaping up for a tremendous extension of electric railways, lighting and power plants and telephone lines, furnishing basis for the belief that the European consumption of copper will be considerably heavier next year than this. Domestic consumption has exceeded all previous records and is still growing."

PRIMITIVE MAGNETIC SEPARATION.

ACCORDING to the *North Queensland Register*, an ingenious method is employed at the London mill, Irvinebank, to separate the iron from the tin concentrates. The ore from the Vulcan mine contains magnetic iron, and the trouble always was to eliminate so undesirable a substance. The specific gravity of the tin and iron, however, so nearly approximates that separation was exceedingly difficult, and was never satisfactorily accomplished. At length Mr. James Tunnie, assayer to the Irvinebank Tin Mining Co., owners of the mill, proposed using electricity to overcome the difficulty. With Mr. Moffatt, who takes a keen interest in ore dressing, the scheme, which has acted so well, was evolved. Water containing the tin and iron was highly charged with electricity, which increased the magnetic influence of the iron, and this created cohesion between the iron particles. The ore was then run over vanners, and the united iron particles, irregularly joined, offered much greater resistance to the water, and were more affected by the vaning motion than the close lying tin. As a result separation was easy, the iron particles fairly dancing off the table along with the lighter stuff. The device gives much more effective treatment, and the reduction in the cost is also considerable.

THE HANCOCK JIG.

AMONG the concentrating machines that have of late years come into prominence is the Hancock jig. Between 20 and 30 years have elapsed since Capt. H. R. Hancock, well known in South Australia as general superintendent for a long period of the Moonta and Wallaroo copper mines in that colony, obtained his first patents and demonstrated the great effectiveness of his machine at the mines in his charge. Nearly 25 years ago the writer saw the Hancock jig in operation, concentrating copper ore on a large scale, at the Moonta mines. It has since been much improved, and is now in use in the United States as well as Australia. Last month the *Mining Record* published a quotation from the Arizona Copper Co's report for the year ended September 30, 1904, in which reference was made to this jig, which was described as "an Australian invention, remarkable for its wonderful capacity as well as for the excellence of its work." Recently the *Sandon Mining Standard* published the following information relative to this useful contrivance:

The Arizona Copper Co. at Clifton, Ariz., has been experimenting for the past year with what is called the Hancock jig, and its operation has been so successful that a second machine has just been installed.

The Hancock jig is also a concentrator and the machine just installed at Clifton takes the place of 35 Frue vanners and two Willey tables. It can be operated with one-quarter the quantity of water and at half the expense. The old Hancock jig took the place of eight other jigs.

These two machines are now handling 600 tons of ore daily and leading mining engineers estimate that they will revolutionize the treatment of copper ores in Arizona.

Mr. C. C. Berger, the Arizona mining engineer, says:

"The new concentrating machine, known as the Hancock jig, which has been in use by the Arizona Copper Co. for the past 12 months, is destined to have an important bearing upon the future of Arizona. It is well known that there are immense tonnages of concentrating ore in Arizona which are too low in grade to work even with a relatively high price of copper. Consequently, anything that may tend to cheapen the cost of producing copper and lessen the cost of mill construction is an item of more than passing interest.

"In the case of the Arizona Copper Co. we have a mill consisting of crushing machinery, screens, one coarse jig, re-grinding machinery, and one fine jig, treating 600 tons of ore per day or, in other words, two machines have taken the place of 45 separate machines. These machines require but little room and consume but little water, hence are a factor in Arizona ore-reduction destined to play an important part in increasing its copper production."

SINKING AN INCLINE SHAFT IN AUSTRALIA.

DEEP sinking is by no means uncommon in Australia, where there are numerous gold-quartz mines developed down to considerable depth. Methods employed and results attained are occasionally made public and these prove of interest to mining men in other parts of the world. The *London Mining Journal* recently published an abstract of a paper on "Sinking an Incline Shaft at the Long Tunnel Mine, Wallhalla," by Mr. John Finlayson, read before the Ballarat (Victoria State) branch of the Amalgamated Mine Managers' Association, as follows:

The Long Tunnel mine is in the Gippsland district of Victoria, and has been a most successful gold producer.

The mine workings in former years had been carried forward from a blind shaft or winze, within a tunnel, and at about half a mile from the entrance of the tunnel. The new shaft was designed to end all these disadvantages by providing a passage direct to the lode.

The country rock consists of hard slates and sandstones (Silurian), with bars of "Elvan," and is regarded as bad drilling rock. The total depth, sunk at an angle of 49° from the horizontal, is 2,886 ft., and the time occupied in this work 20 months. The first 2,300 ft. of the shaft was sunk in two sections at once, and the last 586 ft. sunk in one section. The work was carried forward by contractors working three shifts of eight hours each for six days per week. Six Victorian miners were employed on each shift to do all of the work of sinking, cleaning up, and fitting timbers as the shaft proceeded.

Two 3½ in. rock drills were used at one time in each section for the first 2,000 ft., and three machines of the same size for the remaining distance. The pressure of air at the drills was 100 lb. per sq. in. Size of shaft inside of timbers, 14 by 5 ft.; size of timbers, 8 by 8 in., in frame sets 4 to 6 ft. apart. The shaft is divided into three compartments, the total width of rock excavated being 16 by 7 ft. The total cost of repairs to rock drills was £144, or about 1s. (25 cents) per foot.

The explosives used were 500 cases of 50 lb. of dynamite, costing £1,500. Detonators to the number of 17,200 were used, costing £30 1s. 3d. Fuse cost per foot of shaft, 10.75d., and candles cost the same amount for each foot of sinking—viz., 10.75d. (about 22 cents).

Size of octagon steel used, 1½ in. and 1¼ in., with chisel bits. Total cost of steel, £50.

Average depth of holes bored, 5 ft. 6 in., and diameter 1¾ in.

Number of holes fired, 30, in three rounds of 10 each.

Average rate of pay per shift for all wages men, 11s. (about \$2.75).

COMPANY MEETINGS AND REPORTS.

THE HALL MINING & SMELTING COMPANY, LIMITED.

The sixth ordinary general meeting of the Hall Mining & Smelting Co., Ltd., was held in London, England, on October 30, ulto. The several reports submitted, together with the statement of accounts and balance sheet follow:—

Directors' Report.

The directors herewith submit statement of accounts and balance sheet for the year ended June 30, 1905.

Property.—The property consists of the following claims:—Silver King, 20 acres; Kootenay Bonanza, 20 acres; American Flag, 6 acres; Koh-i-nor, 11 acres; Lake Side, 41 acres; Daylight, 40 acres; Britannia, 25 acres; Rose, Thistle, Sharrack, National Emblem and Horse Shoe, each 50 acres; together with the Eureka, J.M.B., Bid, Jessie, Red Star, etc.—also the Eureka, J.M.B., Bid, Grand, Jessie, Red Star, etc.—right-of-way over the tramway track of about $4\frac{1}{2}$ miles, and a fourth interest in the Emma group of about 182 acres, comprising the Emma, Jumbo, Minnie Moor and Mountain Rose claims.*

Mining.—It will be in the recollection of the shareholders that, in their last report, the board explained that they had arranged with Mr. M. S. Davys, to whom the mines had been leased for some time, to undertake the management and to work the Silver King mine (down to the 7th level) and the Kootenay Bonanza and American Flag claims, on the terms that he should bear half the cost and give his services free in consideration of getting half the net profits.

In pursuance of this understanding a partnership agreement was made with Mr. Davys, commencing from November 16, 1904, to continue until June 30, 1907; and the chief point of interest in connection with the work that he has been doing under this agreement has been the discovery of a vein of ore 5 ft. wide on the level of the No. 1 tunnel on the Silver King, which appears to be in new ground. Judging from the direction this vein is taking, it cannot have been touched by any of the exploration work at the lower levels under the former management, and there is reason to hope that it may prove to be a body of some magnitude.

In addition to this a new prospect shaft on the Kootenay Bonanza has revealed the existence of pay ore, and Mr. Davys is sanguine as to the future of this part of the mine.

Mr. Davys has advised that the work of unwatering the mine to prospect for the body of ore, which he is confident lies between the 5th and 7th levels, be deferred, while work on the new vein above referred to is vigorously pushed, so as to get down as much ore as possible before the winter comes on. Up to the present, under the partnership arrangement, 376½ tons have been shipped, averaging \$22 per ton.

Emma Group of Mines.—Here again, there is reason for congratulation, the profits from the working of the mine, to a moderate extent only, having been very satisfactory, while the developments have proved the existence of an extensive body of excellent fluxing ore containing gold, copper and silver values, besides a large percentage of iron, which renders the company independent of outside aid for fluxing, and should continue to be a source of increased profit as time goes on. As will be seen from Mr. Campbell's report, the sales of ore to several other smelters during the year were 18,248 tons, in addition to 7,257 used in our own furnaces; while our one-fourth share of the net profits amounted to £2,849 15s. 10d.

Smelting.—The company's furnaces have been kept fairly regularly in blast during the year, with results which, considering the keenness of the competition, the directors consider satisfactory, and an earnest of steady improvement in this branch of the business in the future. The supply of lead ore, although at times during the year rather uncertain, is gradually becoming more assured, and under the influence of better prices for metals a good many more mines have been able to resume work, with the result that we have made our

purchases of lead ores from 125 mines, as against 102 last year.

The question of adopting one of the several processes for an improved method of lead smelting has been receiving the careful consideration of the board. As Mr. Hedley mentions in his report, which is attached hereto, much useful information bearing upon this subject has been collected, and as soon as possible an improved process will be installed in conjunction with our present plant, which it is calculated will sensibly enhance the company's profits.

The smelting plant has been kept in efficient working order, and several improvements introduced, which have already led to better results and should materially help the business in the future.

Business Manager's Report.

The agent and business manager (Mr. J. J. Campbell) reported as follows:—

I beg to submit, with the various statements forwarded, the following report on the operations during the past year:—

Mining Department.—At the beginning of the financial year Mr. Davys had extracted practically all the ore which he thought he could get profitably without lowering the water in the mine, and terminated his lease before leaving for England. He proposed, while in England, to discuss with you a scheme for lowering the water to the 7th level, in order to extract the ore which he believed could be mined there with a little development, as a preliminary step to prospecting the mine at depth in a different direction from the prospecting work done at depth under Captain Gifford.

