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THE MONTH.

Throughout Canada a feeling of considerable indignation and resentment has been aroused at the finding of the Alaska Boundary Tribunal, and the opinion is freely expressed that in virtually conceding the American contention Canadian rights and interests have been disregarded and sacrificed in line with an alleged Imperial policy of maintaining, at all hazard or cost, cordial relations with the United States. That valuable territory has been lost to Great Britain is undeniable, and in Canada these losses have been a cause of heart-burning, because, although really the sacrifice was to Great Britain herself and not to Canada, the latter would otherwise have fallen heir to this territorial patrimony; but the fault on those occasions was attributable rather to a lack of appreciation of the prospective value of the territory lost than to anything so contemptible and un-British as toadying or cowardice. Until, therefore, indisputable proof is advanced to the contrary, Canadians owe it to themselves to believe that Lord Alverstone and his colleagues allowed no considerations beyond those immediately involved in the case at issue to govern or influence them in arriving at a decision favourable to the claims of the United States, or that the decision in question was made on any but strictly legal grounds. There can, meanwhile, be no doubt that the original treaty between Great Britain and Russia was couched, so far as the matter of the delineation of the boundary was concerned, in ambiguous language; probably for the very adequate reason that neither party to the treaty had sufficiently accurate information in respect to the geographical features of the country to describe the course of the boundary line with due precision. At the time the treaty was made Russia was really the only power in actual occupation of the Northwest Coast, and her interest in the territory known now as Alaska was purely of a commercial character. That is to say, it was important only as a fur-bearing country, and while neither Russia nor Great Britain regarded the country as of any value, presently and prospectively, for any other reason, Russia did have a keen eye to the possession of a strip of country that would include the heads of inlets in order to conserve to herself the fur trade, which was in the hands of the Chilcats, through whom Russia controlled the trade of the vast interior. None of the Interior Indians were ever allowed to come to the coast to trade directly with the Russians, and as long as no other nation could get behind the Russians through the heads of inlets so long was that trade secure. As Mr. Gosnell points out in his letter on the subject to the *Colonist*, the Russians not only stipulated for such a strip of territory but believed that the treaty assured it to them. In all the official maps of Russia, America or Alaska published up to nearly the present time this territory was shown as claimed by the Americans. It was this same territory that the Hudson's Bay Company leased from the Russian Fur Company, and had there been any flaw in the Russian title the shrewd traders of that corporation, who had been for so long able to circumvent the British Parliament and Government, would not have been slow to take advantage of it. The Hudson's Bay Company's map issued during that very time, under the supervision of Sir George Simpson, showed the Russian territory in the same way the Americans claimed. Of course, it is impossible to go into the minutiae of the dispute here; but it is very clear that taken altogether there is not much doubt but that the decision in respect to disputed territory north of the 56th parallel is in accordance with the merits of the case. It is unfortunate for Canada, whose Government had hoped to obtain an all-Canadian port of entry into the Yukon; but that cannot be helped, and can only be overcome by either a treaty with the United States guaranteeing certain privileges in perpetuity or by building what is known as an all-Canadian route into the Canadian Yukon. The former, if possible to secure, would be preferable from the fact that a long line of railway, which must still combine a waterway with it could satisfactorily compete with an all-water route to Skagway. The other portion of the decision

which takes in Portland Canal and the two important islands of Wales and Pearce, it seems to us is rather a victory than a defeat for Canada. The two islands which the United States gets are insignificant in size and barren. Strategically, it would be difficult to imagine what importance could be attached to them, especially as Wales Island intervenes between them and Port Simpson, the supposed terminus of a trans-continental railway. The boundary seems to follow the main and a natural channel to the Ocean. It is, therefore, unfortunate that, at the present stage of affairs, a feeling should have arisen in Canada to jeopardize the prospects of a closer union with the Mother Country, which would be of immense mutual advantage. We think that when the public have an opportunity of knowing more of the merits of the case they will be rather inclined to be pleased than otherwise with the result of the arbitration.

The mineral exhibit at the annual Interstate Fair, held during October at Spokane, Washington, was a good and fairly representative one, thanks largely to the display made by the Southern Kootenay and Boundary districts of British Columbia. It is frequently claimed for Spokane that it is a mining centre, having tributary to it parts of Washington, Oregon, Idaho and Montana, on the United States side of the international boundary line, and the mining districts in the south-eastern part of British Columbia, on the Canadian side. Judging by the large proportion contributed to the mineral department of the Fair by parts of Southern Kootenay and the Boundary it would appear that either Spokane is entitled to make this claim so far as these districts of British Columbia are concerned, or that they attach considerable importance, from the point of view of advertising their mineral resources this way, to being well represented at this, the most numerously attended annual fair in the inland Northwest. That they had an excellent display of minerals this year is evidenced by the number of awards made in their favour; in fact nearly all the prizes for minerals were taken by these districts, Ymir securing first for nuggets and for a fine collection of free-milling gold ores, respectively; Poplar Creek taking first for gold in quartz; Greenwood, in the Boundary district, receiving a well-merited first for its excellent and comprehensive collection of gold, silver and copper ores; Slocan a second award for silver-lead ores, whilst the Nicola Coal Company and the North-east Crow's Nest Coal & Coke Company each obtained a first award for different kinds of coal. Whilst it is gratifying to find British Columbia mining districts doing so well outside the Province, regret must be expressed that they do not make similar good displays of specimens of their mineral products at the more important exhibitions held in the Coast cities of the Province. Possibly they do not receive sufficient encouragement to attempt this. Surely it should be practicable to obtain for the important annual exhibitions held at Victoria and New Westminster similar large and varied displays of ore to those sent to Spokane this year by Ymir and Greenwood, but these and other mining districts in the Province must first be convinced that the Coast cities are really interested in their mineral products, and, if necessary, some monetary assistance must be given towards the cost of collecting and shipping the ores and the expense of having well-informed men in charge of the exhibits, as was the case last month at Spokane. The mineral production of the Province is now so comparatively large and the mining industry consequently is of such considerable importance that persistent efforts should be made to take advantage of every suitable opportunity to impress these facts upon all within reach.

The report of the directors of the Granby Company for the year ending June 30th, presented at the annual general meeting of shareholders early in October, is in many respects a model one. The Granby Company is the largest mining undertaking in British Columbia, yet the directors are able to intelligently summarize the results of a whole year's operations in a couple of economically worded paragraphs, supplemented by a few statements from the accounts. As we have said, the report conveys all the information that shareholders are entitled, or, so far as their individual interests are concerned, require to know; but from the point of view of the general public, curious for details it may perhaps prove disappointing. It is difficult, for example, from the figures as published, to form any very exact idea of the actual value per ton of the Granby ores, as while the output for the year is given, gross proceeds are not, and the smelter returns do not discriminate between ores and matte purchased and ore shipped for treatment from the company's properties, consequently there is no basis on which to make accurate calculation. From the facts at our disposal, however, it may be assumed that the average value of the ore at the mine is approximately five dollars per ton, this estimate being arrived at by dividing the net proceeds, from which the price paid for custom ores and matte has been deducted, by the tonnage. In the same manner the costs per ton may be estimated at about four dollars; and profits can therefore be reckoned at something like a dollar a ton. All things considered, the showing made by the Granby Company for the year may be regarded as reasonably satisfactory. While it is true that the profits earned only represented a little more than two per cent. on the stock issued, yet it must also be remembered that it necesarily takes time to develop fully an undertaking of this magnitude and the company's present secure position and freedom from indebtedness is as much a tribute to the judicious manner in which its affairs have been administered in the past as a warrant for the belief that its future promises to be a long and prosperous one.

The holding of the annual meeting of the American Mining Congress a few weeks ago at Leadville and Deadwood, the twin cities of the Black Hills district of South Dakota, was made the occasion for the publication of facts and figures relative to the well-known Homestake mine in particular and the Black Hills district in general. One widely-circulated mining news-

paper after making an interesting comparison between the average grade of Cripple Creek ore produced in 1902, which was nearly $30 per ton, and that of the Black Hills, placed at $4.61 per ton, and showing that the large tonnage of the latter, greater than Leadville and Cripple Creek combined, in considerable measure compensated for its comparative low value, gave the value of its total production for each year from 1876 to date. This table of production suggests some encouraging thoughts relative to the larger mines of the Boundary district of British Columbia, also usually classed as low-grade mines. The Black Hills district commenced its mineral production in 1876 with a value for that year of $1,200,000. During 27 years there has been a gradual increase until in 1902 the yearly total had reached $8,250,000, whilst for eight months, to August 31, of the current year, it was $6,750,000. Our own Boundary district produced about $490,000 in 1900, about $2,000,000 in 1901, something like $2,500,000 in 1902, whilst for eight months, to August 31, of this year, the value of its production was approximately $2,400,000. Given a similar rate of progress for a few years and the Boundary will not need to take a back seat, even in the presence of the Black Hills.

A report has been allowed to get abroad that the Trail and Nelson smelters have lately endeavoured to take an unfair advantage of the provisions under which the bounty on lead was granted, by raising the treatment charges on ores of this class. From enquiry we learn that there is no foundation for these allegations. The Hall Mines smelter has made practically no change in the rates charged on silver-lead ores; while the Canadian Smelting Works is still taking Slocan ores on the basis of $15 for freight and treatment, with a 10 per cent. zinc limit. This rate is the result of the keenest competition between the American Smelting & Refining Co., the Puget Sound smelters and the Kootenay smelters. At the same time there should certainly be some accounting for the fact that the Government grant has, as yet, exercised so little apparent effect in stimulating the lead mining industry of the Province, and the explanation that the Act in question had yet to be passed by the Senate, and that consequently producers could not tell definitely when the bounty would be available, is hardly a satisfactory one. Under existing conditions the relatively high price of silver and the added profit the bonus on lead affords, production should at least equal that of three years ago. In fact the Government has a right to expect that such should be the case, the bounty having been granted practically on that assurance.

An undertaking of rather exceptional interest is, we understand, being initiated in the Upper Duncan country, in the construction and establishment of a mono-line railway affording communication to a mineral region of, in general, very great promise but heretofore handicapped by reason of its inaccessibility. In a country so rugged and mountainous as British Columbia, the "mono-railway" system should offer very great advantages, provided, of course, the claims advanced in its favour are substantiated. It is said, for example, that in the mono-rail system, gradients and curves are, from an engineering standpoint, matters of quite secondary importance, while, too, the system can be established at a relatively small cost, maintenance is, of course, much less expensive than in the case of ordinary railways, and the risks of accident are reduced to a minimum. It is sincerely to be hoped, therefore, that the new venture in the Lardo-Duncan will prove both an engineering and a financial success, for thereon largely depends the introduction of the system generally in the Province as a means of affording efficient and cheap transportation facilities to outlying mining districts, and result in the solving of a very difficult problem.

Some notes of the Hendryx Process of Electro-Cyaniding appear elsewhere in this issue. It is stated that Dr. W. A. Hendryx, of Los Angeles, California, has been experimenting for years in this connection, and that he is fully confident he has brought his experiments to a practical issue as demonstrated by the success attending the use of his process on a commercial scale in California, Arizona and New Mexico. If it be found that in ordinary operation it will treat most gold and silver ores—those that are insoluble of course excepted—securing a high percentage of extraction quickly and at low cost, it will be a decided advantage and saving, both in time and cost of treatment—wherever applied to ores or tailings that will yield their precious metal contents under electro-chemical influences. The testing plant seen at work in Spokane last month by a representative of the MINING RECORD appeared to be simple enough in operation, and assurances were received on the spot from competent and reliable men that it was accomplishing the results claimed for it both effectually and economically.

CYANIDE PLANT AND PRACTICE AT YMIR MINE, BRITISH COLUMBIA.*

(By Edwin C. Holden.)

IN making the original estimates for a report recommending the cyanidation of Ymir stamp-mill tailings, the writer was unable to find in any of the standard works on cyanide practice certain data applicable to the local conditions; nor has he as yet seen the same practice recorded in the rapidly growing literature on cyanidation. To present these figures, together with a few novel features of local practice, the present paper is offered.

The ore treated is obtained from a fissure vein of steel dip, occurring in a slate country. The ore body is lenticular in plan, swelling from 4 feet in width at one end to a maximum of 42 feet, and tapering irregularly to less than 18 inches, where pay values cease.

*From Am. In. M.E. (October).

In the wider portions of the fissure the ore is mixed with more or less horse-matter from the walls. The clean ore is white, massive quartz, with from 8 per cent. to 12 per cent. on sulphurets; the latter being pyrite, sphalerite and galena, the predominance being in the order given. The precious metal tenor is variable, the gold more closely following the pyrite, the silver, the galena. The present mill supply is practically all from below the oxidized zone.

The unavoidable admixture of horse-matter and stope filling, with the ore as mined, affects more or less the character of the mill feed, which sometimes contains from 10 per cent. to 25 per cent. of slate. During the last three months of 1902 the mill feed carried 0.3977 ounce gold and 1.903 ounce silver per ton of 2,000 pounds, 2.65 per cent. and 2.92 per cent. zinc. The iron, unfortunately, was not determined.

The ore, which will pass a 2-inch grizzly, is fed into sixteen 5-stamp batteries. The mortars are narrow; the stamps average 850 pounds and drop 6.5 inches from 98 to 100 times per minute. The height of issue ise from 3.5 to 5 inches, and the screens (diagonal slot) are No. 9 or 11, depending upon the height of issue. The crushing capacity is from 2.5 to 3 tons per stamp per twenty-four hours. There are no inside plates, and but one 50 by 144-inch apron plate to each mortar. The saving on the plates was 61.9 per cent. of the gold and 9.4 per cent. of the silver.

The plate tails from each ten stamps were, without classification, put over three Frue vanners. A slightly variable concentrate was made, averaging 20.6 per cent. lead; 1.17 ounce gold and 12.5 ounces silver per ton; and, approximately, zinc, 12.9 per cent; iron, 23 per cent. and insoluble, 6 per cent. There was an extra smelting charge on zinc in excess of 8 per cent.; and it was a delicate matter to determine how high the grade of the vanner tails could be raised with profit, so as to throw over the zinc and reduce the concentrate tonnage. The gold saving in the concentrates was 16 per cent, the silver 35.4 per cent., and the lead 42 per cent. The total saving in the stamp mill was thus 77.9 per cent. of the gold and 44.8 per cent. of the silver. These totals were higher before the tailings plant was installed, when both battery and vanner work were necessarily closer.

The vanner tailings during the quarter ended January, 1903 (and all the figures here given, unless otherwise stated, are for that period), assayed 0.0882 ounce gold and 1.051 ounce silver per ton; lead, 1.3 per cent., and zinc, 2.2 per cent. Of this material, 65 per cent. would pass a 100-mesh screen.

The vanner tailings being of comparatively low grade, the writer felt himself practically confined to the adoption of the system of direct filling and percolation; and, as slimes treatment was not at the same time to be provided for, the object was to treat as large a proportion of the slimes as possible with the sands; or, in other words, to make charges having the lowest practicable rate of percolation. This minimum rate is usually stated as 2 inches per hour.

It is also a current conception that a much larger proportion of slimes can be handled in an intermediately settled charge than in a directly filled one. To determine whether this possible difference in tonnage was important enough to justify the increased cost of installation and operation of a plant with settling vats was an important problem, which our experimental plant decided.

After the usual laboratory tests, the experimental plant, consisting of two 35-ton leachers, 5 feet deep, with solution tanks, zinc boxes, etc., was erected. One leacher was charged direct from a Butters' distributor, which was fed by the bottom discharge of a pointed box carrying the vanner tailings from twenty stamps. The box got rid of excess water and a little of the finest slimes. The second leacher was charged from a two-compartment box in which the vanner tailings were settled, the sands being dropped from the compartments alternately as filled, and shovelled in the leacher as in ordinary intermediate filling plants. We were thus enabled on a commercial scale to compare results of the two systems of filling with the same character of material. A comparison of results from fifty-two charges is here given, screen tests being 100-mesh.

Charged.	Fines. Per Cent.	Gold Recovery. Per Cent.	Silver Recovery. Per Cent
Direct	44.2	76.5	52.2
Intermediate	39.8	77.2	54.1

The average minimum rate of percolation in the direct filled charge was 1.9 inch per hour. In the intermediately filled charges the rate was quite variable, but the average minimum was over 3.25 inches.

Owing to structural difficulties in the experimental plant, which had to be squeezed into an unoccupied corner of the stamp mill, we could not give the settling boxes area enough to settle regularly charges carrying the same proportion of fines as the direct filled ones; but eight of these charges, made when some of the stamps were hung up, carried 43.7 per cent. fines, and the gold and silver recoveries averaged, respectively, 73.6 per cent. and 46.5 per cent.

These results led to the rather unexpected conclusion that direct filling, when properly done, not only leaves a charge in as good condition for treatment as the intermediate method, but renders it possible to treat a larger proportion of the slimes. It may be suggested as an explanation that in a charge settled under water the grains of sand are free to arrange themselves most compactly, with a minimum of voids and the slimes are held near where they originally settled, because the interstitial currents are not marked enough to disturb them; whereas, in charges shoveled into a vat with less than 15 per cent. of moisture, the voids are a maximum, and the slimes which originally coated each grain of sand are washed off and settle through the charge, and, thus segregating, prevent uniform percolation. The fact that direct filled charges never pack nor settle more than 1 per cent., while indirect ones frequently contract over 10 per cent., during treatment, tends to confirm this view.

The final plant is located half a mile from the stamp mill and 300 feet vertically below it. The site, from which over 400 cords of timber were removed in clearing, is on a hillside, and required about 5,000 yards of excavating and 630 yards of masonry for footing and retaining walls. All the plant is housed, the buildings being heavily framed, as required by the deep snowfalls.

The vanner tailings are carried to the plant by a box launder 6 by 8 inches in section, and the excess of battery and vanner waters allows of a minimum grade of slightly under 5 per cent. At that grade, and with 1-inch riffles set 5 inches apart in the bottom of the box, the durability even of the local soft hemlock and cedar lumber used is quite satisfactory.

To make the required fall of 300 feet to the plant, a series of drop boxes is inserted where the topography is favourable; and a 12-inch sand pocket at the bottom of each drop, to prevent wear, should also be an efficient saver of escaping amalgam or mercury.

The tailings enter the top of the storage solution room; and when, as in the period under consideration, from forty to sixty stamps are running, the classification is done in two boxes, the first being 18 by 24 inches wide by 18 inches deep, with two vertical sides and false ends sloping 60 degrees to a 0.5 by 24-inch slot, under which hydraulic currents can be applied. This box settles only the coarse sands, which are drawn off through a 2-inch nipple into the charging launder. The second box is pointed, 3 feet 6 inches in width and depth, and 7 feet long, with a 3-inch outlet. A plug valve in this outlet, in combination with the hydraulic current in the box, regulates the speed of the distributors, while maintaining the same separating action in the box. The overflow from the box, carrying about 60 per cent. of the water and 20 per cent. of the total tailings, is run to waste. This overflow should all pass a 100-mesh screen, and is mostly impalpable material.

All of the vats and tanks, except the sumps, are of steel. The leachers, 32 feet in diameter by 6 feet deep, are on timber foundations with masonry footings. Caps and sills are parallel, an arrangement which renders jacking-up easier than the usual right-angled structure. Bents and posts are placed 4 feet between centres, and the bracing does not extend above the post, the shimming being done between posts and caps. On the caps are 4 by 8-inch joists, spaced 18 inches between centres. There is no flooring on any of the vat or tank joists, and there is head-room under them all, so that leakages occurring in the plant cannot be unknown or inaccessible. The vats are fitted with top annular overflow launders; and, to preserve a level rim, a soft wood strip, projecting above the edge of the vat, is fastened with stove bolts to the side plates, the joint being caulked with oakum. Any settling of the vats which is insufficient to require jacking-up from below can thus be easily rectified, as with tongue-shaped wooden vats.

The distributors are of the usual type, and have twenty 1.5-inch arms. This area of discharge openings, with our quantity of tailings, never allowing any head to accumulate in the distributor hopper, renders uniform distribution difficult. The slightest throw of the stream from the charging drop box off the centre of the hopper results in uneven charging, most of the slimes going to the low side of the vat. Many devices were tried to remedy this, and to prevent twisting of the drop stream, which motion also has a classifying effect; and the last and simplest plan was successful. The drop was made square; and inside the lower end of it an iron strip was fastened to each side. The square drop prevents twisting, and to throw the stream toward the low side of the charge small wedges were driven under the iron strips, as needed. These details may seem trifling; but when the object is to treat the maximum quantity of slimes by percolation they will be found of prime importance in obtaining a uniform charge.

Where there is enough head room to give distributor arms 3-inch grade per foot, arms of 1 inch diameter, or even smaller, could be used without danger of clogging. This would be an improvement upon the usual form, which has 1.5 inch arms at 1.5 inch grade; for it would approach the ideal conditions requiring a maximum number of arms fed from a full hopper.

Continuous, uniform charging is essential to make a good charge; hence, so far as possible, stamp mill hang-ups were made between charges. When, however, an emergency hang-up was made with a charge incomplete, a gentle hydraulic current was started under the filter in the vat; the water feed to the distributor was increased; and, when charging was recommenced, the settlers were run with a strong hydraulic current for a few minutes, allowing only the coarse sands to settle. Despite every precaution, however, a slime layer will mark in the charge every mill hang-up of over ten minutes' duration.

The overflows from the vats and the separators were combined before they reached the overflow sampler, so that I cannot give separate figures on the vat and box separations. The longest distributor arms occasionally make a wave strong enough to throw over a little of the finer sands into the overflow launder, so that of the combined overflow 1.1 per cent. was caught on a 100-mesh screen. Much of this coarse residue, however, was wood fibre from the mine and flumes.

The classification of values in charges and overflows was marked, the average assay and screen tests for the year being:

	Au. Oz. Per Ton.	Ag. Oz. Per Ton.	Through 100-Mesh. Per Cent.
Vanner tails	0.0838	1.008	64.86
Charges	0.0931	0.637	50.70
Overflows	0.0627	1.878	98.90

The high silver in the overflow is due to its association with galena in the slimes.

