

# REPORT

ON THE

SLOCAN, NELSON AND AINSWORTH MINING DISTRICTS

IN

WEST KOOTENAY, BRITISH COLUMBIA,

BY

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By Authority.

JAMES BAKER,

*Minister of Mines.*

FOR REPORTS AND INFORMATION ADDRESS

THE BUREAU OF MINES,

VICTORIA, B. C.

*January, 1897.*

# REPORT.

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*To the Hon. Col. James Baker,  
Minister of Mines, British Columbia.*

SIR :—I beg leave to present, in Bulletin No. 3 of the Bureau of Mines, a description of the mines and mining industry in the Slocan, Nelson, and Ainsworth Mining Divisions of West Kooteney, from the examination of which I have lately returned. I wish to acknowledge again my indebtedness to the mining men for their continued assistance, by which I have been enabled to make this report of much more value, by reason of the fact that not only have I been able to examine many of the mining properties, but to have before me a copy of the smelter returns of nearly all the ore shipped from these districts, so that the values of the ore from the different mines herein given are known to be correct.

Every endeavour was made to visit as many as possible of the leading properties within the time available, but even then some important mines were not seen. In every direction new claims were being opened up, but, as seldom satisfactory information can be given concerning mere prospects, examination was mostly confined to these claims on which more or less work had been done, and on which underground conditions could be studied.

The fame of the large and unique gold-bearing deposits of Rossland has now spread far afield, with the result that during the past year the attention of mining men and capitalists from all parts of the world has been drawn to British Columbia, and many have been here and bought mining property, or will return next year to seek investment, for which this Province without peradventure now offers most favourable and advantageous opportunities.

The mining industry of British Columbia, it must be remembered, apart from the placer, gold and coal mining, is of very recent inception. Until eight or nine years ago the great extent of the mountainous country south of the Canadian Pacific Railway to the Boundary Line, was a wilderness known to few save the Indians and hunters, or the prospectors for gold diggings, but the finding of silver-copper ore on Toad Mountain, and the beginning of work on the silver-lead ore deposits on the east of Kootenay Lake, discovered many years ago by men in the Hudson Bay Company's employ, with the subsequent discovery among the mountains near by of other silver ledges, signalized the commencement of mining in Kootenay. But it was not until 1890-91 that these silver veins were beginning to attract mining men to this Province from abroad, and active operations were getting well under way despite the difficulties and great cost of bringing in supplies or transporting ore to the smelters, when all progress was for a time stopped and hope crushed by the sudden collapse in silver values, occasioned by the closing of the Indian mints to the free coinage of this metal.

Work, nevertheless, on some of the veins was persevered in, and in 1894 nearly \$650,000 worth of silver ore was sent out of Kootenay. Then better means of communication were provided, and in 1895 the production of the different kinds of silver ore increased to over \$1,000,000, which production has been doubled in 1896.

Meanwhile the gold-bearing pyrrhotite deposits on Trail Creek were being exploited under many vicissitudes, until the shipments of pay ore, in 1894, to the value of \$75,000, and of nearly ten times this amount, in 1895, from the large ore bodies of the Le Roi and War Eagle, commanded wide-spread interest by reason of its being gold ore and very profitable, and in 1896 has been seen a great influx of capital's representatives and mining men, who are not only securing gold properties, but are investing in silver as well.

The production of the Kootenay mines, when compared with that of many of the mining centres in other countries, will not appear so very large to a casual reader, but when all the conditions are understood, that an entirely new country of large territorial extent is being rapidly opened up under difficulties, that the supply of needed capital, until recently, has been meagre, and that in reality not a single mine has had time to do sufficient development to put it on a really proper basis for extraction of ore and further exploratory work, this production will then be seen to indicate a most flourishing and hopeful condition of affairs.



As to the future there is now no doubt but that the number of paying mines and the mine out-put will steadily increase in the districts to be described, but not with that extravagant rate of increase predicted by some—at least not until those conditions exist that will permit the extraction of a much greater tonnage of ore. Such conditions are being supplied, and judging from the shipments already made in the new year, which exceed those of any previous year for the corresponding time, the out-put from Kootenay for 1897 will show a very substantial increase.

For some time back there has existed a strong antipathy to silver properties, and foreign investors especially have refused to entertain any proposition that was not on a gold basis, but now the fact is being realised that with silver even at its greatly reduced value, if there is a sufficient number of ounces of this white metal in the ore, a silver or silver-lead mine is quite as profitable and as desirable as a gold mine, and the handsome returns from the very high grade silver ores being mined in the districts to be described, are attracting increasing attention, as is testified by the numbers now seeking silver properties and the transactions recorded, as many mines or claims have been bought or bonded by English, American, and Canadian investors during the past season, not only within these districts but other parts of British Columbia.

The out-look for the coming year is especially bright, as many properties are beginning the new year with ore in sight, new mines have been added to the list, very promising prospects are being opened up, and during 1897 nearly every claim from which ore has been shipped in the past, will be on the list of shippers. There promises to be a steady increase in the amount of the ore extracted and sold, and in the amount of development done, but it is both unwise and hurtful to predict very large and sudden advances in the mineral out-put, as it must be remembered that a greatly increased out-put requires also a greatly increased amount of under-ground work, unless large bodies of very high grade ore are uncovered. Extravagant prophecies may travel far, and if the actual results do not approach the amount thus foretold, harm unjustly a mine or district, in which the progress has been most favourable and satisfactory, quite equal to the expectations of those best qualified to know.

These districts described in this bulletin, being essentially silver-bearing regions, suffered a severe set-back at the time of this disastrous fall in the price of silver in 1893. Nearly all work was suspended and it was only towards the end of 1894 that, taking new courage, work was recommenced with the result that a great increase in the production was evident in 1895, and progress has since been rapid and continuous.

The following is a short resumé concerning the three districts examined, further details and descriptions of the mines, &c., being appended.

#### THE SLOCAN.

The Slocan, according to the number of its shipping mines and the amount and value of the ore sold, now ranks as the most productive mining district in the Province, and in point of importance is not surpassed by any other.

In an area of fifteen by twenty-five miles, there have been discovered many veins of high grade silver-lead ore, which are being developed with great vigour and success, and among the mining men is every feeling of confidence and hopefulness. This winter nearly fifty of these properties are shipping high grade ore that yields very profitable returns, and a large number of other claims are being opened up.

So far but comparatively little imported capital has been expended here, as in the case of nearly every mine now established, sufficient money has been realised from ore extracted during development to pay for more extensive workings, new buildings, mills, trails, roads, and also dividends, but more or less capital will be required to properly open up many other claims on which the veins exist, but are not so easily accessible as those first discovered. But as most of these veins are found along the steep mountain sides and can be worked by tunnels, and the cost of mining is low, requiring little or no machinery, capital will be necessary mostly when tramways and concentrators are to be built, or in some cases for hoisting plants and pumps when tunnel sites may not be available.

Many of these mines are located near the summits of the high precipitous mountains at an elevation of 5,500 to 6,500 feet above sea level where erosion has cleared away nearly all débris from the veins, but lower down also on the mountain sides and in the valleys, are being found other veins or those discovered first much higher up, to the highest of which now run good trails or waggon roads or else wire rope tramways. The snow that lies deep on these summits during the winter is in nowise detrimental to mining operations, as most work is



done after its fall, when the ore can be dragged down the smooth snow trails in rawhides in larger loads and at lower prices than are possible in the summer time, but the tracks of snow-slides must be carefully avoided.

During 1896, 18,215 tons of ore yielded 2,141,088 ounces of silver and 19,210,666 pounds of lead, or an average of 117.4 ounces of silver per ton and 52.7% lead which would have a net profit of about \$75 per ton, while many carloads were shipped that yielded from 300 to 400 ounces of silver per ton.

The "Slocan Star" has of course the largest shute of high grade ore yet found in this district, and we are kindly permitted to state that from 11,529 tons of ore and concentrates sold during the last three years, 912,600 ounces of silver and 13,482,000 lbs. of lead have been paid for by the smelters, and of these amounts 7,000 tons yielded 600,000 ounces of silver and 9,000,000 lbs. of lead during the past season of 1896.

Many of the veins are small, varying from 2 or 3 inches in width to 20 to 30 inches of solid ore, but the high value of silver at present makes this ore very profitable together with the low cost of breaking ground. The small Reco-Goodenough vein, the width of which is measured in inches, is probably the richest vein yet mined, as from the smelter returns of about 600 tons, the average was 407 ounces of silver per ton and 42 % lead. The high percentage of lead makes this ore a very desirable one for the smelters, and the lead contents are usually sufficient to pay the freight and treatment charges, and the duty charged on the lead.

At no time in the history of this district have so many mines had high grade ore exposed, and of such mines can be named among others the Slocan Star, Ruth, Wonderful, Monitor, Idaho, Alamo, Cumberland, Ivanhoe, Queen Bess, Wild Goose, Payne Group, Slocan Boy, Washington, R. E. Lee, Last Chance, Noble Five Group, Reco, Goodenough, Blue Bird, Antoine, Surprise, Rambler, Best, Dardanelles, Northern Belle, Whitewater, Wellington, Charleston, Lucky Jim, London Hill, Reed and Tenderfoot, Fisher Maiden, Thompson Group, Galena Farm, Enterprise, Neepawa, Bondholder, Two Friends, Howard Fraction.

#### NELSON.

The Silver King silver-copper mine of the Hall Mines Co., Ltd., the Poorman gold (quartz) mine, and some small placer workings, have yielded all the production credited to this district, but other mines will be added ere long to this list. Since the completion of the smelter at Nelson there has been greatly increased activity at the mine of this Company.

The Silver King mine has now shipped 31,000 tons of ore that yielded 800,000 ounces of silver and 2,500,000 lbs. of copper, and the development of the property is rapidly being pushed, so as to permit of a greatly increased out-put, while the smelter is being increased so as to undertake the treatment of all classes of ore as may be bought in the market.

The Poorman gold mine has given up about \$100,000 from its quartz ledge, and other properties in this locality that have similar veins are now under bond and will be worked.

The new district, known as the Salmon River Country, lying south of Nelson to the Boundary, and traversed by the Nelson and Fort Shepherd R. R. was not visited, but during the past year many claims were staked off on gold and silver leads on the ridges, between which run the tributaries of this river. This winter considerable work is being done here, and during the coming season much greater interest will be shown in these veins, in which it is stated, ore similar to that of Rossland, and also gold-silver quartz with galena and other sulphides have been discovered, assays of which have given high values. See short description below by Mr. McConnell.

#### AINSWORTH.

The out-put from Ainsworth for 1896 was much lowered by the cessation early in the year of mining on the Blue Bell, in which, it is reported, the ore has become rather low grade for present conditions, but in several of the other mines west of the town of Ainsworth, considerable progress was made.

The Skyline, Number One, Blue Bell, Highlander, Little Phil, Mile Point, Neosho, Sunlight and Tariff, shipped ore, much of which was the silvery "dry ore," and the remainder galena, which does not carry as much silver as the Slocan veins, but averages 30 to 40 ounces in the solid ore.

This district suffered especially in the decline of silver prices, but now vigorous prospecting is being done once more on both sides of the lake, and new mining enterprises are being inaugurated. The town of Kaslo, the eastern entrance to the Slocan, is growing rapidly, and steamers run daily to Nelson to connect with the railroads, while the only public sampling mill in Kootenay is here located.



## Production.

In the following tables the tonnage is the net weight, *i. e.*, with the moisture in the ore, amounting from 1 to 6 % deducted.

(*b.*) The silver and gold are given in fine ounces, and represent the amount of each paid for by the smelter, or 95 % of the assay value.

(*c.*) The price of gold is estimated at \$20 per ounce; of silver for 1895, 65.3 cents, and for 1896, 67 cents per ounce.

(*d.*) The lead is the total amount paid for by the smelters, or 90 % of the assay value, and the price the average of the New York quotations for the year, *i. e.*, for 1895, \$3.23 per 100 lbs., and for 1896, \$2.98 per 100 lbs.

(*e.*) The price of copper is estimated at 5 cents per lb., as paid by the smelters, but the price received for the matte from the Hall Mines Co. is not known.

(*f.*) This table represents the amount and value of the ore actually paid for, as per smelter returns received during the year.

(*g.*) The ton is 2,000 lbs.

## SLOCAN.

	1895.		1896.	
	Amount.	Value.	Amount.	Value.
Gold, ozs. ....	6	\$ 120	152	\$ 3,040
Silver, " ....	1,137,040	742,487	2,141,088	1,434,529
Lead, lbs. ....	9,751,464	315,070	19,210,666	572,479
Total value.....		\$1,057,677		\$2,010,048

Total tonnage, ore and concentrates, 1895, 9,649 ; 1896, 18,215.

do number of mines that shipped in 1895, 30 ; 1896, 42.

do " miners at work in 1896, 1,000.

The number of mines shipping may be increased by adding some that have sent out very small lots of ore.

## NELSON.

	1895.		1896.	
	Amount.	Value.	Amount.	Value.
Gold, ozs. ....	1,275	\$25,500	511	\$ 10,220
Silver, " ....	49,750	32,487	631,960	423,413
Copper, lbs. ....	112,420	5,621	2,237,921	111,896
Total value.....		\$63,608		\$545,529

Total tonnage—1895, 1,148 tons ; 1896, 30,160 tons.

do number of mines producing—1895, 5 ; 1896, 4.

do " miners at work in 1896, about 350.



## AINSWORTH.

	1895.		1896.	
	Amount.	Value.	Amount.	Value.
Silver, ozs. ....	263,030	\$171,759	187,279	\$125,489
Lead, lbs. ....	6,724,000	217,185	2,151,000	64,100
Total value. ....	.....	\$388,944	.....	\$189,589

Total number of mines shipping—1895, 8; 1896, 9.

Tonnage cannot be stated, as the number of tons mined at the Blue Bell Mine was not ascertained, but from the other mines in the district there were shipped:—

1895, 2,208 tons; 1896, 1,664 tons.

Total number of miners at work, about 200.

The decrease in the amount and value of the ore shipped during 1896 is mostly due to the suspension of work on the Blue Bell.

## AMOUNT OF ORE SHIPPED AS PER CUSTOMS RETURNS.

Upon the shipment of ore to the United States a declaration is made in the outward entry of the contents and value of the ore, but the duties are not collected upon this statement, the ore being shipped in bond to the smelters, and the duty charges determined from the smelter returns. There will be, necessarily, differences between these returns and those given above, in that in the declarations the exact values are not given, only the approximate; and again, the above tables give the smelter returns *received* during the year, the customs returns give the amount of ore *shipped* during the year; hence, for most of the ore shipped in December the smelter returns coming back in January, the returns are credited to the year in which the smelter returns are received. The gross values were determined by calculating the value of each metal at its average price for the year. The tonnage includes the shipments of ore, concentrates, base bullion and matte.

## SLOCAN.

Year.	Tons.	Silver.—ozs.	Lead.—lbs.	Gross Value.
1894. ....	4,417	613,926	5,623,621	\$ 572,350
1895. ....	8,828	1,122,705	9,554,079	942,094
1896. ....	17,975	2,316,561	17,778,384	2,085,445
Totals. ....	31,220	4,053,192	32,956,084	\$3,599,889

## NELSON.

Year.	Tons.	Silver.—ozs.	Lead.—lbs.	Gross Value.
1894. ....	810	95,083	218,451	\$ 68,823
1895. ....	348	49,759	112,420	38,120
1896. ....	2,248	586,143	2,010,294	493,225
Totals. ....	3,406	730,985	2,341,165	\$600,168



## AINSWORTH.

Year.	Tons.	Silver.—ozs.	Lead.—lbs.	Gross Value.
1894.....	131	23,621	38,902	\$ 16,165
1895.....	13,938	261,904	6,612,025	384,677
1896.....	5,408	203,897	2,476,972	210,918
Totals.....	19,477	489,422	9,127,899	\$611,760

## Transportation.

Since the commencement of mining in this region the construction of new means of ingress and of transportation has quickly followed the discovery of ore-bearing districts, and the great material advantages of the fine waterways have been utilised in gaining access to the many points where mining is now begun. West Kootenay is singularly favoured by reason of the (a) the Columbia River and Arrow Lakes, (b) the Slocan Lake, and (c) Kootenay Lake and its arms, and of the comparatively easy passes for railways from one to another. Otherwise this very rugged and mountainous country would have presented great difficulties that would have retarded for a much longer time prospecting and mining, but now, however, none of the mines are any great distance from these highways, and readier access is being gained by the building of trails and waggon roads.

## GOVERNMENT AID FOR TRAILS, ETC.

The Provincial Government has followed a plan of assisting, as far as possible, the building of roads and trails to the various new camps, and though it has been impossible to accede to all of the many requests for aid where so many new parts are being opened up by fresh discoveries in many different directions, still the assistance given has been valuable, and has aided materially in the opening up of the country. As the Government Agents, to whose judgment the determination and carrying on of this work is entrusted, are already fully employed by their other necessary duties, it would be a good policy in the matter of economy and more general satisfaction if men could be engaged to carefully examine the different claims for roads and trails and applications for water rights, and then to choose and lay out such as would be of service to the greatest number, and open the most country; such men to be familiar with this work and able to locate such lines of trails as would benefit the greatest number of mining claims, be suitable for the transport *down* of ore, and be extended as further claims are proved up. The present agents have done good work, but they are unable, with so much other work demanding constant attention, to give that personal oversight necessary. It may happen that by special representation a trail may be built to a single group of claims, while another district that would be much more benefited by the opening of a wider field, would be denied, or the trail or road would not be built to serve as a main outlet, but be deflected to favour some particular property, instead of being located so that many more claims could easily connect with it by other trails.