A short lease was then given to Richard White, who, with his three partners, had been working at the mine under Mr. Davys. They sank behind the cave and recovered about 100 tons of ore of good grade. About October 1 they began work on what they supposed to be a small stringer of good ore, which they found near the surface at about the level of No. 1 tunnel, and afterwards found it also in No. 1 tunnel. This widened out somewhat with work, and up to November 16, when his lease terminated, Mr. White shipped 191¼ tons of ore, averaging 82.67 oz. silver and 8.85 per cent copper.

Mr. Davys then resumed charge of operations under the new partnership arrangement made with you, and began work in different parts of the old workings, which he continued with varying success during the winter, and in the spring shipped 761½ tons (leaving some in the upper bins) averaging 21.6 oz. silver and 4 per cent copper.

When spring was sufficiently advanced, the development of the new showing at the level of No. 1 tunnel was resumed, and has been continued since with steady improvement, until now the pay streak is 5 ft. wide, and about 10 tons a day are being stoped from it, and it appears to be going into ground never before explored. The remainder of the ore mined during the winter, and the ore mined up to the end of August, amounting to 300 tons, has now been shipped, and has averaged 22½ oz. silver and 4¼ per cent copper.

In July of this year a prospect shaft was started on the Kootenay Bonanza, and is now down 35 ft., and has been for some distance in ore of shipping grade.

During Mr. White's lease he did some work on the surface at a point above No. 1 tunnel in the direction of the Kootenay Bonanza, and exposed a very promising showing of ore. A raise has been started from No. 3 to tap this ore, and is now up 25 ft.

Emma Mine (Fluxing Ore).—The British Columbia Copper Co., of Greenwood, operating the Mother Lode mine and a large copper smelter at Greenwood, acquired the three-fourths interest in three of the claims in this group, the Emma, Jumbo, and Minnie Moor, and the Montreal and Boston Consolidated Mining Co., acquired the three-fourths interest in the Mountain Rose. On December 1 the management of the Emma, Jumbo and Minnie Moor was handed over to the British Columbia Copper Co. under an agreement which protects our interests. The mine being only nine miles distant from Greenwood, where that company have

*NOTE.—With the exception of the Emma group, which is in the Boundary district of British Columbia, the company's properties are all situated near Nelson, B. C.

a competent engineering staff, it can be conveniently supervised by them. During the summer months of 1904 shipments were kept up well, but with cold weather the water supply for the boilers became very short, and shipments were restricted. The shipments for the year were as follows:—Nelson, 7,257 tons; Trail, 915 tons; Greenwood, 15,556 tons; Boundary Falls, 1,777 tons; in all, 25,505 tons.

Feeling satisfied as to the extent of the ore reserves, a double-compartment working shaft was begun; and, as the ore could be more economically extracted after its completion, only sufficient ore for the requirements of the smelters of the two companies was in the meantime extracted. The working shaft is 150 ft. deep, and the ore body has been entered by a cross-cut from the bottom, where the ore is found to be of the same satisfactory quality as in the other workings.

In a few months it is expected that the West Kootenay Power and Light Co. will be able to supply the mine with electrical power, and the output can then be conveniently and economically regulated to suit the requirements of the two smelting works.

We continued the operation of the Mountain Rose, and shipped 6,254 tons of ore during the year to smelters at Greenwood and Boundary Falls.

It is proposed to do some prospecting on the Jumbo, there being some encouragement in the ore taken out of the original prospect shaft.

Smelting Department.—Although the operations of some of the largest concentrators were seriously hampered by scarcity of water during the past year, the output of lead ores was materially increased, and our purchases of ore of that class amounted to 12,965 tons, an increase of 41.2 per cent over last year. This ore was purchased from 125 different mines, showing a wide-spread revival in mining, from which results in tonnage may be looked for in time. Their great need at present is capital with which to properly develop the promising properties.

We continued throughout the year to obtain sufficient supplies of Hunter V. and Double Standard ore, from the B. C. Standard Mining Co., to render the purchase of any lime rock unnecessary, and the prospects for a permanent supply from the same source are good. At present we are operating these properties under lease, while that company is seeking capital with which to carry out a larger scheme of development.

The Dominion government has now increased the duties on corroded lead and lead ground in oil, and a large corroding works has been established in Montreal, which will double the consumption in Canada of Canadian smelted and refined lead. The capacity of the refinery at Trail is being increased so that we shall be able to have all our bullion refined there.

Taking the company's business as a whole, I look for an improvement in the year ending June 30, 1906.

The staff has rendered the company faithful and efficient service during the year.

Smelter Manager's Report.

The smelter manager (Mr. Robert R. Hedley) reported as follows:—

I beg to submit the following brief report on operations for the year ending June 30, 1905:—

No. 1 blast furnace has been in operation 264 days and No. 2 furnace 290 days, which, figuring their respective capacities, means 76 per cent of the time, which agrees very closely with 1904. We have smelted 5,138 tons of dry ores, 8,210 tons of lead ores not roasted, and 8,281 tons of roasting ores, including a large quantity of lead concentrates. In addition to this, the fluxing ores, Emma and Standard, have been 12,745 tons, and we have re-treated 8,600 tons of matte, which also was roasted. The bullion shipped amounted to 7,603 tons. We also shipped 252 tons of concentrated copper-lead matte, the total content of these two items being 1,206,920 oz. silver, 9,021 oz. gold, 40 tons of copper, and 7,436 tons of lead, with a total valuation of about \$1,100,000.

From a technical point of view the work of the past year has been highly satisfactory and has given excellent metallurgical results, and our metal recovery has been abnormally

high. This is due to a constant watchfulness and attention to minute detail of metallurgical practice. Considering that, with the low tonnage available, the low treatment rates did not cover operating expenses, this should be a matter for congratulation.

The ore supply has, as usual, been very capricious. At times the stocks have been large and of suitable character. At other times we have been obliged to shut down one of our furnaces for lack of ore. This situation has improved since the beginning of the year, and I trust will continue to the end.

The expenditure on maintenance and construction has been heavy, amounting to \$27,000 for maintenance and \$16,000 for construction and plant. The heaviest items of maintenance have been \$8,378 for the blast furnaces, \$6,048 for roasters and briquetters, and \$7,202 for general maintenance. In new plant and improvements the heavy items are \$7,664 for the Merton furnace and \$3,560 for bag house and extension of flues and ventilation. Commenting on this, I may say that much work has been done with a view to the permanent improvement of the plant. The sample mill, being inadequate, was increased in size and the unloading platform lengthened, facilitating the handling of a greater number of cars at a time. Much, however, remains to be done in this department to bring it to the standard of efficiency of the remainder of the works. The advantage of this work will be seen in the reduced costs of sampling and handling. New and substantial gravity bins were provided in connection with the new track system, for holding concentrates and roasting-ores, which were necessitated by the increased roasting facilities afforded. The new elevator, completed this year, in connection with the roasters and lower yard, handles very efficiently the product of the three hand roasters and the Merton, at a very small cost, to an automatic tippie at a high level above the upper yard, affording thereby a greater storage than heretofore. This will also be used to convey foul slags and similar material to receiving bins. The feed floor has been completely renewed, the old floors having become unsafe. At the furnace level much was done toward improving conditions by laying cast iron flooring about the furnaces and improving facilities for the handling of matte, etc. Tuyeres of a new design have been provided to replace the obsolete ones on the small blast furnace, which were leaky and unsafe. Additional jackets for No. 2 furnace were also installed, that furnace being water-jacketed from top to bottom and independent of brick work above the tuyeres, gaining the advantage of being able to clean out the shaft with less labour and in a fraction of the time before necessary.

The most important improvement about the furnaces, however, has been the separator designed by Mr. H. Harris, which does away with the large and cumbersome settlers, with all the expenses entailed in handling, and gives us a very much better separation and, therefore, generally cleaner slags. The principle of this settler is that the separation of matte from slag takes place within the furnace, at the greatest heat, and maintains it in passing from the furnace to the separator, which occupies but little space, and which permits the matte to flow under a water-jacketed partition, filling a small compartment with a constant overflow, while the slag is forced to flow from the original compartment. These settlers, it will be perceived, obviate the customary remixing of matte and slag as they drop into the large settler, and we find that an ordinary cast iron box with about 10 cu. ft. capacity, instead of about 50 cu. ft. as before, quite sufficient for settling purposes, from which the slag flows to a granulating flume. These small settlers are easily handled by a chain block and travelling trolley.

Natural means of effecting ventilation failing, and finding it impossible to expect good work from men working daily in a vitiated atmosphere, it was decided to introduce a system of mechanical suction. Hoods and pipes were provided in connection with a large suction fan, and the fumes therefrom forced into a small bag house, where the valuable constituents could be saved. This has not long been completed, but may already be considered a success.

Considerable expense was incurred in strengthening our

large mechanical roaster; a section of the lower arch was replaced by new work of more substantial design and build, with the result that the furnace has been doing good work for the past seven months almost continuously. We may confidently expect that the brick work of this roaster will give us no further trouble, especially as regards the new portion. The capacity of the roasting plant was further increased by the addition of our Merton furnace. Several changes in the detail and construction of this machine have been necessary to meet our conditions, but the expectation, based on its satisfactory operation during a short period, is that the furnace will materially decrease our roasting costs. It was found necessary to increase the size and length of our flues which connect the roaster with the main flues.

My last report mentioned the construction of a new hand roasting furnace of our own design. This furnace has been eminently satisfactory, being more economical in both fuel and labour for a similar result of efficiency.

The equipment of the machine shop has been improved by the addition of more machinery. The operation of this department saves much money in the maintenance of our machinery in general.

We have been very carefully investigating the merits of improved processes for smelting lead ores, and have acquired a very great deal of extremely interesting information on this subject, and trust that during the current year we may be enabled to instal a plant that will adopt one of these several improved processes to the advantage of our smelting operations.

I must express myself as very well satisfied indeed with the services rendered by the heads of departments, especially by Mr. Harris, who has been untiring in his zeal and devotion to the company's interests.