The system of classification, it must be admitted, was crude; and if the plant were pushed to its full capacity, close hydraulic classification, yielding a clean, quick percolating charge, would be necessary; but, as run at this time, the system was very satisfactory, for it settled and treated a total of 70.1 per cent. of vanner

tailings. When we were treating oxidized ores, charges could not be successfully treated that carried over 45 per cent. of fines.

With all the stamps dropping, a vat was filled in from twenty-eight to thirty-two hours; but during the last quarter of 1902 it required from forty-eight to sixty hours. The experimental work called for five days' treatment; but, with the reduced crushing, we increased the proportion of slimes settled, and treated charges as long as our capacity allowed—the average time of treatment being 10.5 days. A normal charge was 185 tons, dry weight.

The acid tests seem, in the case of the Ymir tailings, to be worthless as an indicator for the use of lime. The ordinary tests for latent acidity called for over one pound of lime per ton. Phenolphthalein indicated more. We used 200 pounds to the charge for a while, until the zinc boxes grew so foul that dried precipitates assayed under 1,200 ounces of total fine bullion per ton. The methyl-orange indicator was more satisfactory. It called for less than 0.5 pound of lime per ton. But the final practice, which gave the best results, was to use less than 0.1 pound per ton, and apply it in 5-pound lots, the last lot going on with the final dose of strong solution. The cyanide consumption was thus reduced over 10 per cent.; and the zinc-box crude precipitates rose in grade to over 5,300 ounces per ton. In treatment, the final filtrates became very cloudy when they titrated between 0.1 per cent. and 0.05 per cent. KCN; and the small addition of lime, just before starting weak treatment, tended to keep the slimes coagulated and the filtrates clearer.

Vacuum percolation was soon discarded, as it gave a very dirty filtrate and packed the charges, so that the final rate of percolation was slower, even with the vacuum, than it would have been if unassisted throughout.

The routine of treatment was as follows:

After levelling and adding dry lime, two 5-ton doses of weak solution (between 0.1 per cent. and 0.05 per cent. KCN) are successively given. When these have disappeared they are followed by four or five 10-ton doses of strong solution (0.2 per cent.) at 5-hour intervals. There is no trace of cyanide in the filtrate for six hours after the first application of weak solution, and there are no values until after fifteen hours. After forty or fifty tons of strong treatment, the charge is drained six hours, when the filtrate has almost ceased, and titrates 0.04 per cent. to 0.07 per cent. KCN. Twenty tons of strong solution are now run in under the filter. It requires from six to eight hours to run this in without channeling the charge, and when it is all in, if drainage has been sufficient, there will not be more than 5 inches of solution on top of the charge. After soaking from three to six hours the charge is drained and a 10-ton top treatment follows. Top and bottom treatments thus alternate until 160 tons of strong solution has been applied. Then follows weak treatment, applied on top in 5-ton doses as rapidly as it disappears, to a total of forty or fifty tons. This is followed by wash solution (0.05 per cent. to trace KCN), forty tons; and this, by water as required, to preserve the balance of solutions or secure low end filtrates. No solution is run to waste other than which is lost as moisture in the residues.

The adoption of bottom treatment had a marked effect. During the first six months' operating, when only top treatment was used, the gold extraction gradually fell off from 70 per cent. to less than 50 per cent.; and assays from the bottom of the charges were discouraging. When the connections for bottom treatment were made in October the gold extraction rose at once from 48 per cent. in September to 75 per cent. for October; and the average actual gold recovery for the last quarter of the year was 80.23 per cent., while the actual silver recovery also rose from 25 per cent. to 41 per cent.

The total time of treatment was from 9.5 to 11.5 days. The average rate of percolation was 1 inch per hour, although 64 per cent. and 71 per cent. gold extraction were obtained from charges having only 0.5 inch and 0.6 inch rates. The highest rate during this period was 1.5 inch per hour. This slow percolation means high cyanide consumption and long treatment; but it also means larger slimes tonnage treated. It does not require a large increase in daily tonnage to pay for extra vats and a little more cyanide.

Residues are discharged through two 10-inch plug flanges placed 4 feet from the sides of the vats. A 2.5-inch hose with 2-inch nozzle is used under 115 pounds pressure, the hose being held in a swivel clamp at the edge of the vat. The bottom 6 inches is cleaned out at reduced pressure. One man will sluice out a charge and clean the filter in from 3.5 to 4 hours.

The filter is three thicknesses of 16-ounce burlap, having the usual false bottom and rope-grouting, and anchored to the vat bottom to counteract its buoyancy.

Precipitation is effected by zinc shavings in eight 10-compartment steel boxes, and it is perfect with the weakest solution when run at the rate of one ton of solution per twenty-four hours per cubic foot of shavings. The shavings in the wash solution box are lead dipped. Whenever there were values in the effluent, running at the normal rate, they were found to be due to precipitate mechanically carried over after dressing boxes, and it was found best not to disturb a box after it had been running more than a week, but to add shavings on top as required.

The clean-up method, while it just about competed with refiners' rates, was not satisfactory. The precipitate was dried, fluxed and smelted direct, without either acid or roasting treatment, and without refining, which produced a bullion of 720 total fineness. The treatment loss was 1 per cent. of the gold and 0.5 per cent. of the silver. The clean-up cost, including freight and treatment of the resulting high-grade zinc slag, was 17 cents per pound of dried slimes. This does not include charges for bullion treatment.

Operating costs per ton in detail for the last quarter, when 7,150 tons were treated, were as follows:

COST OF TREATMENT PER TON.

Cyanide, at $0.22 per pound	$0.200
Zinc, at $0.09 per pound	0.020
Lime, at $0.009 per pound	0.001
Fuel, at $2.50 per cord	0.019

Clean-up supplies	0.029
Repairs	0,014
Miscellaneous	0.003
Labor (wages at $3.50 and $4.50 per day)	0.234
Total	$0.520

Assay office costs were not allocated; but the cyanide plant proportion should approximate $0.025 per ton. These results were obtained when treating but seventy-eight tons per day. The cost can be reduced to 38.6 cents when the plant is treating its full-rated capacity of 200 tons per day; and the introduction of reverberatory and cupel furnaces for clean-up would still further reduce it.

The plant is equipped with steam heating and electric lighting plants, and has an auxiliary water power system capable of developing to 300 h.p. The pumps and lighting dynamo are run by Pelton water motors under 320 feet head; and the only cost of power is the trifling item of maintenance of flumes.

The total cost of the works, including the power plant, was $57,951.63. Omitting the costs of the main mill building, boarding houses, power plant and heating system, and thus reducing the estimate to the basis of an open air plant, the cost was $33,782, including the clearing, excavating and masonry, previously referred to, which amounted to $6,321.34.

THE METALLURGY OF ZINC AND CADMIUM

(By Alfred C. Garde.)

AFTER reading Professor Ingall's recent publication on the "Metallurgy of Zinc and Cadmium"* I recognize in this valuable treatise a full-fledged sequel to "Hoffman's Metallurgy of Lead" and "Peters' Modern Copper Smelting." To the metallurgist, the engineer, the scholar and the student this valuable volume fills the same place and want in the scientific library as the two others have proved with reference to lead and copper smelting. Aside from Schabel's exhaustive German hand-book on metallurgy the American library possesses no treatise dealing with zinc individually. Zinc and Cadmium, owing to their close relationship to one of the chief metals as well as on account of being unknown in the arts until about fifty years ago, have heretofore always been tied to the apron-strings of the ancient lead industry and treated in conjunction therewith. Professor Ingalls in recognizing the astonishing demand for spelter and zinc oxides in the world's markets has foreseen the rank which these products now command by virtue of their rare qualities, and he is therefore to be highly congratulated upon his efforts in presenting the subject so admirably and at so opportune a moment. His treatise will undoubtedly be hailed by the fraternity as one of the missing links in this "Era of metallurgy."

His description of the various roasting processes, together with historical sketch of the evolution of the modern roasting furnace, will readily be admitted as classic and must be regarded as the most complete accumulation of data and illustrations ever published on this important feature of spelter production. Of no less importance is the painstaking description of European and American methods of smelting and distillation of the various zinc ores.

To Canadian engineers and investors the zinc question is becoming of importance. Within the past few years large deposits of desirable zinc ores have been found in British Columbia and Ontario. The discoveries in British Columbia are of such recent date that they are not even mentioned in any of Professor Ingall's late books pertaining to the production and properties of zinc.

The writer is of the opinion that Professor Ingalls would be much interested in looking over this new field, as it presents features in many respects different from other deposits in North America. It is specially noteworthy that the ores are of a highly argentiferous character.

The writer also observes that Professor Ingalls only briefly comments upon the recovery of zinc by means of electrolysis, probably because a number of processes have proved unsuccessful and others of the electro-chemical or electro-metallurgical order, are still more or less within the experimental stage. With this in view, Professor Ingalls no doubt wishes to obtain more facts and data, and it shall be most interesting to follow the evolution of the metallurgy of zinc in any of his future editions.

Engineering and Mining Journal, New York; $6.

THE REFINING OF SILVER IN BRITISH COLUMBIA.

A SHIPMENT of 85,000 ounces of silver 999 fine was made this month to the United States Government at San Francisco for shipment to the Phillipines, representing the product from the smelting of British Columbian lead ores at Trail, and refining the resulting bullion by the electrolytic lead process, which has for many months past been supplying Eastern Canada with commercial pig lead.

When the electrolytic lead refinery was first operated the "silver slimes" (composed of the precious metals and all the impurities, such as copper, antimony, arsenic, etc.) were sold to United States refineries, where the actual separation of the precious metals from the impurities was made. As there were no plants in operation prepared to economically handle this particular product, which differs somewhat from the slimes produced from electrolytic copper refining, it was decided to build a special plant at Trail for the purpose of making a complete separation of the precious metals and impurities, which will make, in connection with the electrolytic lead process and the smelting works, a complete works for the treatment of all lead-silver ores and the production therefrom of pure lead, fine silver, fine gold, copper sulphate, and probably later, metallic antimony.

The first shipment of about 300 ounces of gold which was over 995 fine was made to the United States Assay Office at Seattle a few weeks ago, and a second shipment of about 700 ounces of gold was made shortly thereafter to the same place.

As Canada is now in a position to produce steadily fine gold, the Canadian Government should certainly take steps immediately towards purchasing this gold at whatever point it may be produced and so save the Canadian producers the cost of shipping and selling it to the United States Assay Offices.

It is believed that the above shipments of fine gold, or refined gold to the United States Assay Office, and sliver brick to the Phillipines, are the first which have ever been made as the result of smelting and refining ores in Canada.

The Canadian Smelting Works, Trail, are therefore in a position to supply Eastern Canada with whatever pig lead they may require, fine gold ready for minting purposes, fine silver, copper sulphate for use in Manitoba and the North West Territories, and will in a few months be turning out metallic antimony which will be used in making various babbit metals.

THE HENDRYX PROCESS OF ELECTRO-CYANIDING.

A TESTING plant of the Hendryx process of electro-cyaniding is in operation at the laboratory of Mr. C. M. Fassett, of Spokane, Washington, for the purpose of demonstrating to mining men and others interested the advantages this process offers for the extraction of the precious metals from ores suitable for cyanide treatment. It is claimed for the Hendryx process that it will effectively treat all ores that the ordinary method of cyaniding will treat, and many others that the latter can not be used for, including ores carrying from one to three per cent. copper; further, that complete extraction of the values can be made in from three to six hours, according to the adaptability of the ores to this process, and that consequently fresh pulp can be fed to the tank four to six times a day, instead of having to wait 24 hours or longer, as is necessary where the old process is used. The cost of extraction is stated to be low, too—from 25 to 50 cents per ton.

If the ore be found amenable to this process of treatment it is crushed very fine, to ascertain what percentage of extraction is obtainable. Then tests are made with various sizes of crushings to determine the size best adapted for the treatment of that particular kind of ore. This determined, the pulp is fed into a very weak solution of cyanide contained in a circular tank having a funnel-shaped bottom, above which is a cylinder rising to near the top of the tank. A propellor or agitator within this cylinder causes the pulp in solution to rise to the top, whence it flows over sloping plates to the sides of the tank and there sinks to below the agitator, the contents of the tank being thus kept in continuous agitation until the gold and silver have been deposited on electrically charged plates. Experiments are being made with lead-coated iron plates, these giving a softer backing and permitting of a closer saving when the plates are scraped. The electric current used for depositing the precious metals not only accomplishes this purpose but also aids in the solution of the gold and silver from the ore, and regenerates a considerable proportion of the cyanide that would be lost were only the ordinary agitation process used.

The contents of the tank can easily be sampled at any time, by catching in a cup a little of the liquid as it flows from the cylinder and having it tested to tell how the extraction is proceeding at that stage of the operations. The contents of the tank can be drawn off into settling tanks and new pulp be fed in without delay and without stopping the agitator. After the slimes and tailings have settled the solution can be syphoned off for re-use. The solution is heated before use, the deposition being much more rapid with a warm solution. The total extraction made is from 80 to 96 per cent. of the assay values.

The Hendryx process has already been introduced into Old Mexico, Arizona, and California. The Mexican plant has a capacity of 120 tons per diem; the Arizona plant treated about 12,000 tons; the California plant is only a small one but the process will also be in use in that State on a commercial scale before long.

We publish elsewhere a description of the twenty-stamp combination silver mill in course of erection at Five-Mile Camp, near Ferguson, in the Lardeau district, for the Silver Cup Mines, Ltd. The particulars given were obtained at Five-Mile by our special commisisoner, who found the superintendent of construction, Mr. Elwin Benner, and the draughtsman on the works, Mr. E. C. Hutchinson, both in the employ of the Union Iron Works, of San Francisco, Cal., which is supplying and erecting the plant, most courteous and obliging in facilitating his work of obtaining information. It is worthy of note that Mr. Benner, who has had considerable experience in the erection of stamp mills and other plant in North America, stated that the equipment for the Silver Cup mill includes more machinery and plant than that of any other twenty-stamp mill he knows of. The mill is not an ordinary concentrator; it is fully equipped for dry crushing, wet crushing, concentration, roasting and pan amalgamation, these together making it a "combination" mill, as described. The Silver Cup Mines Company is to be congratulated on its enterprise in putting in this mill and, too, on the fact that its erection is in such capable hands.

The issue of the Annual Summary Report of the Dominion Geological Survey is being so long delayed that its usefulness will to some extent be lessened. Possibly by the time this comment is published the occasion for it will have been removed, yet in view of the fact that this year's season for field work will be well on towards its close before the results of the previous season's work are available to the public it appears desirable to direct attention to the long delay. There may be difficulties in the way of issuing reports of this kind promptly, nevertheless the lengthy delay is regrettable.

A TRIP THROUGH CARIBOO—No. 2.

BULLION, QUESNEL MINING DIVISION.

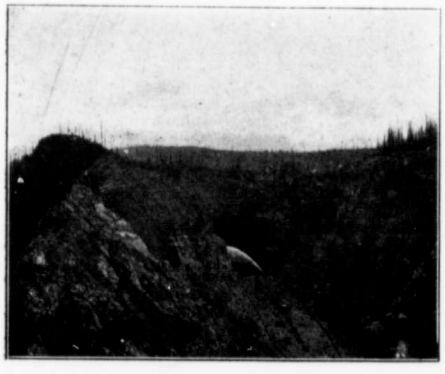
(By Rosalind Watson, M.A., Assoc. M. Inst. M.E.)

BULLION is the camp of the Consolidated Cariboo Hydraulic Mining Company and the centre of the biggest enterprise in Cariboo. You can get to it from Ashcroft, either by departing from the main stage line at 180-Mile House and going—through the Horsefly Country over an exceedingly

Big Lake—A Comfortable Stopping Place.

bad piece of road—the way the Japs chose this year when they walked out because too economical or too poverty-stricken to pay stage fare; or, and preferably, by transferring from the B. C. Express at 150-Mile to Parker's Express and driving over fifty-two miles of moderately bad road. Perhaps we were prejudiced in our impression of the road, but pouring rain, and corduroy, and Beaver Lake Hill, ugh!

The journey from 150-Mile House to Bullion and Quesnelle Forks occupies two days, the intervening



No. 1 Pit, Bullion.

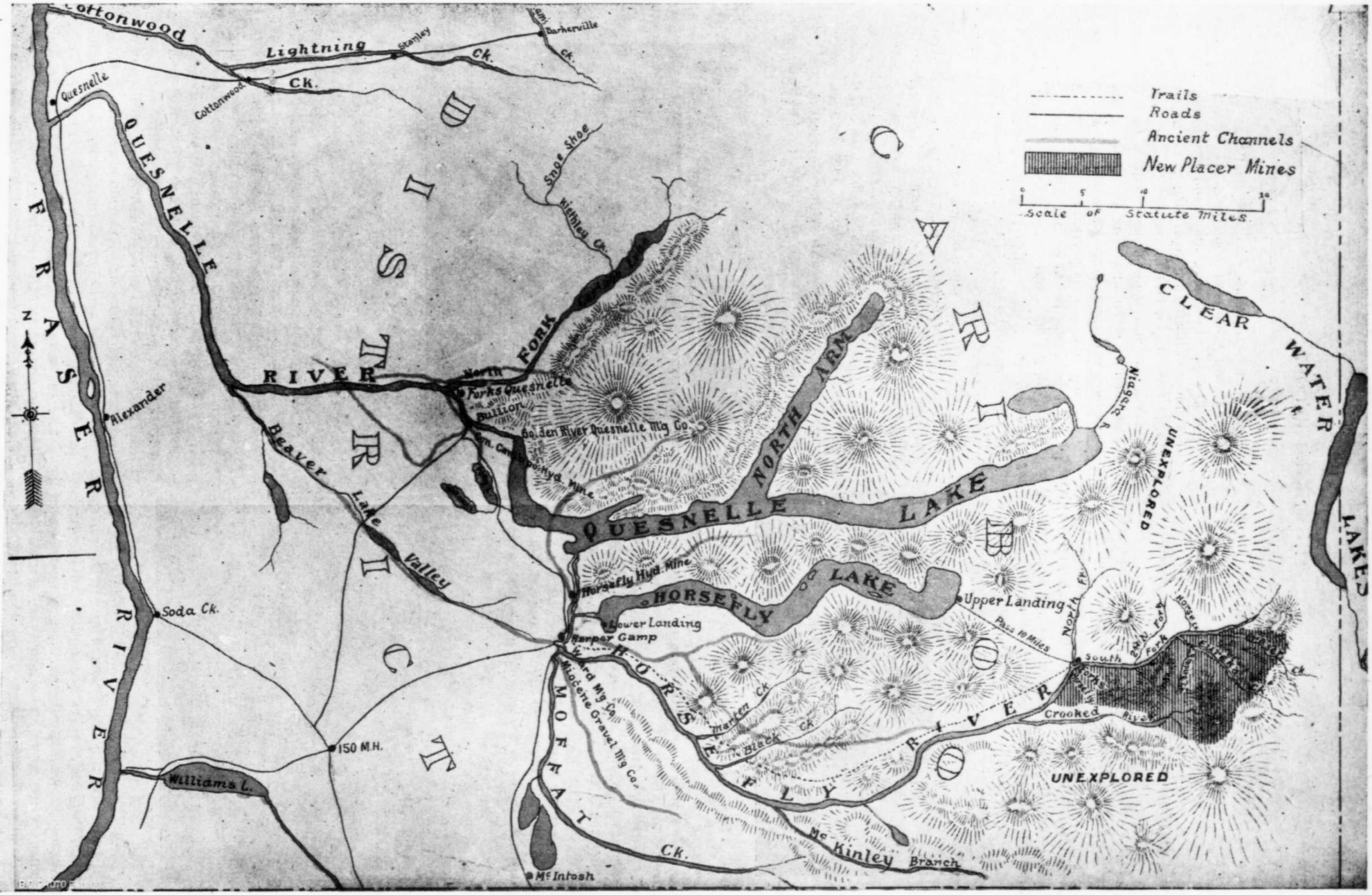
night being spent at Big Lake. Here, at an elevation of 3,000 feet, Mr. Parker has a ranch of four thousand acres on which near the margin of a beautiful sheet of water seven miles long, are a comfortable house and good outbuildings. In spite of high altitude farming is carried on successfully. Oats generally average 1,500 pounds, but one field was seen which would yield 3,000 pounds to the acre. Wheat is raised only as feed. For farm, stage, and freighting purposes one hundred horses are kept. Profitable as farming is, cattle ranching would be more so. This Mr. Parker realizes, and has made a start with a hundred head. The country is an ideal one for grazing purposes—park-like, with abundance of wild hay and pea-vine, and many lakes. This pertains generally to the whole section between the Mountain House and Quesnelle Forks, yet the only land so far taken up is that of Wm. Parker at Big Lake, and of Hamilton at Beaver Lake.

The Consolidated Cariboo Hydraulic Company, Limited, incorporated in 1897, and composed principally of C. P. R. officials, has for six seasons been carrying on extensive mining operations at Bullion, which is situated on the South Fork of Quesnelle River midway between Quesnelle Forks and Quesnelle Lake. There being abundant capital at the disposal of the company, it has been possible to equip the mine and camp in a model fashion, in fact, in a style commensurate with the wealth which the gravels are believed to contain. Already the mine has produced one

Two 8-inch streams opening up Pit No. 2 at S. Fork Mine, Cariboo.

million and a quarter dollars, inclusive of what was taken out during the four seasons previous to '98 when the company was known under another name, although the shareholders were practicaly the same. In consideration of the large mining area, the high-grade gravels and the complete hydraulic plant, the Bullion mine is maintained to be the greatest mine of its kind on the North American continent and probably in the world. Not only so, but it has in J. B. Hobson, its manager for eleven years, a man of ability and great experience, one who has devoted his life to the study and pursuit of hydraulic mining, one who understands what he is about and does not experiment at the company's expense.