Well directed assistance in this line is money well spent, as the more accessible this country is made the more rapid will be its certain development, as not only are the prospectors and miners better able to reach their finds and to spend the slight capital many can command in actual work on their claims, adding so materially to their value if such work shows up favourably, but investors and men with capital able to more quickly and thoroughly develop these locations can reach and examine properties more expeditiously and with less difficulty. Now that special interest is aroused and capital is here seeking investment, the more the country is opened up the more rapid and substantial will be the advance.

## COST OF ROADS AND TRAILS.

The cost of trail-building in most parts is not high, as only in some of the deeper valleys and gulches is there much heavy timber, and if carefully supervised should average from \$80 to \$125 a mile for a good ordinary mountain trail, and if possible there should always be a down-grade to facilitate the transport of ore by "rawhiding." In building roads an instrument should always be used, or otherwise, if trusting to the eye only, the results will not be



of the best. Some of the very best roads travelled over this summer were thus properly laid out, such as the road up into the Washington and Best Basins, to the "Ruth" mine at Sandon and the Enterprise road up Ten Mile Creek. The cost of the mountain waggon road varies from \$800 to \$1,200 a mile, with a safe average of \$1,000 per mile, complete.

In the winter time temporary trails and roads are often easily made when the snow has fallen to some considerable depth.

#### MEANS OF ACCESS AND TRANSPORT.

West Kootenay is now easily entered from two directions, and almost any part important can now be reached with dispatch and comfort, an agreeable surprise to all entering the country for the first time. First—From the north, at Revelstoke, on the main transcontinental line of the Canadian Pacific Railway between Montreal, Winnipeg and Vancouver, on the Pacific Coast, a branch line runs down the Columbia River 32 miles to Arrowhead, at the north end of Upper Arrow Lake, whence (a) a small steamer runs up the north-east arm of Evansport, the port of entrance, to the Lardeau and Trout Lake Districts; (b) the large stern-wheel steamers of the Columbia and Kootenay Navigation Company, for which Company a large boat is being built at Nakusp, to be ready to go into commission next spring, as the traffic has grown quite beyond the capacity of the present equipment, runs as far south as Trail, connecting at Nakusp with a branch line of the C.P.R. into the Slocan, and at Robson with another branch of the same Company into Nelson, along the Kootenay River, and at Trail with the Columbia and Western to Rossland. Second—From the south, from Spokane, Wash., where direct connections are made from the main trunk lines of the Great Northern and Northern Pacific Railways to all parts of the United States, the Spokane Falls and Northern Railway runs north to Northport, a few miles south of the boundary line, whence (a) this road, known as the Nelson and Fort Sheppard Road, follows up the east bank to Waneta and Sayward, in Canadian territory, and thence across to Nelson, connecting directly with the Kootenay Lake steamers at a point 5 miles east of Nelson, whence the road switch-backs into the town; (b) from Northport another branch, or the Red Mountain Railway, crossing the Columbia by large ferries, runs to Rossland; (c) while daily steamers run up the river to Trail, from which point again Rossland is reached, or the steamers taken for Robson, Nakusp and Arrowhead, as detailed above.

#### C.P.R., NAKUSP TO SANDON.

This branch has a daily train each way. From Nakusp it is 28 miles to Roseberry, on Slocan Lake; 32 miles to New Denver; 37 miles to Three Forks; and 41 miles to Sandon.

#### C.P.R., ROBSON TO NELSON.

A train will run both ways daily to connect with the steamboats on both Arrow and Kootenay Lakes.

#### KASLO AND SLOCAN RAILWAY.

This road runs daily trains between Sandon and Cody, east to Kaslo, on Kootenay Lakes, stopping at points whence roads or trails lead directly to many of the Slocan mines.

#### SLOCAN LAKE.

A large steamer will soon be running on this lake, as well as the small one now running daily between Roseberry, New Denver, Silverton, Brandon, Slocan City and any other point on the lake desired.

#### KOOTENAY LAKE.

Three commodious and rapid steamers, the Kokanee, Alberta and International, run daily each way between Kaslo and Nelson, stopping at Ainsworth, Pilot Bay smelter, Balfour or other points along this route when called for. Other smaller boats traverse the lake from the upper end down as far south as Bonner's Ferry, stopping, among other places, at the terminals of the trails into East Kootenay. Generally, if required, a small steamer can be engaged to go to any point on these waters.



## ASSISTANCE OF STEAMBOAT LINES.

On all these steamboat lines every endeavour is made to assist the prospectors, miners, etc., by willingly stopping at any point where signalled or requested to land or take on board men, pack animals, supplies, ore, etc., and this accommodation is simply invaluable. On the swift waters of the Columbia River, the very clever navigation exhibited there is admired by all travellers, as great skill and steady nerve are called for at several points along this river, especially in the season of low water when these boats have to contend, in going up stream, with a powerful current which, in the late autumn and winter seasons, compels the use of steel hawsers fastened to the bank or rocks and the steam capstan.

Large scows are used on the Columbia River line, being fastened directly in front of the steamers, and capable of carrying eight loaded railway cars, are used between Arrowhead and Robson, on which loads of 370 tons of coke for the Nelson smelter, loaded from the cars at Arrowhead, have been brought down this fall, but if necessary loaded cars can be thus transported from the main line of the C.P.R. on to these branch lines running in at Nakusp and Robson.

## RISE AND FALL OF WATER.

The difference on these water-ways between the high and low water marks is great, or 12 to 15 feet, and the season of high water is during the months of July and August, when the hot weather causes the rapid melting of the snow on the ranges. As so much of the country is being cleared by forest fires, permitting the more rapid melting of the snow, the floods may be expected to be even higher, and every precaution must now be taken in any work or building along the water front to be well up beyond any possible height the waters may reach.

## NEW RAILROAD LINES.

The demand for more railroad facilities is now great. The ultimate benefit to our country and Province of some new lines now projected, and their own financial success, are, in the judgment of many acquainted with conditions, assured. These new lines, while having engineering difficulties to overcome, should open up a large part of the southern part of British Columbia now lying practically dormant, and make not only possible the development of resources now almost inaccessible and valueless, but known to exist, and the easy assembling at large smelting centres of the different classes of ores and fuels, but also the fostering of a large demand for agricultural produce, for which no better market can be found than in these mining centres.

Of the new lines projected there are:—(a) the Crow's-Nest Pass Railway, connecting with eastern lines, thence passing close by the deposits of coal in the Crow's-Nest Pass of large extent and fine coking qualities, through East Kootenay, with branch lines to the Kootenay River and along the west shore of Kootenay Lake to Nelson;

(b) A branch of the C.P.R. from Slocan City to a point on the Robson and Nelson line:

(c) The extension of the line from Arrowhead into the Lardeau and Trout Lake districts to the head of Kootenay Lake:

(d.) The extension of the Columbia and Western R.R. from Trail, up the west bank of Columbia to a point opposite Robson, and thence west into the mining districts of the southern part of Yale:

(e.) A railroad from the Columbia River west, through the southern part of the Province, to a point on the Pacific Coast.

## THE IMPORTANCE TO THE COAST CITIES OF THE MINING CENTRES.

This last proposed railroad should be of very great value to the coast cities of British Columbia, by making possible the speedy, prompt and direct dispatch of merchandise and mine supplies to the interior mining centres, which, it must be remembered, are extending westward and nearer to the proper base for a large part of the supplies. These cities can reap great commercial benefits from this growing mining industry, but they must seek conditions that will put them upon an equal or better footing than their very aggressive competitors, for the business men of Eastern Canada and the North-West are now striving eagerly with the Americans for this large and growing traffic, and British Columbians should at once exert themselves to the utmost to secure the lion's share of the business within their own borders.



For the agriculturist or rancher there can be no better market than will be found in these mining centres, where there is a large consumption of all they can produce, and where the best is demanded and readily paid for.

Again, with good railroad facilities, the Coast will be a very favourable point for large smelting works, where can be assembled the different classes of inter-fluxing ores, iron and lime fluxes, and the coke, now being made at the Union Collieries at Comox, on Vancouver Island, which large and prosperous smelting works demand; and moreover the refined products, base, bullion and matte, by reason of the very low ocean freights, will be able to enter the other markets of the world, without paying the excessive duties now imposed when shipped across the line to the south.

England is the largest buyer of foreign lead, and much of this metal is imported into China, Japan, and other Asiatic ports, and Australia is exporting her desilverised lead to all of these buyers.

#### THE LOCATION OF AND TITLE TO MINERAL CLAIMS.

The mineral lands are open to location by any person having a free miner's licence—cost \$5 per year—but only one claim, 1500 feet square, can be staked off on a vein or ore deposit by one person, who must conform to the regulations of the Mineral Act. No vein or ore can be mined beyond the boundaries of such claim, *i. e.*, these locations have no extralateral rights except those claims located prior to 1892, on which the vein or deposit can be followed down on its dip beyond the side line.

Possessory rights are secured by doing \$100 worth of work per year on the claim, or by paying this amount annually into the Treasury of the Province. When \$500 worth of work has been done, the owner of the claim can then secure full title by asking for and securing a crown grant of this land, after which no annual assessment is required.

#### General Geology.

In regard to the geological formations and structure of the districts under discussion, only an outline will be now attempted, and for such details we are indebted for information to the "Report on West Kootenay, of 1889," by Dr. Geo. M. Dawson, and the "Summary Reports" of 1894-5, by Mr. R. G. McConnell, of the Dominion Geological Survey. During the present year, Mr. McConnell and Mr. J. McEvoy hope to publish a provisional map, showing the general disposition of the different main rock series from Kaslo south to the Boundary Line, including parts of the Nelson, Ainsworth, Slocan and Trail Creek Districts, and this map, with its accompanying report, will be a very useful and important source of information concerning this mining region, of which the boundaries of the known mineral-bearing areas are being so rapidly widened by the discovery of more ore bodies in both old and new localities.

It is of great interest, that in all of the geological series represented here, are veins or mineral deposits, especially of silver and silver-lead ores, and no longer are the prospectors limiting their researches to special formations or parts of these districts, but energetic prospecting is being done with successful results all over this part of West Kootenay. For a long time these men refused to enter the granite areas, until finally the discovery by some less skeptical of the silver-lead, and the gold-and-silver or "dry ore" veins on the water-sheds of Springer and Lemon Creeks, east of Slocan Lake, and the success of the Poorman gold mine near Nelson, led to a rush of men into the granite regions with gratifying results.

The success of the rich Rossland mines is causing the wide-spread prospecting of all the country in which occur the same geological formations, and following these up as far as Nelson, many locations have been made in the country drained by the tributary creeks of the Salmon River, and elsewhere in the area between Nelson and Rossland. In the Ainsworth District, on both sides of the lake, can be found men in search of mineral, and in fact, there is now very little of West Kootenay that is not being over-run by them, and the wave of prospecting is extending throughout the Province, so thoroughly has interest and faith in her latent mineral resources been aroused.

There is no reason why mineral should not be found in all of these formations here present or in any part of this region, unless it has so happened that the conditions have prevailed by which the mineral-bearing solutions have not had openings or fractures along which to ascend and deposit their burden of precious ores, either by filling up pre-existing cavities or by leaching into or impregnating the country rock with valuable minerals on one or both sides of the channel or crevice. The finding of rich veins of ore in either of the series, such as of silver-galena ore, points strongly to the fact that as depth is obtained in mining, the continuity of



the pay-shutes is assured, the veins may be "in and out" as the miners term it, or have perfectly barren parts along the fissure, but more or less work will disclose other ore-shutes if this work is pushed ahead along this fracture in the rock which has permitted the passage of ore-bearing solutions and the formation of ore-bodies along it elsewhere.

#### FORMATIONS.

There is a very large area of granite which has been pushed up through the highly metamorphosed stratified rocks, altering them still more near the line of contact, but the boundaries and relations between these different series cannot well be given before the publication of the geological map. However, by means of extracts from the above mentioned reports, some idea may be given of the geology of each of the districts visited.

(A.) THE GRANITES.—Dr. Geo. M. Dawson's "Report in portion of West Kootenay, 1889," says:—

"A large part of the West Kootenay district is occupied by granites and granitoid rocks, the main area of which (so far as observed) includes the whole basin of the Lower Arrow Lake, and extends thence eastward nearly to Queen's Bay on Kootenay Lake. Besides this great granite area, there are several others of smaller dimensions, as indicated on the map, as well as numerous dykes and eruptions too small to be separately shown. It is, in fact, probable that about one-half of the entire region here reported upon is occupied by granite and granitoid rocks, the granites differ considerably in appearance and composition, and appear to be referable to at least two and probably to three distinct periods, though it is as yet impossible to define the respective areas of these. The granites which are supposed to be of the greatest age, were found in some places underlying the lowest beds of the gneisses and mica-schists or Shuswap series. They appear to be closely attached to this stratified series, if not connected with it in origin, and in texture and composition as seen in hand specimens, can often scarcely be distinguished from some of its homogeneous gneisses. They are generally rather fine-grained, and are believed to consist for the most part of muscovite-biotite granite, though much further investigation would be required before it can be asserted that this is their characteristic composition.

"The granites which, however, occupy by far the largest area, are of coarse texture, generally grey, passing to black in colour, and are characterised by black mica, with frequently much black hornblende. They may be described as a whole as hornblende granites, but occasionally pass into mica-syenite. In some localities they are not infrequently coarsely porphyritic with large twinned orthoclase feldspar crystals, while sphene is often present as an accessory mineral.

*"These granites are evidently intrusive and of later date than the stratified rocks, which are altered at contacts."*

Mr. McConnell in the Summary Report of 1894, further writes about the eruptive rocks and granites:—

"The eruptive rocks of the district occupy wide areas and belong to several periods. The oldest, as far as ascertained, consists of a series of basic dykes cutting the Shuswap group, but now in many instances so altered and foliated by pressure and other causes that they have the appearance of constituent beds. They occupy, in some localities, a considerable portion of the area assigned to the Shuswap series. They are older than the overlying formations.

"Eruptive granite rocks, much younger than those referred to above, occupy the western part of the region, from about the north end of the Lower Arrow Lake south to Trail Creek and east to within a few miles of Kootenay Lake. They cover a continuous area of fully 2,000 square miles. Numerous bosses and dykes of granite and pegmatite also occur further to the east, along the borders of Kootenay Lake.

"The granites where examined, are usually grayish in colour, and coarse grained as a rule, and are often porphyritic. The principal constituents are feldspar, quartz, biotite and hornblende. The granites cut all the formations from the Shuswap series up to the Slocan slates, and are consequently younger than any of the stratified rocks of the district. A series of eruptive rocks still younger than the granites, is represented by diorites and diabase and urallite porphyrites. These rocks occupy a considerable area in the Trail Creek country, and are important, as they hold the principal lodes of that district. It is possible that some of the porphyritic rocks, so abundant in the Toad Mountain region, may belong to the same group.

DYKES.—"In addition to the main areas of eruptive rocks, numerous dykes, some of them connected with the main areas, others much younger, as they cut through everything, are met with in every part of the district.



(B.) "THE STRATIFIED ROCKS bordering this granite area, are irregular tilted at high angles, broken by numerous faults, and frequently overturned."

Dr. Dawson determined their thickness to be, taking a section at Ainsworth to be 23,200 feet, and he believes the Shuswap series to be Archaean, while those series above this area, are evidently Palaeozoic in age, and may yet be referred to various systems, including the Carboniferous, and extending downward to the Lower Cambrian. He also states that "the grey and greenish schistose rocks are essentially composed of altered volcanic materials, and their present schistose character may probably be regarded as in the main, due to the enormous pressure to which they have been subjected during the movements of the earth's crust, which resulted in the uplift of the mountains of the region, and the extrusion of the great masses of granite here everywhere found. In these different stratified series no strong evidence of unconformability have been reported."

The series of stratified rocks may be quickly described in ascending order, *i. e.*, by beginning at the lowest series, the Shuswap.

(a.) THE SHUSWAP, or lowest series, probably of Archaean age, consists of gneisses, mica-schists, calcareous gneisses or calc-schists, hornblendic schists, bedded diorites, crystalline limestones or marble, and nearly pure quartzites.

(b.) THE NISCONLITH series of dark calc-schist holding occasional bands of limestone and green schists.

(c.) THE KASLO SCHISTS comprising a series of greenish, probably mostly diabase schists, interbedded with some slates or dark argillites, and limestones.

(d.) THE SLOCAN SLATES or a series of dark shales and slates with limestones and calcareous quartzites.

It is to be remembered that only parts of these districts have been geologically examined as yet.