When moving the adoption of the report and accounts, the chairman (Lord Ernest Hamilton), in the course of a lengthy speech, drew attention to the amount at debit of Profit and Loss account. He said:

"You will see in the balance-sheet, 'Profit and Loss account—debit balance at June 30, 1904, £22,662,' reduced by a profit of £6,000 odd this year to £16,649. At the time when Captain Gifford reported to us that our mine was empty there was a certain sum which stood on our books as a good asset; but of course when our manager reported that the mine was done, naturally, *ipso facto*, the whole of that asset had to be written off, and in that way a debit balance arose of £24,359. That was reduced by a profit last year, and again by a profit this year to an item of £16,600. If, as we hope, and as perhaps we are justified in expecting, the present body of ore which has been found in the neighborhood of No. 1 tunnel turns out to be a body of importance—that is to say, if one may use the expression, a new mine—that ore body can be worked from the old shaft and from the old development work, and, that being so, the old development work at once, *ipso facto*, again becomes a good asset, and the whole of this debit balance is wiped out."

The report and accounts were adopted, and Mr. Stratten Boulnois was re-elected a director.

HALL MINING & SMELTING CO., LTD.—ACCOUNTS TO JUNE 30, 1905.

Dr.		Balance Sheet.					
		£	s.	d.	£	s.	d.
To Share Capital—							
	Authorised—						
	325,000 shares of £1 each	325,000	0	0			
	Issued—						
	25,000 shares of £1 each, issued as fully paid	25,000	0	0			
	250,000 shares of £1 each, issued as 15s. paid, 5s. per share called up, making £1 fully paid	250,000	0	0			
	<u>275,000</u>	<u>275,000</u>	<u>0</u>	<u>0</u>			
	Deduct Calls in arrear		3	0	0		
					<u>274,997</u>	<u>0</u>	<u>0</u>
To Debenture Loan—							
	Series of £50,000 6½ first mortgage debentures, secured by a mortgage on the company's mines, lands, buildings, plant, machinery, etc., to be paid off at 105 per cent (by the operation of a Redemption Fund) within a period of 13 years from March 31, 1900, or at any earlier time after March 31, 1903, at the option of the company on six months' notice						
	Issued—						
	66 debentures of £5 each	330	0	0			
	138 debentures of £10 each	1,380	0	0			
	69 debentures of £50 each	3,450	0	0			
	194 debentures of £100 each	19,400	0	0			
					<u>24,560</u>	<u>0</u>	<u>0</u>
To Creditors—							
	Bank—On loan notes, secured by a charge on the company's stock of supplies, fuels, fluxes, ores and metallurgical products, bullion in shipment and bank balances in British Columbia	37,441	7	3			
	Sundry Creditors—						
	In London	423	2	0			
	In British Columbia	4,993	7	2			
	(For wages, supplies, etc.)				<u>5,416</u>	<u>9</u>	<u>2</u>
					<u>42,857</u>	<u>16</u>	<u>5</u>
					<u>£342,414</u>	<u>16</u>	<u>5</u>

Cr.		£	s.	d.	£	s.	d.	£	s.	d.	
By Expenditure on Capital Account—											
Expenditure to June 30, 1904—											
As per last balance sheet					263,680	5	6				
Further expenditure to June 30, 1905—											
Further payments on account of purchase of one-fourth interest in the Emma group of mines (fluxing ore)		2,057	12	3							
Additional expenditure on buildings, new plant and machinery		3,216	4	9							
					<u>5,273</u>	<u>17</u>	<u>0</u>				
					268,954	2	6				
Deduct—Three fourths of expenditure on Emma mine plant to June 30, 1904, recovered from owners of three-fourths interest					<u>1,703</u>	<u>19</u>	<u>7</u>				
								267,250	2	11	
By Expenditure on patenting Harris Distributing Spout, in which the company owns a one-third interest								124	14	8	
By Development Account—											
The company's one-fourth share of cost of sinking main shaft and driving main tunnel in Emma mine					342	0	1				
Expenditure on Silver King mine, in partnership with M. S. Davys, covered by value of ore on hand					<u>349</u>	<u>15</u>	<u>11</u>				
								691	16	0	
By Office Furniture in London—											
As per last balance sheet					98	8	4				
Deduct—Depreciation written off					<u>9</u>	<u>16</u>	<u>10</u>				
								88	11	6	
By Stock of General Supplies on hand, per manager's valuation—											
At the mine					1,647	10	5				
At the smelter					<u>4,987</u>	<u>15</u>	<u>5</u>				
								6,635	5	10	
By Stock of Fuels and Fluxes—											
At the smelter								1,106	7	0	
By Stock of Ores and Metallurgical Products								23,066	14	5	
By Open Shipments of Bullion								16,583	0	0	
By Unexpired Insurance and Taxes								855	12	6	
By Debtors—											
In British Columbia								694	17	1	
By Cash at Bankers, in Hand, and on Loan—											
In London					1,100	15	2				
In British Columbia					<u>7,565</u>	<u>7</u>	<u>6</u>				
								8,666	2	8	
By Profit and Loss Account—											
Debit balance at June 30, 1904.					22,662	16	2				
Deduct—											
Profit for the year ending June 30, 1905, as per account.		6,023	1	2							
Less—Depreciation of furniture in London					<u>9</u>	<u>16</u>	<u>10</u>				
								<u>6,013</u>	<u>4</u>	<u>4</u>	
									16,619	11	10
									<u>£342,414</u>	<u>16</u>	<u>5</u>

Profit and Loss Account.

Mine Account.

Dr.		£	s.	d.	Cr.	£	s.	d.		
To Expenditure (prior to partnership with M. S. Davys) including safeguarding of property, insurance, taxes, etc.		106	17	9	By Royalty (prior to partnership with M. S. Davys)—					
To Depreciation of Stock (principally mine timbers)		632	14	9	On ore output by tributers	360	8	1		
To Balance, being Profit—					By Sundry Receipts, including interest.	538	12	11		
Carried down to general account		159	8	6						
		<u>£899</u>	<u>1</u>	<u>0</u>						
								<u>£899</u>	<u>1</u>	<u>0</u>

Smelter Account.

Dr.				Cr.			
To Purchase of Custom Ore	170,525	6	5				
<i>Add</i> —Freight, expenses and interest	13,626	16	8	By Value of Bullion, etc., produced	241,996	0	1
			184,152	3	1		
To Administration Expenses	2,909	6	7	<i>Deduct</i> Expenses on same	470	14	4
To Smelting Expenses	42,003	3	4				241,525
To Outside Expenses	1,762	5	7				5
			46,674	15	6		
To Maintenance of Buildings, Plant and Machinery			5,603	13	2		
To Balance, being Profit—Carried down to general account			5,094	14	0		
			£241,525	5	9		£241,525
							5
							9

General Account.

Dr.				Cr.			
	£	s.	d.		£	s.	d.
To General Expenses of the Company—				By Profit on Mine Account—Brought down	159	8	6
In British Columbia and London	1,812	14	0	By Profit on Smelter Account—Brought down	5,094	14	0
To Debenture Interest	1,473	12	0	By Profit on Working Emma Group of mines	2,849	15	10
To Exchange	14	19	3	By Sundry Receipts in London and British Columbia, and profit on sundry transactions	1,220	8	1
To Balance, being Profit—Carried to balance sheet	6,023	1	2				
			£9,324	6	5		£9,324
							6
							5

VANCOUVER ISLAND MINING & DEVELOPMENT CO., LTD.

The third annual general meeting of the Vancouver Island Mining & Development Co., Ltd., was held in London, England, on October 25. After the directors' report and statement of accounts had been submitted the chairman, Mr. F. H. Faviell, said:—

Before proceeding with the ordinary business of this meeting, I should like to explain that we had hoped to have had Mr. Clermont Livingston, our local director, here today, but it is so essential for him to be on the spot at the present time, where there is so much for him to look after, that he has been unable to get away, and although we much regret his absence, we feel sure he is acting in the best interests of the company in sticking to his post.

When I had the pleasure of addressing the shareholders last year, I issued a note of warning as to the speculative nature of the business in which we were embarked, and I am glad that I did so, as the year's operations have clearly shown how difficult it is to locate the exact position of the ore-bodies owing to the disturbed nature of the formation and the dense growth of timber on the surface.

Your board is actuated with only one desire, and that is to do their utmost to make this concern a success and to give the shareholders all the information possible; in proof of this latter we distributed amongst the shareholders, in May, Mr. Livingston's report, just as we received it, dealing with the operations and the delicate negotiations, and the course he recommended in connection with the purchase of the various claims under option to the company. If this had been a large public company it might have been considered rather risky to have published such a document whilst the negotiations were proceeding. But as this is only a small private company we were anxious that those interested, like ourselves, should be able to appreciate the exact position, and I think the publishing of that report will go far to prove that we have in our local director, Mr. Clermont Livingston, a man who is fully alive to the situation and quite capable of looking after the interests of this company. It is impossible for any board to control operations 6,000 miles away unless you have a capable man to advise and direct.

and I think you will agree with me that in Mr. Livingston we have such a man.

As stated in the report which we submit to-day, on the recommendation of Mr. Livingston, we have purchased outright the 26 claims under option to this company for, in round figures, £6,500, which equals £250 per claim; if, as we believe, some of these claims turn out trumps, you have secured a large and valuable block for a very reasonable figure. Over and above these 26 claims, Mr. Livingston has purchased the surface rights from the E. & N. Railway Co., of a large area of ground to the east at \$5 per acre, and we have also secured an extra claim or two and some fractions of claims that lay between, so that we have in all about 1,700 acres, say three sq. miles of ground, on which there would appear to be great possibilities for this company. The bulk of this ground is heavily timbered with excellent timber for mining purposes, so that, in the event of our striking payable ore, we have practically an unlimited supply; a valuable asset in a mining district.

I need not say that it has been a great disappointment to your directors that no large body of ore has been struck in the cross-cuts north and south of the Westholme shaft. The indications were favourable, and in the 250 ft. north cross-cut small stringers were cut, and the schists were more or less impregnated with copper, showing that the formation was suitable for the deposition of ore-bodies. As Mr. Livingston thought things might improve in depth a further cross-cut north was made at the 500 ft. level, but no schist or favourable ground was opened up. In fact, the whole of this cross-cut north was in diabase, whilst in the south cross-cut nothing of any value was struck. The result of the north cross-cutting at this level, 500 ft., was very disappointing, as above we had the copper schists and a small stringer of ore carrying 5% copper; but this formation seems to have been entirely cut out between the 250 and 500 ft. levels by the diabase.