The property comprises thirty-four placer mining leases, aggregating 2,584 acres of land, extending a distance of about ten miles, and embracing a system of ancient river channels. If you refer to the accom-



Cottonwood
Lightning
Ck.
Stanley
Barkerville
Ck.
Quesnelle
Cottonwood
QUESNELLE
FRASER
RIVER
DISTRICT
CARIBOO
Snow Shoe
Keithley Ck.
NORTH FORK
RIVER
North
Forks Quesnelle
Bullion
Golden River Quesnelle Mg Co.
Alexander
Beaver
Lake
Valley
QUESNELLE
LAKE
NORTH ARM
Horsefly Hyd. Mine
HORSEFLY
LAKE
Upper Landing
Lower Landing
Harper Camp
Soda Ck.
150 M.H.
Williams L.
Ward Mg Co.
Miocene Gravel Mg Co.
MOFFAT
Ck.
McIntosh
McKinley
Branch
HORSEFLY
RIVER
Marten Ck.
Black Ck.
Crooked
River
Pass 10 Miles
North Fk.
South
Forks
UNEXPLORED
UNEXPLORED
Niagara R.
CLEAR WATER
LAKES
Trails
Roads
Ancient Channels
New Placer Mines
0
5
10
20
Scale of Statute Miles
N

panying map you will see that the sphere of influence of the company is bounded on the north by the South Fork; on the east by the Quesnelle Lake; on the south by the watershed of Polley, Boot-jack, and Morehead lakes; and on the west by Morehead Creek and Quesnelle River.

That portion of the area which at present is being mined is an ancient river almost paralleling the South Fork, and with outlet at Dancing Bill Gulch. Before the Consolidated Cariboo took hold, work was carried on here by Chinamen, who worked up the channel about 1,000 feet, took out at least $900,000, and

Last Hour's Run at Bullion, 1903.

left piled up, for their successors to remove, all the boulders and tailings.

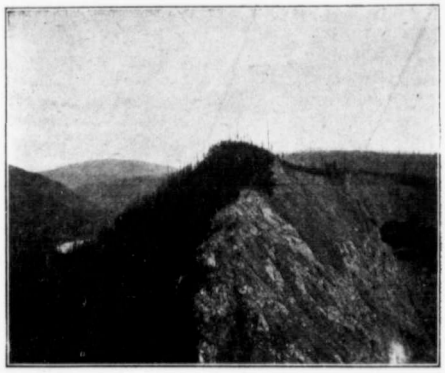
Pit No. 1, to which work was confined in 1903, is of vast proportions: between the rivers the distance is 900 to 1,100 feet, from the "bend" at Dancing Bill Gulch to the face 1,200 feet, and from the top to bottom of the banks 400 to 500 feet. To the "bend" the strike is north 70 degrees west, thence almost magnetic north to the river. A wedge-shaped wall of rock separates the modern South Fork from the ancient stream, and towers up 420 feet high on its eastern side of the pit, with eight high-grade strata marked on it by erosion of rock and the coarse gravel which there remains lodged. This country rock is a diorite, and has associated with it a pinkish syenite which appears to have intruded the older rock and occurs in large quantities, also, in the bed and the western rim. Specimens of both rocks were taken, and sent to Mr. O. E. LeRoy, petrographist of the Canadian Geological Survey, for determination. He has classified them respectively as gabbro-diorite and quartz-syenite-porphyry. His description of their microscopic characteristics is as follows:

(A) Gabbro-Diorite—"The rock consists of large, irregular plates of brown hornblende, rounded idiomorphic individuals of pale green pyroxene, and large and small lath-shaped feldspars which are finely twinned and are probably labrodorite. Iron ore (magnetite and a little pyrite) occurs in considerable abundance. Apalite is also present in small amount. The rock is fresh, being comparatively free from secondary minerals."

(B) Quartz-Syenite-Porphyry—"The rock consists principally of slender and short laths of finely twinned plagioclase, probably albite. Interstitial to these larger individuals are smaller ones of feldspar and rounded grains of quartz. This matrix or ground mass is not in large amount. The mica, but sparingly represented, has altered to chlorite. A few shreds of muscovite, a grain or two of zoisite, and a little magnetite, complete the mineral content. The structure is porphyritic and suggests that the rock is either a dyke or the border facies of a granite or syenite intrusion."

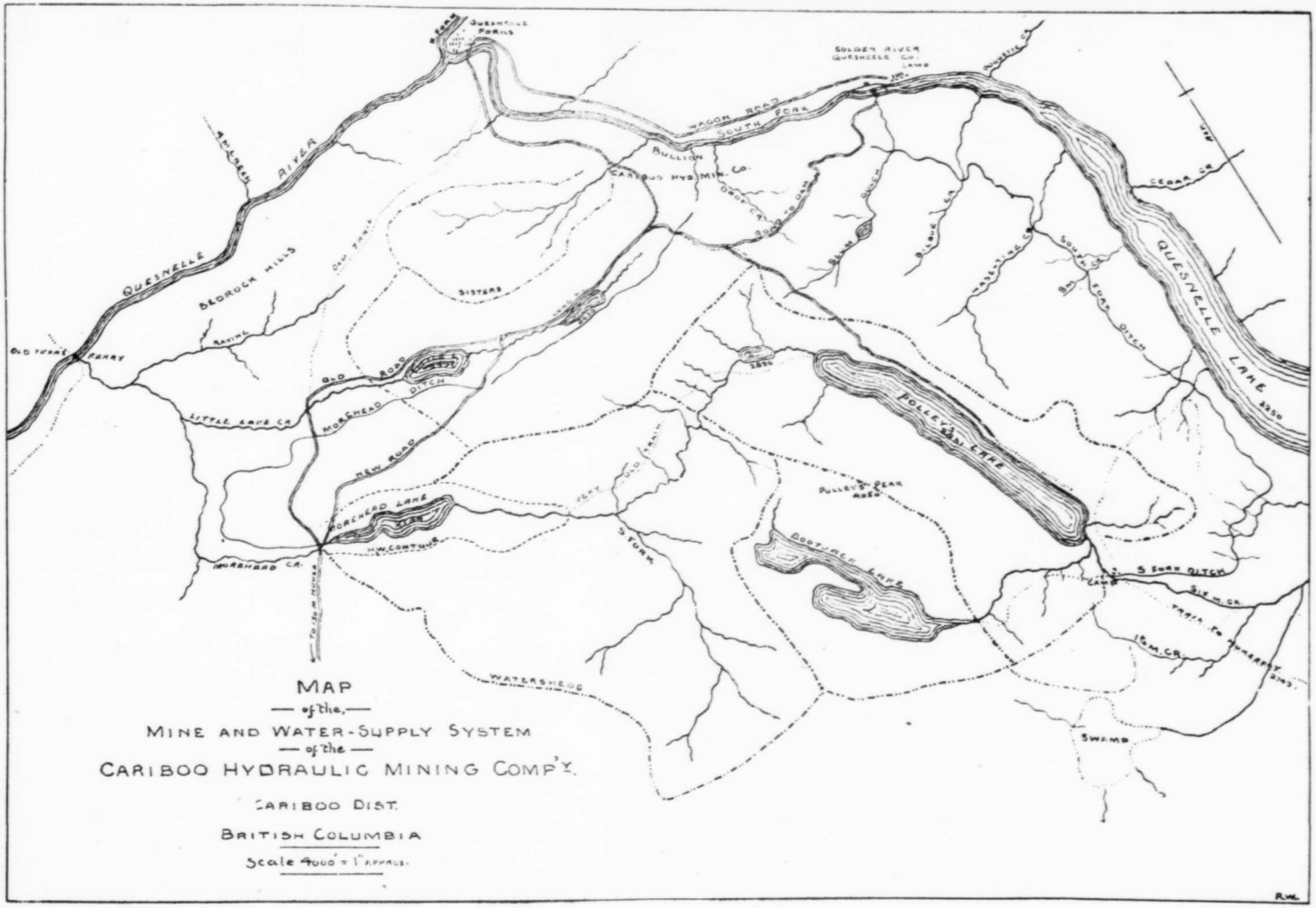
The rock named by Mr. LeRoy gabbro-diorite has also been classed as augite-diorite. There is no discrepancy in the two names, for augite or pyroxene is an essential consistent of gabbro.

The present face is 350 feet deep and consists of top gravel (40 to 50 feet), boulder clay, and about 200 feet of yellowish gravel—out of this gravel it was that the giant during the last four days of the run washed $8,000. The lower portion of the pit has been bared to bed-rock by the removal of the gravel in four benches. This method of washing was necesary because of the grade of the sluice, though had the company permitted Mr. Hobson he would have driven a sluice through the eastern rim and washed to bed-rock at one blow. The main sluice is 1,200 feet long, 1,150 feet of which was cut through bed-rock at a cost of $27,000; above the cut the sluice forks, and each prong is 1,100 feet long, thus making the total amount of bed-rock flume 3,400 feet. The sluice boxes are seven feet wide and four feet deep, paved with improvd steel riffles and with blocks, and run on a grade



"A wedge-shaped wall of rock separates the modern South Fork from the ancient stream."

of 6¼ per cent. Dump causes no anxiety, for the South Fork runs with a swift current through a deep channel between steep sides. As the sluice-cut is now as deep (60 feet) at its lower end as it can be made without impairing the dump; and at its upper end is at the level of bed-rock which rises in the pit on a grade of one per cent., and further, as washing at the face 1903 was 35 feet from bed-rock, the sphere of usefulness of the long sluice line is limited. A tunnel will have to be run in from the South Fork—on a five


QUESNELLE FORKS
GOLDEN RIVER QUESNELLE CO. LAND
WAGON ROAD
SOUTH FORK
QUESNELLE R.
CARIBOO HYD. MIN. CO.
BULLION
CEDAR CR.
QUESNELLE LAKE
BEDROCK HILLS
OLD TRAIL
SISTERS
OLD TOWN FERRY
OLD ROAD
MOREHEAD DITCH
LITTLE LAKE CR.
NEW ROAD
MOREHEAD LAKE
MOREHEAD CR.
HW CONTOUR
POLLEY MT. LAKE
POLLEY MT. PEAK
BOUTILIER LAKE
S FORK
S FORK DITCH
SIX M CR.
TRAIL TO TUNNEY'S CAMP
TEN M CR.
WATERSHED
SWAMP
MAP
— of the, —
MINE AND WATER-SUPPLY SYSTEM
— of the —
CARIBOO HYDRAULIC MINING COMP'Y.
CARIBOO DIST.
BRITISH COLUMBIA
Scale 4000' = 1" APPROX.

per cent. grade and from the same elevation above the river as the present cut—through the eastern rim to the pit; and an upraise made to the surface. Then down this shaft which would gradually by attrition be turned into an incline, and through the 1,200 feet of tunnel fitted with gold-saving appliances, the gravel would be washed.

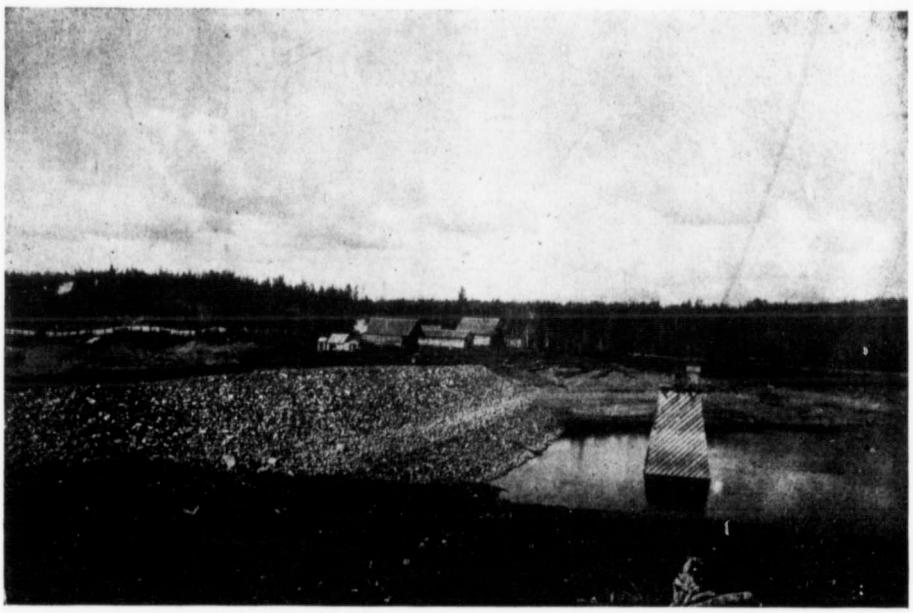
Boulders too large for the sluices are blasted, usually two by the same shot, and 150 shots at a time. Bank blasts also, are required. Of these the record-breaker shook up seven acres of ground by means of 136,000 pounds of black powder. In preparing for such a blast a shaft is sunk and drifts in which the powder is set, are run. The explosion is said to be marked by a dull thud rather than by severe detonation.

Water is conveyed by 33 miles of ditch and delivered through 1,800 feet of steel pipe grading from 48 inches at the sand-box to 22 inches at the giant. During the season just closed only one No. 8 Hydraulic Giant was in service and that with an 8-inch deflecting nozzle, which required 2,500 miner's inches of water—a 9-inch nozzle would require 3,500 inches. If washing bed-rock there is a pressure of 420 feet. The gold is rather fine in character and worth about $17.12 per ounce. Only a few nuggets have been found of which the largest weighed 6¼ ounces, valued at $115. Mercury is poured into the sluice boxes four times a day, sixty flasks the amount required during a season. Of this only about ten per cent. is lost, for the amalgam is retorted and the mercury distilled.

This summer Mr. Dubois, an analyst sent thither by the Wellsbach Company, tested the Horsefly and Bullion gravels for platinum and osmiridium, and expressed himself satisfied with the results of his experiments. In consequence, Mr. Hobson expects that a special plant will be installed next year for saving metals of the platinum group, and any fine gold that may now be lost.

Labour is brought in from the outside, usually about the middle of March, as the pits have to be cleared of ice; and piping begins any time between the 5th of April and the 10th of May. In 1903 one hundred and twenty men, whites and Japanese, were employed at an average wage of two dollars and a half.

Most discouraging to all concerned has been the past season. Owing to failure of water supply, the mine had to be closed down after a run of only fifty-three days. The clean-up amounted to about $47,000. This is small in comparison with other years, as may be seen by the table that follows:—



View of Morehead Lake, Dam and Camp Buildings.

Year.	Time Run.	Bullion Recovered.
1898	128 days 16½ hrs.	$105,141.36
1899	144 days 8 hrs.	92,678.93
1900	171 days 13½ hrs.	350,085.77
1901	104 days 1½ hrs.	142,273.51
1902	65 days 15 hrs.	61,395.19
1903	53 days (approx.)	47,000.00

To appreciate the water difficulty, one must know something about the water supply system, which, as it now stands, consists of thirty-three miles of canal, three main reservoirs, and two pooling reservoirs, and

with a capacity of delivery at the mine of 7,250 miner's inches. Since 1894, Boot-jack and Polley's lakes have formed two of these main reservoirs, and have supplied water to the hydraulic pits by means of twenty-one miles of canal, known as the South Fork ditch. In order to increase the supply, the Morehead dam and canal were completed in 1898, at a cost of $118,000, and Morehead Lake thus converted into a third reservoir. In the following year the Morehead pooling reservoir was constructed at the head of Black Jack Gulch and above the South Fork pooling reservoir. Among the advantages of a pooling reservoir are (1) that it collects the early spring water required in the beginning of the season for washing in the pits; (2) gives increased supply when needed, at short intervals, for the removal of boulders or heavy material; (3) pools the water flowing down the canal after the gates have been ordered closed, or at such times as the giants are being lubricated and repairs made without

View of Morehead Lake Reservoir, Looking East from the Dam.

the gates being closed. In addition to the ten miles of Morehead canal and twenty-one miles of South Fork ditch, there are two miles of Dancing Bill ditch —the name given to that part of the system between the junction of the above mentioned canals and the pits.

Now, Boot-jack, Polley and Morehead lakes are not fed by large streams, so depend largely upon snowfall and spring rains. During the winters of 1902 and 1903 the snowfall was comparatively light; not only so, but the snow melted in spring under adverse circumstances, namely, warm days followed by frosty nights; consequently, instead of there being a freshet that would have filled up the lakes, the water ran slowly and much of it was lost by evaporation. Such a shortage of water in the future must be provided against by an extension of the system. Mr. Hobson stated that four times the amount of water already under control was procurable. To harness such, however, will require another large outlay. The pity is that Quesnelle Lake was not a a few hundred feet higher in altitude. As has been pointed out, expenditure will also be required for the excavation of a sluice tunnel through the eastern rim of No. 1 pit to the South Fork, because the present sluice is of insufficient grade for the washing of bed-rock as work advances towards the south.

To offset the need of future outlay of capital comes the cheering fact that there are about 500,000,000 cubic yards of auriferous gravels available for future washing, and that the 6,000,000 cubic yards already washed averaged twenty-five cents per yard. Nor have the operating expenses so very far exceeded the bullion recovered during thse inaugural years, as will be seen by the accompanying figures received from the manager:—

Season.	Expenditures
1894	$423,922.83
1895	43,860.79
1896	163,865.31
1897	108,544.24
1898	142,801.96
1899	334,639.03
1900	212,918.25
1901	154,454.60
1902	232,723.24
	$1,817,730.25
Debit Balance	$711,774.57
Less stores on hand as per inventories	86,403.29
Net Balance	$625,371.28

Season.			Receipts.
1894	Bullion	Recovered	$ 5,161.85
1895	"	"	58,571.19
1896	"	"	124,026.86
1897	"	"	138,520.00
1898	"	"	105,141.36
1899	"	"	92,678.03
1900	"	"	350,085.77
1901	"	"	142,273.51
1902	"	"	61,395.19
Total			$1,077,854.66
Miscellaneous profits on stores, boarding house, etc., from 1894 to 1902, inclusive			28,101.02
Balance			711,774.57
			$1,817,730.25

In February, 1902, the new camp was completed at a cost of $19,000. It consists of manager's house and office, boarding house, general office, melting house, store, four bunkhouses for men, one for foreman and shift bosses, hospital, carpenter and blacksmith shops, storehouses and stables. All are substantially built, painted red, and roofed with sheet iron, so present a very neat and uniform appearance. The bunkhouses are built with a common room in the centre from which a passage leads to right and left, and on to each pass-

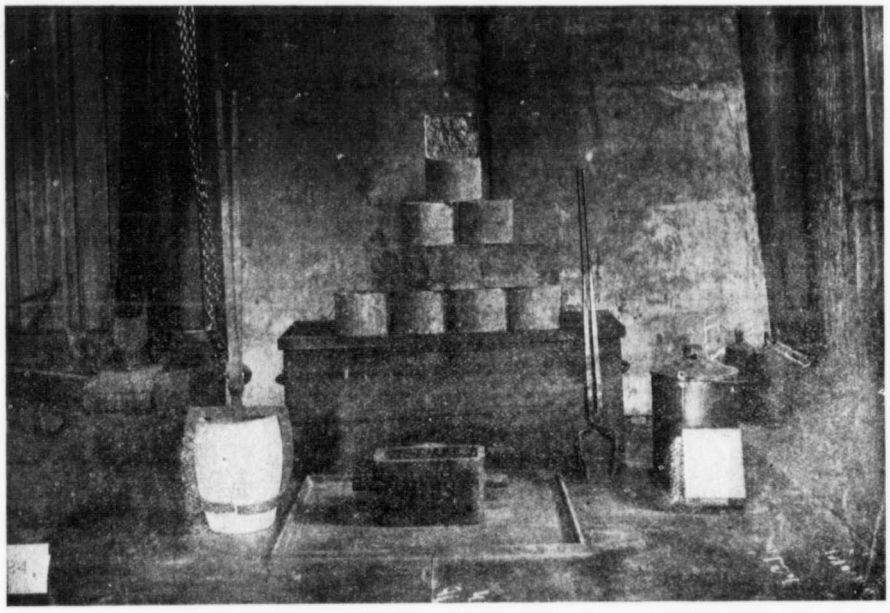
age four rooms open. Having the men pay a dollar a month for a Jap to care for their rooms has worked very satisfactorily. Near the South Fork pit in the direction of the old camp are the Japanese quarters; also the garden which contains all sorts of vegetables —celery, asparagus, beans, peas, potatoes, tomatoes, lettuce, turnips, parsnips, cabbage, cauliflower, raddishes, squash—these at an altitude of 2,800 feet! Farther on there is a sawmill with a capacity for cutting daily 4,000 feet of lumber.

The very complete electric light and power drill plant includes one General Electric Company's direct current dynamo, capacity 30 killowatts, 240 amperes, 125 volts; one 24-inch Tuthill water-wheel; one 40-horsepower tubular boiler and one 35-horsepower Erie engine used when water power is not convenient. For lighting the mine four projectors, a searchlight, and six arc lamps are used. The camp buildings are lighted by electricity instead of oil, thereby making a saving of 70 per cent. For running cuts in bed-rock electric drills are found more economical than hand drills. The cost of running 312 feet of holes per ten hour shift with three Gerdner drills was $31.55, for the same amount of drilling by hand the cost was $91. The saving made in favour of power drills was thus $59.45.

The melting plant consists of three retorts with condensers for distillation of mercury, and two furnaces, all with a capacity for treating one thousand pounds of gold. A complete assay outfit is on hand to determine the value of the bullion.

Four miles from Bullion, where the South Fork widens into Quesnelle Lake a dam was constructed some years ago by the Golden River Quesnelle Company to hold back the water of the lake and so permit of the bed of the South Fork being mined. The dam and mine gates remain to-day as an excellent piece of engineering, but the project for which they were built did not meet with success. Already in early days the stream had been mined several times over. In return for the half million or so dollars spent, $8,000 was the pittance recovered. The dam has now passed into the hands of the Consolidated Cariboo, and in the fall the gates are closed and mining leases granted to all-comers. In the past, Chinamen have profited by the opportunity. The express driver said he took out for them last winter about $17,000 in sums approximating a thousand dollars at a time.

Mr. Hobson is manager also of the Horsefly Hydraulic Mining Company, which has valuable property on the southwest side of Horsefly River, seven miles from Quesnelle Lake. Nothing, however, has been done there since 1900, on account of difficulty in procuring labour. The Horsefly—so-called on account of the flies that infest the region—was very quiet last summer with no work going on save at the mine of the Horsefly Gold Mining Company, where about 20 men were employed. Popularly known as Ward's Mine, this ground is of historic interest.