#### THE SLOCAN DIVISION.

In the "Summary Report" of 1894-95, Mr. McConnell says:

"The region between Slocan Lake and River and Kootenay Lake, particularly examined during the season (1895), is covered mainly by granite fringed on the north and east by a border of slates and schists, and is everywhere of a mountainous character. The granite mass, originally dome-shaped, has been carved by the drainage system of the region into bold, craggy mountains and mountain ranges, which culminate in a rugged mass of snow-clad peaks, situated between the south end of Slocan Lake and Ainsworth, the highest summits of which approximate 9,000 feet in height above the sea. The principal streams of the district, including Lemon Creek, Ten-Mile Creek (Slocan Lake), the south fork of Kaslo Creek, Woodbury Creek, and Coffee Creek, radiate from this group and descend rapidly through deep, steep-sided valleys to the main waterways. A second range of prominent peaks, scarcely inferior in height to the central group, occurs north of the Kaslo-Slocan Railroad. The Whitewater, Lyell Creek, and other tributaries of Kaslo Creek, head in glaciers which descend from this range.

"The principal geological boundary in the district between Slocan Lake and River and Kootenay Lake is the sinuous line separating the granite area from the bordering slates. Starting from Four-Mile Creek, on Slocan Lake (at Silverton), this line follows that stream in an easterly direction for ten miles, then bends to the north across the range separating Four-Mile Creek from Cody Creek, and following the latter stream in a northerly direction for a couple of miles. From Cody Creek the granite border runs almost directly east of Twelve-Mile Creek; after crossing this creek the line becomes more irregular, as several spurs leave the granite area and penetrate for varying distances the group of mountains lying between Ten-Mile Creek and the south fork of Kaslo Creek. At the latter stream the granite recedes a couple of miles, then bends around a deep embayment of slates, and continues on in an easterly direction towards Kootenay Lake. Four miles from the Lake (now in the Ainsworth Division) the line of junction turns abruptly southward, and continues in this direction until near Balfour, where it bends more to the west and crosses the outlet of Kootenay Lake, about four miles below its head. Inliers of slate in the granite occur at the head of Eight-Mile Creek (Slocan Lake), on Four-Mile Creek, and at other places, while bosses of granite, separated from the main area, break through the slates at Paddy's Peak, Reco Mountain, and north-east of New Denver.

"The upper series of stratified rocks, consisting mostly of dark, evenly bedded slates, with some limestones, is largely developed in the Slocan Country, and is well shown along the Kaslo waggon road from Fifteen-Mile House westward, to a point a couple of miles west of



Three Forks, where this series is cut off by an area of eruptive rocks. Southward the slates of this series strike into the great granite mass which occupies the central part of the district, and are all cut off, with the exception of a narrow strip which skirts the granite on the east, as far south as the west area of Kootenay Lake."

#### AINSWORTH DIVISION.

"The Shuswap series occupies the basin of the Kootenay Lake, from Kaslo south for at least 40 miles. It borders both shores of the lake in bands varying in width from one to two miles or more. The strike north of Balfour is nearly north and south, but south of the west arm of Kootenay Lake it trends more to the west. The dip is almost invariably to the west, except where overturns have taken place.

"The series of green schists, dark argillites and limestones which overlies the Shuswap rocks, is well exposed along the waggon road from Kaslo to Three Forks. The green schist and associated rocks extend southward with a gradually diminishing width to a point on the west area of Kootenay Lake, two miles west of Balfour, where they are nearly, or altogether, cut off by the granite. Southward from this point, about four miles east of the Ymir Mountains two bands of argillites interbedded with crystalline limestones occur, which probably belong to the same formation."

East of the lake the Shuswap series, extending to the summit of the range, is developed on a grand scale, while from the Town of Ainsworth westward each of the series is represented, the "Number One" and "Skyline" mines being in the narrow border of Slocan Slates Series along the eastern limits of the granite border, as described above.

#### NELSON DIVISION.

The granite area is much developed here, but a band of the green schists (Summary Report, 1894), beginning near Ward's Ferry on the Kootenay River, strikes eastward across Toad Mountain to the head of the Salmon River, then down the valley of this stream. The distribution of this band assumes the form of a bay of stratified rocks opening to the south, and extending down through the Trail Creek District, with areas of uraltite porphyrite and other eruptive rocks, and penetrating towards the north, the central granitic area of the district.

On Toad Mountain, the green and grey very schistose rocks (Kaslo Schists series?), in which is the Silver King lode, are believed by Dr. Dawson "to be stratified volcanic material of Palaeozoic age," and to consist in the most part of diabases and diabase porphyrites, and on the east are underlain by the gneiss of the Shuswap series, and overlain on the west near Red Mountain by reddish weathering slates.

#### Corrections.

In bulletin No. 2, the Report on Trail Creek Mining Division, the following errors were made:—

(a.) The capital stock of the Commander Mining and Smelting Co., Spokane, Pres. W. J. Harris, was stated to be \$1,000,00 in \$1 shares, instead of \$500,000.

(b.) The Palo Alto Mining Company is registered at Victoria, B. C., and not at Spokane. Pres., L. F. Solly; Sec., C. Dubois Mason, Victoria; Managing Director, W. G. Estep, are the new officers elected last August 3rd.

#### The Slocan Mining Division.

##### THE ORE AND ORE DEPOSITS.

There are four distinct kinds of veins in the Slocan:—

1. The *argentiferous galena*, with zinc blend, and some grey-copper in a gangue or matrix of quartz and spathic iron. These veins cut across the stratified rocks, and *through* the dykes of eruptive rock, where, in many cases, there is a good body of ore, and they also occur in the granite area, and with even the limited amount of prospecting, some have been traced from 3 to 4,000 feet along the strike, and one for nearly 2 miles. In the Slocan slates, it has not yet been proven, that as the vein cuts through shales, slates, limestones or quartzites, that any one of the series has been more favourable to the formation of ore-bodies than another, as in the different veins it will be seen that good ore shutes may have the wall of any of these rocks mentioned. The ore has been deposited along fissures, both in the open fissure cavities, and



by impregnation of the country rock, and in the cavity-filled veins can be seen the banded structure described elsewhere, or the solid, usually big-cubed galena, shows lines of foliation parallel with the walls, but it is evident that further motion has occurred along some of these vein fissures, after ore has been deposited.

Most of the veins are narrow, varying from 2 and 3 inches, to 15 and 20 inches in width, with occasional widenings to 3 or 4 feet of solid ore, and even much more, as seen in the Slocan Star and the Alamo-Idaho veins. The ore shutes are not persistent horizontally, as is characteristic of nearly all veins, but ore is often continuous for several hundred feet, and where it then pinches, a thin streak of oxides is the index usually followed in the search for more ore, which seldom fails to re-appear with more or less work. The mistake is made sometimes of following along a slip-wall or crevice that may cross the vein crevice at a flat angle, and thus lead the miner astray. Besides the solid ore, some veins have associated with them 2, 3 or more feet of mixed ore, gangue and country rock, or a brecciated mass, which may be of such grade as to pay well for concentration; and already there are three concentrators, the Alamo, Slocan Star and Washington, doing very satisfactory work, and the Noble Five mill almost completed, with the erection of two, at least, contemplated this year. The product or concentrates is silver-bearing galena, but any value contained in the decomposed material that may enter the mill, will in all probability not be saved, likewise, that in much of the grey copper, which apparently slimes badly and escapes.

The ore is shipped as "crude," or the solid or unaltered sulphides, or as "carbonates," *i.e.*, the decomposed ore, consisting of oxides and carbonates of iron, lead and silver, the mass having a reddish-brown colour, with more or less yellow material; those carbonates with a soft, velvety feel, assaying highest in silver. All material about these veins should be carefully assayed before being relegated to the waste-dump, where good ore, unsuspected, has already been thrown, especially soft, iron-stained decomposed rock or vein matter.

**GOLD.**—It might be well to be on the lookout for gold, remembering the good gold values found in the galena ores of the Monitor mine, which yield from \$2 to \$14 in gold per ton; one lot of 20 tons of crude ore assaying \$20 per ton in gold, while the "carbonates" average \$13, the smelter paying for all gold above \$2, or one-tenth of an ounce. The "carbonates" seldom are as high grade in silver as the unaltered, or crude ore in the vein, but in some mines this class of ore is very valuable.

While most of the veins are not wide, the richness of their ores greatly compensates, as may be seen from the lead and silver values as *per smelter returns* from a few of the mines as:—

Slocan Star.....	80 to 95	ozs. silver per ton,	70 to 75	% lead.
Reco.....	83 to 730	" "	19 to 67	% "
Good-enough .....	167 to 507	" "	15 to 67	% "
Noble Five .....	62 to 543	" "	30 to 75	% "
Last Chance .....	135 to 238	" "	35 to 78	% "
Wonderful .....	113 to 133	" "	70 to 76	% "
Ruth .....	40 to 125	" "	15 to 73	% "
Monitor .....	142 to 367	" "	32 to 57	% "
Wellington .....	125 to 328	" "	10 to 55	% "
Whitewater .....	72 to 326	" "	10 to 65	% "
Dardanelles .....	149 to 470	" "	15 to 55	% "
Enterprise .....	155 to 180	" "	18 to 30	% "
Two Friends .....	248 to 380	" "	38 to 52	% "
etc.,	etc.,	etc.,	etc.	

The other Slocan mines have ore of the same character and high grade, as may be seen in detailed accounts below. The lowest values in the above indicate the lowest smelter returns on ore that is classed as "carbonates." The average value of all the ore sold has been given above.

**ZINC.**—In most of these veins the zinc blende carries a small silver value and is sorted or concentrated out of the ore, so that very little ore sent to the smelters has over 10% zinc limit. But in the "Enterprise" mine, on Ten-Mile Creek, the best silver assays are said to be got from the zinc blende, which is much more valuable than the galena. As is to be expected, small lots of very rich ore are mined, lots that will yield from one to two thousand ounces per ton, but the average figures already given will indicate the importance of these veins that are now being mined in both the granite and stratified rocks of this district.



2. The veins of *argentiferous tetrahedrite* or grey copper and jamesonite and silver compounds in a quartz gangue.

These veins can be seen in the granite exposure on the "Best" and "Rambler" mines, and in the stratified rocks on the "London Hill" property, from which very high grade ore has been shipped.

3. The "*dry ore*" veins on Springer and Lemon Creeks, in the granite, with a quartz gangue containing argentite, native silver, and gold.

These veins are now attracting much attention, as high assay returns have been secured as per smelter returns; sorted ore of this character from the Howard fraction yielding 163 to 206 ounces of silver per ton, and \$16 to \$26 per ton in gold.

The "Chapleau" recently received the smelter returns on four tons of sorted ore, from which 3.6 ounces of gold and 94.7 ounces of silver per ton were returned, netting to the owners \$102 per ton after deducting freight and treatment charges.

4. The *gold-quartz veins* in the southern part of the granite, such as those reported to be on the Alpine group.

The values and characteristics of the last three mentioned classes of vein will be better known later on, as the work now begun yields results and information.

### Costs.

MINING.—(a.) The cost of driving tunnels and drifts varies from \$3 to \$9 per foot in stratified rocks, and from \$7 to \$10 in the granite:

(b.) The cost of sinking shafts from \$12 to \$20, but so far little work of this kind has been done:

(c.) The cost of stoping cannot be ascertained, but the following table, compiled by Edmund B. Kirby, M. E., and given in a paper to the Colorado Scientific Society, December 3rd, 1894, from experience gained in Colorado, where nearly similar conditions and cost of labour, supplies, etc., obtain, may be of value:—

APPROXIMATE YIELD AND COST OF STOPING PER TON OF ORE BROKEN.

THICKNESS OF PAY-STREAK.				Tons	Cost
Calculated for ore when 13 cubic feet = 1 ton.				per square fathom of ore sheet.	of stoping per ton.
A streak	4 inches wide	yields.....		0.92	\$17.33
"	6	" "	.....	1.38	11.55
"	8	" "	.....	1.85	8.67
"	10	" "	.....	2.31	6.93
"	12	" "	.....	2.77	5.78
"	14	" "	.....	3.23	4.95

(d.) For labour the average paid miners is \$3.50 for 10 hours, or \$3 for 8 hours; timbermen, \$3.50 for 10 hours; shift bosses, \$4 to \$5 a day; blacksmiths, \$3.50 to \$4 per 10 hours; trammers and topmen, \$2.50 to \$3 for 10 hours:

(e.) For supplies, No. 1 giant powder costs about 18 to 22 cents a lb.; No. 2, \$9 per 50 lb. box; drill steel, 16 cents a lb.; candles, \$7 a 40 lb. box; cordwood, \$1.50 to \$2.50 at the mine; rough timber, \$11.50 to \$12.50 per M. The cost of food and other supplies is now very reasonable.

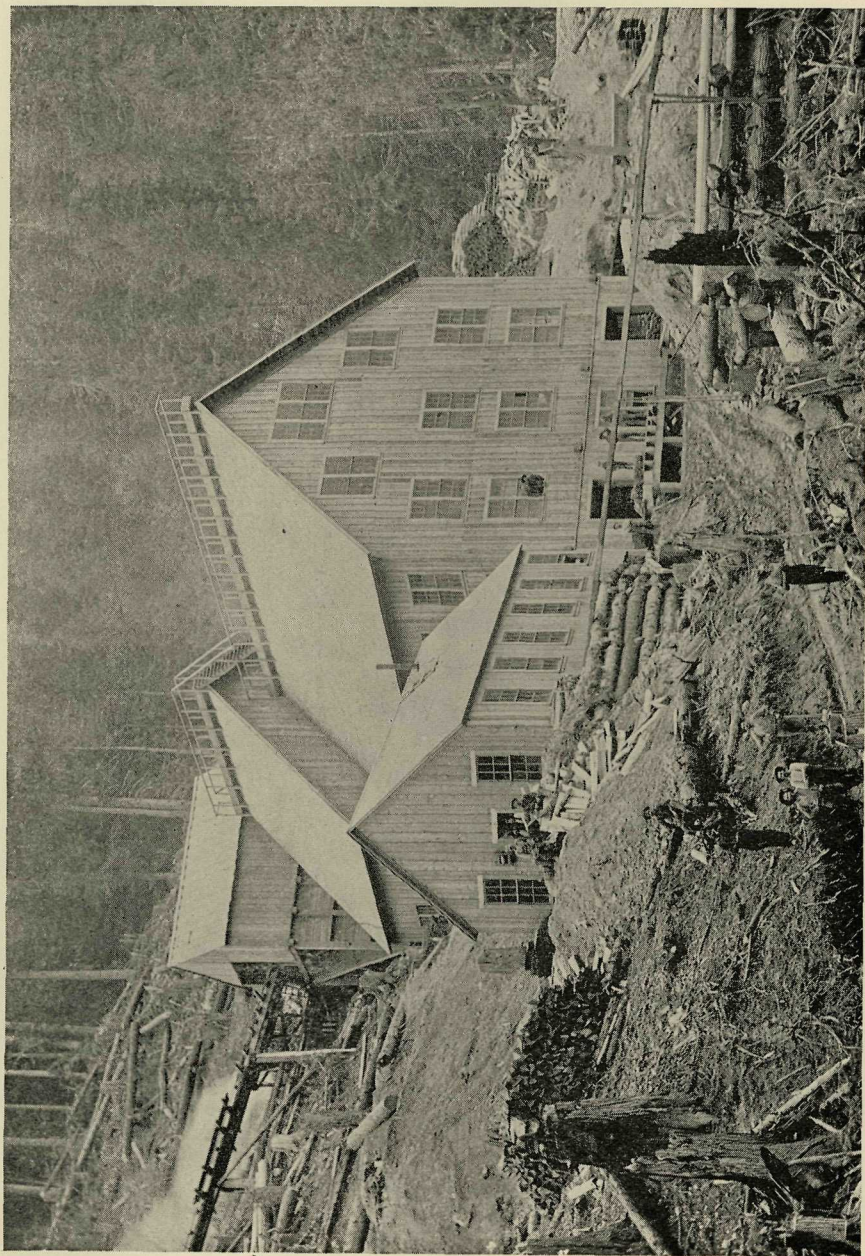
TRANSPORTATION.—(a.) The cost of packing down ore on horses in the summer time varies from \$5 to \$8.50 per ton to railroad. In the winter time, by rawhiding, \$2.50 to \$3.50 per ton:

(b.) By waggons or sleighs, \$1 to \$2.50 per ton:

(c.) Cost of transportation from shipping centres to the smelters in the United States, from Sandon, \$7.50; from Slocan City, \$11.00.

TREATMENT.—The treatment charges depend upon whether the ore is crude or "carbonates," and on the latter according to the percentage of lead. On the crude ore, or nearly pure galena, the smelter charges vary from \$15.50 to \$18 per ton; on the carbonates from \$9 to \$15 per ton; the \$9 rate being given in one case where the lead did not exceed 20%.





SLOCAN STAR CONCENTRATOR.

(See page 51, *Bulletin No. 3.*)



The smelters pay for 95% of the silver and 90% of lead, assay values, at the New York quotations at time of settlement.

For zinc, 50 cents is charged per unit—about 10%. The duty on lead in the ore entering the United States is  $\frac{3}{4}$  of a cent per lb.

#### DESCRIPTION OF CLAIMS.

In describing the mining properties the following grouping has been followed. Beginning at Sandon, on the south fork of Carpenter Creek, now the distributing and main shipping centre in the Slocan, where recently the Bank of British Columbia and the Bank of British North America have opened offices:—

(a.) The mines and claims on the mountain range south of the creek are the Slocan Star, Ruth, Wonderful, Canadian, and Adam's groups, Ivanhoe, Yakima, Alamo, Idaho, Cumberland, Queen Bess, Monitor, and adjacent claims:—

(b.) The mines and claims on the south slope of the mountain range running east and west, north of the creek, as Lucky Jim, Payne, Slocan Boy, R. E. Lee, Last Chance, Noble Five, American Boy, Reco, Goodenough, Blue Bird, &c., with the claims in the basins on the north slope as Northern Belle, Dardanelles, Rambler, Best, Surprise, Antoine, Washington, &c.:

(c.) The mines and claims north of the K. & S. R. R., as the Whitewater, Wellington, London Hill, &c.:

(d.) The mines and claims on the creeks tributary to Slocan Lake:

(e.) Claims on Cariboo Creek and its tributaries.