On the Estelle claim, in close proximity to the Richard III., a surface outcrop of copper ore was discovered giving high values in copper, and some gold and silver. We sank on this outcrop, but, after going down 50 ft., found it had cut out. About 350 ft. to the east of this prospecting shaft

some good copper schists have been uncovered, and later on it may be worth while doing further work at this point.

There has been issued with the report and accounts which we present to-day a plan showing the various claims which we have secured on Mount Sicker, as well as the adjacent land purchased from the E. & N. Railway Co. We have also had printed and distributed a further report from Mr. Livingston, dated July 17, 1905, dealing with the latest developments with regard to these claims.

As we have expended a considerable sum of money in endeavouring to locate the continuation of the Tyece ore-body, and so far without success, Mr. Livingston suggests, and your directors concur, that the best policy at the present time in regard to Mount Sicker is to rest on our oars, so to speak, until more is known of the geology of the mountain. By adopting this course we shall be able to frame our future policy and operations better than at the present time.

In the meantime I have pleasure in stating that other discoveries have been made, at no very great distance from Mount Sicker, of extensive copper ore deposits of an entirely different character to what we have on Mount Sicker. These are on Koksilah mountain, about 12 miles from Mount Sicker. For some time past a certain amount of work has been carried on by prospectors in that district, and a good many tons of ore have been exposed, and some 50 tons have been sent to the smelter, giving a return of about 10 per cent copper per ton of ore, and a considerable tonnage is at grass of equal value.

Mr. Livingston is much impressed with these new discoveries, and has succeeded in securing options on some of the claims where the ore outcrops, which he strongly recommends us to purchase. At the present time we can secure them at reasonable prices, as they are owned by small men who have not the means to develop them properly.

As we believe it would be the most prudent course not to have the whole of our eggs in one basket, but to spread our investments as much as possible, having regard to the prospects, we have decided to take an interest in these Koksilah claims, and to take up the six options that Mr. Livingston has secured. These will cost us to purchase them outright about £2,000, and in order that we may be in a position to do this and leave our present capital intact, we propose to make a fresh issue of shares, which will be offered to the present shareholders in the first instance. I may mention that we have already received promises to the extent of £1,000, and so convinced is Mr. Livingston of the possibilities of this new field that he has offered to take up some of the fresh capital himself, which I think is good proof of what he thinks of these claims. I therefore hope that the shareholders present here to-day will also respond, to enable us to carry out the arrangements of which I have given a brief outline.

I should mention that there is one good feature about these claims on Koksilah; the ore outcrops in several places and runs close to the surface, having been exposed by simply stripping the surface soil, or overburden. A considerable tonnage has thus been laid bare by some local capitalists on one of these claims, and these gentlemen are very anxious to secure the adjoining claim, the Bluebell, which we have secured, and on which there is a good surface showing. Mr. Livingston estimated that the ore was worth over \$20 per ton, and on the King Solomon there was about \$16,000 of ore exposed on a very small expenditure for labour. There is a fairly good road to the railway, so that ore can be easily transported to the local smelters for treatment.

With regard to the accounts we present to-day, these need little or no explanation from me. The whole of our expenditure during the year in Vancouver Island is, as stated in our report, on account of labour, supervision, machinery, tools, etc., in connection with prospecting and proving the ground on our various claims. Your directors have taken a large pecuniary interest in this company, having subscribed for about one-quarter of the shares issued up to the present time. They have every confidence in Mr. Livingston, and, knowing the great possibilities that there are for the profitable investment of capital in Vancouver Island, they look forward to a successful career for this

company in the future. That we are not alone in this opinion is clearly shown by the interest that has of late been taken by capitalists and others in various enterprises on the Canadian Pacific Coast.

Mr. W. Gardner remarked: Any man putting his money into a mining concern must exercise hope and patience to a considerable degree, and I believe implicitly in this case that by so doing he will ultimately reap his reward. Although a considerable amount of money has been spent with, so far, negative results, we are advised that we may in due time expect to strike ore. The showings on the Koksilah properties point to the belief that they are likely to yield a more immediate source of revenue than those on Mount Sicker. In reference to this belief, I might remark that Mr. J. S. H. Mason, manager of the King Solomon (the adjoining property), on an expenditure of \$4,000 has exposed ore to the estimated value of \$70,000, which is a very satisfactory result.

Referring to the showings of the King Solomon, those shareholders who may be interested in the developments on this Koksilah mountain will find a very good illustrated article on same in the September number of the B. C. MINING RECORD. (Mr. Gardner here read several extracts from said paper.) I think with these facts before us we need have no hesitation in going in for the claims shown on the map on the table before you, and I believe we shall come out all right in this business, and we may think ourselves fortunate in getting in on these properties at this early stage. I trust that the new shares to be issued, necessary to provide the money to pay for and work these new claims, will be taken up by the shareholders in a good substantial way, because, of course, without cash to work them, the claims will be of little use to us.

The report and accounts were adopted, and Mr. F. H. Faviell was re-elected a director.

CARIBOO CONSOLIDATED, LTD.

The directors of the Cariboo Consolidated, Ltd., convened an extraordinary general meeting of the company for the purpose of submitting resolutions in favour of increasing the capital of the company to £220,000, by the creation of 200,000 preference shares of 2s. each. It was explained in an accompanying circular that the policy formulated by the board for the raising of further capital is rendered necessary in consequence of the gravel so far opened up not being dry enough to permit of extensive breasting operations. As some time may elapse before it will be in this condition, it is absolutely necessary to run the main east tunnel some hundreds of feet further in order to keep well ahead of the gravel blocked out while it is drying; and also to be thus able to employ as large an amount of labour as possible in recovering the gold without overtaking the development work. At the several points where the manager has already attempted to breast out in the gravel a fair amount of success has resulted in winning the gold, and taking the width of the channel into account, this is considered quite satisfactory. The width of the channel at present being worked is some 160 ft., whereas higher up stream it narrows down to between 40 and 60 ft., and it is here, from all indications, that the manager is confident of tapping the richer ground. One of the directors (Mr. Fred. Williams) recently visited the properties, and his report was annexed to the circular. Mr. Williams dealt fully with the present position of affairs and the future prospects of the La Fontaine mine. The spasmodic breasting work to date has resulted in the discovery of over 450 oz. of gold, under adverse conditions, and, moreover, without allowing the gravel sufficient time to dry, thereby increasing the working expenses. The preference shares it is proposed to offer to the shareholders *pro rata*, i.e., one share for every ordinary share held in the company. Preference shareholders will be entitled *pro rata* according to their holdings to 75 per cent of the profits of the company available for dividends, the remaining 25 per cent to be divided among the holders of ordinary shares *pro rata* to their holdings; this position also appertains in the event of liquidation after the satisfaction of all liabilities other than those to shareholders. Each preference shareholder will be entitled to three votes per

share, which makes the voting interest equivalent to the proportion of profits to be received. The directors strongly appeal to and recommend all shareholders to take up their respective proportions of the preference issue, and have themselves (with several of the largest shareholders) signified their intention of subscribing for the proportions to which they are entitled, viz.:—£10,000 of the issue, which is the minimum amount upon which it is proposed to go to allotment.

The meeting was held in London, England, on November 9. The chairman (Sir Bevan Edwards) moved resolutions in favour of increasing the capital of the company to £220,000 by the creation of 200,000 preference shares of 2s each. He explained that the only other alternative to the scheme submitted was reconstruction, which, if resorted to, would have the effect of squeezing out some unfortunate shareholders altogether. With regard to the mine, it has now arrived at the producing stage, and additional funds are required in order to open up a greater extent of the channel for breasting, or taking out the gravel.

Mr. Fred. Williams seconded the resolutions. He spoke hopefully as to the future of the property, and quoted Mr. Bailey's last letter, in which the mine manager stated that "we undoubtedly have bright prospects ahead, and the development work we are now doing is bound to be successful." The resolutions were carried unanimously, and the chairman stated that the scheme was largely supported by the shareholders. There were about 116,000 proxies on the table, and about 25,000 represented in the room.

WAR EAGLE AND CENTRE STAR MINING CO'S

The following notice was last month sent to shareholders of the War Eagle Consolidated Mining & Development Co., Ltd.:

The directors of this company and of the Centre Star Mining Co., Ltd., being of the opinion that an amalgamation of these companies would permit of the more profitable and economical working of the mines, and would be greatly in the interest of the shareholders of both companies, and having for that purpose, pursuant to powers contained in the memorandum and articles of association, and after examination and valuation of the properties of both companies by independent experts, entered into an agreement of sale of the whole property and undertaking of this company to the Centre Star Mining Co., Ltd., upon terms which will permit of the exchange of ten shares of the capital stock of the Centre Star Mining Co., Ltd., for every fifteen shares of the stock of this company.

Notice is hereby given that an extraordinary general meeting of the War Eagle Consolidated Mining & Development Co., Ltd., will be held at the offices of the company, Toronto, on November 23, 1905, for the purpose of considering, and if approved, of sanctioning and confirming the said agreement and sale, and the dissolution and winding up of the company after the amalgamation with the Centre Star Mining Co., Ltd., consequent upon such sale.

The meeting was duly held and the amalgamation proposals were approved. A meeting of the Centre Star Co. has been called for November 28 to consider the scheme.

WHITE BEAR MINING CO., LTD.

At a meeting of the directors of the White Bear Mining Co., Ltd., held in Toronto, Ontario, on November 3, the position of the company was carefully considered, and after full consideration and discussion the following resolution was unanimously adopted:

"That the property and assets of the company be transferred to a trustee for a new company, to be incorporated upon the condition that the capital of the new company be not more than \$1,000,000 divided into 10 cent shares, par value, and that the present shareholders receive a share of the new company for every share held in the present company, the share of the new company, however, while of the par value of 10 cents, to be paid up only to the extent of 8 cents a share, and that the proper officers of the company be authorized to execute the necessary conveyances and transfers to carry out the intention of the resolution."

The new shares will thus be assessable to not exceeding two cents.

The directors at that time also authorized a special meeting of the shareholders to be held in Toronto on Thursday, November 16. That meeting was held and the foregoing resolution was ratified and confirmed. A special meeting of the shareholders was to be held in Rosslund on November 22, for the purpose of making the action of the eastern stockholders legal beyond a doubt and to ratify the action taken by them in Toronto.