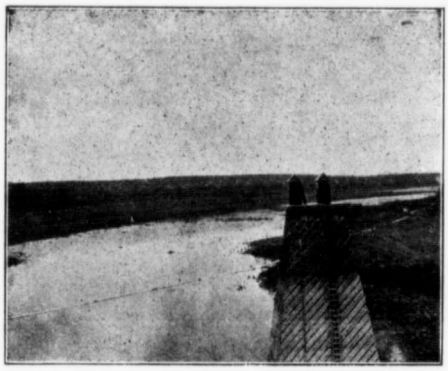


Melting room, Consolidated Cariboo Hydraulic Mine. Eleven cakes retorted gold valued at $81,622.00.

When, early in 1859, Mr. Dunlevy was mining in the bars of Chilcoten River, an Indian, tall and commanding, came one evening into camp and in French said "Much gold!" With a stick, next moment, he

drew in the sand the Horsefly country and the South Fork of the Quesnelle River. Sixteen days later the Indian, as agreed, met the white man at Beaver Creek. Early in March, 1859, they arrived at the spot where Ward's Mine now is; but as only a small area of "pay" was found, and provisions were running short, Dunlevy, after a stay of two or three days, struck across country to the Hudson's Bay fort Alexander. In the month of May he proceeded up the Fraser and on his way met John Rose who told him of Quesnelle River, its forks, and Rose's bar. The information thus received decided him to go in the direction of the North Fork. This he did and mined for a time on Horsefly and Keithley Creeks.

Following in the footsteps of Dunlevy, though unconscious of the fact, came John McLean the very next month. McLean has arrived in Victoria from California in May, '58, had crossed to the mouth of the Fraser, thence to Yale, and had spent the winter mining at Boston Bar. In March, with five men in his party, he continued up the Fraser, rocking in the eddies as he went, and on the 12th of June landed at Quesnelle. He proceeded up the Quesnelle River and its South Fork to a spot opposite the Dancing Bill Gulch, then to obtain fresh supplies hewed his way through woods to Fort Alexander, and while there heard from Indians of the Horsefly country. So making up a party of twelve, the Blue Lead Company, he set out for that quarter. It was noon when they arrived. While dinner was being cooked, Mr. McLean

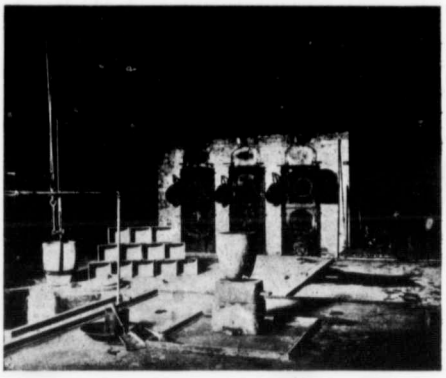


Morehead Lake, showing how completely the water supply has been exhausted.

went to the bed of the stream, opposite to Ward's claim, and in an eddy digging down eighteen to twenty inches, struck a sticky gravel that was rich. By the time dinner was called he had panned out sixteen dollars. When the meal was over a rocker was put together and during the afternoon twenty-seven ounces of gold rocked out. In a couple of days they had realized $7,000. A wingdam, therefore, was resolved upon. Late in the fall of '59, they left the Horsefly with $13,000, but returned in the spring, and to handle the deepening gravel, put in a water-wheel and pumps.

In June, McLean received a letter from Rose stating that the latter had discovered coarse gold in Keithley. With the exception of two men, the Blue Lead Company set out for Keithley, a Creek that was paying two ounces a day to the man and which, along with its tributary, Snowshoe, has produced about $2,000,000

In 1903, work on Keithley so far as could be learned, was confined to Veith and some Chinamen. The former was bench-drifting with about six men. He



Melting room at Cariboo Hydraulic Mine with gold ingot in foreground valued at $134,728.

took out thirty ounces a week last winter, it is alleged, and sometimes as much as fifty-six ounces; value of gold, $17.20. On Snowshoe Creek the same man has an hydraulic plant, employs twelve men and has done so for several years. At time of visit he was reported to have cleaned up about $3,000. Howison, of Spokane, has bonded from Veith a quartz claim in this locality and was busy sampling. At Goose Creek, on the opposite side of Cariboo Lake from Keithley, Helgesen has been hydraulicing for four years, and in August was taking out about $200 a week.

THROUGH THE LARDEAU.

AN ACCOUNT OF RECENT PROGRESS AND OF PRESENT DAY CONDITIONS IN THIS MOST PROMISING MINERAL AREA.

(By Our Special Commissioner.)

LAST month's notes on the Lardeau dealt with the portion of that country situate in the northern part of Ainsworth Mining Division, and in the Trout Lake Mining Division as far north as Trout Lake. I propose now to describe in due course the principal mining properties about Trout Lake and the Lardo Creek section, both in the Trout Lake division; and about Fish River and its tributary creeks, in the Lardeau division will have notice. The area comprised within these limits is so extensive, though, and the number of mineral claims more or less prospected so

large that of necessity some promising properties will either have but scant notice or not be mentioned.

ABOUT TROUT LAKE.

The principal creeks flowing into Trout Lake are Lardo Creek coming in from the northeast, and Trout Creek, from the northwest, both entering the lake at its northern end. Others are Glacier, Five-Mile, Rock, and Abrahamson's Creeks, from the west, and Seven-Mile, Eight-Mile, and American Creeks from the east. Mineral locations have been made on all these creeks, and in many places on the mountains drained by them, but with the exception of the American, on American Creek, which has sent out a small quantity of silver-lead ore, none of the claims on these lesser creeks have yet become shippers.

LUCKY BOY GROUP.—Philadelphia men, represented locally by Mr. G. W. Stead, are operating the Lucky Boy group, consisting of the Lucky Boy, Horseshoe, X Y Z, Blue Jay and C. H. claims. These are situate about seven miles from Trout Lake City and at an elevation of 1,700 to 1,800 feet above the lake. Most of the development work has been done on the Lucky Boy and Horseshoe, from which some 3,000 sacks of silver ore were shipped during last spring and summer. The ore is stated to occur at a contact between lime and schist, and to contain a deal of tetrahedrite and carbonates. The lead varies from a few inches to about four feet in width. The shaft on the Lucky Boy is 180 feet in depth and from it drifts have been run on the lead. A tunnel is being driven on the Horseshoe to cut the lead at a depth of about 200 feet. The development work has been carried out under the direction of Mr. John Watson, assistant manager, formerly on the Brooklyn mine, in the Boundary, and on the North Star in East Kootenay.

The same owners have the Ethel, another good property, which they have been developing for some time. This mine is situate several miles south of the Lucky Boy group, and at a greater elevation above Trout Lake.

ABOUT FERGUSON.

The town of Ferguson is distant four miles from Trout Lake City, in a north-easterly direction. It is situate at the junction of the north and south forks of Lardo Creek. Its elevation above the sea is about 3,000 feet, or 820 feet higher than Trout Lake. Six or seven years ago the Lillooet, Fraser River & Cariboo Goldfields, Ltd., now in liquidation, owned lands and mineral claims in this vicinity, which the company made easily accessible by constructing a waggon road from Trout Lake. Its substantial log buildings, by the roadside just west of Ferguson townsite, are now unoccupied, but they are a reminder of the energy and enterprise of an English organization that did much to open up this part of the Lardeau district. Another evidence of profitless enterprise to be seen at Ferguson is the Vulcan smelter, thus described in the Report of the Minister of Mines for 1901: "The smelter appears to consist of a small blast furnace with an air-tight V hopper at the top. The blast is induced by a steam injector, supplied with steam from a special boiler, which causes a partial vacuum above the furnace charge, making an inward draft through the tuyere holes." It was only given a short trial here—less than two days—and it was pronounced a failure.

LADE GROUP.—The officers of several mining companies are at Ferguson, namely, the Silver Cup Mines, Ltd., the Great Western Mines, Ltd., the Metropolitan Gold and Silver Mining Co. of B. C., Ltd., and the Ophir-Lade Mining Syndicate, Ltd. The last mentioned company has a group of seven Crown-granted claims, known as the Lade group, and situate about 14 miles from Ferguson on Granite Creek. From the prospectus of the Great Northern Mines, Ltd., a company recently promoted to acquire this group among other properties, it is learned that on them "a tunnel 112 feet long has been run, and a shaft sunk on the ore. Five tons of the ore shipped to the smelter gave returns of $1,100.00 to the ton, in free gold," and that "the property is traversed by a main ledge 8 to 12 feet, and several smaller veins carrying high values in free gold and telluride." The further statement is made that on account of the distance from transportation and the altitude (more than 8,000 feet) the development of the property has been deferred until a more convenient season.

TRIUNE GROUP.—The Metropolitan Gold & Silver Mining Company has its executive office in Minneapolis, Minnesota, and its registered office at Ferguson, with Mr. John A. McCrossan as manager in British Columbia. The company owns the Triune and Metropolitan groups of claims, the former about nine miles southeast from Ferguson, and the latter about eight miles up the North Fork of Lardo Creek. There is no road to the Metropolitan group, only trails, so in the absence of transportation facilities, no development is being done on any of the eight claims comprising this group. The Triune group consists of the Triune, Silver Chief, Enterprise, Revenge, Kamloops and Kamloops Fraction. The location of the mine is not a favourable one, the workings being in the side of a mountain having an almost precipitous face. Tunneling and raising are the chief development work done, the Silver Chief having present attention. Two tunnels have been driven on a ledge about four feet in width. The lower tunnel is in 300 feet and the upper 250 feet, and these are connected by a 130-foot raise. Another raise is in ore for about 120 feet from the upper tunnel. Besides the foregoing some 600 feet of raising and cross-cutting have been done in development. The ore is silver-lead carrying from $12 to $18 in gold, about 250 ozs. silver, and 35 per cent. lead to the ton. It is treated at Trail and that shipped last year averaged about $132 per ton after payment of freight and treatment charges. Ore to the value of about $110,000 has been taken out of the mine and it is estimated that by the close of the current year the total value of the output will have reached $140,000. A Hallidie aerial tramway, a mile and a half in length, was constructed down Triune Creek last year, to con-

nect with the waggon road at seven and a half miles from Ferguson, but frequent snowslides in one locality prevented it being operated for any length of time. It is thought that with fewer and higher towers this difficulty will be overcome, and the question of reconstruction is being considered.

GREAT WESTERN GROUP.—Without question the most important mining enterprises in this part of the Lardeau are those of the Great Western Mines, Ltd., and the Silver Sup Mines, Ltd., two English companies. Mr. Donald G. Forbes is general manager for both, and Mr. Erland G. Hadow secretary. The Great Western Company owns two groups of claims, one of three claims on a mountain above Comaplix on the N. E. Arm of Upper Arrow Lake, and the other of seven claims situate on a mountain rising immediately to the eastward of Ferguson, across the North Fork of Lardo Creek. The latter group consists of the Nettie L. Ajax, Good Luck, Copper Reef, Lulu Belle Fraction, Nettie L. Fraction, and No. 1 Fraction. The direct distance from Ferguson to the Nettie L. mine, which is about 2,100 feet higher than the town, appears to be less than a mile, but by waggon road it is four miles. Altogether some 6,000 lineal feet of work have been done in underground development, the greater part of it on the Nettie L. Latterly the Ajax has also had considerable development work done on it. Three levels have been opened on the Nettie L. On No. 1 level the main cross-cut cut the main lead at 185 feet in, and a drift was run on this lead 430 feet south and 120 feet north. At 115 feet from the cross-cut the south drift encountered a cross lead and this was drifted on 150 feet. A second cross-cut tunnel (No. 2 level) started at a depth of 260 feet below No. 1 level, was run 670 feet, cutting the lead which was drifted on 740 feet and a raise was made to the level above. On No. 3 level the main lead was drifted on 240 feet north and 80 feet south, and the cross lead was worked for 150 feet. The ore in the cross lead has been stoped from No. 3 level to the surface. Three cross-cut tunnels have been driven on the Ajax. No. 1 is in 70 feet and from it two shafts have been sunk each 55 feet on the incline. No. 2 tunnel is in 447 feet. No. 3 is on the same level as No. 1 on the Nettie L. It is a cross-cut for 534 feet and then a drift 212 feet north and 147 feet south. The total tonnage of ore shipped from these mines from February, 1900, to June 30th, 1903, is 2,298 tons net, returning $121,761.06 net cash. Average values are gold 0.13 oz., silver 149.6 ozs., and lead 26.7 per cent. The small power plant on the mine consists of a 60-h.p. steam boiler, a 14 x 18 Ingersoll-Sergeant air compressor, machine drills, and a 7 x 9 double cylinder single drum Lidgerwood hoist. A Riblet aerial tramway, 8,000 feet from the mine down to the mill site at Five-Mile, is in course of construction. About 50 men are on the Great Western payroll.

View taken from New Silver Cup tram right of way of upper part of grading for mill site. Blacksmith shop at top of Bend.

SILVER CUP GROUP.—The Silver Cup group was previously owned by the Sunshine, Ltd., which company sold the property to the Silver Cup Mines, Ltd., in March of 1902. There are nine claims in the group, namely, the Silver Cup, Silver Cup Fraction, Sunshine, Excelsior, Excelsior Fraction, Gold Bug Fraction, Mountain, Mountain Fraction and Gold Seeker Fraction. They are situate about eight miles south east from Ferguson and at an elevation above sea level of 6,500 to 7,000 feet. Two parallel systems of lenticular deposits of ore occur here. The ore is argentiferous galena, zinc blende and grey copper, average values being gold .062 oz., silver 172.76 oz., and lead 23.9 per cent. Shipments during the period March-June, 1903, totaled 1,027,951 tons net, which returned $87,045.08 net cash. Most of the work has been done on the Silver Cup claim. The upper cross-cut tunnel on this

claim at 293 feet in cut what is called the Blind lead, this not showing on the surface. A drift has been run 200 feet north and 232 feet south on this lead. At 56 feet farther in the cross-cut tapped the Silver Cup lead and this has been drifted in at this level 80 feet north and 232 feet south. The lower workings are 93 feet below the upper, and these give depth of 243 feet

View of lower workings of Silver Cup Mine, showing waste and concentrate dump.

from the surface. The Blind lead was cut at 226 feet in this cross-cut tunnel and the Silver Cup lead at 282 feet. A drift runs south 755 feet, part of the way on the Blind lead, and another on the Cup lead 90 feet north and 191 feet south. Nearly all the ore has been stoped from these lower workings to the surface.

On the Sunshine the upper workings consist of a drift 290 feet in length at a level about 140 feet lower than the lower workings of the Silver Cup. Another tunnel, in 875 feet at the end of last August, at a level 100 feet below the upper workings, is being driven to cut the Silver Cup ore shoots.

A Riblet tram, 8,000 feet long, connects the Silver Cup with the waggon road at Eight-Mile, the difference in the elevation between upper and lower terminals being about 3,000 feet. A 50-h.p. horizontal return tubular boiler, a 14 x 18 McKiernan air compressor, and a 5 x 7 Lidgerwood pneumatic hoist were sent up to the mine over this tram, boiler and air compressor having been made in sections to admit of their being so transported. The compressor is nominally a 5-drill engine. At the elevation it is here working its capacity is 350 cubic feet of free air per minute. Extensions of the aerial tramway system are being made, Mr. B. C. Riblet having been given an order to construct a tram, 15,000 feet in length, between the existing tram and the mill now in course of erection at Five Mile, and a short tram from the upper workings of the Silver Cup to the upper terminals of the tram now in operation. A new boarding house was being built at the time the mine was visited, and there were some fifty men on the mine payroll.

Silver Cup Mill.—At Five-Mile Camp, distant rather more than a mile from Ferguson, on the South Fork of Lardo Creek, the Union Iron Works, of San Francisco, California, is erecting for the Silver Cup Company a 20-stamp combination silver mill, which is intended to treat the ore of both the Silver Cup and Nettie L. The mill is designed so that the ores of the two mines may be treated simultaneously if required, an imaginary line dividing the plant right through the centre of the mill. Separate aerial trams from mines to mill, grizzlies, crushers, units of ten stamps, buddles, vanners, pulp elevators, furnaces, and all other plant right through to the retorts, are so arranged that the product of one mine may be kept separate from that of the other. In the district the mill is generally spoken of as a concentrator, but it is more—it is as above stated, a combination silver mill, the combination consisting of milling, concentrating, roasting and pan-amalagamation. The mill main building is 68 feet wide by 216 feet 6 inches long, and, and its total height from the lowest floor up to where the ore is received from the aerial tram buckets is 92 feet. The length of the building is taken up as follows: Extension behind ore bins for tramway terminal, 15 feet; battery room, 37 feet 6 inches; Dodd buddle room, 23 feet 5 inches; vanner room, 24 feet; dry floor and furnace room, 84 feet 7 inches; pan room, 32 feet; total, 216 feet 6 inches. The building is of lumber cut on the spot, excepting the truss cords which were hewn out of solid timber in the neighbouring forest. It is laid on 8 x 10

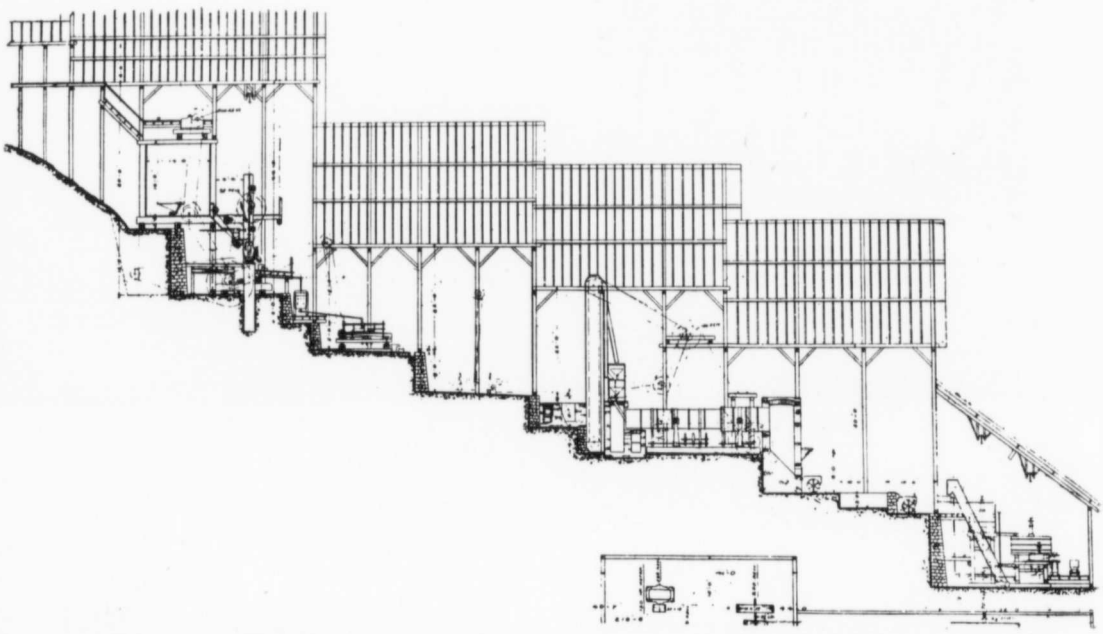
View in Selkirk range from Silver Cup mine.

sills, with 8 x 10 posts, plates and caps. There are 14 truss cords, each 8 inches by 12 inches and 68 feet long. The sides are double-boarded and interlined with tar paper and the roof is boarded, lined with tar paper and covered with corrugated galvanized iron. The several terraces are supported by substantial mas-

onry retaining walls. The mill is lighted by electricity throughout and in it provision has been made against fire, having a water supply with hydrants and hose.

Particulars of the plant, together with the treatment process, are as follows: The ore is delivered by the buckets of the aerial tramways from the respective mines into separate hoppers, being dumped directly on to 4 feet x 12 feet grizzlies through which the fine ore passes into ore bins, while the coarser rock rolls on to the crusher floor. There are two 10 x 16 crushers of the Blake type and the coarse ore is put into these by hand. The crushed ore together with the fines is fed automatically by suspended feeders directly into motors where it is reduced by 1,000-lbs. stamps to a pulp. The battery frame is a 20-stamp frame of a back-knee type, with the stamps arranged in two units of ten stamps each, these again being in sections of five stamps. The stamps and rock crushers are operated by a 75-h.p. induction motor, the electric power coming from the power house about 1,000 feet away. After the pulp leaves the mortars it is automatically sampled and passed to two sets of Spitzkasten hydraulic sizers, and the coarse pulp is then delivered to four 10-foot Dodd riffle buddles and the fines to four 6-foot Union concentrators. The sulphurets from the buddles and vanners are then dried on an 8 feet x 36 feet dry floor, whence they are delivered to two vertical elevators and distributed by means of screw conveyors to the two 50 inch x 60 inch x 30 feet Howell-White furnaces. On being fed into the furnaces the ore is automatically mixed with salt and then roasted and desulphurized, the same process also driving off the lead. The power in this department is furnished by a 150-h.p. induction motor. The dry floor and furnace room are entirely shut off by galvanized iron partitions, to keep the fumes from the other parts of the mill building.

From the furnaces the ore is taken in cars to the cooling floor, which is 10 feet wide by 3 feet deep by 67 feet long. When cooled it is shovelled into charging barrows and dumped directly into 5-foot amalgamating pans, ten in number, these having bottoms into which steam is introduced at low pressure, the heat assisting materially in the amalgamation with the quicksilver, the charge is next run into 8-foot settlers, of which there are five. After leaving the settlers it is strained, the loose quicksilver going back to the elevator and the amalgam being taken out and wheeled in cars to the retort room, which is with the boiler room, a separate building. The quicksilver is here driven off, condensed and conveyed by means of an elevator to a table placed above the amalgamating pans, whence it is piped for re-use. A 48-inch clean-up pan in the pan room is used for treating all residue of the mill likely to have values in it. This is collected, agitated in this pan, and all amalgam collected and drawn off. The retort room contains a smelting



Side elevation of the Silver Cup mill built by the Union Iron Works, San Francisco.

furnace and the boiler room a 10-h.p. vertical boiler for heating the mill building.

The plant for the power house, situate nearer the creek than the mill, consists of two batteries each containing two 48-inch Pelton water wheels, governed by water pressure governors, and operating under 140-ft. head 2,120-k.w. generators, exciters, transformers, switchboard, etc. Water is brought from a dam, constructed across the creek, in a 4 feet by 2 feet 6 inch lumber flume 3,750 feet in length, delivered into a 12 feet by 12 feet by 12 feet penstock whence it is conveyed through a 28-inch to 26-inch steel pipe to the Pelton wheels.