#### SLOCAN STAR.

This property has not only paid a larger amount of dividends, or \$300,000, than any other mine in British Columbia, apart from the coal and placer mines, but has proved itself to be the largest silver-lead mine so far developed in the Province. It was discovered October 17th, 1891, by one of the present owners, Mr. Bruce White, and others, who, following up Sandon Creek, discovered in the bed of this stream, a mile above its junction with the south fork of Carpenter Creek, the site of the Town of Sandon, a vein 13 feet wide, of quartz and spathic iron interspersed with galena, zinc blende, and angular pieces of the slate country rock. Prospecting to the west in a dense forest of heavy timber along the strike of the vein, at about 800 feet, a large exposure of the surface croppings of the large ore-shute was found, and here the Slocan Star claim has developed the ore-body to be described below.

This group of claims, all Crown Grants or Crown Grants applied for, comprises the *Slocan Star*, *Slocan King*, *Silversmith*, *La Plunta*, *Windsor*, *Shogo*, *Emma*, and *Jennie*, of which the Slocan Star, Slocan King, and Silversmith, apex claims, are located along the trend of the vein for about 4,000 feet. It is owned by the Byron N. White Co., Pres., Angus Smith, Milwaukee, Wis.; Gen. Manager, Byron N. White; Superintendent, Bruce White, Sandon. Capital stock of the company 1,000,000 shares at 50 cents each.

**ORE-BODY.**—This vein cuts across the steep, heavily timbered mountain side and nearly at right angles to the well stratified slates, quartzites and silicious limestones of the Slocan slate series, with an east and west strike and a dip of 54° to the south. While this vein has been traced through and beyond this property into other claims, it has not yet been traced continuously, nor has it any constant width, varying from a width of a few feet to 20 or 30 feet, with in other places no signs of mineralization at all along the fissure along which the country rock has been more or less shattered and the ascending mineral-bearing solutions have formed large deposits or shutes of fine ore. A large porphyry dyke runs nearly parallel with the vein and in places in the mine is found in it, but evidently affected by this fissure.

Along this fissure is seen much brecciated slate cemented together by the gangue materials, galena and blende, and in many other parts of the mine was noticed more or less parallelism in the deposition of the different minerals; but one interesting peculiarity noticed was the fact that many samples of ore clearly showed by the separation by the quartz of corresponding parts that the sulphides, as galena or blende, after deposition, had been shattered, perhaps, by further movement along this line of break, and then cemented into the present mass by quartz.

It is doubtful if two well-defined walls can be traced in this mine, for while the hanging or fissure wall is very distinct, the ore merges into the country rock towards the supposed foot-wall, but more time could not be spent in very careful observation. In the mining of this one large ore shute as has been opened up and exploited upon the Slocan Star, the ore body



has been found to vary from a few feet to 25 feet in width of mixed but pay ore, and a large amount of ore has been mined from bodies 2 to 8 and 10 feet wide of solid galena.

ORE.—(a) The first-class ore consists of the nearly pure galena, both fine and coarse-grained, carrying some grey copper and some blende, but not enough to pass the excess line, or 10% of zinc. Average value, 95 ozs. silver per ton, 72 to 75% lead.

This ore is sacked and shipped direct to the smelters.

(b) The concentrating ore consists of the mixed ore or the spathic iron quartz gangue with galena, with a little grey copper, and in all the ore there are evidently some of the silver sulphides. The large amount of mixed ore taken from the upper workings and kept separate became available on the construction of the concentrator, and was being sent down the hill. In concentrating most of the blende is removed so that the concentrates carry not more than 6% zinc. Average value of concentrates, 80 ozs. silver per ton, 70% lead.

THE MINE.—This main ore shute has been developed for a distance of 430 feet along the vein and to a depth of nearly 350 feet from the surface down on the dip, and from it several small bodies of ore have formed along divergent crevices.

TUNNEL No. 1 was first run into the large surface exposure for 50 feet and then stopes were run to the surface or 30 feet.

TUNNEL No. 2 is a cross-cut for 100 feet, and then a drift for 100 feet, with a stope up to No. 1 80 feet long and 4 to 10 feet wide.

TUNNEL No. 3 is 70 feet below No. 2, and in cross-cutting at 70 feet, intersecting a leader of ore drifted upon for 25 feet, and then passing through the slates, more or less mineralized, cut the main lead at 150 feet. A drift 150 feet to the west, through low-grade ore, entered a splendid body of high-grade ore which, on being stoped back 110 feet to the east, had led back to within a few feet of connecting with the short drift run at a 70-foot mark in the tunnel, thus leaving a pillar nearly 40 feet wide of what promises to be low grade, but paying, concentrating ore. This stope is now 180 feet long and 4 to 7 feet wide, and is worked up for most of the distance to the upper level, while the drift has a total length of 430 feet along most of which is much concentrating ore. But this shute has developed its largest and most productive ore body between the level and No. 4, below which no work will be done until Tunnel No. 5 reaches the ledge.

TUNNEL No. 4 was the main working entry at the time of visit, and here were erected the ore-bins at the upper terminal of the gravity tramway to the concentrator. At a distance of 575 feet this tunnel entered the vein, where it was 10 to 12 feet wide, and to the west a drift of 75 feet long had encountered a fault which had not been explored, but up along which a stope had been extended a short distance in, 8 to 10 feet of mixed ore. Easterly from the tunnel, at 100 feet, an up-raise had been made 210 feet to the next level, and all the way in good but mixed ore, with 14 to 16 feet of concentrating ore at the foot or tunnel level. At 150 feet in this east level a cross-cut showed up a width of over 25 feet of mixed ore with several feet of solid galena, but at the face, or 225 feet, the shute was then narrowed to 3 feet. A large amount of stoping has been done for 70 or 80 feet below level No. 3, where the body of clean ore had been 8 to 10 feet thick, but a large amount of ore was still showing in all the limits of these stopes.

TUNNEL No. 5 was in 200 feet in the slates, with 600 feet remaining to reach the vein 210 feet on the dip below level No. 4. The ground was all ready for the building and air-compressor plant, *i. e.*, 4-drill Rand and an 80-horse-power boiler, and rapid progress would be made with the machine drills in the extended exploration of this claim, along this level.

On the "Silver King" to the east, near the vein exposure in the creek, a tunnel had been driven in 80 feet, but although there was considerable ore for some of the distance, the ground was much broken up. To the west, on the "Silversmith," ore was exposed in some shallow cuts, but this claim has in reality been but very little prospected.

TIMBER AND WATER are abundant for mining purposes—the timber being of large size, and immediately at the mine, where the stopes are timbered up with heavy stulls and lagging.

TRANSPORTATION.—A steep waggon road from Sandon climbs up past the mill to tunnel Nos. 3, 4 and 5, but all ore is sent down to the mill by the 3-rail gravity tramway, about 1,600 feet long, covered where necessary by snow-sheds, the concentrating ore being automatically dumped into the mill bins, the sacked first-class ore being loaded into ore waggons or sleighs, and drawn, also the concentrates,  $\frac{1}{2}$  mile to the railroad at Sandon, at a cost of 80 cents per ton. Number of men employed 83, of which 55 were in the mine, and 10 at the mill.



## THE CONCENTRATOR.

This mill, designed and constructed by Mr. T. L. Mitchell, Sandon, who built the Washington Mine Concentrator, and is now completing the mill for the Noble Five Mining Co., is situated at the foot of the tramway, and is 46 by 102 feet, with four floors.

**BINS.**—There are two 150 tons capacity each, one for the coarse ore from the mine, the other for crushed ore below the crusher for supply.

**POWER.**—(a.) A Pelton wheel, a 3-foot steel disk, with a  $1\frac{7}{16}$ -in. nozzle, supplies, when the water is sufficient, ample power, and is situated on the upper floor, so that the water from it, after going through a 12-mesh screen, may be used for washing in the operation of the mill.

(b.) When water is scarce, an auxiliary steam engine will be used, or a 40 h. p. engine, with a 50 h. p. boiler.

**WATER.**—(a.) A flume 3,000 feet long in two branches, brings from Sandon and another small stream, water that flows down through 1,200 feet of spiral rivetted steel pipe, the lower 250 feet 7 in. in diameter, with a total head of 471 feet at the wheel. (b.) Another flume from Cody Creek, 9,650 feet long, 2 x 2 feet, on a 0.2% grade, costing \$7,400, now supplies water for washing purposes in the mine, but has no head for power.

**MACHINERY** was made by E. P. Allis & Co., Milwaukee, much after Mr. Mitchell's designs, and comprises:—

(a.) A Blake crusher, Reliance pattern, 9 by 15 inches:

(b.) Four sets of rolls, Reliance pattern, 14 by 26 inches:

(c.) Six Hartz jigs, *i. e.*, 2 double 2-compartment, and 1 double 3-compartment jigs:

(d.) Six 2-compartment Collum jigs:

(e.) Elevators, trommels, classifiers and settling tanks, etc.:

(f.) Two double-decked round slime tables, 18 feet diameter.

**METHOD OF CONCENTRATION.**—The ore from the crusher is automatically fed by a cam-feeder to 2 sets of coarse rolls, whence the material is elevated by elevator No. 1, into one revolving screen with 3 sizes of screens, from which (a) the refusal of the screens passes to 2 coarse Hartz jigs; (b) the material from the 16 m.m. (.64 in.) screen, to 2 coarse Hartz jigs; (c) the material from the 7 m.m. (.28 in.) screen, to 2 coarse Hartz jigs; (d) the material from the 3 m.m. (.12 in.) screen, passes to 2 three-compartment hydraulic classifiers, which give 3 separations, each of which goes to two of the double-compartment Collum jigs, while the overflow passes on to the V-shaped settling tanks, or species of spitz-kasten, from which each of the four sizes of fine stuff goes to its own slime table.

The pitch of each slime table is different, so as to conform to the size of the fine sand fed to it, and by using two water sprays, 3 separations are here made, the heads, middlings and tails, of which the middlings pass back by elevator No. 2, to the hydraulic classifiers.

The middlings from four coarse jigs pass to the coarse set of middlings rolls, and thence back to elevator No. 1, the 7 m.m. middlings to middlings rolls, and thence to elevator No. 2, while the fine middlings from six Collum jigs, go to fine middlings rolls, which discharge into elevator No. 2. The automatic discharge material from six coarse jigs, and the sieve work from the six Collum jigs, and the heads from the tables, pass by the concentrate sluices to the concentrator bins below, whence they are shoveled into sacks of 155 lbs. to 160 each, while the overflow, carrying much fine material, goes into the settling tanks in the slime house.

**CAPACITY OF MILL** is up to 150 tons of ore per 24 hours, the ratio of the concentration varying, of course, with the grade of the ore sent down from the mine.

The mill has worked excellently from the start and is giving great satisfaction. The product is very clean galena, with seldom over 6 %, and never up to 10 %, of zinc, but there is a considerable loss of silver, some of which is carried away in the blende, while the greatest source of loss is believed to be in the grey copper, much of which escapes in the finest slimes.

**COST** was, for buildings, \$12,700; for machinery, not including engine and boiler, \$17,000.

**OTHER CLAIMS.**—To the east considerable work by tunneling has been done on the *Eureka* claim, which lies up on the steep mountain side along which this vein, by the angle of its dip, would be expected to run. Between 60 and 70 tons of ore have been shipped during 1894-5-6.

The *Rabbit Paw*, lying to the south and west, is being prospected by a company who are searching for its extension westward of the vein.



## RUTH.

This group of claims, the *Ruth*, *Hope*, *Wyoming*, and the *Ruth Fraction*, all surveyed for Crown grants, are located on the same mountain side, one-half mile from the Slocan Star and one and one-quarter miles by road from Sandon, and was owned by the locators, F. P. O'Neil, D. C. Clark, J. Y. Kesler, F. E. Starkey, D. E. McVey, and W. H. McVey until last October, when two-thirds interest in this property was sold for \$166,000 to Mr. H. M. Foster, England, Messrs. D. E. and W. H. McVey retaining their one-third interest.

After many hardships and disappointments, but persistent prospecting, the Ruth vein was accidentally disclosed by a small piece or two of iron-stained rock sticking in the roots of a wind-fallen tree that had stood nearly on the top of the ledge, and even then considerable work had to be done before the ore shute was struck from which has since come the mine's production. Under the direction of the foreman, D. S. McDougal, this property has been prospected in a systematic manner, and all the work has been done with care and thoroughness, which has greatly enhanced its market value, as is evidenced by the recent transfer at such good terms.

The vein dipping N. W. 60°-90° strikes across the slates N. E. by S. W., and carries in the gangue of spathic iron and some quartz very coarsely crystalline galena, that runs from 100 to 120 ounces in silver per ton and 54 to 76 % lead, while within surface influences the sulphides have been changed to the "carbonates," that run from 30 to 65 ounces of silver per ton, of both of which classes of ore 1,500 tons have been sent to the smelters. The width varies, but in one drift the shute was seen to be at one part 9 feet wide, but as far as the vein was opened up, or 800 feet, it was very persistent and regular in its course, the fault dislocations being small. The ore is always banded parallel, of course, with the walls, and in the upper workings bands of galena have bands of the oxidized ore on either side, or there were in the other parts alternate bands of spathic iron, galena, and blende.

THE MINE.—*Tunnel* No. 1 follows the vein or vein crevice for 350 feet, but the ore shute is not reached by it, it not being far enough into the mountain to be under the ore mined in the tunnels above.

*Tunnel* No. 2 was 740 feet long (Aug 16th), but for 90 feet but little ore was found, or 11 tons, but beyond this the vein, though small, is more defined, until 150 feet in, where a stope 160 feet long begins, and runs up 40 feet, with an average width of 3-3½ feet, with ore still in the roof. An upraise of 85 feet connects with *tunnel* No. 3. Farther in was another stope 55 feet long and up 30 feet, showing at the top 4½ feet of banded ore or galena, spathic iron, and "carbonates." Still another stope 160 feet long, 3½-4 feet wide, was up about 40 feet with ore in the roof, while beyond this in the tunnel level there was a width of 8 feet of first-class ore for a length of 25 feet, and at 630 feet an 80 foot upraise, also in ore. In the breast of the tunnel the vein was passing through a porphyry dyke, but only as a narrow seam of ore.

TUNNEL NO. 3 was 330 feet long with ore all this distance, but not so wide as below, although at the face were 3 feet of galena and decomposed ore or "carbonates." As the ground was soft all the tunnels were timbered up in an excellent manner and every part of the mine was in the best of order, and there is much good timber on the property. A waggon road 6,600 feet long had just been completed at a cost of \$1,575, thus giving easy facilities for the shipment of ore to the railways. Number of men employed 25.

## WONDERFUL.

The *Wonderful*, 34.50 acres, Crown Grant, and the *Lookout*, and *Columbus* mineral locations, situated on the mountain slope about one mile west of the Ruth and Slocan Star, and south of the branch of Carpenter Creek, is owned by the Wonderful Group Mining Co., of Spokane, Pres., W. W. D. Turner; Sec., H. G. Bell, Spokane. Capital stock \$1,000,000 in \$1 shares. Superintendent, E. J. Field, Sandon.

The mining operations conducted during the last season on the Wonderful, were rather unique. The property had been under bond to Jno. A. Finch, who had done over 2,000 feet of underground work, mostly along the supposed course of a vein, but with not very successful results, only two carloads of ore being shipped from these workings in 1895. Ore was found scattered through the wash and the much shattered slates near the surface, so the company decided to prospect the claim by bringing water from one of the small streams in a small flume and then letting it cut its way down through the wash to bed-rock as it rushed down the mountain side to Miller Creek. Water was turned on June 18th, and it was found that



pieces of galena ore were being left in the bottom of the cut, and this prospecting then developed into hydraulic mining, the water being allowed to run for several hours, when there would be a "clean up" of tons of high grade ore, with the result that over \$25,000 were thus won.

As the work proceeded it was seen that the mineral-bearing wash or débris was not more than 100 to 120 feet wide, while the real "pay dirt" had a much less width than this, and as seen in the cut that as the channel cut down it left on either side country rock apparently in place. In the pay dirt there was not only the solid ore but much decomposed mineral, all of which of course was swept away, only the boulders of galena, with all the surface decomposed, remaining; one of solid galena weighing over 13 cwt. While some believed that the ore had been brought down from a vein higher up on the mountain side, the fact that this ore was found only in a narrow channel, and that immediately above the slope of the mountain ran back with a gentle rise, led to the belief that the washing was being done very close to the vein, if not immediately above it, and this conclusion then arrived at has apparently been confirmed in that this washing is now reported by the manager to have disclosed the solid vein in place, with a strike S. W. and N. E., and regular underground mining has been begun.

A good wide track or trail, 7,500 feet long, was built from the mine to Sandon, and the ore is packed out to the railroad, the ore assaying from 113 to 133 ounces of silver per ton, and 70-76% lead, and Mr. Field has succeeded not only, as he claims, in uncovering the vein by this method of prospecting, but has recovered 400 tons of first class ore from the débris.