CANADIAN NORTHWEST OIL CO., LTD.

The first statutory general meeting of the Canadian Northwest Oil Co., Ltd., was held in Victoria on November 1. There was a large attendance of shareholders, and Mr. Elliott S. Rowe was in the chair. Reports of the provisional directors and Messrs D A Kelly and A Maxwell Muir were presented. Directors were elected as follows: Messrs W. J. Snodgrass, Elliott S Rowe, T. J. Jones, D. D.S., R. E. Bittancourt, David Black, T. M. Henderson, James A. Douglas, H. A. Lilley, Captain J. M. Newcomb.

At a meeting of directors held afterwards the following officers were appointed: W. J. Snodgrass, president; Elliott S. Rowe, vice-president; A. Maxwell Muir, C.E., secretary-treasurer, and D. A. Kelly, manager.

GRANBY CONSOLIDATED M. S. & P. CO., LTD.

Notice has been given that an extraordinary meeting of the shareholders of the Granby Consolidated Mining, Smelting & Power Co., Ltd., will be held at the company's office, No. 52 Broadway, New York, N. Y., on December 1, 1905, for the purpose of adopting new by-laws, authorizing the application to raise the par value of the stock to \$100, increasing the number of directors from twelve to fifteen, and the transaction of any other business that may properly be done at an ordinary general meeting.

MCKINLEY MINES, LTD.

Directors were elected at a meeting of the McKinley Mines, Ltd., held lately, as follows: Messrs. B. Lequime (president), C. R. Hamilton, A. B. Mackenzie, H. W. Warrington and D. Whiteside. Mr. M. O'Brien has been appointed general manager.

COMPANY CABLES AND NOTES.

CABLES.

Alaska Mexican (gold).—October: 120-stamp mill, 291½ days, 20,707 tons ore; estimated realisable value of bullion, \$33,101. Saved 400 tons sulphurets; estimated realisable value, \$33,396. Working expenses, \$33,101.

Alaska Treadwell (gold).—October: 240-stamp mill, 291½ days, 300-stamp mill 291½ days; \$3,944 tons ore; estimated realisable value of bullion, \$31,806. Saved 1,678 tons sulphurets; estimated realisable value, \$71,217. Working expenses, \$77,187.

Alaska United (gold).—October: Ready bullion claim: 120-stamp mill, 291½ days, 19,160 tons ore; estimated realisable value of bullion, \$26,043. Saved 375 tons sulphurets; estimated realisable value, \$10,012. Working expenses, \$26,752.

Le Roi (gold-copper).—October: Shipments for month 8,225 tons ore (to Northport smelter 2,150, to Trail smelting works 6,075 tons), containing 2,950 oz. gold, 3,750 oz. silver and 187,500 lb. copper. Estimated profit, after deducting cost of mining, smelting, realisation and depreciation, \$19,500. Expended on development work during the month, \$11,000.

Le Roi No. 2 (gold-copper).—October: Shipped 680 tons ore. Net receipts, \$17,950, being payment for 807 tons ore shipped, and \$1,633 payment for 57 tons concentrates shipped; in all \$19,583.

Tyce (copper).—October: Smelter ran 16 days, and smelted, Tyce ore, 2,975 tons; customs ore, 491 tons; total, 3,466 tons. Matte produced from same, 385 tons. Gross value of contents (copper, silver and gold), after deducting costs of refining and purchase of custom ore, \$51,238.

NOTES.

Arlington, Eric (gold).—During October smelter returns were received from 109.5 tons of ore, yielding \$3,663.82 net. The expenses in British Columbia during the month, including development, amounted to \$3,752.04; 123 feet of development work was done.

On the petition of Charles T. Hancock, of Vancouver, B. C., it was ordered that the Iowa-Lillooet Gold Mining Co., Ltd., be wound up under the provisions of the "Winding Up Act" and amending Acts, and that W. T. Stein, of the City of Vancouver, be appointed provisional liquidator of the company.

The Byron N. White Co., owning the Slocan Star mine near Sandon, Slocan, has paid another dividend of 5 per cent on a capitalisation of \$500,000, or \$25,000. It is stated that much of this profit was made from the realisation of zinc contained in ore concentrated at the company's own mill.

The judgment of His Lordship Chief Justice Hunter in the case of the Star Mining & Milling Co. against the owners of the Slocan Star mine, Sandon, has been rendered, and is in favour of the defendants. The action was for damages for taking ore from the Rabbit Paw and Heber fractional mineral claims owned by plaintiffs, which ore defendants claimed under their lateral rights.

The B. C. Copper Co. has made the first payment under the bond it has on the Apex group, in the Similkameen. The development work done by the company during two months prior to making the payment is reported to have resulted so satisfactorily that work is to be continued through the winter.

The Dominion Copper Co. has been preparing to start operating its smelter at Boundary Falls. It was expected that the first furnace would be blown in about the end of November.

CERTIFICATES OF INCORPORATION.

Western Hydraulic Mining Co., Ltd., with a capital of \$150,000, divided into 30,000 shares of \$5 each.

Pingree Mines, Ltd., with a capital of \$600,000, divided into 600,000 shares of \$1 each.

Wormacold Creek Mining Co., Ltd., with a capital of \$10,000, divided into 10,000 shares of \$1 each.

Vancouver Fire Clay Co., Ltd., with a capital of \$100,000, divided into 1,000 shares of \$100 each.

REGISTRATION OF EXTRA-PROVINCIAL COMPANIES.

Chestnut Hill Mining Co.—Head office at Philadelphia, Pennsylvania, U.S.A. Capital \$200,000, divided into \$200,000 shares of \$1 each. Head office in British Columbia, at Trout Lake. Attorney (not empowered to issue and transfer stock), Thomas E. Ehrehart, mine manager.

Loyal Lease, Ltd.—Head office at Seattle, Washington, U.S.A. Capital \$200,000, divided into 2,000 shares of \$100 each. Head office in British Columbia, at Vancouver. Attorney (not empowered to issue and transfer stock) William Ernest Burns, barrister, Vancouver.

ZINC NOTES.

A big stack to carry off the fumes from the zinc smelter, is being erected on the top of a hill at Frank. The stack will be a prominent landmark in the district.

Mr. W. R. Ingalls, the head of the zinc commission that has been enquiring into the zinc resources of British Columbia, visited Frank two or three weeks ago to look over the Canadian Metal Co.'s zinc smelter. He was accompanied by Mr. Philip Argall, another member of the commission. The general manager, Mr. J. C. Ferrau, entertained the visitors, who were afforded every facility for inspecting the plant and buildings and were given much information relative to the prospects for establishing a successful zinc smelting industry here.

The zinc enriching works at Rosebery, Slocan lake, are reported to have been shut down for the winter owing to the inconvenience of handling the ore from the Monitor mine, and to cold weather. Next season will, it is stated,

see the scope of operations at these works much enlarged.

Too much snow on the ground prevented the members of the zinc commission, who were unable to visit the property before the snow fell, from seeing the big showings of ore on the Monarch group, at the head of Pingston creek, which flows into Arrow lake opposite St. Leon hot springs. As, however, the property had some time previously been examined by Mr. R. W. Brock, of the Geological Survey Department of Canada, the commission will not be without a disinterested description of this promising property.

COAL NOTES.

The Crow's Nest Pass Coal Co., of Fernie, was awarded first prize for its exhibit of coal and coke at the Portland fair.

The coal-washing plant which the West Canadian Collieries Co. has been installing at its colliery at Lille, near Frans, south-west Alberta, is completed and in regular operation.

Mr. W. Rankin has arrived at Frank from Winnipeg to take the position of coal inspector for the C. P. R. at the Frank mine. The C. P. R. now has an inspector stationed at each of the coal camps in the district.

Mr. E. C. Rhinehart, of Blairmore, has been engaged to superintend the construction of the new tippie to be built by Breckenridge & Lund at their Lundbreck mine, Alberta.

The October pay roll of the Crow's Nest Pass Coal Co.'s three collieries was as follows: Coal Creek, \$73,533.25; Michael, \$40,426.95; Carbonado, \$16,743.90; total, \$130,704.10.

Mr. Robert W. Coulthard has been appointed general sales agent for the Crow's Nest Pass Coal Co. His territory will include all the country between Winnipeg and the coast, also extending south a considerable distance into the States. Mr. Coulthard's headquarters will be in Fernie, East Kootenay.

The West Canadian Collieries Co. has had a gang of men at work blasting out a roadbed alongside the C. P. R. track at the west entrance to the Frank slide, for the purpose of extending the stub of the Frank and Grassy mountain railway connection with the C. P. R.

At Frank Contractor Joseph Morino has completed the cement foundation for the scales the Canadian-American Coal & Cose Co. is putting in at the site of the new tippie and is now on the masonry work. Mr. Morino's crew has also finished extending the water main from the foot of Dominion avenue, across the lake to the boiler house at the mine.

MACHINERY AND CONSTRUCTION NOTES.

The Kootenay Engineering Works at Nelson is constructing for the Canadian Smelting Works, Trail, a large lead smelting furnace.

The Forty-Nine Creek Gold Mining Co., is putting in a stamp mill on the Referendum, on Forty-Nine Creek, about 18 miles from Nelson. The mill building has been erected and the machinery is arriving. When completed the capacity of the mill will be about 100 tons per day.

The La Plata Mining Co. is erecting a concentrator at its Molly Gibson mine, on Kokanee Creek, which flows into Kootenay Lake about six miles east of Nelson. The installation of the machinery will shortly be taken in hand, the building being nearly completed.

The Rossland representative of the Canadian Rand Drill Co., and the Jenckes' Machine Co., a short time since paid a business visit to Erie, Ymir district, where he sold a hoisting engine, a plug driller and other machinery to the Queen mine.

The city of Vernon, in the Okanagan district, is embarking on a municipal electric lighting venture. Steam power will be used for driving the generator. The steam plant will consist of a 250-h.p. 14 and 25 by 36 Jenckes-Corhiss steam engine, horizontal return tubular boilers, 9 by 14

by 16 independent jet condenser, boiler feed pump and feed water heater, all complete, and recently shipped by the Jenckes Machine Co., Ltd., of Sherbrooke, Quebec.