The sawmill has a capacity of about 8,000 feet per diem. It has a portable horizontal tubular boiler, 10 x 10 engine, 50-inch circular saw, swing saw, planer, etc. The blacksmith's shop is equipped with all tools and appliances requisite for doing all mechanical work on the place. Other buildings are two brick houses, boarding house with kitchen, office, laboratory, assayer's residence, etc. When visited there were some 90 men engaged in construction work, not including those employed by Riblet Bros. in putting up the aerial tramways to connect the Silver Cup and Nettie L. mines with the mill.

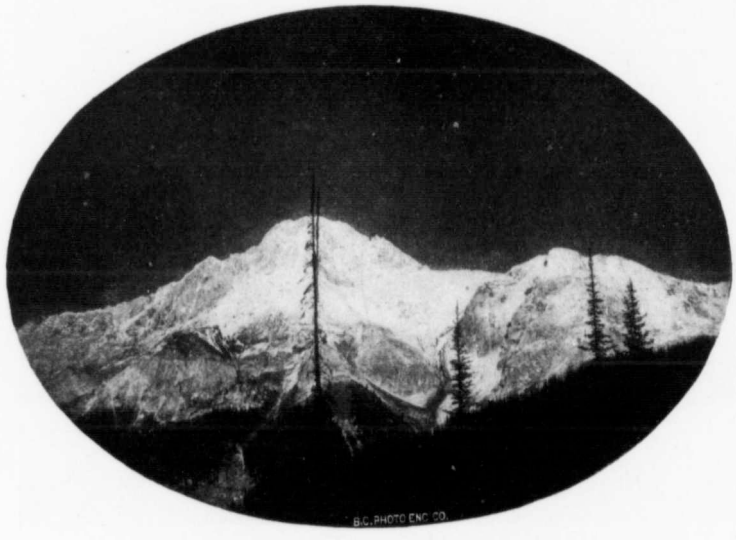
View from Bad Shot Mine, B.C.

Badshot Group.—There are so many mineral locations on both the North and South Forks of Lardo Creek and on numerous tributary creeks and neighbouring mountains that it would take up too much space to even make mention of them all. One well-known group is the Badshot, consisting of five Crown-granted claims, situate at the head of Gainer Creek and owned by Messrs. F. C. Campbell and Wm. Johnson, of Trout Lake. On this group one vein of galena ore about 18 inches in width and running up to $5 in gold, 225 ozs. silver and 75 per cent. lead, has been opened up by a shaft and drifts, and another vein shows in a 75-foot shaft, about three feet of solid ore and carbonates and two feet of mineralized quartz and ledge matter.

On Great Northern Mountain, the Broadview, True Fissure, Silver Queen, St. Elmo, and Great Northern among others, have been more or less developed, chiefly by tunnelling, and shipments of ore have been made from several of them. The Broadview particularly is stated to have a fine showing of ore, described as chalcopyrite in association with galena and iron in a quartz gangue. This claim is one of the Alpha group, on which the Lillooet, Fraser River & Cariboo Goldfields, Ltd., did a lot of work. The Jennie Lind and the Sunshine, situate on the North Fork of Lardo Creek, and owned by Messrs. Geo. Whiteside and Stanley Menhinick, are among the oldest locations in that section. They were located in 1893 on one of the biggest showings of low-grade ore in the camp.

Kootenay Consolidated Properties. — Although the numerous claims acquired by it are outside the district visited, being situate on the Duncan slope, that is on the main Duncan River and its West Fork, the properties of the Kootenay Consolidated Mining Co., Ltd., will be mentioned in passing. This company is described as one of the biggest propositions yet organized for that part of British Columbia. It is a consolidation of the following companies: Old Gold Quartz and Placer Mining Co., Primrose Gold Mining Co., Mountain Lion Mining Co., Treadwell Gold Mines Co. of B. C., and Lardeau-Duncan Gold, Silver and Copper Mining Co., each having its own group of

claims. About 5,000 feet of development have been done on the whole of these groups, mostly tunnelling in ore, large bodies of which are stated to be blocked out. On the Old Gold the lead is about 5 feet in width; on the Primrose it varies from 6 to 18 inches; on the Black Warrior, about 24 inches; on the Rio Grande and Comstock 12 inches, and on the Treadwell from 4 to 20 inches. The values on the Primrose are chiefly in gold occurring in quartz also carrying iron, galena and some copper. The ore of the Old Gold and several others is mineralized largely with silver and lead, the gold values not being high. The outlet from these properties is at present *via* Ferguson, by pack trail and waggon road, but it will eventually be down the Duncan River to Howser Lake and thence to the head of Kootenay Lake. A road has been graded from Kootenay Lake to Howser Lake, and a small steamer at times runs thence up Duncan River to 40-Mile, which is 18 miles from the nearest of the claims and 26 miles from the farthest. The Kootenay Consolidated Company contemplates putting in an electric railway, for which it holds a charter, and later erecting a smelter. The consolidation was carried out by Judge J. M. Miller, of Trout Lake City, who succeeded in interesting in it a number of men connected with mining in Nevada, Colorado and California. The company is capitalized at $5,000,000 in $1 shares. Its executive office is in Minneapolis, Minnesota, and its officials are Messrs. M. C. Miller, president; H. L. Archer, vice-president; H. S. Dudley, secretary-treasurer; C. S. Dudley, general manager, and J. M. Miller, Western manager and attorney in British Columbia.



The Great Lime Dyke.

The following references to the upper part of the Trout Lake Mining Division, taken from a report of the then Provincial Mineralogist, Mr. W. A. Carlisle, published in the Report of the Minister of Mines for 1897, may prove of interest here: "This district is very mountainous, especially that part drained by the Duncan River, and the divided summits of highly-tilted sedimentary rocks tower from 7,000 to probably 11,000 feet in height, harbouring in the high basins and on the divides glaciers and perpetual snow, affording scenic effects of great grandeur and beauty probably unsurpassed anywhere in the Province. The mointain sides are steep, leading down into deep, narrow valleys, which are heavily and densely timbered, more particularly in the Lardo basins, to an elevation of 5,000 to 5,500 feet above sea level * * * The underbrush, up to an elevation of about 5,000 feet, is heavy, and little or no feed for horses can be found, except near and above timber line, where it is generally excellent. The country is drained by many creeks and strong streams, which will yet prove of great value for milling and power purposes, although in the autumn and winter months the amount of water must necesasrily be of much less volume than during the rest of the year. * * * * The Selkirks here are very grand—the lofty, craggy peaks towering above gigantic glaciers, while the steep mountain sides are scored in places by avalanches or snowslides, yet near these summits have been made discoveries of silver-galena deposits, especially at or near the line of contact of schists and slates with the great tip-tilted band or marbleized limestone, or 'Lime Dykes' that stands up prominently for many miles with towering precipitous, naked sides and castellated crests."

FISH RIVER CAMP.

The district known as the Fish River Camp runs north 25 to 30 miles from the head of the Northeast

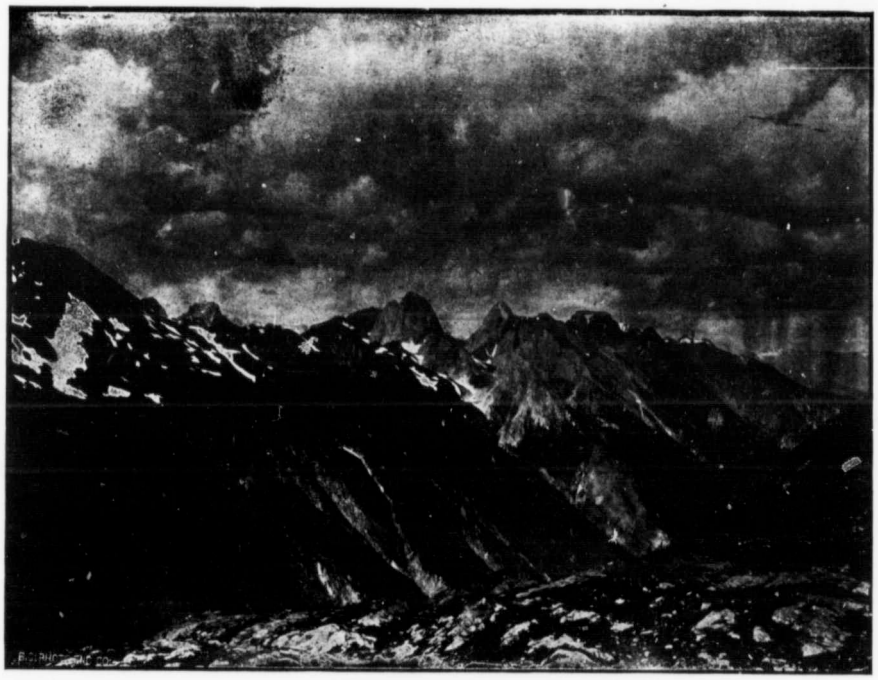
Arm of Upper Arrow Lake at Beaton (Thompson's Landing) and it has an approximate width of 20 miles. Fish River in its southward course to Arrow Lake about divides the camp equally, the eastern half being drained by Johnson, Pool, Lexington, Ruby Silver, Boyd, Kellie, Glacier and Battle Creeks, and the western portion by Menhinick, Scott, Sable, McRae, Bullard and McDougall Creeks. In conformation the coutnry is rugged, the mountains rising abruptly, in places directly from the river and in others from flats or bottoms bordering it. The summits are high, some of them being snow-clad the year through. Mr. E. A. Haggen, M.E., of Revelstoke, who early last summer visited the more prominent mining properties in the district and followed what he described as being a remarkable mineral zone from the range of mountains on the west side of Fish River south-easterly across Pool and Mohawk Creeks to the Beatrice Mine on the summit of the divide between the head waters of Mohawk Creek and the watershed of the Lardo, wrote of it as follows: "General ore-bearing leads traverse this zone in parallel courses, frequently standing prominently above the country rock or forming ridges sometimes 50 feet in height, as on the Old Homestead, resembling in appearance the famous saddle-back reefs of old Bendigo (Australia). The ores of this zone are argentiferous galenas of high grade associated with tetrahedite and free-milling gold. The gold and argentiferous ores occur separately, evidently due to different conditions of deposition, but the silver-lead ores also carry gold. Many prospectors who have covered the country, and claim to know it well, aver that the mineral zone referred to is continuously traceable through to the Lower Lardeau and that the Nettie L., Silver Cup, Triune and other well-known properties on the divide between the South Fork of the Lardo and Trout Lake, really occur in the extension of this zone. If that be true this mineral zone is more than 20 miles in length. Its width is placed at a mile and a half. Bands of graphitic schist accompany it throughout its length, encasing its leads and forming as well-defined walls as can be found associated with any ore deposits. These walls enable the ore bodies occurring in the belt to be easily located and followed. Other mineral zones lie at distances varying to six or seven miles on each side of this central zone, and in parallel strike, but associated with the lime dykes that form so prominent a feature of the geology of the Lardeau. Indeed, what is known as "the great lime dyke of the Lardeau" has come to be regarded as one of the great geological features of the Province. The gold belt is said to be nine miles long by a mile and a half wide."

Beatrice Group.—Among the more prominent of the mining properties in the camp are the Beatrice Group, at the head of Mohawk Creek, a tributary of Pool Creek; the Oyster-Criterion, Eva and Cholla groups, on Lexington Mountain, between Pool and Lexington Creeks; and the Camborne group, on Menhinick Creek. The Beatrice group consists of three Crown-granted claims—the Beatrice, Edmond and Folsom—owned by the Beatrice Mines, Ltd., having a nominal capital of $500,000, with Mr. Geo. S. McCarter, of Revelstoke, as president, and Mr. Frank F. Fullmer, of Beaton, as manager. Development was commenced on the property in the fall of 1898, and before the winter had passed a drift had been run 140 feet on a vein of high-grade silver-lead ore giving from 18 inches to 4 feet of solid galena containing values in silver, lead and about $3 gold. The 280 tons shipped that winter returned a good profit above costs of mining, raw-hiding, freight and treatment. In 1899-1900 a cross-cut tunnel was driven 90 feet, this cutting the same lead at a deeper level. A drift, 165 feet in length, was run all the way in a vein of similar size and character of ore to that above described, and containing $8 in gold, 150 to 280 ozs. silver and 22 per cent. lead. In October, 1902, a start was made to put in an adit 803 feet to tap the same vein at a depth of about 630 feet, the intention being to use this as a main working tunnel. When 550 feet had been driven, the fan broke down and, the air being bad, work had to be stopped in the adit until the snow melted sufficiently to admit of a new fan being taken in. After stopping work in the adit another cross-cut was started to cut at a depth of 200 feet a vein believed to be an extension of the Eva and Oyster-Criterion lead. This runs through all three of the Beatrice claims and it is claimed it can be traced for five miles. Where opened on this property this lead shows free gold, and bunches and stringers of galena also occur in it. In the summit the work of building a trail on a waggon road grade was undertaken, so that shipment of ore might be resumed.

Oyster-Criterion Group. — The Oyster-Criterion group consists of the Oyster, Criterion, Imperial, Rossland, Balfour, Mascot Fraction and Gold Bug Fraction, and these are so located as to give a length of 4,600 feet on the strike of the leads. Between June, 1902, and April 1903, about 1,500 feet of cross-cutting and drifting were done by the Ophir-Lade Mining Syndicate, Ltd. A 187-foot tunnel on the Criterion claim cut one galena and three quartz veins, and a 145-foot cross-cut on the Rossland encountered a continuation of the vein known as the Criterion vein. The galena vein has been followed 192 feet to its intersection with the Criterion vein. It varies in width up to five feet and is stated to carry about $10 in gold besides its silver values. The Criterion vein has been drifted on about 190 feet and three cross-cuts made show its width to range from 16 feet at one end of the drift to 22 feet at the other. On the footwall there is a pay shoot about four feet in width assaying up to $90 in gold. Another vein opened up believed to be the No. 2 vein of the adjoining Eva mine, shows a width of nearly four feet and gives an average assay value of about $20. Much other work in cross-cutting, drifting and raising was done prior to work being stopped to await the installation of the air compressor. It is stated that development work on the Criterion vein alone has proved the occurrence of a pay shoot between 500 and 600 feet in length and about 100 feet in depth from the surface down to the tunnel workings. Work was resumed at the Oyster-Criterion in September, and now that power is available for running the

machine drills and the stamp mill is completed, the mine should be a continuous and profit-earning producer.

OYSTER-CRITERION STAMP MILL.—The stamp mill was nearly completed when Camborne was visited late in August. It is a Fraser & Chalmers' 10-stamp mill with stamps of 1,000 lbs. each. Room has been provided for a second section of ten stamps. The present capacity of the mill is about forty tons per diem. The main building is 40 feet by 68 feet and 70 feet high from lowest floor to peak. The compressor and motor room is 24 feet by 52 feet. The building is constructed of lumber covered with corrugated galvanized iron, and it is lighted by electricity. It will be heated by tramway has been constructed between the mine and mill, the distance between the terminals being about 3,500 feet, with one span of 1,260 feet. The difference in elevation is about 1,500 feet. It is a "one-man system," one man at the upper terminal operating it. There are ten buckets and these are loaded and unloaded automatically. The height of the towers ensures these travelling clear of ten feet of snow—a greater depth than is usually experienced here. Provision is also made, by means of carriers, for taking up timbers any length not exceeding 40 feet. There is as well a passenger car to accommodate one person at a time. This tramway was completed early in September and has since been in use.



A typical view of the Selkirks.

either stoves or hot-water radiators. Besides the stamp batteries the plant here includes a 7 x 10 Blake rock crusher, three automatic sizers, three Frue vanners (one having a corrugated rubber belt), a 4-foot Pelton wheel which runs the entire mill—crusher, stamps and tables—and a 5-foot Pelton supplying power to the first half of a 10-drill duplex Rand air compressor from which an air pipe line runs up to the mine. A 250-light dynamo is direct-connected to its own Pelton wheel. The hydraulic plant is driven by water conveyed 150 feet in a 3-foot flume from a dam on Pool Creek to a 4 foot by 4 foot by 12 foot penstock and thence in riveted steel pipe, first of 18 inches in diameter and then of 16 inches, to the water wheel, giving a pressure lead of 270 feet. A Riblet aerial

EVA GROUP.—The Eva group, consisting of the Eva, Highland Mary, Iron Dollar, Joker, Highland Mary Fraction and Last Chance mineral claims, is held by the Calumet & B. C. Gold Mines, Ltd. Mr. J. F. Musselman, of Nelson, B.C., is managing director, and Mr. John Knox, Jr., M.E., of Camborne, superintendent. The Eva is located on the west slope of Lexington Mountain, above Pool Creek, and about a mile and a half north of where that stream enters Fish River. Three years ago it was acquired by the Imperial Development Syndicate, of Nelson, and under the energetic management of Mr. A. H. Gracey, M.E., it was developed into a very promising gold mine. In September, 1902, the MINING RECORD published the following relative to this property: "In point of location

and amount of work done the Eva is the premier free-milling gold property of the camp and district, and other properties there are that have as good showings as had the Eva at the same stage of development, but the Eva, with 2,000 feet of underground work done; with one ore shoot 200 feet long, and from one foot to six feet wide of $30 ore, developed to a depth of nearly 3,000 feet, and another ore shoot 200 feet long and from 10 feet to 15 feet wide of $6 to $8 ore, developed to a depth of more than 100 feet; with immense bodies of lower grade ore developed to greater or lesser depth by other underground workings, and with several fine surface showings exposed by open cuts and strippings, but not yet under cut, needs only the installation of a reduction plant to qualify as a profitable producer." Since the foregoing—from the pen of a contributor familiar with the property and district—was first published the Calumet & B. C. Gold Mines Co., has further developed the Eva, with results that have induced the management to erect a 10-stamp

Head waters of Pool Creek.

mill at Camborne. Recent reports from the mine indicate that the quantity of ore of good grade available is now considerably larger and that the outlook is favourable for a lengthy and payable mill run. The mill is a Fraser & Chalmers 10-stamp section of a 40-stamp mill with stamps weighing 1,050 lbs. each. The building is of lumber with shingle roof. It stands on a graded site with the foundations of the battery frame resting on solid rock. The main building, including battery and vanner rooms, 32 feet by 80 feet, and the height from the lowest floor to peak of tower in which is situate the lower terminal of the tramway is 85 feet. The stamp mill is well finished and is equipped with automatic feeders. In the vanner room there are four 6-foot Frue vanners, one having a corrugated rubber belt. These are fed from a cone sizer. The machinery is driven by three Pelton water motors, one 65-h.p. operating a Comet B rock crusher, one of 135-h.p. driving the stamps, and one of 20-h.p. the vanners and a dynamo for a 200-light electric plant. A 25-h.p. boiler of locomotive fire-box type heats the mill building. The Peltons are impulse wheels working under a head of 400 feet. The water is brought from Pool Creek about 4,000 feet to a penstock above the mill in 24-inch by 36-inch covered flume. The country over which the flume passes consists of a series of rock bluffs crossed by small snowslides, necessitating the cutting of a bench for the flume the entire distance. A rivetted steel pipe 1,000 feet long, diameter 18 inches and 16 inches, conveys the water from the penstock to the Pelton wheels. The Riblet tramway is 4,200 feet between terminals. It has one span of 1,900 feet and passes over a high ridge before dropping 200 feet at a 45-degree slope to the upper terminal. The fixed cable on the loaded side is 1-inch and on the return side ⅞-inch, whilst the traction rope is ¾-inch. The capacity of the tramway is about 100 tons every ten hours. The buckets each hold 10 cubic feet. They are not detachable, but are securely fastened to the traction rope, this ensuring the advantage of never having a bucket run away.

Cholla Group.—The Cholla group consists of ten claims, situate in the neighbourhood of the Oyster-Criterion and Eva groups, namely, the Cholla, Tucson, L. V., Blue Jay, Dora, Thelma, Clara, Treadwell, Thelma Fraction, and Canyon Fraction. They are owned by the Imperial Development Syndicate, Ltd., of Nelson, the company that developed the Eva property and sold it to the Calumet & B. C. Company for $250,000, one fifth in paid-up stock in that company and the balance in cash, part of which has already been paid. From the manager, Mr. A. H. Gracey, it was ascertained that twelve veins in all have been discovered on the group, but only surface prospecting has been done on most of these. Development has been proceeding for some time past on the Cholla, Blue Jay and Thelma. No. 1 tunnel has been driven about 150 feet on the vein and some 50 feet beyond as a cross-cut. From this tunnel a winze was sunk 50 feet in a vein of free-milling ore of a payable grade and varying from 30 inches to 5 feet in width. Streaks of the ore are high grade, and it is estimated the whole vein will average about $10 in gold, besides 3 to 4 per cent. of concentrates carrying values in iron pyrites and galena. No. 2 tunnel is a cross-cut, in more than 100 feet when the district was visited and then thought to be within 25 feet of the vein. A drift tunnel had been commenced on the Thelma on a vein stripped on the surface for 700 to 800 feet, and showing 5 to 8 feet of solid quartz. The shoot of ore where the drift was started was above the average grade of this vein, running from $10 to $13, but not sufficient work had been done to show whether or not there was any considerable quantity of ore of this grade. Six men were employed on the property.

Camborne Group.—The Camborne group of nine or ten claims had been operated by the Northwestern Development Syndicate, Ltd., of Nelson, B.C., and Hancock, Michigan, U.S.A., but last August financial difficulties necessitated a suspension of work at both mine and stamp mill. This company is at the time of writing the only one in Fish River camp that has sent out gold produced in a stamp mill though it is probable the Eva and Oyster-Criterion mills will have become

producers before this appears in print. The MINING RECORD has already criticized the mismanagement that so embarrassed this company as to compel it to suspend operations after fairly entering upon what for a time bade fair to prove a period of profitable production, so nothing need be added here to those strictures. The Gold Finch claim is still believed to be, in competent hands, the making of a payable mine, so it is to be hoped the company will get over its troubles and yet make a success of its undertaking. The claims are situate on Menhinick Creek., which furnishes an excellent water power to drive a 4-foot 6-inch Pelton wheel, this operating two dynamos which generate power to run the Hammond 10-stamp mill installed here, and to work the Durkee electric drills used in the mine. A Hammond aerial tramway, 4,800 feet in length and having 12 buckets with a carrying capacity of 800 lbs. each, connects mine and stamp mill. The difference in the elevation of the terminals being about 1,600 feet. As the lead known as the Eva vein is believed to extend across Fish River and through the Camborne group there appears to be good reason to regard the property as a valuable one, especially as the surface showings of free gold ore were about the best to be seen in the camp. The Northwestern Development Syndicate owns some fine timber lands along Fish River and a half interest in the Goldfields townsite situate less than a mile from the stamp mill.