#### Argo.

North of the townsite of Sandon are three claims, the *Argo*, *Belt*, and *St. Charles*, owned by Wm. Snowden, Jno. A. Whittier, and Alex. McDonald, and immediately above the K. & S. R. R. and a few hundred feet from the town, hence near the bottom of the deep valley of this branch of Carpenter Creek, ore was found during the past summer, and on the surface in one place the vein was cleaned off for 10 to 12 feet, showing a maximum width of three to four feet of solid ore. A tunnel, then 45 feet long, was being run to explore this new ledge.

#### MONITOR.

This claim, 1,500 by 1,500 feet, Crown Grant to be applied for, and the *Hustler Fraction*, are located at Three Forks, on the south slope of the south fork of Carpenter Creek, and are owned by the locator, George A. Petty, who, finding the white-coated galena float on the hillside after considerable search, found the vein which runs north-east and south-west and dips south-east 60° to 90°, crossing the slates at right angles, in close proximity to a porphyry dyke. This vein varies in width from a few inches to 3½ feet of galena and carbonate, or oxide ore, and by surface cuts has been found to be faulted in two places to the north-west—at one point 50 feet and the other 30 feet.

The lowest tunnel, No. 1, 161 feet long, is a cross-cut, but has not yet disclosed the vein, but in No. 2, 15 feet higher up the hill and 275 feet long, the ore is continuous for 195 feet, and from 3 inches to 2½ feet wide, and at the face the 50-foot fault is struck and a cross-cut to the west is being driven to pick up the continuation of the lead. Tunnel No. 3, 100 feet above, after cross-cutting 50 feet had just struck the vein, where it was much broken up. Tunnel No. 4, 110 feet above No. 3 and 480 feet from the north end-line of the claim, or 300 feet south-west of the mouth of No. 1, is a cross-cut for 73 feet, and then a drift both ways along the vein, with a slope 75 feet long and 38 feet to the surface in which was a fine shute of ore, 12 to 16 inches wide, that at either end has changed to zinc blende, but in all probability will again be found to improve on extending the drift. The foot-wall of the vein is very smooth and regular, and apart from the solid ore there is much shattered slate cemented with quartz and galena. The 30-foot fault is south-west of this working. All the mine buildings, ore-sheds and mine timbering, where such was necessary, were in first-class order, and there is much good timber on the claim.

The ore is similar to that found in the other veins in the Slocan, only it carries an appreciable value in gold, the smelter returns showing that the galena, or crude ore, as shipped in car-load lots, assays from \$2 to 14 per ton in gold, 142 to 304 ounces of silver, and 37 to 55% lead, netting, after deducting freight and smelter charges, from \$91 to \$203 per ton, one shipment of 19 tons returning \$20 in gold per ton, 367.6 ounces of silver and 32% lead, or \$249 net per ton. In the carbonate ores the gold values averaged for 88 tons over \$13 in gold



per ton, the silver values ranging from 128.4 to 323.8 ounces per ton, and the lead from 19 to 33%, or \$83 to \$212.40 net per ton. No tests have been made, as known, to determine whether this gold occurs in the sulphides or disseminated in a free state in the quartz. Number of men engaged 12.

OTHER CLAIMS.—On the mountain slope west of Carpenter Creek, the *Idler* is being worked by the Idler Mining Company, who have a vein of silver galena ore.

#### ALAMO.

The Alamo Mining Company, capital stock \$500,000, General Manager J. D. Farrel, Spokane, Superintendent P. J. Hickey, own the *Alamo*, *Ivy Leaf*, *Twin Lakes*, 76.6 acres, Crown-granted, and the *Clarence*, *Hampton*, *Victory*, *Morning* and the *Continental* claims situated in the Alamo Basin,  $3\frac{1}{2}$  miles up Howson Creek, which enters Carpenter Creek near where the concentrator is erected, along the track of the C.P.R., one mile below Three Forks.

THE MINE.—In this vein has been found one of the largest and most productive ore shutes yet mined in the Slocan, an ore shute that extends into and is being worked on the Idaho claim. This vein strike, east and west (mag.) dip south  $70^{\circ}$  to  $80^{\circ}$ , crosses a deep spur from the main ridge, and thus offers the best of facilities for the driving of tunnels along it at different levels. Along this line of fissuring in the slates is much brecciated country rock, quartz, lime spar, spathic iron and ore, of which 8 to 9 feet of solid galena, interspersed with grey copper, have been stoped out, also carbonate ores, while much mixed or mill ore has been sent down to the concentrator. In some of the levels there has been encountered a cross-fault of considerable throw beyond which the ore shute has since been picked up. Tunnel No. 4, the lowest, extends west for 300 feet along the vein which here carries little ore, and the fault being met, the drift was run north-west 130 feet, then south-east 34 feet, striking again, apparently, the ledge. In tunnel No. 3, in 340 feet, and No. 2, a large amount of ore has been stoped out up to the Idaho side-line, the ore shute being 4 to 6 feet wide, the ore breaking to two smooth walls between which is both solid ore and ore mixed with shattered slates and quartz. Tunnel No. 1, 240 feet below the summit of the spur, was in several hundred feet, and the stopes from the lower levels continue on up for 30 to 40 feet above this level, when it pinches above where has been found the greatest width of ore in the mine. There is ample room for other tunnels below No. 4, and such will yet be driven in to exploit a large area of the vein. Ore is being found on other claims on this group, and men were at work prospecting and developing these other leads.

TRANSPORTATION.—(a) From Tunnel No. 3 a 3-rail tramway, 340 feet long, ends in the ore-bins at (b) a very good waggon road, 3 miles long, dropping down 1,700 feet to the ore-bins at the head of (c) the exceptionally long 3-rail gravity tramway, 7,100 feet long, which is in two sections, 3,400 feet and 3,700 feet long respectively, and dropping 1,675 feet, delivers the ore into the bins at the mill at the C. P. R. track. The waggon road also runs down to the mill.

THE CONCENTRATOR.—From the supply bins of 1,500 tons capacity, the ore is trammed into the mill, which is built large enough to permit, if needed, the doubling of the present plant of machinery. On the upper floor, after passing over a grizzly, the ore is fed to a Comet breaker, whence it passes to 16 by 30 inch rolls, and thence by elevator to 3 5-foot trommels, delivering 4 sizes to the jigs on the next floor, of which there are (1) 1 coarse two-compartment Hartz jigs, (2) 2 three-compartment Hartz jigs, and (3) 2 four-compartment Hartz jigs. The middlings pass to a 5-foot Huntingdon mill, and for classifying the fine stuff, Lake Superior classifiers are in use, the tailings going into V-shaped settlers, that feed to 4 double-decked 18-foot round tables. The power is got from a Pelton wheel generating 80 h. p., with water under a 224 foot head in a 12 inch penstock, from a flume that runs about 2 miles to the head gates on the south fork of Carpenter Creek, the water of Howson Creek being also utilised. The sacked concentrates are then loaded directly upon the railroad cars.

This mill was built by Fraser and Chalmers, Chicago, and its daily capacity is 50 tons. It is owned by the Slocan Milling Company, and is under the management of Mr. Farrel.

#### IDAHO-CUMBERLAND.

The Cumberland Mining Co., capital stock \$500,000 in \$10 shares, also under the management of Mr. Farrel and Superintendent Hickey, owns the *Cumberland*, Crown Grant, 32.74 acres, *High Ore*, *Daisy*, *Eastern*, *Thistle*, and the Idaho Mining Co., the *Idaho* and *St. John*, Crown-granted, 101.53 acres.



On the Idaho ground, the extension of the Alamo vein is being worked through that mine—tunnels 1, 2 and 3 having been extended across the line. In tunnel No. 1, a stope 25 to 30 feet above the level, had 10 to 30 inches of very good ore, and up a 60 foot raise, 12-15 inches of solid ore continued to the top, while in the face of the level were 2 feet of solid galena, and 4 to 5 feet of mill ore. These claims lie north and west of the Alamo group, in the Idaho basin.

In the Idaho basin, reached by a branch road one-half mile long from the main road, another vein on the Idaho, striking N. E. and S. W., and dipping S. E. 60°-70°, yielded a large amount of good ore from the upper cuts and tunnels, but in the main tunnel 550 feet long, there was found little ore, but 10 to 12 feet of brecciated slate, quartz, calcite and iron pyrites.

On the Cumberland, four tunnels had been driven in on a vein that runs parallel with the one just mentioned on the Idaho, but being only 150 to 200 feet west, it had not yet been shown whether this is another vein, or the Idaho vein faulted. The upper tunnels Nos. 1 and 2 were caved in, but in No. 3, a narrow vein of nearly solid galena and blende had been followed and stoped out for a distance of 350 feet, and in an under-hand stope a streak of 4 to 10 inches of galena was being mined. Tunnel No. 4 was not being worked. Several hundred feet lower down, a cross-cut tunnel had been driven 500 feet, to cut two small veins showing on the surface. All ore is shipped by the Alamo road and tramway, and treated, if concentrating ore, at the mill, and this property is proving very productive. On the Idaho and Alamo 35 men were engaged.

OTHER CLAIMS.—The *Hustler* and *Silver Bell*, lying south-west, and west of the Idaho claim, owned by a Victoria syndicate, are said to be traversed by both the Alamo-Idaho vein and the Idaho-Cumberland vein, on the latter of which work has been done, and much more will be done this summer.

#### YAKIMA.

The *Yakima*, *Sunshine*, *Monday* and *Oregon* in the next basin east of the Alamo, owned by the Sunshine Mining Co., Manager J. D. Farrel, was not visited, as work had been suspended, but several carloads of galena ore had been shipped from this property during 1894 and 1895.

OTHER CLAIMS.—Many other claims on these slopes are now being prospected, and with successful results. On the *Wild Goose* and *Corinth*, owned by J. Gilhooley, A. J. Murphy, and A. Behue, Three Forks, a vein of solid galena, 6 inches to 2 feet in width, has been stripped for 200 feet on the surface, and ore is now being mined in a tunnel driven in on this ledge. These claims are about three-quarters of a mile by trail up the creek beyond the Queen Bess.

#### QUEEN BESS.

On the east slope of Howson Creek, opposite to the Idaho Basin, are the *Queen Bess*, *Young Dominion*, Crown-granted, 78.2 acres, and the *May Be*, *Concord*, *American Girl*, *Hub*, and *First Extension*, the property of Jas. Moran, Jno. A. Finch, P. Larson, *et al.*, Superintendent, Jas. Moran, Three Forks. A ridge separates these claims and the Monitor, and on the Queen Bess claim has been done most of the work, resulting in the discovery of four veins within 500 feet. On the east vein a tunnel had been driven 200 feet, in which the ground was much broken up and the small vein decomposed, the ore from which produced in shipments by leasers in 1893, of 40 tons, 96 ounces of silver per ton and 74% lead. Work was being pushed ahead on the west vein, 300 feet distant, and in a 65-foot tunnel, after 15 feet of surface material, a vein, strike N. E. and S. W., dip S. E. 80 to 85, was followed for 45 feet and stoped up 20-30 feet, producing high grade ore assaying 141 ounces of silver per ton and 75% lead of a very coarse cubed galena, of which 25 or 30 tons piled on the dump were being sacked for shipment to the Omaha and Grant smelter. At the face a winze was being sunk on two leaders of galena separated by four feet of slate. The third vein lying between the east and west leads had only been stripped and thus traced for 200 feet, but there was a wide zone heavily iron-stained, slightly impregnated with galena, and reported to give assays in gold of \$4 to \$6 per ton. The fourth vein is 100 feet west of the west lead, and at the surface 6 inches wide of carbonate ore assaying 50 to 60 ounces of silver and up to 40% lead. The ore will be packed down over a short trail to the road and thence one-half mile to the Alamo tramway, and then delivered at the C.P.R. track. It had been decided to thoroughly explore this property, and this winter 14 men are employed.



## CANADIAN GROUP.

On the summit of the ridge, at an altitude of about 7,200 feet, between the south fork of Carpenter Creek and Four-Mile Creek, or two miles S. W. of Sandon, whence a trail *via* the Ruth mine runs to these properties, are the *Adams* and *Brandon*, Crown-granted 86.1 acres, and the *Katie D.*, *Sarah B.*, and *Hill Top*, owned by M. Adams, Sandon, and W. H. Brandon, Slocan City. Several small galena veins are to be seen on these claims, but as yet not much work has been done to explore them. On the Hill Top a small vein of galena a few inches wide can be traced for some distance, strike N. and S., dip west 60°. On the south slope of the Brandon a vein is traceable down the hill for several hundred feet, sticking up as a rib of galena, calcite, and quartz, 4 to 12 inches thick, in which are driven two short tunnels, in the upper one of which the ore is cut off, while in the lower there are 3 to 5 feet of mixed milling ore. About 1,200 to 1,500 feet east of this is another vein, strike north and south, dip 60° west, which, although small, can be traced up the slope for several hundred feet and then down through the bottom of a narrow gully in the cliff, forming the north slope of the ridge at this point. A tunnel was in 35 feet under a smooth hanging wall, and the vein consisted mostly of coarse calcite, with some galena, but on the surface the ore was sticking out in places in ribs of solid big-cubed galena. There is very little or no timber on this ridge, and only small springs of water. Trails lead over to the Alamo and Idaho mines to the west along the ridge, or down the mountain to the south to Four-Mile Creek, and thence to Silver-ton, on Slocan Lake. No work was being done at time of visit—Aug. 21st.

## THE IVANHOE.

Lying next to the Canadian group, on the east, are the *Ivanhoe* and *Elgin*, Crown-granted 81 acres, owned by the Minnesota Silver Co., Ltd., Pres., W. H. Yawkey, and under the same management as the Idaho and Alamo.

Mr. McConnel, in his report of 1895, says, "The Ivanhoe, situated high up on the slope of the mountain, shows several nearly parallel veins. Two cross-cut tunnels the upper 50 feet and the lower 90 feet in length, connected by an upraise of 70 feet, have been driven, and drifts have been extended along the lead from the ends of both tunnels for varying distances. The workings have exposed an ore shute 60 to 70 feet in length, with a maximum width of five feet of pure and concentrating ore. A contract for a third cross-cut tunnel, 150 feet below No. 2, had been let at time of visit."

During the past year about 15 carloads of ore were shipped to the smelters, and development work is being continually carried on.

## ADAM'S GROUP.

On the same high ridge, and on the west of the Canadian group, lie the *Britomarte*, *Chamb-let*, Crown Grants, 86.3 acres, *Midnight*, *Mammoth* and *Slater Fraction*, owned by Capt. R. C. Adams, Montreal, *et al.*

In the slates and limestones run many dykes and spurs of porphyry, and on the south slope on the Britomarte, close to the Canadian group, an open cut exposes a vein of mixed ore, *i. e.*, cube galena, calcite, and quartz, 15 to 30 inches wide, running north and south with a dip of 80° west, this vein crossing over the ridge where it stands up as a narrow rib of solid galena ore 4 to 14 inches wide and intersecting on the north slope another galena-bearing vein. On the south slope, running down the hill, are three or four narrow veins of galena close together, that nearly merge into one another at a point where a 12-foot tunnel has been driven in on a vein of 4 to 12 inches wide of nearly pure galena. On the north slope is a very steep, rocky face, scored yearly by snow-slides, and running nearly parallel with the dykes, are several small veins of the same kind of ore as found in the others. On one of these veins, traceable to the summit, a tunnel was being driven, and for its length, or 20 feet, there were four feet of mixed ore, calcite, coarse galena, blende, and grey copper, of which six or seven tons were on the dump. Above the tunnel on the surface this vein showed 8 feet of mixed ore, with small, nearly parallel, veins, evidently stringers from the main lead. About one hundred feet S. W. of this vein is another that showed in one place four feet of mixed ore, and was running 60° E. by S. 60° W. On the south slope two tunnels have been run in to tap these veins, one for 50 feet, 150 feet below the summit, where in a cut were 6-7 feet of concentrating ore, and the other 400 feet below the summit, for 245 feet, in which for the last 40 feet some ore had been followed.



This property can be developed by running a cross-cut tunnel from a place free from any likelihood of snowslides, as is done on other properties in this district, and from this same point an aerial tramway, on a steep grade, could be built down to a point convenient to a waggon road to be built to Sandon. Good cabins are being erected about 1,000 feet below the workings, and a trail, four miles long, as mentioned in connection with the Canadian group, leads down to Sandon.

#### NOBLE FIVE MINES.

The original Noble Five group, located for 5,000 feet along the course of one vein, comprised the *Noble Five*, *Bonanza King*, *World's Fair*, *Knoxville*, and *Maud S*, 66.6 acres, but the two adjoining claims on another vein, the *Deadman* and *Wild Goose*, have been added since the consolidation of these properties as now owned by the Noble Five Consolidated Mining and Milling Co., Spokane, Wash.; Pres., Jno. D. Porter; Sec., J. F. Cutler; Gen. Manager, J. G. McGuigan, Sandon, B. C. Capitalization, 1,200,000 shares at \$1 each.