The new shaft house and gallows frame at the St. Eugene mine, Moyie, are described by the Moyie *Leader* as being much larger than those destroyed by fire a few weeks ago. The shaft house is 210 ft. in height and more than 40 ft. in width. The house for the gallows frame is 100 ft. in height. Work has been commenced on the framing shed, which will run parallel with the shaft house; this will be 35 by 100 ft. There are now 175 men employed at the mine and the number is being steadily increased. After the new buildings and machinery shall have been completed the working force will be in excess of 300. It is intended to operate the mine on a larger scale than before the fire; 31 machine drills will be worked. The concentrating mill is being overhauled in readiness for a continuous run, which is intended shall be commenced early in December.

The Granby Consolidated Mining, Smelting & Power Co. has ordered from the Jenckes Machine Co., Ltd., of Sherbrooke, Quebec, the following additional machinery for its copper mines at Phoenix: One 150-h.p. double drum electric hoist; dimensions of drums, which will be conical in shape, 7 ft. diameter at the larger end, 5 ft. diameter at the smaller end, and 5 ft. long; by means of friction clutches each drum can be operated independently; both drums controlled by powerful brakes; capacity of hoist is a load of 10,000 lb. raised at a rate of 700 ft. a minute; shipping weight is in excess of 50,000 lb. One Farrel-Bacon crusher, B pattern; receiving opening of crusher, 42 by 30 in.; capacity per day of 10 hours is 1,400 tons of ore crushed to 8-in. cube; heaviest single piece of machine will weigh about 75,000 lb. The Granby Co. already has in operation at its mines two crushers of similar make, size and capacity.

TRADE NOTES AND CATALOGUES.

Fairbanks, Morse & Co. have sent their Catalogue No. 101A, Sheffield Gasoline Motor Cars.

The Westinghouse Machine Co. has issued a new catalogue of the Westinghouse Standard Engine, which has behind it a history of more than a quarter of a century of uninterrupted success, fully demonstrating the correctness of the principles on which it was designed. Various types of this engine are described and illustrated, both complete and in detail of parts. The pamphlet contains much information of interest to those who have to do with steam engines.

The Jeffrey Manufacturing Co.'s Catalogue No. 20, illustrating machinery specially designed for handling coal at the mines, contains representations of a great variety of coal mining and handling machinery. The illustration of more than a score of tipples, each of different construction, exhibiting arrangements of screening and loading apparatus and other appliances, and of washing plants, gives an excellent idea of the suitability of one or other of the structures to particular conditions obtaining at different mines. Other illustrations, whether of complete plants or of parts of machinery, are equally useful. The catalogue should be obtained by all engaged in coal-mining.

Messrs. W. F. Stanley & Co., Ltd., of Holborn, London, England, have issued another catalogue of drawing and surveying instruments. Apart from its merits as a comprehensive price list, the catalogue is an interesting publication. From the short preface it is learned that this firm, founded in 1853, has passed its jubilee under the continuous management of Mr. W. F. Stanley—a record not often beaten in the history of business houses; and Mr. Stanley's experiences during that half-century would surely be worth reading. At the commencement of his career a theodolite was made by hand and would consist of some 226 separate parts, while at the present time this instrument, by the application of the highest class machinery, can be produced with only 102 pieces. The catalogue is larger than its immediate predecessor by some 60 pages, included in these being a list of scientific works.

PATENT OFFICE REPORT.

Mr. Rowland Brittain, patent attorney of Vancouver, sends the following report on patents issued to British Columbians during October:—

Messrs. D. Inches and E. J. Hosker, machinist and locomotive engineer, respectively, on the Pacific section of the C. P. R., received a United States patent on their improved lock handle for stop-cocks. This handle has been particularly designed for application to what is known as the angle cock at each end of a vehicle on the Westinghouse air brake train pipe, to prevent such stop-cocks being inadvertently closed. The unintentional closing of an angle cock by cutting off the rear portion of a train from connection with the air brake system has been the frequent cause of railway accidents which hitherto could hardly be considered as preventable. The handle, which is the subject of this patent, is provided with a detent which locks it in either the open or shut position as required, so that it cannot be accidentally moved. The invention is a very ingenious and eminently practical one, and should be readily adopted by the various railway companies, as no modification of the body of the stop-cock is required, the old handle merely requiring to be removed and the new one substituted at a comparatively trifling expense, while it will save the recurrence of a class of accidents which are usually disastrous to rolling stock, and the cause of serious interruption of traffic. The air brake companies will also be only too willing to adopt an invention which will enhance the usefulness of their brake system.

Mr. Alfred Taylor, of Victoria, was the recipient of Canadian and Spanish patents on an improved push-button fire-alarm, patents on which are pending in several other countries. The device is designed to combine in an ordinary electric call service such as is in common use in hotels and public buildings, the advantages of a fire alarm system. It consists in the introduction within the push-button of an electric call of an hermetically sealed endwise extensible chamber charged with a material which is readily volatilized by heat. The chamber is interposed between the push-button and the terminals of the electric circuit so that while under ordinary circumstances the push-button may be used to establish contact and ring an alarm, the same function is performed in the event of fire by the expansion under the increased temperature of the volatile material within the chamber. The advantage of being able to obtain the security of a fire alarm system without the necessity of a separate alarm installation will commend the invention to hotel proprietors and others. The alarm may be readily adjusted to ring at any given temperature, and is so sensitive that it may be used to indicate very slight increases of temperature so that the application of it may be extended to any purpose where elevation beyond a certain temperature requires to be carefully guarded against, as in incubators, etc.

BOOK REVIEWED.

Pyrite Smelting.—A discussion, edited by T. A. Rickard. Published by *The Engineering and Mining Journal*, New York, U.S.A., and London, England. Price \$2 (or 10s.) postpaid.

This is a valuable contribution to metallurgical literature, covering in an exhaustive and thorough manner one of the most fascinating phases of economic smelting. It presents in compact form all of the various articles on the subject of Pyrite Smelting which appeared in *The Engineering and Mining Journal* during nearly 18 months, to February, 1905. Among well known contributors who took part in the discussion were Dr. E. D. Peters, Messrs. Herbert Lang, L. D. Godshall, G. F. Beardsley, W. A. Heywood, T. T. Read, W. H. Nutting, E. A. Weinberg, R. F. Lloyd, W. H. Freeland, H. W. Hixon, J. W. Malcolmson, H. Haas, J. Parke Channing and numerous others. The discussion elicited the views of this subject of men who are without doubt the highest experts on the actual practice and technology of smelting.

In reviewing this book the London *Mining Journal* deals with it at considerable length, as follows:

It is almost impossible within the limits of an ordinary review to do full justice to a book such as this one, which, dealing with a comparatively modern branch of metallurgical practice, and containing a mass of facts and up-to-date expert opinion in relation thereto, will probably take rank as a metallurgical classic.

The oxidising smelting of raw sulphide ores in the blast furnace has been variously spoken of as matte smelting, raw sulphide smelting, pyritic smelting, and pyrite smelting, which latter term is considered by the editor of the book, Mr. T. A. Rickard, to be the one most correctly descriptive of the process. Whilst uniformity of nomenclature is much to be desired, it is seldom in any branch of knowledge attained on logical grounds, but is more generally the result of usage. The term "matte smelting" is certainly misleading, since it connotes processes other than the one under consideration; and the same objection applies, though in a lesser degree, to the term "raw sulphide smelting"; whether we use the expression "pyrite smelting" or "pyritic smelting" is of very little import, but we might observe that, although the termination "ic," as here applied, is not quite logically correct, as Mr. Rickard indicates, yet it is more euphonious and is sufficiently descriptive.

Speaking generally, the objects of "pyrite smelting" are, firstly, the concentration of the copper contents of a charge into as rich a matte as possible, and sometimes into a matte sufficiently rich for direct conversion into blister copper or for reverberatory smelting; and secondly, the recovery of the gold and silver by concentration in as rich a matte as possible, consistent with clean slags, and in as few operations as possible. Sometimes one of these objects is of more importance than another, sometimes both are aimed at equally. Incidentally the place of carbon as a fuel is in part taken up by the iron and sulphur existing in combination in the pyritic ores smelted, with a consequent saving of fuel; this is important, as the *raison d'être* of the process is mainly economic.

Briefly, the advantages of pyrite smelting are the efficient and economical concentration of copper into a matte even from low grade pyrites, and the recovery of gold and silver from low grade silicious and pyritic ores at a cost which compares favourably with that of stamp milling and cyaniding or chlorination: the economy of the process consisting in the saving of the cost of roasting and of the upkeep of roasting plant, and the saving of carbonaceous fuel used in the blast furnace.

With a view of thoroughly ventilating the subject of pyrite smelting, a series of ten questions was sent out by the then editor of the *Engineering and Mining Journal* (Mr. T. A. Rickard), and these questions formed the basis of a discussion which ran through that periodical between October, 1903, and February, 1905. The various contributions which then appeared have been revised by the respective authors, and, together with a most interesting introductory article by the editor, and one or two others bearing more or less on the subject, have been collected into the present volume. The replies to the ten questions, received during the course of the discussion, were at its close ably reviewed by Dr. E. Peters, and his review is, of course, included in the book.

The questions sent out were as follows:—

1. What types of ore are suited to the process?
2. Is hot blast advisable?
3. To what extent can fuel be eliminated?
4. What amount of copper is required for the collection of the precious metals?
5. What percentage of lime is necessary to clean slag?
6. What percentage of zinc in the charge can be treated profitably?
7. What is the degree of desulphurisation attainable?
8. What are the possibilities as to capacity of furnace?
9. What are the limitations of the process?
10. What is the relative economy as compared to rival processes?

The substance of the answers received was as follows:—

1. The best ore mixture is one of iron and copper sulphides with silicious fluxing ores, though ores containing lead, antimony, and arsenic may be used if they do not hold enough lead to pay for lead smelting. The presence of much fine pyrites in the charge increases the difficulty of working. Pure iron pyrites only pays to smelt when smelted with silicious ores (of gold and silver) which are themselves fluxes. The process is particularly good for pyrites and pyrrhotite ores poor in gold and silver, and with sufficient copper to give a good matte. In pyrite smelting the slag made must be silicious, otherwise the matte concentration is low—a fact which, as far as it goes, seems to fit in well with Mr. Herbert Lang's views as to the nature of the reactions taking place in pyrite smelting (p. 214). According to Mr. Hixon, pyritic smelting is inapplicable to nickel copper sulphides on account of nickel matte being more infusible. We might add, further, that the oxidisability of nickel unfits it for concentration in an oxidising smelting, nickel being more oxidisable than iron.