AROUND CAMBORNE.—Among the many other claims in the camp the writer heard mention made of were the following: The Lucky Jack group of eight claims, on Lexington Mountain, is owned by Butler and Rowland, who were working on a big lead. The Sir Wilfrid group, on Pool Creek, of four claims was stated to have several strong leads, one showing 22 feet of solid quartz mineralized with iron and copper and carrying about $4 in gold to the ton. The Alma group of three claims, owned in Toronto, was described as having one of the best showings in the camp—about four feet of solid galena, running about 60 per cent. lead, 30 to 35 ozs. silver and $5 to $6 gold—but not much development work had been done on this property. The Western Star group had been acquired by the Elwood Tinworkers' Association, an Indiana organization also owning the Copper Dollar, on Lexington Mountain. The Black Bear and Wide West groups, on tributaries of Pool Creek, near its head waters, have good showings of galena, in opening up which much work has been done. The Homestead group of 12 claims, situate on Mohawk Creek and owned by Mackay Brothers and Stroutt (who also own the Sir Wilfrid group) has some tunnelling and a deal of open-cut work on six parallel leads, varying in width from two feet to 12 feet. On one of these there is a nice showing of free gold, whilst the others give fair values, prospecting well with the horn.

ABOUT GOLDFIELDS.—In the neighbourhood of the Goldfields townsite are many claims besides those already named. The Lily group close by has free-milling ore assaying $12. A lot of prospecting has been done on the Swamp Angel group. The Independence group has the same lead as the Goldfinch, which claim it adjoins. Beyond is the Union Jack group, with but little work done. Across Fish River is the Stockholm, adjoining the Eva group, and on one of the same leads, and nearby is the Copper Dollar, another good claim.

Just one more group will be mentioned—the Nelson group, situate about four miles from Camborne, at the head of Ten-Mile Creek. It consists of the Nelson, Gold Flake, Gold Medal and Bronze Medal, owned by Messrs. Cory Menhinick, Geo. Young and Gus. Sandham. The lead is a new find, the first in that part of the district. It has been opened up in three places, free gold showing in each and the values being good. Of course many properties of merit have been omitted from this summary, for the Lardeau district covers a large extent of country, much of which is mineral-bearing. It is a region of big possibilities and although its progress has not been rapid, the outlook for it is more favourable now than at any previous time in its history.

B. C. COPPER CO.'S SMELTER, GREENWOOD.

THE B. C. Copper Co. recently made arrangements to obtain from the Cascade Water Power and Light Company's power works at Cascade electric power with which to operate the plant and machinery at the Greenwood smelter, now run by steam. The preliminary agreement provides for the supply of up to 500 horse-power for a period of three months. Later, after the smelter plant shall have been added to, more power will probably be required for the enlarged operations then to be undertaken. A contract has been let for putting up the necessary transmission line between the electric power sub-station at Phoenix and the smelter at Greenwood, a distance of nearly five miles, and a sub-station is being built on the smelter site. Although the pole line will be erected before the winter shall set in it is unlikely that it will be practicable to make the change at the smelter until early next year, since it will take some time to manufacture the requisite motors and other plant.

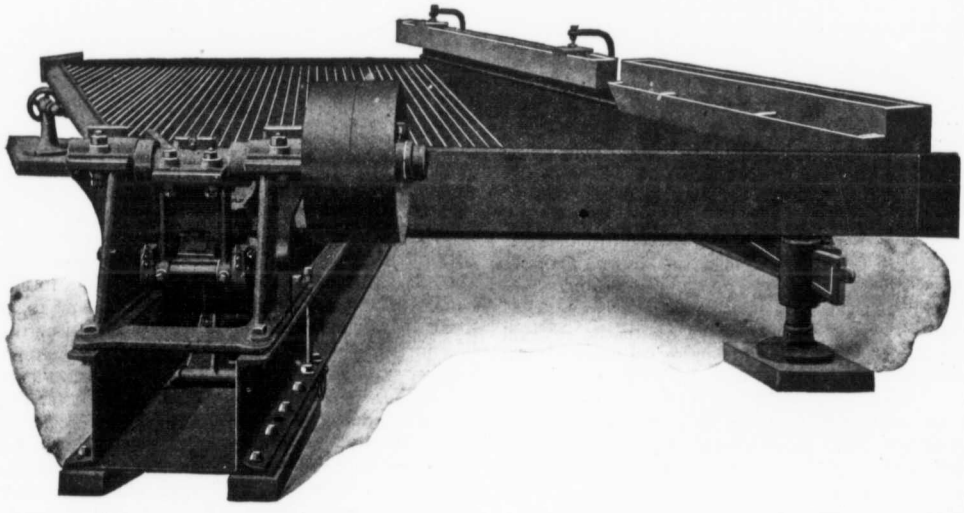
After a long delay the locomotive manufactured by the Canadian Rand Drill Company for hauling the slag cars at the Montreal & Boston Copper Company's smelter, Boundary Falls, has arrived. The five-ton cars have been lying at the works for several months awaiting the receipt of the locomotive before they could be used for the purpose for which they were obtained.

B. C. Riblet has received an order for a short aerial tramway from the upper workings of the Silver Cup mine, Lardeau district, to the upper terminal of the 8,000-foot tram already in operation between the mine and the waggon road at Eight-Mile.

A Baldwin locomotive and several cars for dumping slag hot instead of granulating it, have been received at the smelter, and rails have been laid for the slag train to travel over. The slag cars were made at the Union Iron Works, Spokane, Washington. Lack of dump room for granulated slag, which, including the requisite fall for the water to carry it away, has to be spread over a comparatively large area of ground,

necessitates the change being made from granulation to hot dumping.

The company has ordered from the Allis-Chalmers Company, of Chicago, a convertor plant. After its installation the matte produced will be converted into blister copper at the company's own works instead of as at present, being shipped as a 45 to 50 per cent. matte. There will be two stands of 10-foot 6-inch converters, the blast for which will be furnished by a Nordberg blowing engine run by a rope drive from a 300-h.p. induction motor. The requisite crushing and re-lining machinery for the converter shells, and the structural steel for a converter building, together with a 40-foot travelling crane with main and auxiliary hoists, were also included in the order. The site for the converter building has already been graded and the masonry retaining walls, dust chamber, and base for the steel plate stack built. The new plant will be installed as soon as received from the manufacturers.



THE OVERSTROM CONCENTRATOR.

THE Overstrom concentrator No. 3, as redesigned and as now manufactured by Allis-Chalmers Company, is made of structural steel and iron, with the exception of the table top, by which rigidity of frame and smoothness of motion are secured. There are three features wherein special improvements have been made, viz., head motion, reciprocating motion and carrying mechanism of the table top. The motion is imparted to the table by means of rocking arms at the head and tail ends of the table, the rocking arm at the head end being connected with the head motion by means of a connecting rod and cast steel yoke. The rocking arm at the tail end engages the spring, which is held in an adjustable spring seat. These rocking arms are carried on steel shafts and the table is always in tension by means of the spring at one end and the head motion at the other, acting against the table pullers through the rocking arms. The reciprocating motion, which tends to bring the particles of ore forward in the direction of the line of reciprocation, has greater action on particles of mineral which are near the table surface than on the lighter gangue, which rides on the top. The table top is reciprocated on four hollow steel rollers, each six feet long by one and one-quarter inches in diameter, which roll between roller seats. The arrangement is such that in the course of an hour's motion the rollers have turned one revolution, thus making the wear uniform and imparting a smooth, noiseless motion. The table top is characterized by double tapered riffles, which are one thirty-second of an inch high at the head end, gradually increasing in height till they reach three-sixteenths of an inch in height in the length of six feet. From this point they diminish in height to a feather edge at a point twenty inches from the discharge end. The table top is diagonal to the line of reciprocation. The flow of water is in a direction transverse to the reciprocation motion of the mineral. Gravity acts on the mineral vertically, the reciprocating motion and flow of water in horizontal lines.

WATERLOO MINE, CAMP McKINNEY.

UNDER its present management the Waterloo mine, at Camp McKinney, continues to make good progress. The net receipts from gold and silver recovered during the four months, from the middle of June to the middle of October, the five-stamp mill at the mine had been running when this information was obtained from the company's head office, Spokane, Wash., were about $22,000, this amount including $3,854.96 received early in October from the Trail smelter for a carload of concentrates and sorted ore shipped from the mine in September.

From about 18 tons (dry weight) of concentrates the yield per ton was, gold 5.62 ozs., silver 7.50 ozs., and from 11 tons of sorted ore, shipped to fill up the 30-ton car, a return of 9.81 ozs. gold and 12.50 ozs. silver per ton was obtained. The average assay, made at the mine during the month of August, of daily grab samples was about $24, the daily assays ranging from $12 to $46. The concentrates during the same month gave an average daily assay of about $94 per ton. During September the daily assays of ore ranged from $9.80 to $78, and the average for the month was $30.65, whilst that for the concentrates was $90.53 per ton. From 60 to 65 per cent. of the values of the ore milled are saved on the plates and about 10 per cent. in the concentrates. The tailings assay from $5 to $7 per ton, and these are impounded, the intention being to shortly put in a small cyanide plant to treat them.

When work was resumed at the mine last spring the development work done by the old company consisted chiefly of a shaft sunk 160 feet, a drift run about 100 feet at the 60-foot level, and a cross-cut at the 150-foot level, which had just cut the vein. Since then the shaft has been deepened to 270 feet and a cross-cut driven nearly 100 feet at the 250-foot level. As the latter did not encounter the vein, as expected it would, a winze was sunk on it 60 feet from the 150-foot level when it was found that it had faulted and that consequently its direction was different to that calculated on, which accounted for the 250-foot level cross-cut not striking. An incline was made from the 250-foot level through country rock to the bottom of the winze for ventilation, and since then work in the mine has been largely restricted to stoping on and above the 150-foot level, the management having satisfied itself that the vein lives down to the lower level reached. A blind lead was passed through by the cross-cut on the 250-foot level, but as the object then was to reach the main lead no work was done on the former, which will, however, be prospected shortly.

Five additional stamps, ordered from the Risdon Iron Works, San Francisco, are expected to reach the mine by November 1st, and it is thought these will be in operation at the mill about three weeks later. A second Wilfley table is now on the way from Denver, Colorado.

ALASKA SMELTING AND REFINING CO.

MR. PAUL JOHNSON, M.E., smelter manager for the Alaska Smelting and Refining Co. (an auxiliary company organized by the Brown Alaska Co.) has lately been in Spokane, Washington, ordering machinery and plant for the sample mill of the smelting works he is erecting for the company at Hadley, Prince of Wales Island, S. E. Alaska. He placed an order for the rock crushers, rolls and steam engine with the Allis-Chalmers Co., of Chicago, through that company's Spokane agents, the Bradley Engineering and Machinery Co., and one for the automatic samplers, shafting, pulleys, etc., with the Union Iron Works, of Spokane. The crushers are to be Gates gyratory crushers, one each No. 6, No. 3 and No. 1, with a style B Gates sample grinder and two F crushers in the bucking room. Paul Johnson's automatic system of sampling is to be used in the mill, and there will be four of the Johnson samplers—one each Nos. 1 and 2, and two of No. 3. The machinery will be operated by an 18 x 36 Reynolds-Corliss engine of about 150-horsepower.

The big crusher (No. 6) will be placed on the ground floor level, to secure a solid rock foundation for it. A bucket elevator, with 14 x 7 x 12 buckets on a rubber belt, will elevate the ore to the No. 1 automatic sampler, which will cut out 20 per cent. of the ore, passing this on to No. 3 crusher and thence to No. 2 sampler, which will in turn discard 80 per cent. of the ore it receives. The retained ore will then be elevated by a bucket elevator, having 7 x 4½ buckets on a rubber belt, to the No. 1 crusher whence it will fall to the No. 3 sampler which will reject 80 per cent. The ore will then pass through 10 x 16 rolls and into the fourth sampler (of a similar size to No. 3) whence 20 per cent. of it will be taken to the bucking room, where the sample grinder and F crusher will further reduce it, making it into a pulp for the assayer. The second F crusher in the bucking room will be used for crushing matte for sampling purposes.

The sampling plant will be housed in a lumber building 60 feet long, 53 feet high, and 69 feet wide in its lower portion with a width of 30 feet in the higher part. Immediately to the east of it will be four ore bins, having a total capacity of 1,200 tons, these to be connected with the Brown-Alaska Company's mines by a tramway. On the west another set of bins of similar capacity will be used for custom ores which will be conveyed to these bins over a tram connecting them with the landing wharf. The two lower groups of ore bins, placed between the sample mill and the furnace house, will have a total storage capacity of about 10,000 tons. Mr. Johnson intends to make a new departure here by using belt conveyors, instead of ore cars pushed over tram-lines, to convey the ore from the upper bins to the sampler and from the mill to the lower bins. Large side-dumping cars will be used to run the ore from the lower bins to the furnace, into which they will dump it, thus dispensing with the men as feeders.

It is intended to have the sample mill completed by January 1st next, when the company will commence purchasing custom ores in readiness to start the furnace about two months later.

RECENT METALLURGICAL PATENTS.

Mr. Rowland Brittain, patent attorney, Vancouver, sends us the following report:

Treatment of Sulfide Ores, U.S. Patent No. 740,701 issued October, 6th, 1903, to Amedee M. G. Se-Billot, of Paris, France.

Claim: A process for treating ores containing sulphur consisting of sulfating the ore in a closed vessel by the action of sulfuric acid upon the metallic sulfides at a temperature above its boiling point and simultaneously recovering the sulfuric acid used, calcining the sulfated ore at a temperature of 700 degrees centigrade to dissociate the sulfate of iron to prevent dissolving of a too great quantity of sulfate of iron in the lixiviating liquors, and then lixiviating the calcined ore.

SOME NOTES FROM THE MINING CAMPS.

ATLIN.

STEADY and satisfactory progress is reported from all the mining districts of the Province. Returns of the season's operations in Atlin are of a generally favourable nature, although early in the year work was seriously interfered with by high water, followed by labour troubles, Nevertheless, it is thought that the gold yield will again show a further increase. Good returns have already been received from McKee, Birch, Wright, Otter, Slate and Pine creeks, while there is every prospect that the clean-up on Boulder Creek will be exceptionally heavy. The British American Dredging Company recently completed the installation of a dredging plant, at the cost of $200,000, on its property in this district, and more attention has been directed this year to the development of quartz prospects. Last month a large sale was effected of 1,900 acres of bench and creek leases on McKee and Eldorado Creeks, and preparations have already been made for the equipment of this property in readiness for the early commencement of mining operations next spring.

Some interesting exploratory work has been prosecuted during the summer beyond the boundaries of the known mineralized area in the Atlin district. In one instance efforts in this direction have apparently met with the promise of success, and large deposits of auriferous gravel in the upper water shed of Dixi Creek, to the southeast of Pine-Spence Valley, have yielded by preliminary test very fair returns. The syndicate undertaking this work installed during the season a small hydraulic plant and constructed 2,500 feet of ditching, with a view to commencing other washing operations next spring. There is meanwhile strong grounds for the belief that in this and other mining districts of the Province much attention will be directed next year to the exploitation of the unexplored mineral areas. In Poplar Creek, for example, the authority of so well informed a man as Mr. John Keen, president of the Mining Association, is likely to attract as many as five thousand prospectors when the spring opens, but as all the available ground on this creek and its vicinity has already been staked for many miles, it follows that the men who go in will strike out for the comparatively unknown territory beyond. Again in the case of the Similkameen and the west fork of the Kettle—the latter, it is expected, to be shortly opened up by a railway—prospecting is becoming much more active.

CASSIAR.

Hydraulicing operations on Thibert Creek have been concluded for the season, the company having met with very fair success considering that work was necessarily restricted by unfavourable weather conditions to which a shortage in water supply is attributable. The value of the clean-up is reported to have been between twenty-five and thirty thousand dollars, which compares very favourably with last year's results.

VANCOUVER ISLAND.

Regular shipments have commenced from Marble Bay, Texada. The Lenora, Mt. Sicker, continues to ship steadily, the grade of ore beinf, it is reported, higher. Coke is still being imported from Seattle as well as Comox, and a shipment of 3,000 tons from the other side has been delivered in box cars, *via* the Great Northern.

LILLOOET.

In the Bridge River district development work has been steadily prosecuted at the Ben d'Or, Lorne and Pioneer mines, while the Anderson Lake mines have made this year a very satisfactory showing, last month's clean-up having been a record one. Placer enterprise at North Fork has, however, been somewhat restricted by water shortage, but better results have been achieved had the machinery now on its way to the mine arrived earlier. Three thousand five hundred dollars is reported to have been recovered by the owners of th Lorne mine, who employ an arrastra in crushing the ore.

NICOLA.

Mr. B. F. August, a mining engineer of Columbia, Ohio, who recently visited the coal deposits at Coldwater, in the Nicola district, has expressed a very favourable opinion of the extent of the occurrences in that region, and for certain purposes the quality is all that could be desired. The chief present value of coal deposits in the interior depends largely on the coke-making properties of the material, and by present utilized processes in this Province, it does not yet appear that the Nicola coal in general would make a good coke. Mr. August believes, however, that a market for this coal could be found as far east as St. Paul, while he is by no means uncertain that it may not also be turned into account in the development of a local smelting industry.

ROSSLAND.

The Le Roi Company's last monthly report is decidedly more favourable in character than either the July and August reports. Not only are the returns for the month higher, the estimated profits being $17,000, but the manager intimates that an ore body over 100 feet has been located by diamond drilling at the 1,350-foot level.

The result of the preliminary trial runs of the new Elmore plant at Rossland are reported to have been eminently satisfactory. The mill has been in operation for the past two weeks, and from the results already obtained it is expected that it will be at least possible to make an average recovery of 90 per cent of the values. On one run a $3 ore yielded concentrates carrying $30 values, while there was practically no loss in tailings. With the plant as at present constituted, costs, it is expected, should not exceed $2 per ton. The Le Roi No. 2 mine for treatment by this plant has large reserves of both high-grade milling ore, ranging from $8 to $15 a ton and also an accumulation on the dumps of second-class material averaging less than $6.

Another successful mill run has been made by the lessees of the I X L mine, the clean-up after eleven days' working representing $1,800. The work of building heavy bulkheads, to close the ends of drifts on the six and eight hundred foot levels in the Nickel Plate mine, undertaken with a view to prevent the flow of water into the adjoining Centre Star property has now been completed. The Centre Star Company entered suit against the Nickel Plate some six months since, claiming damage on account of the sweepage of water in question, and in consequence the present attempt has been made by the latter to overcome the cause of complaint. Whether the measures adopted will prove efficacious, remains yet to be seen; hence the adjournment of the hearing of the case until December next.

NELSON.

The Athabasca-Venus appears to be in a more satisfactory position than for some time past, although it is doubtful whether the original shareholders will ever be able to realize fully on their investment. More attention has been paid of late to development work, but at the same time the monthly tonnage output of between seven and eight hundred tons has been steadily maintained. At the Athabasca some promising new stopes have been opened, and at the greater depth attained the formation appears to be less broken. Of course, if this last report is true, it will make the very widest difference in the position of the company, as the sole reason of failure heretofore may be attributed to the excessive cost of extracting the ore and developing the mine in a locality where geological disturbances were so great.

BOUNDARY.

The Granby mines in the Boundary district are installing two additional steam shovels for use in loading ore into the railway cars. Work on the new tunnel projected to reach the workings of the Old Ironsides mine at the 300-foot level has been commenced. There is decided activity throughout this district, and development work has recently been resumed on a number of the smaller properties.

FAIRVIEW.

In the Fairview district the Dominion Company has resumed operations and work is to at once proceed in the

development of the Okanagan Falls water power. More favourable reports have been received from the Stemwinder in the same locality, a high grade ore body having been recently encountered. It is reported that the directors have practically succeeded in marketing the issue of preference stock. At Camp McKinney, the Waterloo mine is this year doing very well, the clean-up amounting to $10,000 in September being again satisfactory.

KAMLOOPS.

An effort is being made to secure the capital necessary for the establishment of a smelter at Kamloops. The ores in this district average about eight dollars a ton and it is said, the mine development in the locality now justifies the erection of local reduction works capable of handling from two to three hundred tons daily. A concentrator is to be installed at the Iron Mask mine.

EAST KOOTENAY.

The re-organization of the Sullivan Mining Company, operating in the Kimberley district, East Kootenay, is proceeding in a satisfactory manner, and there is now every assurance that the additional capital of rather over $200,000 required will be raised by the issue of 5 per cent. first mortgage bonds. The mine is now shipping ore from the dump at a profit, 300 tons having been sent to the Nelson smelter during the past month. Mining operations have also been resumed. Later advices state that $50,000 of the company's indebtedness on account of smelter construction has been taken up by the issue of five-year first mortgage bonds bearing interest at 7 per cent. recently authorized by the company. The principal smelter debt, which, with interest, amounts to about $116,000, is due to 17 of the large stockholders, who agreed to accept bonds at par.

TEXADA ISLAND.

A Texada Island correspondent writes: Marble Bay mine has sunk its shaft another 100 feet, and is drifting to the ore body. Every level has shown a larger ore body than the one above.

The waste dump of Marble Bay, purchased by the Crofton smelter, is being shipped rapidly to Crofton. There is so much lime in the waste that it has been found available for fluxing.

Cornell mine is making regular shipments to Ladysmith. Drifting is continuing on the 560-foot level.

Copper Queen winze, on the 500-foot level, is down eighty feet. It is in solid ore from the collar down. Drifts will be run from the winze to prove the size of the ore body. If this is as big as hoped a large shaft will be raised from the 500-foot level and machinery installed.