This property is located about  $3\frac{1}{2}$  miles by trail N. E. of Sandon, and 2,500 to 3,000 feet above that town, on the steep southern slope of the mountain, on which have been discovered the series of veins now mined from the Payne group on the west to the Blue Bird on the east. There are two veins, and perhaps three, now known, striking N. E. by S. W., dip  $60^\circ$  S. E., through slates and limestones, intersecting at an angle of  $30^\circ$  to  $45^\circ$  the "porphyry" or granitic dykes through which the veins continue, and in places carry their best ore-shutes. The ore occurs both as solid galena and as carbonates and oxides in a spathic iron and quartz gangue, and from the limited workings these claims have yielded from \$125,000 to \$150,000.

**NOBLE FIVE vein.** On the surface in a rocky gulch scoured by snow-slides, are large croppings of iron-rock, which on being broken into is found to consist of galena, blende, and spathic iron, while in the mine the ore is arranged along a smooth, slickensided wall that is sometimes on the hanging and then on the footwall side, in bands arranged in one drift with four bands, *i. e.*, spathic iron, blende, spathic iron, and then galena, with fragments of slate scattered through the ore-shute and spurs of ore running off into the country rock. In the early history of this mine, when the costs and difficulties of shipping were excessive and changes of management often, small drifts were run in on the ledge and the ore extracted in an unsystematic manner, but under the new management the property is being developed in a thorough manner, and the mine placed in a proper condition for its best development and most economical working.

On the most southerly claim, the Noble Five, a tunnel 65 feet long and short cross-cuts were driven resulting in the finding of some good ore, but as this was a dangerous place for snow-slides this work has not yet been extended to prospect this part of the vein. On the Knoxville and Bonanza King has been done most of the mining, consisting at the time of visit (August 18th) of tunnels aggregating 1,380 feet in length and opening up the vein vertically to a depth of 600 feet. In these workings but little high grade ore was left in sight, although much ground remained to be prospected, but there were stopes 6 to 8 feet wide, while the amount of concentrating ore exposed, consisting mostly of galena in decomposed material, was considerable, and in some of the drifts, 7 to 9 feet wide. The mine was not in a condition at that time to show up or do justice to this large and strong ledge, but the three main tunnels to be run and connected by winzes will put this property on a proper working basis.

About 200 feet below these workings the main tunnel has been started in a place perfectly safe from slides and cross-cutted to the vein which on the surface at this point had a strong out-crop of galena. This tunnel will be extended well into the mountain along the vein and connected with the upper tunnels, thus enabling all ore to be brought down to the mouth of this main level, where will be the ore-bins at the head of an aerial rope-tramway, 6,100 feet long, vertical drop 2,100 feet, now being built to the concentrator at Cody.

On the Deadman and Wild Goose claims are several large dykes and tongues of "porphyry," and the Deadman vein is about 400 feet east of the Noble Five vein and parallel to it. No work is being done in any of the three tunnels; in two of which that were entered but little ore had been left in sight, but several faults were in evidence. Ore has been shipped for three years from this vein, or 26 car-loads in all, of ore that assayed 63 ounces in silver per ton and 15% lead for the "carbonates," and up to 255 ozs. of silver per ton and 69% lead for the solid galena ore.

There is little or no timber on the property of this Company, and in fact upon any of these properties high up on the mountain, fire having destroyed the most of it, but lower down on the slopes the supply is good.



**CONCENTRATOR.**—Following up his success with the Slocan Star mill, Mr. T. L. Mitchell has just completed a mill on Cody Creek, at the Town of Cody, which is arranged practically after the same scheme as that followed out in the Slocan Star. A flume brings water from Cody Creek and in the conveyance of ore from the mine automatic devices have been introduced throughout. At the main working tunnel of the mine bins of 600 tons capacity automatically discharge into the buckets of the Finlayson double rope tramway, and at the lower terminal the ore drops into the bins of 260 tons capacity and thence automatically to the 9 by 15 inch rock-crusher and thence into the mill. The capacity of the tramway will be 20 tons an hour. The machinery for the mill has been purchased from the E. P. Allis Company, of Milwaukee, Wis., and the first-class ore and concentrates will be loaded into the cars of the K. and S. R. R. which has a branch line running to Cody.

#### LAST CHANCE.

This property, the Last Chance, 600 by 1,050 feet, Crown-granted, the *Starlight*, *Starlight Fraction*, *Blizzard* and *Little Widow*, Crown Grants applied for, lying immediately west of the Noble Five group, is owned by the Last Chance Mining and Milling Co., Spokane. Capital stock, 500,000 shares at \$1 each.

There are two small parallel veins running N.E. by S.W., one standing vertical, the other dipping S.E. 50°, and two tunnels 100 feet apart in elevation. The upper tunnel is 240 feet long with cross-cuts and drifts on smaller veins that lead off from the main one, while the lower, a cross-cut tunnel, intercepts the inclined vein at 180 feet, along which drifting has been done for 140 feet, with an upraise to the upper workings. This tunnel was being continued to strike the other vein but had not done so at 100 feet, but it was in the works between these two tunnel levels that the character of the ore and the vein was best seen, as from an incline started down on the vein near the mouth of the upper tunnel, and when about midway between the levels extended as a drift, very high-grade ore had been mined where the vein, varying in size from a few inches to 3 feet of solid, rich silver-bearing galena was found to have, where galena was not solid, a quartz gangue with galena, forming good concentrating ore. Within surface influences the veins have suffered the usual alteration, and rich "carbonate" ore has also been stoped out.

While so far most of the work has been directed toward the development of this mine a quantity of excellent ore has been sent down by rawhiding to Sandon and thence shipped to the smelters, as in 1895 about 9 car-loads of ore assaying 166 to 191 ozs. in silver per ton and 71 to 78% lead, and in 1896 17 car-loads averaging 182 ozs. in silver per ton and 62% lead, were sold. This property is another example of many which have paid for themselves from the beginning, and during this last year a dividend of \$20,000 has been declared, after providing for the new mine buildings, more extensive underground work and the purchase of other claims. There is but little timber on these claims. Foreman J. Regan. Number of men engaged 10.

**OTHER CLAIMS.**—Below this claim is the *American Boy*, now being worked by Thomas McGuigan, with a yield to date of 5 or 6 cars of good silver-lead ore, and the *Ajax*, under the control of Matthews and Braden, who also have the *Ruby Silver* at the northern end of the Noble Five string of claims, both of which mines have shipped high grade ore. Upon the summit, at an elevation of 76-7,800 feet, Dr. Hendryx, of Nelson, was driving a cross-cut tunnel on the *Galena*, to cut a vein of silver-lead ore that shows up well on the precipitous bluff to the north, and is thought to be the northern extension of the R. E. Lee vein. It has a strike N. E. by S. W. across the slates and limestones, and also across a prophry dyke, and a dip of 60° to the S. E.

#### RECO GROUP.

Immediately to the east of the Noble Five claims on the same south slope of the mountain, lie the *Reucan*, *Texas*, *Clifton* and *New Denver*, 150.65 acres, Crown Grants applied for, and the mineral location, the Ephraim, the property of the Reco Mining and Milling Co., Ltd., Sandon, B. C. Capital stock, \$1,000,000 in \$1 shares; treasury stock 100,000 shares. Pres. and Gen. Manager, Jno. M. Harris; Sec. F. T. Kelly, Sandon, B.C.

Two distinct silver-lead veins strike N. E. by S. W., dip 60° to 75° S. E., are being worked on this ground, i.e., (1) Big vein and (2) the Small or Goodenough vein, and in all probability veins lying in contiguous claims will be discovered, on prospecting, to extend into this territory. This mine affords another example of the opening up and development, and the purchase of other claims, without any capital save that got in mining, from the beginning of work, of rich



ore. On the Big vein have been run three tunnels, from which has been taken most of the ore extracted from this lead, save that from one small stope that yielded over \$16,000; and in tunnels Nos. 1 and 3, the former 650 feet long, and the other 900 feet long, connected by a raise 125 feet long in the vein; the veins consist mostly of decomposed vein matter, in places a few inches wide, in others several feet. Work on this vein so far has been confined to purely development during the past year, but in 1895, 4 carloads of galena, the ore yielded on an average 179.8 ozs. silver per ton, and 71% lead (smelter returns). While the carbonate ore or 9 carloads yielded from 89.3 to 161.6 ozs. silver per ton, and 23.2 to 37.1% lead.

From the Small or Goodenough vein, lying several hundred feet to the east, has come the richest silver-bearing galena yet found in Kootenay, the silver evidently occurring as argentite, although much ruby silver is found in some of the solid galena. The mining operations are being carried on in co-operation with the Goodenough mine, and three tunnels, Nos. 2, 4 and 6, have been driven to and then extended both ways along the vein in each of these properties; the vein being from 2 or 3 inches wide up to 20 inches of solid ore, with in places only a narrow streak of iron-stained matter. The ore so lies that generally the ground can be mined out along it, leaving the ore to be afterwards broken down clean. The ground is faulted in one place with a lateral throw of the vein for 10 feet, and where the vein passes through the porphyry dykes the ore shute is found, generally, to be about the most productive part of the vein. From these tunnels several hundred feet of drifting have been driven, the vein being not always productive, but in the miners' term "in and out," and these levels will be continued much farther before reaching the limits of the claim. (See Goodenough mine below).

This ore, while mined from a small vein, is very profitable, and at the time of visit, in August, several tons of rich ore were piled at each tunnel mouth, and the following data from smelter returns will give some idea of the value:—The galena ore has run from 225 to 730 ounces of silver per ton, and 67% lead; one lot of 21 tons assaying 730 ounces of silver per ton, and 67% lead; and two shipments in 1896, or 45 tons, yielded net (or 95% of assay) 24,820 ounces of silver, and 27 tons of lead, or \$340 per ton, after deducting all charges.

The carbonate ore from this vein, for 20 carloads, has yielded from 230 to 337.8 ounces of silver per ton, and 19 to 28% lead.

This company now propose to build an aerial tramway down to Cody Creek, and there erect a concentrator. Foreman, Alex. McPhee. Number of men, 15 (in Aug.)

#### GOODENOUGH.

The *Goodenough*, title, Crown grant, 8.3 acres, and the location the *Grey Copper*, 600 by 1,284 feet, lying south of the Ruecau, are owned by Jno. A. Whittier, Jno Thompson, and Jno. Martin, Sandon, and six men were at work on the "small vein," as described in the Reco above. In the workings, tunnel No. 6, or the lowest, was a cross-cut for 275 feet, and near the point of intersection with the vein an upraise had been made for 169 feet to tunnel level No. 4 along the Ruecau-Goodenough line, following for nearly all that distance several inches of the very high grade ore. In the N.E. the drift ran off into the Reco ground, while to the S.W. the Goodenough drift, in 170 feet, with 500 feet of the vein on this level available before leaving the side line, had good ore for 110 feet both above and below the level, with a narrow streak of carbonates to the face, an improvement in the ore shute being expected when the vein passed through the dyke 30 feet ahead. In the tunnel levels Nos. 2 and 4, the relation of the vein to the surface was such that but a comparative short distance along the vein could be worked on this ground, and all was stoped out, but in the Reco these two levels were being extended to the N.E.

There is a fair amount of good timber. As in the other mines, greatest activity is during the winter season, when the cost of shipping ore to Sandon, by rawhiding, is \$3 per ton, instead of \$7 by packing on mules in the summer. The grade of the ore, of course, is similar to that sent from the Reco, the smelter returns for carload lots giving from 277 to 507 ounces of silver per ton, and 48 to 67% lead for galena ore, and 168.5 to 322.5 ounces of silver per ton, and 2 to 34% lead for carbonate ores, while one lot of 6½ tons assayed 768 ounces silver per ton and 64.1% lead.

OTHER CLAIMS.—To the east of these claims lies the *Blue Bird*, on which some work was being done on a tunnel. Three, if not four, veins have been discovered, and 10 to 12 carloads of ore, averaging 134 ounces of silver per ton, and 75% lead, have been sent to the smelters. South of the Goodenough property lies the Chambers group, i. e., the *Chambers*, *Eureka*, *Jay Gould*, and *Wellington*, 600 by 1,500 feet claims; one of the oldest locations in the camp on which exploratory work has been done, but the depth of wash here, at the base of the moun-



ain, makes such operations more difficult than higher up, where the surface is pretty well scoured off the leads, and any float can generally be soon traced to its source. One carload of ore was shipped during 1896.

Much good country in this vicinity yet remains to be explored, and while but little or no ground is now left open for location, there is every probability that thorough prospecting will be followed by good results.

The *Omega*, south of the Reco group, has a vein of galena ore, but all work is at a standstill pending legal decisions as to the ownership of this ground.

#### R. E. LEE.

Title, Crown Grant, 600 by 1,500 feet. Located on the ridge of the mountain, one-quarter of a mile west of the Last Chance, and five miles by trail and road from McGuigan's Siding, on the K. & S. R. R. Owned by Lorenzo Alexander, of Kaslo. At the time of visit, in August, ten men were employed by leasers, who were working on a narrow galena vein, striking N.E. by S.W. and dipping S.E. 45°, near a very large exposure of "porphyry" or eruptive granite. Two tunnels, one 500 feet long, had been run in and connected by a 95-foot upraise, and from the lower tunnel, down an incline, some ore was being extracted. In places in the mine the ore has been found 18 inches wide. During the last year about three carloads of ore have been shipped that averaged 130 ounces in silver per ton and 75% lead, the cost of transport to the railway line being \$5.50 to \$7.50 per ton. Mr. Alexander has now 8 or 9 men at work, is building more substantial living houses, ore sheds, etc., and from the mine is taking some good ore.

#### SLOCAN BOY.

This claim, 600 by 1,500 feet, title Crown Grant, lies on the ridge immediately east of the Payne group and south of the Washington, and is leased by S. K. Green *et al*, to T. M. Gibson and Lang Keith.

Two leads were being worked, one on the south end of the claim, a very small but rich silver-lead vein, being worked through three tunnels, one 140 feet, another 160 feet long. The other, the southern extension of the Washington vein, is also argentiferous galena that follows along two to three feet from an eight foot porphyry dyke, on both sides of which the shales and slates are very much contorted and to a very considerable extent converted into gangue matter. Beginning at the north end-line a tunnel is run in 170 feet along a small streak of ore, and connects with level No. 1, 235 feet long, which runs from the shaft, 200 feet deep, where at a depth of 100 feet the vein, here dipping at a high angle, is passed through. Eight to ten carloads of ore, both galena and carbonates, had been shipped, of which 30 tons of the ore from the small vein gave 332.4 ounces of silver per ton, and 75.4% lead, while the ore from the other vein averaged over 100 ounces of silver per ton and 68% lead.

#### PAYNE GROUP.

At time of visit, part of this property was in litigation, recently terminated by all interests being bought up from Mr. S. S. Bailey by Mr. A. W. McCune *et al*, and this group will comprise the *Payne*, *Mountain Chief*, *Maid of Erin*, and the *Two Jacks*, 38.4 acres, title, Crown Grants, with 2,500 feet along this vein, located on the ridge forming the western end of the range on which are the mines that have been described, three miles east of Three Forks, and three or four miles N. W. from Sandon, to which place is being built a new waggon road.

The Payne was the first location made in the Slocan District and the locators believing the trend of the vein would follow the strike of the country rocks as at Ainsworth, put in their stakes accordingly, and in reality made their location across the vein. Until lately this ground had been opened up by Mr. Bailey, and on the Payne a tunnel has been run in for over 300 feet, with ore continuous for nearly all that distance, the vein strike, N. E. by S. W., having a quartz gangue, but with a maximum width in parts of solid high grade galena of three feet. Substantial mine buildings were being erected at this tunnel mouth, to supplement those already built, and on the Maid of Erin, to the south, a tunnel lower down had been begun and extended into the Payne claim. To the north of this claim, on the Mountain Chief, tunnels had also been run in on the vein, and ore stoped out to the grass roots, but the main mining operations will be conducted from the southern side of the mountain, on which slope is a fair amount of timber suitable for mining purposes; fires having destroyed most of the wood supply. It is reported that over (Sept. 1896) \$100,000 worth of ore has already been sold from this vein, the carbonates



assaying 80 to 100 ozs. silver per ton, and 35 to 40 % lead, and the galena ore 175 ounces of silver and 70 % lead; or an average net value on all ore sold of over \$100 per ton. Mr. Scott McDonald, formerly in charge of the Skyline, is superintendent of the work now being vigorously carried on. At time of visit 28 men were engaged on the different claims.

#### WASHINGTON.

On the northern slope of this mountain the *Washington* was located on the vein that showed in the face of the cliff, and over 1,400 tons of ore were shipped in the early years of 1892-3-4, but work ceased until the end of 1895, when the concentrator was built, permitting the shipment of much mill ore on hand in the mine and on the dump. This claim, Crown-granted, 14.76 acres, together with four mineral locations, is the property of J. L. Montgomery, of New York; J. L. Retallack *et al*, Kaslo.

The porphyry dyke in places lies next to the ore, but so far has not been found to cut across the vein, which, with a strike N. E. by S. W., and a dip to the S. E. from 60° to 85°, is 3 to 12 feet wide, with an average width of 5 to 6 feet of galena in the gangue of spathic iron and quartz with zinc blende, much of which is sorted out. Bodies of clean, solid galena are also mined, but there is very little carbonates or decomposed ore. In the upper tunnel, No. 1, 77 feet long, there was considerable mill ore, but most of the ore came from tunnel No. 2, 200 feet below and 275 feet long, over which was a large stope 150 feet long and 30 feet high, with a good quantity of concentrating ore in sight, which on being broken was sent down to tunnel No. 3, 300 feet long, in which the ore-shute is much smaller and completely cut off at the face by a fault not yet explored. From the mouth of this tunnel-level the ore passes down through a shute 180 feet long, to a 3-rail gravity tramway, 1,450 feet long, which leads to the shute down to the strong log ore-bins of the concentrator, where an excellent waggon road—one of the best seen in West Kootenay—three miles long, runs to McGuigan's siding on the K. & S. R. R.