2. Opinion is pretty nearly unanimous as to the efficacy of hot blast in pyritic smelting, and it is certain that, with very many ore mixtures it is absolutely necessary to heat the blast. Moreover, and this is a point upon which insufficient stress is laid, the use of heated blast renders it possible to attain results such as high degree of matte concentration, which the mere addition of coke in the furnace as an apparent alternative not only will not bring about, but absolutely retards. In some cases a high pressure cold blast may be as effective as a hot blast, but increasing the pressure also increases the flue dust losses.

3. With regard to the elimination of coke the opinions vary, as this depends so largely on the nature of the charge; but it would appear that the coke used can be brought down to about 3 per cent as a practical limit, though Mr. F. R. Carpenter says that it can all be eliminated.

As the carbonaceous fuel is diminished, more iron and sulphur are oxidised and more silicious flux is needed.

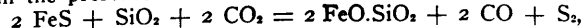
Not only can coke be so largely eliminated, but for successful pyrite smelting—that is, for a high matte concentration, it must be eliminated; any extra heat which is required by virtue of low pyrite contents, of insufficient iron and sulphur, must be added in the form of hot blast, which is thus seen to be specially advantageous on charges low in pyrites and with a heavy silicious charge.

A mixture of metallic oxides and silica with but little pyritic material can be pyritically smelted with the aid of hot blast.

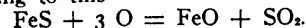
Dr. Peters says that the addition of excess coke in the furnace simply causes the matte to run down and leaves a silicious skeleton behind, with ultimate freezing up. Mr. H. Lang, however, says that excess coke does not induce freezing; in his view the matte concentration and heat production are brought about according to the two following equations:



and in the presence of extra coke—



and not according to this—



According to Mr. Lang's view, the presence of free oxygen, as demanded by the last equation, is not necessary; yet even on his own theory, the first equation he gives clearly shows that in pyritic smelting the oxidation of the iron is effected by free oxygen; whilst in the second equation the amount of oxygen consumed is evidently increased by just the amount necessary to convert the extra carbon into CO, which means increasing the blast to that extent. But, as Dr. Peters indicates, even this would be no good, since the matte would simply run away so much more easily without being "held back" sufficiently to get oxidised and allow of concentration. Whatever the nature of the reactions, the addition of carbon must in general result in the rapid fusion of unoxidised matte, with a lower concentration, owing both to the increased heat and to the shortage of oxygen; and it must also tend to give stiffening of the slag and freezing of the charge in many cases. We must confess that, to us,

Mr. Lang's opinions on this point appear to be incorrect; and as he states that coke may be added up to 12 to 15 per cent without interfering with the process, we could wish that he had specified more explicitly the conditions obtaining when he made the observations.

He observes that iron has a greater affinity for oxygen than sulphur has, while Mr. L. F. Wright notes that the presence of 12 per cent SO₂ is sufficient to check the combustion of sulphur; Mr. Lang quite justly asserts that the oxidation of iron is the main source of the heat not provided by carbon, either in the furnace or as hot blast. As regards the question of sulphur, Mr. C. Palmer (p. 233) says that but little free sulphur is found in the fine dust—a fact which, however, does not prove much, inasmuch as we know that some free sulphur is evolved from the furnace charge by simple decomposition of pyrites into ferrous sulphide and sulphur. In pyritic smelting the addition of excess coke might be prejudicial by reducing iron from the slag, giving a tendency both to form sows of infusible sub-sulphide matte and also a too silicious infusible slag. Dr. Peters and Mr. Lang are, however, in direct conflict on this question of the coke; Dr. Peters (p. 145) says that excess coke induces freezing; Mr. Lang says it does not. The writer of this review certainly considers that any condition tending to produce a too silicious slag—and excess of coke with a slag already silicious—is such a condition, in virtue of the reduction of iron from slag by carbon—must tend to stop the worsening of the furnace; indeed, it is an axiom of pyritic smelting that, as the coke is diminished, the silica should be increased.

4. A little copper in the charge—about 1 $\frac{1}{2}$ per cent—usually gives slags cleaner in gold and silver, though Mr. E. P. Mathewson asserts that copper is not necessary, which is also Mr. Nutting's opinion when speaking of non-zincy charges. As Dr. Peters says, the absence of copper may not matter under special conditions, such as the presence of traces of tellurium, bismuth, arsenic, antimony, etc., which may act as collectors for the precious metals. The presence of subsulphide (free iron in the matte) may also induce better collection of the gold and silver. Mr. Bretherton notes that more copper is needed to collect the gold and silver (we should like to add, especially the silver) if zinc is present. Dr. Peters, on page 166, says that the free iron in iron mattes is produced thus: $FeS + 2 FeO = 3 Fe + SO_2$, which is, to say the least of it, doubtful. The writer believes it to be produced by direct reduction of FeO (in slag) by carbon.

5. With regard to lime, the opinions are very diverse. Mr. R. Lloyd depends upon other bases, and says that clean slags can be got with purely metallic bases, which is perfectly correct. Lane, however, lowers the specific gravity of a slag and gives a better separation of slag and matte. Also calcium goes further in slag forming than iron, not only because of its smaller atomic weight with the same atomicity, but because, whilst a mono-silicate of iron is produced, a bi-silicate of lime is the normal product. On the other hand, as Carpenter says, lime increases the amount of slag.

With regard to zinc there is some divergence of opinion as to the amount which may be present, though there is unanimity in the opinion that a charge works better without it. About 10 per cent of zinc would seem to be the limit. ZnS has a more evil effect on a slag than ZnO, and for this reason, where concentration is low, it would be better to roast the ore before smelting when there is more than a few per cent of zinc as sulphide. Zinc seems to have a particularly bad effect in the presence of alumina. Where there is a high degree of concentration, roasting is unnecessary, as the ZnS gets oxidised in the blast furnace. Some of the authorities quoted do not see any particular virtue in an iron slag as a flux for zinc, the fact is, however, undoubted, and may possibly be explained by the greater fusibility of a compound of ferrous oxide and zinc oxide (where the ZnO acts as an acid oxide) over zinc silicate. The increased volatilisation losses of silver, in presence of zinc, are referred to by Mr. Nutting.

7. The consensus of opinion is that, in practice, 60—80 per cent of the sulphur may be eliminated. The average desulphurisation is 75 per cent. As noticed by Mr. Lang, the joint presence of arsenic and sulphur in a charge may result in the volatilisation of arsenic sulphide, this involving the possibility of high matte concentration with but little oxidising action.

8. The possibilities as to capacity of furnace vary with the conditions prevailing, but the capacity is as a rule greater with hot blast.

9. Limitation of the process.—The presence of sulphides, and especially those of iron, is necessary, and the process is inapplicable in presence of much lead or zinc. However, as previously pointed out, by using the hot blast we are enabled to smelt pyritically charges much poorer in sulphides than we could smelt with cold blast, with the same degree of concentration.

10. The process is very cheap, and comparable with cyaniding or chlorination as a silver gold recovery.

Summarising with regard to heavy pyritic ores, Dr. Peters gives, as advantages of the pyrite process, the following:—

1. No roasting required (saving in plant, in costs, in losses of metal, in time).
2. Great saving in coke.
3. More silica can be used in the charge.
4. More complete elimination of Pb, As, and Sb.
5. Heavy spar less objectionable than in ordinary smelting.

The drawbacks of the process are:—

1. Heavier blast required.
2. Exceptional care and skill.
3. Shorter campaigns.
4. Possible reconcentration of matte.
5. Zinc more injurious than with a roasted charge.
6. Sulphur fumes are wasted.

Local conditions must decide on which side the balance of profit lies, as Dr. Peters says.

Mr. Rickard deserves the best thanks of all interested in metallurgy for reprinting the subject matter of the discussion in a book, in which form it becomes accessible to a much larger public than when scattered through several numbers of a periodical.

BOOKS, ETC., RECEIVED

Department of Mines, New Zealand—Papers and Reports Relating to Minerals and Mining. Comprising (1) Statement by the Minister of Mines; (2) Report on the Goldfields; (3) Report on Coal-Mines; (4) State Coal Mines. A comprehensive review of the mining industry of New Zealand, and matters connected therewith, for the year 1904. With many tables, plans, half-tones, etc.

California State Mining Bureau—California Mines and Minerals; Bulletin No. 41. Compiled by Chas. G. Yale, State Mineralogist. An illustrated survey of the mining industry of California, giving (1) Quantity and Value of Mineral Products of California 1904; (2) County Mineral Products and Value—1904; lithographed Maps of Individual Counties with References showing Locations of Companies, Railroads, Stage-lines, etc. Obtainable from Lewis E. Aubrey, State Mineralogist, Ferry Building, San Francisco, California.

United States Geological Survey—Geology and Underground Water Conditions of the Jornada Del Muerto, New Mexico. By Charles Rollin Keyes. Pages 39; illustrated by half-tones and maps.

Field Measurements of Rate of Movement of Underground Waters. By Charles S. Slichter. Pages 119; illustrated by numerous half-tones and diagrams.

Field Assay of Water. By Marshall O. Leighton. Pages 76; illustrated by half-tones and diagrams.

A Review of Latest Forbidding Pollution of Inland Waters in the United States, Second Edition.—By Edwin B. Goodell. Pages 144.

MONTHLY AVERAGE PRICES OF METALS.
(From The Engineering and Mining Journal, New York.)

MINING MEN AND MATTERS.

SILVER.

Month.	New York		London.	
	1904	1905	1904	1905
January.....	57.058	60.600	26.423	27.930
February.....	57.692	61.023	26.463	28.047
March.....	56.741	58.046	26.764	26.794
April.....	54.202	56.000	24.974	26.108
May.....	55.430	57.832	25.578	26.664
June.....	55.673	58.918	25.444	26.910
July.....	58.083	60.272	26.769	27.822
August.....	57.896	60.272	26.349	28.528
September.....	57.130	61.023	26.349	28.528
October.....	57.923	62.034	26.780	28.637
November.....	58.453	.....	26.952	.....
December.....	60.563	.....	27.930	.....
Year.....	57.221	.....	26.399	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER IN NEW YORK.