The tunnel on the Puget Sound Iron mine property to tape the bottom of the shaft is in 100 feet. The work is being done with a steam drill. The tunnel will be about 400 feet long to the shaft, and give a depth of 150 feet at the shaft. This tunnel and the drift already run from the shaft give a depth of more than 300 feet of high-grade ore.

Work on the copper lead on the Puget Sound Iron mine property is continuing, and fine ore is being quarrier off the surface. A tunnel is being driven from the Paxton iron mine which, if continued, will tap the copper at a depth of about 250 feet.

The Cordillero continues drifting. Felsite has been struck in the Cornell, Copper Queen and Marble Bay. The same may be found in the Cordillero any day.

The Silver Crown, which was staked early in the summer, is giving promise of a good prospect. A little pick and shovel work has discovered galena in several places, with a well-mineralized vein several feet wide. The discovery is close to the line between the limestone and porphyry formations, and with a little development will prove valuable.

A trial shipment of ore from the Nutcracker recently has given satisfaction to the shippers and proven the value of the Nutcracker as a gold producer.

A good grade of copper-silver ore is being taken from the Golden Slipper.

COMPANY MEETINGS AND REPORTS.

GRANBY CONSOLIDATED MINING, SMELTING AND POWER CO., LTD.

The directors in submitting the report of the business of this company for the last fiscal year, state, "Operations have been greatly hampered by the difficulties that have existed in the coal and coke situation, which have necessitated the running of our smelter plant at practically only one-half its capacity. We are glad to state that these difficulties have now been overcome, and we look for no further trouble in this direction. Our smelter plant has now been increased by two furnaces, making six in all, which we expect will be run full from now on in place of the average of two furnaces as was the case last year.

The mines are now developed so as to produce a very large tonnage without further expenditure in this line. The plant at the mines and also that at the smelter are in the very highest state of efficiency. All development work and repairs have been charged to working expenses. Our company has no debt of any kind except current monthly accounts."

The following is a summary of the year's business:

The production for the year amounted to 12,551,758 lbs. Fine Copper; 277,574 oz. Silver; 35,121 oz. Gold, for which was received	$2,232,741 12	
Received from rents and real estate sales	38,511 80	
		$2,271,252 92

The above represents the *net proceeds* at Granby Works, freight to New York, refining and other charges being deducted from the gross receipts.

COSTS.

Working expenses at mine & smelter	$1,136,830 82	
Foreign ore purchased	72,954 06	
Foreign matte purchased	766,004 54	
		$1,975,789 42
Net profits for year ending June 30th, 1903.		$ 295,463 50
Surplus from previous year		398,071 93
		$ 693,535 43

DEDUCT.

Bonus, 1,000 shares treasury stock to valued employees.	10,000 00
Net surplus June 30th, 1903.	$ 683,535 43

As shown in detail in annexed statement of assets and liabilities.

There has been expended in new construction at the mines and smelter during the year $ 207,481 00

Mine development	(lineal feet)	3,127
Mine surface stripping	(cubic yards)	28,400
Granby ore shipped to smelter	(tons)	295,820
Granby ore smelted	"	289,583
Foreign ore smelted	"	7,690
Foreign matte treated	"	6,130

ASSETS AND LIABILITIES.

June 30, 1903.

ASSETS.

Cost of land, real estate, machinery, buildings, dwellings, equipment, etc.	$13,845,516 40
Cash, copper in transit and on hand, less advances	179,807 95
Store supplies	93,913 41
Accounts and bills receivable	55,496 82
	$14,174,724 58

LIABILITIES.

Capital stock	$13,363,030 00
Accounts payable, current for month	128,169 15
Surplus	683,535 43
	$14,174,724 58

Montreal, August 10th, 1903.

To the President and Shareholders of the Granby Consolidated Mining, Smelting and Power Co., Ltd.

Gentlemen,—We have examined and audited the books and vouchers of your company for the year ending 30th June, 1903, and find them correct.

We have gone carefully over the cash transactions and find the disbursements vouched for, and have also verified other general entries and totals.

The books and general system, and record of the financial transactions of your company, are systematically and satisfactorily kept.

W. A. MATLEY,
GARDNER STEVENS,
Auditors.

PROVIDENCE MINING CO.

The first annual meeting of the Providence Mining Company owning a high grade silver mine in the Boundary district was held in Greenwood last week. During the year 543 tons of ore were shipped, yielding a net profit of $31,192, or nearly $57.50 per ton. The cost of mining of $42.55 would here appear to be exceptionally high, but it is explained on the grounds that the ore bodies are very narrow, only averaging six inches in width, while the rock is exceedingly hard. The manager estimates that there is now in sight in the mine 750 tons of ore averaging $100 to the ton. The manager, for the present recommends the suspension of dividends for a short time in order to permit of the accumulation of a cash reserve fund, but the regular monthly dividend of 2 per cent. was declared for October. Another vein 12 inches wide, carrying equally high grade values was recently encountered at the 175-foot level, and adds further to the excellent prospects of the company.

NORTHWESTERN DEVELOPMENT SYNDICATE.

A meeting of the shareholders of this syndicate was held at Hancock, Michigan, on October 15th, to consider what further action should be taken with regard to operating the mines near Camborne. Nothing definite, however, was decided. Reports on the condition of the mine were read and considered. These reports merely confirm the information previously obtained to the effect that the property has been most culpably mismanaged. It appears likely, meanwhile, that steps may be taken to re-organize the company and resume operations under, it is hoped, better auspices. Should the necessary capital, however, not be obtained the ownership of the property will revert to Mr. Rosenberger, and the other creditors. It is estimated that $15,000 will be required to prove the property, while there is also a floating indebtedness of approximately the same amount.

WINNIPEG MINES, LTD.

The annual general meeting of shareholders of the Winnipeg was held at the mine near Phoenix last week. From the managing director's statement it appears that the property, at which operations were recently resumed, is in a more satisfactory condition and that with the moderate treatment rate offered by the Boundary Falls smelter, it will henceforward be possible to work the mine at a profit. Shipments are being made from the 50-foot level at present, and in the meantime the deeper workings are being unwatered. Mr. Plewman in his report further states that when the 100-foot level was unwatered a few days ago a considerable cave-in was disclosed. This level has been cleaned out, timbered where necessary and mining commenced, and in a few days a shipment will be made from what is known on the level as the Western or Copper vein. Unwatering the mine still continues, and we have now reached the 300-foot level, and in a few days we hope to have it pumped out. The main workings of the Winnipeg mines are on this level and it is expected to have it clained out, rails laid and all connections made by the time the compressor plant is installed.

"Instead of making any further appeals to the shareholders I hope to see the sale of the treasury stock altogether withdrawn in a few days. We still need that $5,000 as shown by the trial balance and financial statement (which speak for themselves), but with 29 cars of ore at or gone to the smelter, and regular shipments of 10 or 20 cars per week following, I have no hesitation in expressing my belief that the Winnipeg mine can take care of itself in the future."

The year's accounts presented to the meeting showed that there had been incurred an outlay of $31,189, of which $18,482 represented the direct cost of further development work. Ore extraction during the year brought in $6,074, and the remainder, the cash disbursed, came from assessments, sales of treasury stock, cash on hand at beginning of year, fire insurance and other resources. There were meanwhile owing $3,583 on bank overdraft, and $2,270 for unpaid labour and other current liabilities.

PERSONALS.

Mr. J. Cuthbert Welch left Crofton last month for the Le Roi smelter, at Northport, Wash., where he will act as assistant superintendent.

Mr. Geo. B. McAulay, of Spokane, Wash., managing director of the Cariboo McKinney Mining & Milling Co., is on a visit to Toronto, and may go thence to Bermuda for the benefit of his health.

Mr. Alexander Hill, of London, England, consulting engineer to the Le Roi No. 2, recently paid a visit to the company's mines at Rossland, afterwards going East *via* Spokane.

Dr. W. A. Hendryx, of Los Angeles, California, at one time associated with his brother at the Pilot Bay smelter, was at Spokane last month, where a test plant in connection with his electro-cyaniding process, was in operation.

General Chas. S. Warren has returned to Butte, Montana, from a visit to Rossland and Republic, where he holds mining interests. He will probably spend the winter in Tonopah, Nevada, in which mining camp he is also interested.

Mr. Albert I. Goodell, superintendent of the Montreal & Boston Copper Co.'s smelter, has returned to the works at Boundary Falls after a month's absence in the East. He was accompanied by Mr. H. T. Pemberton, of Montreal, Quebec, who has been appointed business manager for the company.

Mr. Chas. Elmore, inventor and patentee of the Elmore oil concentrating process, has been at Rossland for several weeks watching the completion and starting up of the concentrating plant the Le Roi No. 2 has put in there for the concentration of its lower grade ores by the Elmore process.

Mr. F. V. Marment, a director of the B. C. Exploring Syndicate, was last month reported to have left London, accompanied by Mr. Wm. Jones, who is to report on the Iron Mask mine, Kamloops, on behalf of the Ashanti Lands, Ltd.

A coal mining expert of continental reputation, Mr. H. B. Wright, has arrived at Fernie to take the position of chief engineer for the Crow's Nest Pass Coal Company. He is a native of Quebec, but spent 15 years coal mining in West Virginia. He is naturally impressed by the possibilities of the Crow field in which his professional work is now to be done.

Mr. H. T. Pemberton, of Montreal, Quebec, has been appointed business manager for the Montreal & Boston Copper Company. He accompanied the superintendent of the company's smelter, Mr. A. I. Goodell, to Boundary Falls on that gentleman's return from Montreal about the middle of October.

Mr. J. Cuthbert Welch, formerly of the Trail smelter and afterwards assistant superintendent at the Montreal & Boston Copper Co.'s smelter, Boundary Falls, has been appointed assistant superintendent at the Le Roi Company's smelter at Northport, Washington.

Mr. Paul Johnson, M.E., smelter manager for the Alaska Smelting & Refining Co., for whom he is erecting a smelter at Hadley, Prince of Wales Island, S. E. Alaska, recently spent a week at Spokane, Washington, where he placed orders for machinery and plant for the smelter sample mill. He left that city on October 15, on a fortnight's trip to Salt Lake City, Denver and smelting centres in Montana, and expects to return to Hadley, *via* Seattle, Wash., early in November.

MACHINERY NOTES.

TWENTY-TWO carloads of machinery arrived at Lytton from England during the month, for a dredge that is being built to operate at the mouth of the Thompson River by the Fraser River Gold Dredging Co.

A compressor plant and other machinery is being installed at the Gribbell Island mines, from which shipments are to commence shortly.

The Mt. Baker & Yale Mining Co. has purchased a 10-stamp mill, and other plant which is to be installed immediately.

The Bull River Mining & Power Company—a recent promotion—is installing a large plant for developing the water power at Bull River Falls, East Kootenay.

The capacity of the aerial tramway installed last year at the Tyee mine, Mt. Sicker, is being doubled, the property being now in a position to greatly increase shipments to the smelter.

A very complete concentration plant is being built by the Vancouver Engineering Works for the Iron Mask mine at Kamloops.

The Star Mining & Milling Co., of Nelson, has leased the Poorman-Granite mill and tramway. The latter mine has been closed down indefinitely.

Work is steadily progressing on the installation of the seven-drill compressor plant at the Oro Denoro in the Boundary district.

While the new cylinders to replace those which exploded a few weeks ago in the 60-drill Granby compressor, are being manufactured in Sherbrooke, Que., the old steam plant is being utilized at the company's properties in Phoenix. The new cylinders have been shipped from the makers, and are expected to arrive shortly.

COMPANY NOTES AND CABLES.

TYEE COPPER COMPANY.—Results of smelting for 30 days of September were as follows: Smelter—Tyee ore, 4,417 tons; custom ore, 440 tons; total, 4,857 tons. Matte produced from same, including 130 tons low-grade matte, 532 tons; gross value of contents (copper, silver and gold), less costs of refining, $58,222.

LE ROI.—The manager's cabled report for September reads as follows: "Shipped from the mine to the Northport smelter during the past month 11,583 tons of ore, containing 5,561 oz. of gold, 5,015. of silver, and 232,750 lbs. copper; estimated profit on this ore, $17,000. Shipped from the dump to the Northport smelter during the past month 6,277 tons of ore, containing 1,733 oz. of gold, 1,650 oz. of silver, and 70,942 lbs. copper; estimated profit on this ore, $5,250." As regards development, the manager states that he is proceeding in accordance with the plan outlined in his cable of 9th September last, which was as follows: "Have commenced to drive on the line of diamond drill hole No. 7 (previously reported as indicating apparently high-grade ore) and south 1,350 level cross-cut, prospecting for ledge over 100 feet in width, will occupy at least sixty days' time, so as to prove the value of these ore bodies."

LE ROI No. 2.—From the mine manager's report for the month of August: Output—Since last report there have been shipped to the smelter 1,497 tons, containing gold, 975 oz., at $20 per oz., $19,495; silver, 2,672 oz., at 0.54¾ per oz., $1,463; copper, 93,329 lbs., at $0.13⅛ per lb., $12,249; total, $33,207. The value per ton of ore shipped was, therefore, $22.18. The proceeds of the ore shipped amounted to $20,239, or $13.52 per ton. Freight treatment and smelting deductions amounted to $8.66 per ton. Exploration—Jose mine—500-foot level. —A stringer of ore in hanging wall side of drift was followed but finally abandoned, pending further investigation with diamond drill. The information required was subsequently provided by diamond drill hole No. 36. 600-foot level—75 feet. were driven, but the showing continued to be poor, averaging about $4 to $4.50, until we decided to improve ventilation by breaking through into winze from 500. In doing so we encountered the main portion of the lead, which gave us exceedingly rich copper values The high percentages of copper were quite unexpected after the comparatively poor values we found in the face of the original drift. We are now investigating this new stuff In the tramway tunnel the ledge matter has been followed as closely as possible; there is, however, a streak of waste running right down the mine at this place, and diamond drill work will now be advisable to save time. Diamond drill work—In hole No. 32 we met with nothing. In hole No. 33 we met with ore at from 52 feet to 58 feet, which is evidently the same lead as in No. 31, from 71 feet to 80 feet. It is this ore that we are now about to drift into from the Annie dyke. Holes 34 and 35 encountered nothing but mineralized ground, showing that the heavy copper values found on 600, east of Annie dyke and below ore body No. 9 had not penetrated to 700. Hole No. 36 on the 500-foot level had encountered nothing up to the end of the month. No. 1 mine—No. development work of any importance has been done here during the month. The drifts have been widened out in one or two places, as shown on plan, but remainder of work has been stoping. General remarks on stopes—Josie mine: No. 20—This still continues very good. At east end there are two dykes, between which the ore is bunched up. This gives us an excellent chance to make a cheap raise through to the 300 without breaking any dyke matter into our fines. Besides tracing the upward run of the ore body, this will improve the ventilation. No. 9—The stope continues to be the best in the mine, in spite of our fears when we first opened up there that the ore body would speedily pinched out; it shows no sign of doing so as yet. No. 1 mine—This mine, under present circumstances, is hardly paying for itself; it is acting as a drag on the Josie, and should be shut down till cheap smelting rates are obtained. When these can be secured, it will be a great help to the Josie, instead of a hindrance. Forecast for September—In the Josie, diamond drill work will continue on the 500, drifting on 700, and drifting and diamond drill work in tramway tunnel. Work on 600 will be directed to opening up downward continuation of ore body No. 9. All work will be pushed westwards to investigate virgin country in Annie claim.

ARLINGTON MINE (Erie).—During the month of September there were shipped five carloads of ore to the Hall Mines Smelter, Nelson. The net smelter returns were $5,341.95, being an average of over $1,000 a carload. The expenses in Canada for the month were $4,322.03, leaving a profit of $1,003.64.

MOLLY GIBSON.—At a meeting of the directors of the Molly Gibson Mining Company at Sherbrooke in October, Mr. W. Farrol, general manager of the Eastern Townships bank, was appointed president in the stead of Col. W. S. Ray. Mr. C. F. French was appointed secretary-treasurer. It is expected that work will be resumed on the property at an early date, but nothing definite has been received yet by the local representative of the company.

YMIR.—A circular has been recently issued to shareholders, from which the following information is taken: "The mine manager reports the return for the month of August, by cable, as follows: Fifty stamps ran 27 days, and crushed 4,200 tons (2,000 pounds) of ore, producing 686 oz. bullion. The estimated realizable value (gross) of the product is $7,750; 240 tons of concentrates, shipped, gross estimated value, $4,750;

cyanide plant treated 2,850 tons (2,000 pounds) of tailings, producing bullion having estimated gross value of $1,500; sundry revenue, $1,030; total $15,030; working expenses, $18,000; loss, $2,970. There has been expended during the month on development, $7,750."

The circular adds: "The low return for August, for which the Board was prepared, is due to the fact that until the completion of the development work for opening up the lower levels where the rich ore has been met with the available mill feed has been confined to a small and decreasing area. The mill, in consequence, could not be kept running at its full capacity on payable ore."

The manager states: "I expect to keep the full mill going right through the winter." In a cable dated the 10th October the manager reports he has already commenced to treat the higher grade ore met with in the lower levels.

CARIBOO CONSOLIDATED.—Sir Bevan Edwards, chairman of the Cariboo Consolidated, Limited, who has been spending some weeks at the company's property, has addressed a letter to the London board, expressing a very hopeful view of the future of the undertaking. An extract from the letter in question reads as follows: "The manager, Mr. Bailey, has done splendidly, and everything is not only up to date, but he will make a large saving on his original estimates. Everything has been done in the most careful and economical manner, and the work he has done is the talk of the whole country. Nothing like it has been done in Cariboo before. There is no doubt now that our prospects are extremely hopeful, and provided he meets with no difficulty in getting into the channel (which, however, I do not anticipate) he is bound to make a brilliant success. Of course, from the data we have it is impossible to state exact figures, but I feel confident that the returns we shall get will far exceed your expectations, and this one shaft alone will give us between 30,000 and 40,000 ounces a year, based on the most conservative estimate. The second set of borings are giving excellent prospects, which should give us a second valuable mine, which may in all probability give almost as good returns as those we expect to get from La Fontaine."

MINING RETURNS AND STATISTICS.

NELSON.

THE Hall Mines smelter shipped 420 tons of bullion and 140 tons of copper matte in August; and 452 tons of bullion in September. The bullion was consigned to the Selby refinery, San Francisco. The smelter received 4,452 tons of ore in August and 4,313 tons in September.

The United States Assay Office, Helena, reports the receipt of gold to the value of $22,472 from British Columbia during September.

YUKON.

Records from the Comptroller's office at Dawson show that gold shipments during the months of May, June, July and August of the present year reach a valuation of $6,957,133, or a decrease of $1,101,664 compared with returns for the corresponding period of last year.

Returns from the Seattle office for the five years to July 15th, 1903 are:

Nome, Alaska	$11,285,971 08
Balance of Alaska	2,654,037 79
Total for Alaska	$13,940,008 87
British Columbia and Canada	3,428,780 47
British Yukon (principally Klondike)	54,842,144 37
Washington, Oregon, Idaho and Montana	1,153,856 47
Total	$73,364,790 18

BOUNDARY.

Ore shipments for the year todate now exceed half a million tons. For the year to date the production of individual mines has been as follows in tons: Granby, 286,848; Mother Lode, 101,511; Snowshoe, 60,112; B. C., 19,365; Emma, 15,284; Sunset, 14,801; Oro Denoro, 9,436; Morrison, 3,339; Athelstan, 2,640; Winnipeg, 1,840; Providence, 705; Elkhorn, 173.

ROSSLAND.

Returns of ore-production from Rossland from January 1st to October 24th in tons are: Le Roi, 170,915; Centre Star, 65,536; War Eagle, 48,105; Le Roi No. 2, 21,855; Jumbo, 2,643; Spitzee, 300; I X L (milled), 1,310; Kootenay, 5,794; Giant, 828; Iron Horse, 40; Velvet, 3,376; White Bear, 297; O. K. 25; Homestake, 90. Total, 322,114 tons.

SLOCAN.

The following shipments have been made since January 1st: American Boy (tons), 708; Antoine, 212; Arlington, 40; Alberta, 3; Black Prince, 17; Bondholder, 2; Bosun, 99; Blue Bird, 57; Cripple Stick, 2; Dayton, 4; Dolly Varden, 20; Enterprise, 675; Fisher Maiden, 280; Hartney, 42; Hamilton, 4; Highland Light, 2; Idaho, 170; Ivanhoe, 715; Lucky Jim, 103; Mercury, 62; Monitor, 660; Mountain Con., 20; Meteor, 52; Ottawa, 126; Payne, 1822; Queen Bess, 204; Rambler, 1448; Reco, 153; Republic, 70; Ruth, 641; Rio, 9; Red Fox, 119; Slocan Star, 2025; Slocan Boy, 16; Silver Glance, 55; Surprise, 5; Vancouver, 20; Wonderful, 23. Total tons, 11,685.

COAL EXPORTATIONS AND TRADE.

There has been little change in market conditions during the past month. The outlook, however, continues satisfactory and the Vancouver Island collieries are gradually again increasing production. The Western Fuel Company at Nanaimo is adding to its equipment and plant, and recently ordered through the Vancouver branch of the Fairbanks Company a 400-h.p. Rand compressor, which is to be completed and installed by January 15th, 1904. This company shipped to Puget Sound points 14,125 tons of coal in September.

Production from the Crow's Nest collieries in September aggregated 63,191, of which 17,350 represented coke shipments.

LOCAL STOCK MARKET FOR OCTOBER, 1903.

Prepared by the Stuart Robertson Co., Ltd., Stock Brokers, Victoria, B.C.

Companies.	Highest. Bid.	Lowest. Bid.
Cariboo-McKinney	7½	7½
Cariboo Hydraulic	75	75
Centre Star	20	19½
Crow's Nest Pass Coal	72.50	62.50
Fairview Corporation	3	3
Iron Mask	6	6
North Star	9½	8½
Payne	12½	12
Rambler	38½	31
Sullivan	4½	4
War Eagle	10½	10
Waterloo	5½	4
St. Eugene	40	40
Granby	3.75	3.75
Black Tail	2	2
Lone Pine	2	2
San Poil	2¼	2
Tom Thumb	3	2
Mountain Lion	22	20

THE METAL MARKET.