**CONCENTRATOR.**—This mill was the first built in the Slocan, by Mr. T. L. Mitchell, who used machinery mostly made in Canada. It has a daily capacity, when water is sufficient, of 50 tons of ore, and the ore, after passing through a 4 by 10 inch Blake crusher into the supply bin, is automatically fed to the coarse rolls, and thence elevated to the revolving screen which makes three sizes. (a) The smallest screened material is further sized to 3 sizes by an hydraulic classifier, each of which passes to one of the 3 fine Hartz jigs, while the overflow of the classifier runs into a V-shaped settling tank, and the settlings of which are drawn off into a double round slime-table, the middlings from which pass to elevator No. 1, into the trommel, and then to classifier again; (b) Of the 2nd and 3rd sizes of the revolving screen, and the refusal or the product passing out at the lower end of the screen, each passes to one of the 3 coarse Hartz jigs, the middlings from which go to coarse middlings rolls, and then back by elevator No. 1. The middlings from the fine jigs pass to fine set of rolls, and also to elevator No. 1. The clean concentrates pass into concentrator bins, which drain into settling tanks to save the slimes, and all shipping material is sent down the hill in sacks.

**ORE.**—The crude ore or unconcentrated galena assays from 108 to 136 ozs. of silver per ton, and 66% lead, and during the past year, the concentrates, of which 50 to 60 carloads have been shipped, yielded 95 ozs. silver per ton, and 60% lead. As the water supply for the mill is for some months precarious, or only available for half of the year, and for the last season even less than that, it has not been feasible to pursue mining operations to that extent otherwise possible, but the development work will be done in the meantime, as there is a good site for another tunnel on the lead below the present No. 3.

#### BEST.

The *Best*, 600 by 1,500 feet, title Crown Grant, and the *Cincher*, alt. 5,800 feet, lie in the Best basin on the north slope of the mountain range, on which are the Reco, Noble Five and other mines already described, and are owned by A. W. McCune, Geo. W. Hughes, P. Larsen and Scott McDonald. The Washington Mine Road has been extended to the mine, which is thus 4 miles from McGuigan's Siding.

The ridge separating this basin from the Dardanelles basin is formed by a fine grained granitic boss, on which are the above claims and part of the Rambler group, and on the Best claim this mass is seamed with a series of quartz veins from a few inches to 6 feet wide, running N. W. and S. E. (mag.) and dipping north-easterly 30°-45°. The ore consists of quartz and rich silver-bearing tetrahedrite and jamesonite, with, in isolated places, galena and a little blende and iron and copper-pyrites. These veins are irregular in size, inasmuch as they will



have a width of 2 or 3 feet, then pinch out or break into several small stringers. An incline shaft had been sunk 75 feet on one of the veins, and in this and a 25-foot drift, ore was continuous with a maximum width of 3 feet, and 120 feet down the hill in a tunnel 312 feet long; at 100 feet a vein of 6-8 inches of good ore was being followed to the S. E. for 65 feet (Sept. 6th), and at 215 feet a raise to connect with the incline was up 55 feet, at the foot of which was a vein 18 inches wide, of galena, grey copper and blende. The value of the ore shipped was not learned, but other shipments this winter are expected, when the mine will have been put in the best shape for good work. Foreman, F. Banaman, with 9 men.

#### RAMBLER GROUP.

Higher up in the Best basin and south of the Best claim, lie the Rambler group, *i. e.*, the *Rambler, Caribou, Antelope, Tiger* and *Best Fraction*, Crown Grants applied for, the property of the Rambler and Caribou Consolidated G. and S. Mining Co. Capital stock \$1,000,000. Pres. J. B. McArthur, Rossland; Sec. A. L. McClaine, Kaslo; Superintendent, Richard Shea.

Although the ground embraced within the limits of this property has hardly yet begun to be prospected, two different series of veins have been discovered and are being worked. The veins first found were two quartz veins in the same granite as the Best, with the same character of ore, but when building a trail a narrow streak, a finger-width of red and brown iron oxides, betrayed the existence of a typical silver-galena vein, running through the Slocan slates series and porphyry, close to the contact with the granitic area, and since following this streak, three feet of solid high grade ore have been found in one of the tunnels. Galena ore in good quantity has been found in other veins on which a little work had just been done, and every indication pointed to the high value of this property.

(A.) VEINS IN THE GRANITE.—About half way up the slope of the ridge of the granite, two strong quartz veins 200 feet apart, traceable to the summit 4 to 500 feet above, had been entered by two tunnels, and the strike of each was about N. 20° E., by S. 20° W., nearly at right angles to Best veins, a short distance away. In one tunnel 20 feet long the vein, dipping easterly 70°, consisted of a very white crystalline quartz, with druses, 3 to 20 inches wide, with parts of the vein strongly impregnated with grey copper and jamesonite, and in the other tunnel, 75 feet long, the vein, dipping easterly 40° to 50°, was continuous, with a width of 2 to 20 inches of very fine looking tetrahedrite or grey copper ore from a small slope in which, it was stated, 18 tons shipped to the Pilot Bay smelter had assayed 499 ounces of silver per ton, \$7.50 in gold, and 2% copper. No work was being done on these veins at time of visit, but large and commodious cabins, ore-houses, etc., were being erected, there being a good supply of large timber in the basin. Mining was being carried on in the

(B.) SILVER LEAD VEINS.—The vein material mentioned above had been traced on the surface for over 400 feet by cuts, and tunnel No. 1, after being run as a cross-cut for 78 feet through porphyry and slate, had been drifted for 30 feet (Sept. 6th) along a vein of solid galena ore, in places a few inches wide, in others 12 to 24 inches, and at one point in the drift there were two bands of galena along what made the walls of the drift, with crushed country rock between. Along the planes of bedding and fracture in the rock, there were iron pyrites and galena, and the country rock was impregnated with pyrites. In tunnel No. 2, 170 feet long and 50 feet above and 115 feet beyond the face of No. 1 drift, the vein varies from 3 and 4 inches to 2 and 3 feet in width, but at the face the ore was scattered through the country rock. On the ridge a small tunnel exposed 2 feet of solid ore, of which 15 tons had been piled outside, and this vein appeared to be traceable for several hundred feet to some stopes made by leasers in 1893 on the Antelope ground on the slope of the ridge overlooking the Dardanelles basin. Although these stopes were badly caved in, the vein was seen to be lying very flat, with 2 to 3 feet of mixed ore, and in one place 2 feet of solid galena ore, and during the present winter this vein will be properly prospected and put in shape for mining.

The galena ore shipped, as per smelter returns, has yielded from 79.6 to 273.3 ounces of silver per ton, and 31 to 64% lead, one lot of 27 tons netting \$185.12 per ton, while the carbonate ores, running 22½% lead, assayed 166 to 178.5 ounces per ton of silver. Ore shipments will be sustained, and it was proposed to extend the Washington waggon road *via* the Best up to the mine, to greatly facilitate the export of the mine output, and it is now reported that this has been done.

OTHER CLAIMS. On the *City of Spokane* Foss and McDonald were exploring for the extension to the south-west of the main lead vein.



## SURPRISE AND ANTOINE.

In the next basin, or the Surprise basin, mining operations are active, but lack of time forbade a visit to the well known mines, the *Surprise* and the *Antoine*, that lie to the north of the Noble Five group, but down on the north slope of the ridge. The *Surprise*, title, Crown grant, 15.7 acres, manager, Alex. Smith, Kaslo, has made regular shipments of high grade ore during the years of 1894-5-6, and is now being actively worked. The *Antoine*, Manager, J. C. Ryan, Kaslo, is also shipping, ten car-loads of ore being sent to the smelters during the past year.

## RUBY SILVER.

The *Ruby Silver*, owned by Matthews and Braden, Kaslo, is being developed, and during the last season the mine shipped two car-loads of high grade silver ore, one lot of 11½ tons assaying 198.2 ounces of silver per ton, and 46% lead, and another, 13½ tons, 256.4 ounces per ton of silver, and 66% lead. This claim, lying just north of the Noble Five claims, is Crown-granted, and contains 17.34 acres.

## DARDANELLES.

This important group of claims lies in the Dardanelles basin, between the Best and Jackson basins, but as all work was suspended in September, this mine was not visited. Recently the newly organised Dardanelles Mining and Milling Co., Ltd., of Kaslo, B. C., Sec. A. L. McClaine, Kaslo, capital stock \$1,000,000 in \$1 shares, has acquired the following claims, embracing 175 acres, the *Dardanelles*, *Dardanelles No. 2*, *Diamond Cross*, and *Okanagan*; and mining operations on a sufficient and systematic scale are to be now inaugurated.

On the vein on the Dardanelles, cutting across the Slocan slates and the porphyry dykes, a shaft has been sunk 220 feet and 1,300 feet of drifts and raises run, and from these workings over 250 tons of high grade ore were shipped that averaged 265 ounces of silver per ton and 26% lead, while several hundred tons of second class ore, said to assay over 75 ounces of silver and 16% lead, were piled on the dump, 76 tons of which were shipped to the Pilot Bay smelter, giving the above returns. From a copy of the smelter returns the ore is seen to have run from 145.8 to 470.2 ounces of silver per ton, and from 15 to 56% lead; one shipment of 10 tons giving this highest return, while 115 tons yielded 300 ounces of silver per ton. The ore carries a few units excess of zinc above the 10% smelter limit.

Other veins have been slightly prospected upon the Okanagan and Diamond Cross, but these will now be properly opened up. In the 220 foot shaft the small plant of a 7 H.P. boiler and a No. 6 Knowles pump, was quite inadequate to handle the water, and a plant of requisite capacity will be now put in, and this vein will be extensively exploited. There is a good supply of timber for mine purposes; and for transportation at present a trail 1½ miles leads out to the Washington waggon road and thence to McGuigan's Siding.

Wm. S. Tretheway, M. E., will be superintendent for the company, and the above information has been taken from his report to the company and from a copy of the smelter returns.

## NORTHERN BELLE.

The *Northern Belle*, *Dublin Queen*, *Kootenay Star* and *Ophir*, surveyed for Crown Grant, located in Jackson Basin 5 miles south of Whitewater station on the Kaslo and Slocan R.R. and 4 or 5 miles by trail via Reco Mine trail, north-east of Sandon, have been bonded by R. Jackson to Geo. Alexander *et al.* Nine men were at work upon this property under R. J. McPhee, and a waggon road about 5 miles long, with all grades under 10%, was to be constructed from the railroad to the mine. There are many features of interest in this vein which, accompanied by a greenish coloured eruptive rock and cutting across the very carboniferous shales and slates and limestones, is much disturbed by faults of a small amount of dislocation. One peculiarity is that throughout all the workings where the vein has been explored, along the very smooth foot-wall lies a band of a few inches to 3 feet of solid zinc blende and above this, in a quartz and spathic iron gangue, is the galena varying in texture from the fine steel galena to the very coarsely crystalline. Up to 18 inches of solid ore have been mined, while in places in the mine there is a width of several feet of mixed milling ore. Prior to the giving of the present bond all the ore in sight had been extracted to cover the heavy legal expenses forced upon the owner by a former leaser, and ore was being found during the present develop-



ment, but at time of visit the mine was just being put in proper shape for exploration. In the uppermost tunnel, No. 1, 50 feet long, work had begun on a big out-crop of decomposed vein-matter and blende, and 60 feet below, tunnel No. 2, driven in 250 feet, had been the source of most of the ore shipped. In the upper and underhand stopes the underlying band of blende always proved persistent, but as the ground was soft and much water was coming in, but little work was being done on this level, although 400 sacks of first-class ore lay at the tunnel mouth. The new cross-cut tunnel, No. 3, 60 feet lower down, was in (Aug. 23rd) 35 feet and apparently approaching the vein. Tunnel No. 4, 135 feet vertically below No. 2, had been driven 340 feet along under a smooth wall, or along a line of fissuring, along which had been irregularly deposited a small amount of ore. Tunnel No. 5 had been begun under present management on the strong out-crop of the vein near Jackson Creek, in which a good amount of water power and milling purposes is said to be available all the year round, and at the surface on the smooth wall lay about two feet of black-jack, then 3 to 4 feet of the greenish eruptive rock, and then a band 1 to 2 feet wide of steel galena, which continues, with a varying thickness, for most of the distance to the face, where lying next a very smooth hanging wall were 6 to 18 inches of this fine-grained ore. On the dump were 10 to 12 tons of good ore and a considerable amount of milling rock, and if further work justifies, a concentrator may be erected on this creek. There is a plentiful supply of good timber right at the mine, and the present management purpose a thorough exploration of the property, and with a new road ore can easily be hauled to a railroad at a cost of \$2 per ton. During the month of December 5 or 6 carloads were shipped to the smelters, the returns on which had not been received.

OTHER CLAIMS.—Time did not permit the examination of other claims in this basin, but work was being done on several with very encouraging results, other veins of high grade silver-lead ore being uncovered. On the *Bell and Sunset*, at the upper end of the basin, L. Peterson was engaged by the owners, J. L. Retallack *et al*, Kaslo, in opening up a vein of this ore found running through these claims, and ore has also been found on the *Silver King* owned by J. Moore and P. A. McPhee, of Kaslo. About  $\frac{1}{3}$  of a mile north of the Northern Belle very rich ore was found on a small vein on the *Bon Ton*, title Crown Grant, owned by Capt. R. C. Adams, Montreal, but no work has been done for some time on this claim. On the *Crown Point*, formerly the San Franciscan, lying up on the mountain slope east of the Basin and of the Northern Belle group, it is reported that a silver-lead vein can be traced by different croppings through the claim, but nothing but assessment work has so far been done.

#### WHITewater.

This property has also paid for itself since its discovery, high grade silver ore having been mined from the grass roots without ever a demand for money being made upon the owners; and this year a dividend will be paid of \$25,000.

The two claims, the *Whitewater* and the *Irene*, Crown Grants applied for, are located about one mile north of Whitewater station on the K. & S. R. R., 18 miles west of Kaslo, and are owned by J. C. Eaton, J. I. Retallack, J. L. Montgomery, and W. C. Pierce, Kaslo; Superintendent, J. C. Eaton.

Crossing the shales and slates on the Whitewater claim the vein runs east and west (mag.) and dips S. 40 to 45. A good waggon road, 8,300 feet long, has been built, at a cost of \$2,800, from the mine to the railroad, and there is an abundant supply of good mine timber, and also in Whitewater Creek ample water for power and other purposes.

In mining all the underground workings are kept timbered up in an excellent manner, as is imperative, as this vein is evidently located in a shear zone along which the country rock has been shattered and ground up for a distance of 10 to 25 feet from the fissure, so that very little blasting is required in this soft material, only pick and shovel work, while the timbers must be kept right up to the face, spiling even often being necessary. Along the well-defined smooth foot-wall or fissure plane, there is usually a band of spathic iron, sometimes five feet thick, and upon this will be found a varying thickness of galena and then carbonates or oxidised ore, the ore being often scattered irregularly through the broken mass of shale for a width of 20 feet.

On the surface the vein has now been disclosed for 800 feet, and from strippings several carloads of good ore have been shipped from the crushed mass of shale and iron oxides and yellow carbonates, copper stained by the decomposed tetrahedrite. In the mine the uppermost tunnel, No. 00, had been driven in 30 feet along the much decomposed vein, and ore was being piled up at the mouth. Tunnel No. 1, 260 feet below No. 00, had been driven west along the vein for 130 feet, but with little ore. In tunnel No. 2, 400 feet long, 75 feet below No. 1,





NELSON, B. C.

(See page 75.)

SHOWING SMELTING WORKS OF THE HALL MINES Co., LTD., AND LOWER TERMINAL OF AERIAL ROPE TRAMWAY,  
BUT NOT THE NEW REFINERY BUILDINGS AND STACK RECENTLY ERECTED.



with 45° dip, 3 or 4 carloads of ore were extracted from a small stope near the entry and beyond this the vein was almost barren for 340 feet, when the ore shute widened from 6 inches to 6 feet of solid ore, and in the face, beside the carbonate ore, were 6 to 12 inches of solid steel galena. Tunnel No. 3, 96 feet on the dip below No. 2, had been extended 425 feet, with 4 to 10 inches of continuous ore for 200 feet, when in a cross-cut, running both ways, was a mass of barren crushed shale about 20 feet wide, with a band of steel galena along either boundary of this zone. At the face of the ore shute was small, but the solid mass of spathic iron was 3 to 5 feet wide. Near the mouth of this tunnel \$1,000 worth of ore was taken from a narrow streak of carbonate ore in driving 40 feet, and a winze had been sunk 15 feet to a short tunnel following good ore, and then 70 feet farther, with 2 to 4 feet of very high grade ore for 40 feet, of galena, varying from very fine to the coarsely crystalline and carbonate ores. In tunnel No. 4, 104 feet on the dip below No. 3, the heading was in 175 feet, and in the face was a solid band of spathic iron 2 feet wide on the regular dip of the vein, with a finely crushed mass of black slate and shale on either side. In a stope 40 feet long, and up one set above the drift, there were 6 to 12 inches of the steel galena, and then coarse broken galena, as if shattered by movement since deposition.