Month.	Electrolytic		Lake.	
	1904	1905	1904	1905
January.....	12.410	15.008	12.653	15.128
February.....	12.063	15.011	12.245	15.136
March.....	12.299	15.125	12.531	15.250
April.....	12.923	14.920	13.120	15.045
May.....	12.758	14.627	12.000	14.820
June.....	12.959	14.673	12.590	14.813
July.....	12.350	14.888	12.603	15.005
August.....	12.343	15.664	12.468	15.725
September.....	12.495	15.965	12.620	15.978
October.....	12.993	16.279	13.115	16.332
November.....	14.284	.....	14.456	.....
December.....	14.661	.....	14.649	.....
Year.....	12.623	.....	12.990	.....

Prices are in cents per pound. Electrolytic quotations are for cakes ingots and wire bars; cathodes are usually 0.25c. lower.

COPPER IN LONDON.

Month.	1904	1905	Month.	1904	1905
January.....	57.500	63.262	July.....	57.256	66.657
February.....	56.500	67.963	August.....	56.952	69.830
March.....	57.321	68.174	September.....	57.645	69.667
April.....	58.247	67.017	October.....	60.012	71.406
May.....	57.321	64.875	November.....	65.065	.....
June.....	56.378	65.381	December.....	66.354	.....
Av. year.....	.....	.....	.....	58.657	.....

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904	1905	Month.	1904	1905
January.....	38.845	29.335	July.....	26.573	31.760
February.....	38.087	29.262	August.....	27.012	32.866
March.....	38.317	29.522	September.....	27.780	32.696
April.....	38.132	30.623	October.....	28.596	32.481
May.....	37.718	30.049	November.....	29.185	.....
June.....	36.325	30.329	December.....	29.286	.....
Av. year.....	.....	.....	.....	27.906	.....

LEAD IN NEW YORK.

Month.	1904	1905	Month.	1904	1905
January.....	4.347	4.552	July.....	4.192	4.524
February.....	4.375	4.450	August.....	4.111	4.665
March.....	4.475	4.470	September.....	4.200	4.850
April.....	4.475	4.500	October.....	4.200	4.850
May.....	4.425	4.500	November.....	4.200	.....
June.....	4.496	4.500	December.....	4.600	.....
Av. year.....	.....	.....	.....	4.309	.....

SPELTER.

Month.	New York		St. Louis		
	1904	1905	1904	1905	1905
January.....	4.563	6.190	4.673	6.052	25.063
February.....	4.216	6.129	4.717	5.983	24.594
March.....	5.057	6.067	4.841	5.912	23.825
April.....	5.219	5.817	5.028	5.662	23.813
May.....	5.031	5.474	4.852	5.284	23.594
June.....	4.769	5.190	4.596	5.040	23.575
July.....	4.873	5.396	4.722	5.247	23.958
August.....	5.046	6.287	4.716	5.524	24.675
September.....	5.181	6.067	5.023	5.934	23.225
October.....	5.513	.....	5.363	.....	.....
November.....	5.872	.....	5.720	.....	.....
December.....	.....	.....	.....	.....	.....
Year.....	5.100	.....	4.931	.....	.....

Mr. W. Bromfield Brough, of the Cariboo Gold Fields, Ltd., Barkerville, Cariboo, will shortly leave for London, England.

Mr. Con. Wolfe, mine manager, of Ymir, has been ill in Spokane, Washington, but is now reported to be convalescent.

Mr. J. E. McAllister, superintendent of the B. C. Copper Co.'s smelter, Greenwood, Boundary district, was in New York lately.

Mr. Alfred S. Garde is in Ottawa, having proceeded there to make a progress report concerning the work of the zinc commission.

Mr. John Bowron, gold commissioner for Cariboo district, who has been ill at Victoria for several weeks, is now convalescent.

Mr. John Hopp, of Stanley, for years in charge of mining operations on Slough creek, Cariboo, recently spent a few days in Victoria.

Mr. J. D. Sword, formerly of Rossland, paid that city a visit this month, going thence to Seattle, before returning to Goldfield, Nevada.

Mr. Carl Davis, formerly superintendent of the Centre Star and War Eagle mines, at Rossland, B. C., is now managing a mine in South Africa.

Mr. J. Laing Stocks, of Nelson, is representative in British Columbia of the Highland (Kootenay, B. C.) Mining Co. and the Duncan United Mines, Ltd.

Mr. Fred O. Harvey, an English engineer sent out to examine and report on the Tyce mine, at Mt. Sicker, Vancouver Island, has returned to England.

Mr. Neil Franklin Mackay, of Victoria, has been gazetted a gold commissioner in and for the province of British Columbia, from the 1st day of November, 1905.

Mr. C. A. Singer, superintendent of the Conrad Consolidated group of mineral claims, Windy Arm, Yukon, was expected to visit Seattle, Washington, during November.

Mr. Geo. E. Wiltse, secretary-treasurer of the Canadian-American Coal & Coke Co., Frank, Alberta, has returned from a vacation spent at Vermillion, South Dakota.

Mr. W. C. Thomas, superintendent of the Dominion Copper Co.'s smelter at Boundary Falls, Boundary district, expects to blow in one furnace about December 1.

Mr. G. F. Ransom, of Sandon, Slocan, manager for the Payne Consolidated Mining Co., has gone to Montreal, Quebec, where he will meet the directors of the company.

Mr. Frank Fletcher, P.L.S., has completed the survey of the Union Jack group, on Porcupine creek, Ymir district, for the Active Gold Mining Co. of Cincinnati, Ohio, U. S. A.

Mr. S. C. Holman, superintendent of the B. C. Copper Co.'s Mother Lode mine, in Deadwood camp, Boundary district, was a visitor to Spokane, Washington, during the month.

Capt. John Hampson, manager of the Alice mine, near Creston, hopes the water supply will hold out and so enable him to operate the mine and concentrator well into the winter.

Mr. Jay P. Graves, general manager of the Granby Consolidated M. S. & P. Co., has returned from New York, where he attended the annual meeting of shareholders in the company.

Mr. G. L. Mackenzie, who was manager of the Van Anda mine, on Texada Island, British Columbia, until the close of 1904, going thence on a trip to Mexico, is now in Dumfriesshire, Scotland.

Mr. F. A. Burgess, local manager for the Thistle Gold Co., Barkerville, has gone to his home at Minneapolis, Minnesota, for the winter, the hydraulic season in the Cariboo having been closed for this year.

Mr. B. A. Lasell, of the China Creek Hydraulic and United companies, Cariboo, has gone to New York, whence he will proceed to Mexico to there examine some mining properties for New York men.

Mr. J. B. Hobson, of Bullion, Quesnel Forks, has returned to British Columbia from the east, whence he went on business connected with the transfer of the big hydraulic gold mine of the Consolidated Cariboo Hydraulic Mining Co. to New York capitalists.

Mr. W. R. Ingalls, editor of *The Engineering and Mining Journal*, was a recent visitor to Victoria, B. C., in connection with the work of the commission appointed by the Canadian government to enquire into the position and prospects of zinc mining in British Columbia.

Mr. James H. Henley, late superintendent of the Granite Mountain mine, Phillipsburg, Montana, U. S. A., has been appointed superintendent of the Britannia Copper Syndicate's Britannia mine, Howe Sound. He took charge of the Britannia on November 14.

Hon. F. W. Aylmer, of Golden, north-east Kootenay, who is a Dominion resident engineer, has been at Nelson lately.

Mr. R. T. Ward's gold prospecting drill was shipped from Ashcroft for Harper's camp about the middle of November.

The report that Mr. Frank G. Stevens, formerly superintendent of the Le Roi No. 2 mine, Rosslund, and now resident at the Santo Domingo mine, Etzatlan, Jalisco, Mexico, was married on September 4 to Miss Christie Carroll Shaw, has been confirmed.

Mr. Chas. W. McMeekin, mining engineer for the Britannia Copper Syndicate, has returned to Vancouver, from a visit to the Mt. Andrews mine, Prince of Wales Island, south-east Alaska, whence he went to examine the development work there in progress.

Lieut.-Col. Henry M. Pellatt, of Toronto, Ontario, who has for years been prominently connected with the Crow's Nest Pass Coal Mining Co.'s big enterprise in south-east Kootenay, has been created a Knight-Bachelor by the King.

Mr. J. C. Haas, mining engineer, of Spokane, Washington, U. S. A., who has been associated with mining development in the Boundary district since the early nineties, has been examining mining properties situated near Hedley, Similkameen, for clients.

Mr. A. F. Blair, consulting engineer for Messrs. Heyl & Mining Co., and Mr. O. T. Switzer, manager of the British-America Dredging Co., both operating in the Atlin district of British Columbia, recently came down to Victoria and, after spending a few days here, left for the States.

Mr. H. B. Wright, of Fernie, East Kootenay, British Columbia, has resigned the position of chief engineer to the Crow's Nest Pass Coal Co., owning and operating three collieries and 1,122 coke ovens in the Crow's Nest Pass coal fields. Extensive construction work was done during the several years Mr. Wright held the post he is now vacating.

Mr. M. M. Johnson, of Salt Lake City, Utah, went to Camborne, Fish river camp, during the month, for the purpose of examining the McMinnville and Kingston groups of mineral claims, but his visit was too late in the season for him to see the surface showings on the properties, snow having fallen and covered them.

Mr. R. D. Featherstonhaugh, manager for the Northern Mines, Ltd., which company is operating a steam shovel on its placer gold property on Spruce creek, Atlin, has returned to Atlin from a visit to Vancouver, where is situated the head office of his company.

Mr. W. W. Leach, formerly of the Geological Survey Department of Canada, and for some time past with the Crow's Nest Pass Coal Co., at Fernie, B. C., has been appointed chief engineer for the West Canadian Collieries, Ltd., of Blairmore, south-west Alberta. This company is a British corporation, and owns some 20,000 acres of selected coal lands in the Blairmore-Frank district. Its coal properties are known respectively as Grassy Mountain, Lille, Bellevue,

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