The feature of the month has been the remarkable advance in the price of silver which has been quoted as high as 61¾. This is the highest point reached since February, 1901. In January of this year the average price of the metal was a

fraction over 45.50, and since then the advance has been practically continuous. The outlook at present is regarded as decidedly satisfactory and no re-action is immediately anticipated.

Copper has been fairly active, but prices have remained largely unchanged. The latest quotations are Lake, 12⅝ to 12¾; electrolytic in ingots, cakes and wirebars, 12½ to 12⅝; cathodes, 12¼ to 12⅜; casting copper, 12¼ to 12⅜. The *Engineering and Mining Journal* states that the statistics for the first half of October show a decrease in the visible supplies of 600 tons. The American lead market is quiet and no change is reported. The price quoted in St. Louis is 4.25 to 4.32½; New York, 4.35 to 4.40 The average price in New York last month was 4.243. English lead at the close of October was quoted at £11 3s. 9d. Spelter has receded to 5.30, St. Louis; 5.45 New York. Spot metal, however, is somewhat scarce.

DECISION OF THE ALASKAN BOUNDARY COMMISSION.

FOLLOWING is an official digest of the decision of the tribunal: The decision of the tribunal is made up of answers to the seven questions contained in the twenty of 1903 constituting the tribunal.

First question—What is intended as the point of commencement of the line?

Answer—The line commences at Cape Muzon.

Second question—What channel is the Portland Channel?

Answer—The Portland Channel passes north of Pearse and Wales Islands, and enters the ocean through Tongas Passage between Wales and Sitklan Islands.

Third question—What course should the line take from the point of commencement to the entrance of Portland Channel?

Answer—A straight line to the middle of the entrance of Tongas Passage.

Fourth question—To what point on the 56th parallel is the line to be drawn from the head of the Portland Channel, and what course should it follow between these points?

Answer—A straight line between Salmon and Bear Rivers direct to the 56th parallel of latitude.

Fifth question—In extending the line of demarcation northward from said point on the parallel of the 56th degree of north latitude, following the crest of the mountains situated parallel to the coast until its intersection with the 141st degree of longitude west of Greenwich, subject to the condtiion that if such line should anywhere exceed the distance of ten marine leagues from the ocean, then the boundary between the British and the Russian territory should be formed by a line parallel to the sinuosities of the coast, and distant therefrom not more than ten marine leagues; was it the intention and meaning of said convention of 1825 that there should remain in the exclusive possession of Russia a continuous fringe or strip of coast on the mainland, not exceeding ten marine leagues in width, separating the British possessions from the bays, ports, inlets, havens and waters of the ocean, and extending from the said point on the 56th degree of latitude north to a point where such a line of demarcation should intersect the 141st degree of longitude west of the meridian of Greenwich?

Sixth question—If the foregoing questions should be answered in the negative, and in the event of the summit of such mountains proving to be in places more than ten marine leagues from the coast, should the width of the lisiere which was to belong to Russia be measured (1) from the mainland coast of the ocean, strictly so-called, along a line perdendicular thereto, or (2) was it the intention and meaning of the said convention that where the mainland coast is indented by deep inlets, forming part of the territorial waters of Russia, the width of the liciere was to be measured (a) from the line of the general direction of the mainland coast, or (b) from the line separating the waters of the ocean from the territorial waters of Russia, or (c) from the heads of the aforesaid inlets?

Required no answer after the fifth question had been answered in the affirmative.

THE MOUNTAIN LINE.

Seventh question—what, if any exist, are the mountains referred to as situated parallel to the coast, which mountains when within ten marine leagues from the coast are declared to form the eastern boundary?

Answer—The majority of the tribunal have selected the line of peaks starting at the head of Portland Canal and running along the high mountains, on the outer edge of the mountains, shown on the maps of every survey made in 1893, extending to Mount Whipple and thence along what is known as the Hunter Line of 1878, crossing the Stikine River about twenty-four miles from its mouth, thence northerly along the high peaks to Kate's Needle, from Kate's Needle to the Devil's Thumb. The tribunal stated that there was not sufficient evidence, owing to the absence of a complete survey, to identify the mountains which correspond to those intended by the treaty. This contemplates a further survey of that portion of the two governments. From the vicinity of Devil's Thumb the line runs to the continental watershed, thence through White and Taiya or Chilkoot Passes, westerly to a mountain, indicated on the map attached to the treaty as 6,850 feet, thence to another mountain 5,800 feet and from that point in a somewhat curved line across the head of the Glaciers to Mount Fairweather. This places the Canadian outpost on the upper water of Chilkoot River in British territory and the mining camps of Porcupine and Clacier Creeks in American territory. From Mount Fairweather the line passes north on high peaks along the mountains indicated on the map by Mounts Pinta, Ruhama and Vancouver to Mount St. Elias.

INDUSTRIAL CONDITIONS AND PROGRESS IN VANCOUVER.

(From a Special Correspondent.)

THIS month brings many new developments in the lumber industry, showing that the activity of the operators is on the increase. American speculators are purchasing timber in the vicinity of Vancouver; others are about to erect mills, and large owners are about to interview the Government to have their timber holdings transferred to spruce limits that they may engage in the manufacture of pulp.

Two thousand acres of timber land situated on the north arm of Burrard Inlet, were purchased recently by Americans. The relative inaccessability of the area is considered as rather a drawback, but to overcome the difficulty of high slopes, long and steep chutes will be constructed to convey the timber to the water.

Messrs. Small & Buckland, of Ithaca, New York, are establishng a new lumber mill in New Westmintser, having a capacity of 50,000 feet per day.

Those interested in the Western Pulp and Mill Co. are endeavouring to induce the Government to grant a transfer of their present lease to one giving rights over spruce limits. Both Victoria and Vancouver people are concerned in this undertaking, and if they are successful in obtaining the concession, the manufacture of pulp will be proceeded with on a large scale.

The activity of British investors in pulp undertakings on Princess Royal Island has had not a little to do with the interest taken locally in the project. Col. Mellis and Mr. E. Youlle, a member of the London Stock Exchange, are engaging Mr. W. A. Bauer, of Vancouver, to prepare plans for this mill, and have asked him to make all possible haste. This enterprise will mean an expenditure of $500,000, and while the mills will be established on Princess Royal Island, the Coast cities will benefit to a large extent. The promoter of this enterprise is Mr. J. J. Palmer, of Toronto, formerly interested in the Marble Bay mines on Texada Island.

In addition to the new cedar mill about to be constructed on the south shore of False Creek in Vancouver by Messrs.

Wilson & Bell, Mr. W. J. Beam is building a wharf and erecting a warehouse thereon in connection with his sash and door factory on the north side of the same body of water. Mr. Beam's factory was started in a small way, and this increase of facilities has been demanded by growing trade.

Since the destruction of McNair's lumber and shingle mill, when $100,000 damage was done, the president of the company, Mr. James A. McNair, has returned from the East. Following his arrival comes the announcement that as a result of his visit arrangements have been completed whereby Mr. S. C. H. Miner, president of the Granby Smelter Company, and Mr. A. C. Flumerfelt, assistant general manager of the same concern, have become largely interested in the Hastings Shingle Manufacturing Company. Both these gentlemen occupy important and influential positions in business circles, especially of the western part of the Dominion, and their successful connection with the Granby company is well known. Mr. Miner is one of the directorate of the Eastern Townships Bank, which, it is announced, is about to establish a branch in this city. He is also associated with other financial institutions. These gentlemen have been asked to act on the directorate of the Hastings Shingle Manufacturing Company, and when Mr. Flumerfelt visits this city in the near future the matter will be discussed. It is also proposed to rebuild the mill, which, it will be remembered, was destroyed by fire. The Hastings Shingle Manufacturing Company is one of the largest concerns operating on the Coast, having four mills in the State of Washington, at Sumas, Whatcom, Van Buren, and Nooksack, besides the large businesses in Vancouver.

A new industry is being established in New Westminster which should have a promising future before it. The enterprise will be known as the Fraser River Tanning Company. Wisconsin monied men are behind the scheme, and they are represented by Mr. W. S. Turnbull, a prominent barrister of that State. The local representative is Mr. E. J. Fader, who is also president of the company. The board of directors is at present provisional. In plant some $32,000 will be invested, while a further expenditure of $75,000, for other purposes is anticipated. The initial output will be 100 hides per day, but if more hides than this number are offered they can be easily enough handled. It is expected that by next spring the tannery will be in operation.

The Vancouver Power Company's installation at Lake Beautiful in proceeding rapidly and it is expected that power will be available for the purposes of local industries by the end of the present year. The power house on the company's site is nearing completion, and the dam also will soon be finished. Machinery is being meanwhile installed, and a travelling crane, having a lifting capacity of 80,000 pounds is being employed in lifting the machinery from the scows, and placing it in position in the power house. Some idea of the magnitude of the installation may be obtained from the following particulars: The bearings of the main shaft weigh about five tons each; the shaft itself of steel is 21 feet long and 18 inches in diameter; the valve, which controls and regulates the supply of water, weighs nearly two tons, while another large casting described as the breech, which will distribute the water to the two wheels to be first installed, weighs 10,160 pounds. The other work is far advanced. The wire cables have been strung from the works to the city, and the large steel towers at Barnet are being put in place. To facilitate the work at the tunnel, larger drills are being installed. The tunnel has now been driven in a distance of about a mile.

The first section of pipe connecting the dam with the power house is to be made of wood stave, while massive steel pipe will sustain the increased pressure over the rest of the 2,000 feet. This pipe is 54 inches in diameter, at the part furthest removed from the wheels, gradually reducing to 42 inches nearest thereto. The two wheels which are to be put in as the initial installation, will have a capacity of 1,500 h.p. each or 3,000 h.p., this being only one-quarter of the power for which provision is being made, and which may ultimately be made use of.

Artesian boring is going on at the B. C. Electric Railway Company's power house at Burnaby. A contractor is sinking for an ample supply of water, and boring will be continued to a depth of 1,000 feet if necessary. It is more than likely that an adequate supply of water will, however, be obtained at less than 100 feet, for at forty feet good indications were encountered. The work is being watched with interest, for if the boring is deep the underlying strata of the district will be thus ascertained.

LUMBERING AT REVELSTOKE.

THE Harbor Lumber Company, Ltd., has recently effected great improvements in the plant and equipment of the mills at Revelstoke, Comaplix and Camborne. The Revelstoke *Mail* publishes the following description of the Revelstoke mill:

"A new saw-bench has been put in on the upper floor, also a steam nigger of the most improved design. From the saw-bench the lumber passes over live rollers which automatically deliver the good material to the edger, while as witch carries off the waste to the slab-slasher. The edgings are automatically picked up by carrier and elevator and passed deliver the good material to the edger, while a switch carries to the slab slashers to cut into lengths when anything not fit for lath is sent to the firewood saws and cut into 15-inch lengths. The firewood is delivered in bins ready for the waggon to draw away. On the lower floor are set the boilers and engines, planing and moulding machines, etc. There are four planers in use and a fifth is being put in. By an ingenious arrangement of travellers the good lumber is carried from the edger to whichever machine it has to go for the finishing touches and is thence taken by hand trucks to the proper dimension pile in the yard. From the time it leaves the saw till it is ready for market the lumber requires no handling.

"The motive power is supplied by an engine of 275-h.p., made by the Phoenix Works. There are two boilers, the steam capacity of the plant having been doubled and the power quadrupled since it was taken over. The shavings are taken up by pneumatic pipes and carried into the boiler furnaces, which are thus fed automatically."

The Comaplix mill has also been improved and so rearranged that the boards and dimension lumber now travel on live rolls to the edger and the slabs go to the slab slasher, where they are cut into 4-foot lengths, the pieces that will make laths going thence through the lath machine, and the rest to be used as cordwood. One object in the re-designing of the mill is to provide there shall be no waste. As the dimension lumber goes from the live rolls to the travelling chain it is sorted for the different grades, and for the different planers. From the planers the lumber is removed by hand-carts to the corresponding lots in the yard. The plant consists of saw-bench, with upper and lower circular saw, four planers, edger, slab slasher, 250-h.p. boiler and engine, the boiler being built by the Waterous Company, and the engine by W. Yates, of London, Ont. The Camborne mill has been improved by the addition of a new water wheel, edger and planer.

A very important lumbering undertaking has been recently promoted to develop the forest resources on the Arrow Lakes, and a company under the title of the Big Bend Lumber Company, Limited, has been incorporated with a capital of $500,000 to carry out this purpose. A mill of the most modern design is meanwhile being built at Arrowhead. It is estimated that the machinery for this mill will cost in the neighbourhood of $125,000. The plant has been designed to make an output of 25,000,000 feet of lumber per annum.

During the month over forty square miles of timber country on the Duncan, was sold through Messrs. LeMaistre, Cowan, Kenman and others to Messrs. Lammers & Goldreck, who, it is said, contemplates the erection of a mill at Nelson.

EAST KOOTENAY.

A new lumber company has been organized to operate at Mayook Siding, below Fort Steele Junction, in East Kootenay. The company have acquired 1,000 acres of timber limits formerly owned by the Baker estate.

It is anticipated that the logging camps in the vicinity of Moyie will give employment to some three hundred men during the coming winter months.

MONTHLY FREIGHT AND SHIPPING REPORT.

Messrs R. P. Rithete & Co. issue the following report:

Extreme dullness has marked the grain freight market during the past month, although rates remain at about 15s. to 15s. 6d. for U. K. The decline in price of wheat, which it was expected would place export prices on a definite basis, has been neutralized by lower values in England, and the increasing disengaged list gives a rather weaker tone to the market.

Lumber freights are lower with but little activity and rates cover a wide range. We quote freights as follows:

Grain—San Francisco to Cork, f.o., 15s. to 15s. 6d. Portland to Cork, f.o., 17s. 6d. to 18s. 9d. Tacoma and Seattle to Cork, nominal.

Lumber—British Columbia or Puget Sound to Sydney, 27s. 6d. to 28s. 9d.; Melbourne or Adelaide, 27s. 6d. to 30s.; Port Pirie, 26s. 3d. to 27s. 6d.; Fremantle, 38s. 9d. to 42s. 6d.; Shanghai, 32s. 6d. to 35s.; Kiao-Chau, 40s.; Taku, 35s. to 37s. 6d.; Vladivostock, 40s.; West Coast, S.A., 27s. 6d. to 30s.; South Africa, 47s. 6. to 50s.; U. K. or Continent, 45s. to 47s. 6d.

COST OF LIGHTING.

Professor Vivian B. Lewes, the celebrated expert, estimates the costs of lighting by various methods, in a lecture recently delivered before the Petroleum Institute of London, England:

COST OF 1000 CANDLES PER HOUR.

	Cents.
Electricity 7 cents per unit:	
Incandescent	28
Arc	7.5
Coal Gas:	
Flat flame	36
Argand	24
Incandescent	4.5
Incandescent high pressure	3.5
Oil:	
Lamp (oil at 16 cents)	14.5
Oil-gas (oil at 8 cents	12.0
Incandescent lamp (oil at 16 cents)	4.5
Incandescent air-gas (spirit at 20 cents)	4.0

RECENT REGISTRATIONS.

Certificates of incorporation were issued in October to the following companies:

North America Soap Company, Ltd., capital $250,000 in shares of $1 each.

The Walworth-Robertson Company, Limited, capital $30,000.

McArthurs, Limited, capital $5,000.

P. R. Brown, Limited, capital $10,000.

Standard Lumber Co., Ltd., capital $30,000.

Wm. Holden Co., Limited, capital $10,000.

Cranbrook Sash & Door Factory, Limited, capital, $40,000.

Western Steamship Company, Limited, capital $150,000.

MINING COMPANIES.

Fisher Maiden Mining Company, Limited, non-personal liability, re-incorporated and registered under Section 6 of "Companies' Act, 1898, Amendment Act, 1901." Capital, $150,000. Objects: to acquire and hold the Troy and St. Helena mineral claims in the Slocan Mining Division.

Poplar Creek Gold Mines, Limited, non-personal liability, incorporated under the "Companies' Act, 1897." Capital, $150,000 in shares of 10 cents each. The company is specially limited under Section 56 of the above Act. Objects: The acquisition and development of mines and mineral claims.

Monashee Gold Mines, Limited, non-personal liability, incorporated under "Companies' Act, 1897." Capital, $1,000,000,

in shares of $1 each. The company is specially limited under Section 56 of the above Act. Objects: To purchase and develop certain mineral claims in the Osoyoos Division of Yale District.

Sharpless Mining & Milling Company, Limited, non-personal liability, incorporated under the "Companies' Act, 1897." Capital, $300,000 in shares of $1 each. The company is specially limited under Section 56 of the above Act. Objects: To acquire and work mineral claims and mining properties.

FISH HATCHERIES.

Mr. J. W. Crawford, Fish Inspector to the State of Washington, recently spent several weeks in the interior of British Columbia. After visiting the various creeks and streams tributary to the Fraser River, he arrived at the conclusion that Lillooet Lake, at the source of the river of the same name, is admirably situated for the establishment of a salmon hatchery, the spot being a natural spawning ground, while also there would be no danger here of the destruction of the young fish by trout. Mr. Crawford was specially recommended by the canners of Washington to ascertain the most desirable spot for the location of a hatchery in British Columbia, in anticipation of permission being granted them by the Canadian authorities to maintain such an establishment in this country.

HADDINGTON ISLAND STONE.

It is reported that contractors of San Francisco are desirous of securing a large supply, possibly 200,000 tons of stone from Haddington Island for the erection of wharves in that city, California stone being generally too soft to be used for the work in question.

The Great Northern Mines, Limited

A CONSOLIDATION OF THE FOLLOWING GOLD PROPERTIES:

THE LUCKY JACK GROUP, Poplar Creek.
THE SWEDE GROUP, Poplar Creek.
THE OYSTER-CRITERION GROUP, Fish River and Pool Creek.
THE IMPERIAL GROUP, Fish River and Pool Creek. **THE LADE GROUP,** Gainer Creek
THE STRATHCONA GROUP, Silver Cup Mountain.

TWENTY-ONE CLAIMS OF VALUABLE GOLD MINING PROPERTY.

Capital, $1,500,000 in shares of the par value of One Dollar.

DIRECTORS.

W. B. POOL, President the Ophir-Lade Mining Syndicate, Limited, Ferguson, B.C.

W. F. COCHRANE, the Cochrane Ranch Company, Limited, Macleod, Alberta.

F. W. GODSAL, Ranch Owner, Cowley, Alberta.

J. J. YOUNG, M.L.A., President The Herald Company, Limited, Calgary, Alberta.

T. KILPATRICK, Superintendent C. P. R., Revelstoke, B.C.

E. M. MORGAN, Locator of the Lucky Jack Mine, Poplar, B.C.

JAMES LADE, Mine Superintendent, Camborne, B.C.

B. CRILLEY, Assistant Manager Ophir-Lade Mining Syndicate, Limited, Ferguson, B.C.

HEAD OFFICE: FERGUSON, B. C.

BRANCH OFFICES: Poplar Creek, B. C.; Camborne, B.C.

BANKERS: Imperial Bank of Canada, Ferguson, B.C.

SOLICITOR AND SECRETARY: Robert Hodge, Ferguson, B.C.

The promoters of the Great Northern Mines, Limited, have every reason to feel that they are presenting a proposition which stands unique in the history of mining, and one in which the few who are fortunate enough to have shares allotted to them may well feel that they have an interest in some of the richest gold mines ever discovered.

Every man who reads has heard of the sensation created by the discovery of the Lucky Jack, at Poplar Creek. That a claim of such unheard-of richness should have lain for years on a well known line of travel, passed over by hundreds of prospectors—even having a railroad built through it—to be discovered at last by the men from whom this company bought it, is almost incredible. It is a case of truth being stranger than fiction.

The Company's second acquisition, the Swede Group, comprising the Goldsmith and Gold Hill claims, (over 100 acres), is, in the opinion of many, an even bigger and richer property.

It is an accepted fact among mining men that a camp does not usually produce more than two or three great mines. In the Poplar Creek Camp there are three great gold properties, and the Great Northern Mines, Limited, owns two of them.

The promoters of this Company have in the past successfully operated the famous Nettie L. and Silver Cup Mines in the Lardeau. They can point to an experience of nearly ten years mining and prospecting in this district, during which time they have organized several companies, and developed many valuable properties, in each case with marked success.

Having acquired several of the most notable free milling gold groups in British Columbia, the promoters decided to consolidate them in one big, solidly organized company, and place on the market, for a limited time only, a small block of the stock at par. Hence this prospectus.

The consolidation includes the following properties, which are more fully described in another part of this prospectus:

GAINER CREEK PROPERTY.

No. 1—Olive Mabel, Goldenville, Foundation, Annie L., Ophir, Two-and-a-half.—All Crown-granted, partially developed; contain rich, free milling and telluride ore. Famous—Surveyed for Crown grant.

FISH CREEK PROPERTIES.

No. 2—Oyster, Criterion, Mascot, Gold Bug.—Claims all Crown-granted, developed, and stamp mill, aerial tram compressor, etc., erected ready to mine and pay dividends this year.

No. 3—Rossland, Imperial Balfour.—Crown granted and partially developed; adjoining above group and Eva mine.

FERGUSON PROPERTY.

No. 4—Strathcona, Triune Fraction.—Assessment completed to date.

POPLAR CREEK PROPERTIES.

No. 5—Lucky Jack, Lucky Three, Little Phil.—Surveyed and Crown grants applied for.

No. 6—Goldsmith, Gold Hill.—Will be Crown-granted immediately.

It is the intention of the Company to actively develop all these valuable properties and sell such of them as they do not wish to mine themselves, either to outside capitalists or to subsidiary companies to be formed by the parent Company, the proceeds going to the shareholders of the Great Northern Mines, Limited.

The company will under no consideration sell more than one hundred thousand shares, and the proceeds will be used strictly for development purposes and paying for plant and machinery.

The shares are of the par value of one dollar, and are offered for a limited time only at that figure. They are fully paid, non-assessable and carry no further liability whatever.

The directors reserve the right to allot shares according to priority of application, or in the event of the shares being over-subscribed, to allot them pro rata.

APPLICATIONS FOR SHARES.

Applications for shares should be made to the Secretary of the Company, Ferguson, B.C.

Ferguson, B.C., September 21, 1903.