From this description it will be seen that work has been confined almost entirely to development, and that but little stoping has been done between levels. Good and commodious ore sheds were being built at the lower tunnel, and other mine buildings, cabin, etc., were close by.

ORE.—Six lots of ore sent from this vein was the first sent out of the Slocan, *via* Kaslo, and in the early days it cost \$100 per ton before any returns were received. Much of the ore shipped is of the "carbonate" class, and the silver value ranging from 72 to 298.5 ozs. per ton, the lead from 11 to 30%, while the galena ore yielding 35 to 65% lead, assays in silver from 75 to 362.6 ounces per ton, or an average on the whole out-put of the mine for 1896 of 114 ozs. per ton, and 30% lead. This ore carries from 16 to 17% zinc, and the smelter charges vary from \$9 to \$13 per ton—\$9 if the lead is below 20%; the cost of the freight being \$1 per ton to the railroad, and \$11 to the smelter. No. of men, 28.

OTHER CLAIMS.—Work was being done on the *Elkhorn*, the eastern extension of the Whitewater, and on the *Charleston* further up the mountain, Mr. J. Mitchell was driving a tunnel to reach a vein from which he had already taken some ore. Seven men are now working on the *Corean*, the western extension of the *Charleston*; seven men are opening up this vein and getting some ore, and seven men are working on the *Lone Star*, the property of the Hansard Mining Co. These three claims were staked out by Mr. Wm. Mathewson, the locator of the *Wellington*. To the east of the *Wellington* seven men are employed on the *Sunset*, on what is believed to be the extension of the *Wellington* ledge, which is thought to extend into the claim east of the *Sunset*, the *Colorado*, where again seven men are mining. On the *Eldon* and *Acton* claims, 3,000 feet west of the *Lone Star*, the *Eldon* Gold and Silver Mining Co., of Spokane, Wash., have at work ten men.

#### WELLINGTON.

On the same mountain slope, one and a half miles west of the Whitewater, lie the *Wellington*, *Crown Grant*, 50.5 acres, *Ivanhoe*, *Ottawa*, *Metis*, *Bleucher*, *Goodluck* and *Bolderwood*, the property of the Kootenay and Columbia Prospecting and Mining Company, of Ottawa, Ont. Capital stock, \$40,000. Superintendent, John McConnell, Kaslo.

On the *Wellington* are two veins in the Slocan slates, one striking N. 50° E. and dipping 60° southerly, and the other dipping north, described by Mr. McConnell, of the Geological Survey, as a "wide crushed zone, traversing the slates in an east and west direction. The crushed slates hold stringers and pockets of quartz, spathic iron and calcspar." A cross-cut tunnel 170 feet long taps the vein at 40 feet in depth, and an 800-foot cross-cut tunnel intersects the south-dipping vein at 550 feet at the 200-foot level, along which so far the vein dipping north has not been found, although it is now being followed down towards this level. The works are all connected on the south vein from the 200-foot level, up in the 140-ft. drift the north vein is intersected. At present ore is being mined from both veins, but the highest grade ore comes from the vein dipping north. The mine is about 2 miles from the siding on the K. & S. R. R., and ore is packed down half way by the trail, and half way by waggon road. The ground is very soft, requiring little or no powder, but the timbering, as in the Whitewater, must be constantly kept up to face of work.

ORE.—From a copy of the smelter returns, the ore which occurs both as the carbonate and galena, with grey copper and zinc blende, in which is found good silver value, has assayed from 125 to 328 ounces of silver per ton in carload lots, and 10 to 55% lead, the average for 400



tons shipped, being 173 ounces silver, and 30% lead. Number of men employed, 24. During the year 1896, 25 lots of ore have been shipped, and the mine has been put in excellent condition for mining and further development.

#### THE LUCKY JIM.

The *Lucky Jim* group is located at Bear Lake, 20 miles west of Kaslo, 1,300 feet south of the K. & S. R. R., and 670 feet above it, and belongs to Wm. Braden and E. J. Matthews, of Kaslo. Mr. McConnell reports in the Summary Report of 1895, that this claim is situated on what "appears to be a faulted line of contact between the slates and a brecciated band of limestone. The ore occurs in large pockets and side fissures, penetrating the limestone." In developing this mineralized limestone band, in which the ore is galena, zinc blende, iron pyrites and some "carbonates," a 3-drill Rand Compressor is being used for the machine drills, but as most of this ore is concentrating material, it is proposed to erect a mill during the coming spring.

THE ORE.—Of 110 tons shipped, the silver value was 59.2 to 75 ounces of silver per ton, and 50 to 56% lead, and by tests in concentrating, the probable value of the concentrates will be 60-75 ounces of silver per ton, and 55 to 56% lead. Number of men employed, 15. Superintendent, E. J. Matthews.

#### LONDON HILL GROUP.

The *London*, the *Third of July*, the *Pompeii* claims, 1,500 by 1,500 feet, and the fractional claim the *Round-Up*, situated on the ridge of the mountains, west of Carpenter Creek, about three miles from Bear Lake and the K. & S. R. R., are being acquired by the London Hill Development and Mining Co., Ltd., Kaslo, B. C. O. T. Stone, President, T. G. Proctor, General Manager. Capital stock \$150,000 in 600,000 shares of 25 cents each.

This mine was not seen, but Mr. D. R. Irving reports that near the summit of a ridge two tunnels had been driven, in one of which, over 40 feet long, was a 4-foot quartz vein, carrying grey copper ore and silver sulphides. On the other side of the ridge, 254 feet below the summit, a tunnel 320 feet long was being driven to tap the vein in depth, in which several small quartz veins, traversing the slates and quartzites were cut. Three lots of high grade ore, or about 40 tons, have been shipped, on which the smelter returns were 190 ozs., 267 ozs. and 150 ozs. of silver per ton respectively; and this winter Mr. Proctor has a force of men engaged opening up this property. As in other veins of this character of ore, there is much 2nd class ore that will have to be milled near the mine, but the method to be adopted will be decided upon after more underground work has been done.

#### Slocan Lake.

This beautiful lake, lying in a deep valley between the valleys of the Arrow and Kootenay Lakes, is 23 miles long and about one mile wide, and in the valleys and on the ridges that trend away from it to the east, mines of very great promise are being rapidly opened up, and new finds of value are being made as prospecting is more thoroughly and widely carried on. As yet the great granite mountains to the west have not been found to be mineral-bearing, but more diligent search may reveal as good veins of rich mineral as have been found in the granite area east of the lake, which, until lately, was shunned by the prospectors, who had an unwarranted lack of faith in the likelihood of veins being in this formation.

However, all doubt has been dispelled, the granite area is fast gaining in importance, and this part of the Slocan now offers many good inducements for further search and investment. It is true that most of the leads so far discovered are small, but the high value of the ore to a great extent compensates for this, and as to their persistence, there is no reason why these pay-shutes should not continue to carry their size and value as depth is attained.

At Roseberry the lake steamers connect with the C.P.R.R., and then stop at New Denver, which has one of the best townsites in Kootenay, and is the official centre for the Slocan; at Silvertown at the mouth of Four-Mile Creek; at landings at Ten-Mile and Twelve-Mile Creeks, or any other point desired; and at Slocan City and Brandon, two rival towns at the south end of the lake, whence the trails lead off to Springer, Lemon, Twelve and Ten-Mile Creeks, and a branch of the C. P. R. will be built during the coming season to connect with the line running from Robson to Nelson.

On the south slope of the range dividing the south fork of Carpenter Creek from Four-Mile Creek, on the north slope of which are the series of mines, from the Slocan Star to the Idaho and Alamo, are the Mountain Chief, California, Alpha Group, Reed and Robertson,



Jenny Lind, Ottawa Group and Fisher Maiden, all of which were visited, except the first two, and south of the Four-Mile Creek are the Thompson Group, Vancouver Group, and the Hewitt claim.

Four-Mile Creek, for ten miles of its course, forms a dividing line between the Slocan slates and the granite, although small areas of each cross the river in places.

#### THE MOUNTAIN CHIEF.

This property lies at the western extremity of this ridge and is owned by Mr. Geo. W. Hughes, who was one of the earliest shippers from this district *via* Nakusp, having purchased the claim in 1892 and then shipped a large amount of ore in 1893-4 and 5, of galena averaging 130 ounces of silver and 70% lead. After this the lead was lost, and much work has been done prospecting for its continuation. This fall several car-loads of zincy galena ore have been shipped, and work is being pushed ahead.

#### THE ALPHA.

The *Alpha*, Crown-granted, 51.67 acres, and other claims are locally known as the Grady group, and are owned by Jas. McNaught, Alex. McKenzie, and Jas. McKenzie. Manager, F. McNaught, Silverton. A good road  $2\frac{1}{2}$  miles long from Silverton, leads to the foot of a 3-rail gravity tramway, about 1,200 feet long, up to tunnel No. 1. No work had been done for some time, as there was some litigation in progress, in fact, none since the fall of 1894, but over 1,000 tons of ore had been sold that averaged 115 ounces in silver per ton and 70% lead.

This vein runs true N.E. and S.W., and dips S.E.  $30^{\circ}$  to  $40^{\circ}$ , through the black limestones, shales, and slates, but no ore was in sight. The ground is much disturbed and faults were in evidence. There are five tunnels, of which No. 1 was in about 300 feet to the face, with three upraises, cross-cuts, and an incline, and another tunnel starting near the mouth of this one ran 50 feet N.  $70^{\circ}$  E., while immediately below was a third, connected by stopes with the upper ones. No. 4, 80 feet down the hill, is a cross-cut for 100 feet through the much contorted country rock, and then a drift 110 feet along a smooth fault wall lying next to which is much black gouge, but no ore. Tunnel No. 5, below No. 4, appears to be following another lead altogether, from the position and strike, or north and south, dip E.  $45^{\circ}$ - $50^{\circ}$ , and for 110 feet along a smooth wall with several inches of decomposed matter or iron oxides; but there were no signs of any ore having been taken from this working.

OTHER CLAIMS.—North-west about one mile is the *California*, owned by J. MacDonald, J. Marino, B. C. VanHouten *et al*, to which mine a road had been built from New Denver, as a car-load of galena ore was ready on the dump for shipment.

#### THE REED AND ROBERTSON GROUP.

High up on this range, 6 miles by road and trail from Silverton, is a very strong vein that runs up the south slope, crosses the ridge and then passes down the north slope as far, it is believed, as the Carnation claim, and along its strike eight or ten claims have been staked.

*Reed and Tenderfoot*.—These two claims, surveyed for Crown Grants, extend up the slope and across the ridge, and had been secured by Mr. C. W. Callahan, M.E., for his clients, who was prospecting the vein by surface cuts. The vein runs about north and south (mag.) and dips from  $45^{\circ}$  E. to nearly horizontal. At the southern boundary of the Reed a tunnel had been driven in 110 feet, disclosing considerable milling galena ore, and on the surface the ledge was very wide with also a good deal of mill ore occurring in wide bands of very coarsely crystallized calcite, 10 to 12 feet wide, while next to the calcite bands are several inches of solid galena. Higher up the slope the calcite bands continue, forming a prominent land mark from their whiteness, and in several cuts narrow bands of solid very large cubed galena lie next to these bands that at a point 300 feet above the tunnel come together in a solid mass of lime 10 to 14 feet wide, with several feet of concentrating ore, and few inches of solid lead ore. At the small cuts, about 30 tons of splendid ore were piled up, but more work is required to demonstrate the value and conditions of this very striking lead. There is no timber on these claims to amount to anything, and to get this ore in quantity down to Four-Mile Creek, a long aerial rope tramway, on a very steep pitch, will have to be built down a ridge safe from snow-slides.

The *Jenny Lind*, lying south of the Reed, has about 800 feet of the vein crossing one corner, and is owned by Paul and Chas. Anderson, Silverton. The vein presents very much the same characteristics of a large amount of calcite and brecciated slate and lime with



irregular masses of concentrating ore and stringers of solid galena. A tunnel had been driven 150 feet in a direction diagonally across the ledge, but in it as yet no ore in quantity has been found. In 1895, 30 tons of galena was shipped, and on the dump was piled mixed ore or calcite, galena and blende.

*The Robertson*, lying south of the Reed and Jenny Lind, is owned by Wm. Robertson *et al*, Silverton. The vein is here covered mostly by wash, but a 40-foot tunnel had been run in where the ledge showed 8 to 10 feet of calcite, with little galena. No work was being done.

The *Wakefield*, *Ottawa* and *Cazabazhua*, owned by Geo. Fairburn and Wm. Smith, Silverton, and located on the southern extension of the vein, had on the Wakefield a tunnel running N. E. 125 feet, in which, at 80 feet, were 16 to 20 inches of solid fine-grained galena, beyond which was the coarse calcite lying on a dip of only 12° to 20° from the horizontal, and on the Ottawa further down the slope, the ledge is said to be lying even flatter. No work but assessment has been done during this year.

#### FISHER MAIDEN GROUP.

At the time of visit to those claims no work was being done, but they belong to Jno. Poppen and Albert Webb, Silverton, and lie along a small creek flowing into Four-Mile Creek, seven miles east by trail from Silverton.

This vein was discovered in a narrow gulch in syenitic granite, with a strike N. E. by S. W., and a dip 75° N. W. It shows on both sides of the gulch, where in two tunnels were stopes 1-3 feet wide up to the surface. Below these workings have been run two other tunnels, one on the south of the gulch being in 100 feet with cross-cuts, but showing no ore. On the north side over 400 feet of work had been done, in which four drifts had been run along smooth fissure planes that proved to carry no ore. At one part where two drifts branched off at an angle of 45°, was a winze full of water, close by which were lying several large blocks of galena ore in a quartz gangue. On the dump were pieces of ore, consisting of zinc blende in a quartz and spathic iron (?) gangue, also some galena ore, but the percentage of lead was very low. Native silver was found along the seams, and of about 50 tons shipped in the fall of 1894, the silver value is reported to have been 180 ounces per ton, while one lot of 9½ tons carried about 40% lead, the remainder 10%.

**OTHER CLAIMS.**—South of Four-Mile Creek are many locations on silver-lead veins, and work is being done on a number of important groups. *The Thompson* group, about six miles east of Silverton, on the Fennel Creek, has been bonded to Dr. H. Bell-Irving, of Vancouver, for \$40,000, who is engaged developing a galena vein from which a considerable amount of ore has already been taken, and has contracted for the shipment of 100 tons of ore on the dump, while 300-500 tons are believed to be in sight that will yield about \$100 to the ton on the average.

Farther west of this group, on Granite Creek, is the *Vancouver* group, embracing the Vancouver, Mountain Boomer, Le Roi, Iowa, and Doone, owned by the Moynahan Bros. *The Hewitt*, owned by Capt. R. G. Tatlow, C. F. Yates, *et al*, Vancouver, was being opened by Major Reed, with ten men, who was running a tunnel on a vein believed by him to be the extension of the vein on the Galena Farm, to be described, and the breast of the tunnel was reported to be all mixed ore or zinc blende and spathic iron, with 5 feet of mixed ore in a 75-foot shaft.

#### GALENA FARM.

This property, otherwise known as the "Currie Group," obtained its name by the finding of ore scattered over a plateau east of the Slocan Lake, and the subsequent discovery of the large ledge that now bids well to rank among the largest producers in this district. Great importance may be attached to this vein in that, while resembling in many details the large Slocan Star lead that runs through the slates and limestones, this is evidently in the granite, although pieces of slate occur in the quartz gangue, a small, but very probably shallow, area of slates occurring close by, but bosses of granite protrude from the wash all over these claims, from which the slate formation has been eroded, and this lead not only demonstrates the importance of the granite area, but also points to the persistence of the veins in the different geological horizons.

The first to work this property were discouraged rather by the presence of much zinc blende and the small amount of galena scattered through the ledge matter, but in the prospecting done during the last season by the present owners, fine solid galena ore with high silver values had been uncovered. The group of claims comprising the *Currie*, *Grover*, *Stephenson*, *Katie* and *Peerless*, Crown Grants applied for, one and a half miles south of Silverton, and one



mile east of the lake, was secured by Mr. C. W. Callahan, M. E., for English investors who have recently formed the Galena Mines Company, Ltd., London, England, with a capital of £550,000, in 550,000 £1 shares.

On the Currie claim this vein was seen to have a strike east and west (mag.) and a north dip of 50° to 65°, and on the surface, and an outcrop now traced for 1,600 feet, with, in places 12 to 14 feet wide, of milk-white quartz, spathic iron, fragments of slate and granite, and some zinc blende and galena. In an old shaft, at a depth of 50 feet, a short cross-cut entered the vein at 12 feet, and there a drift was run 60 feet east and 70 feet west, exposing a large body of concentrating ore for all this distance, and along the smooth hanging wall a good body of solid high grade galena. In the west drift, 35 feet from the cross-cut, a winze was being started, since sunk 45 feet, in four feet of solid, fine-grained galena. In an open working 500 feet west of the shaft, were 16 inches of solid galena along a smooth foot wall with considerable concentrating material.

Since the time of visit a 2-compartment working shaft, now down 65 feet, has been sunk west of the old shaft and 140 feet north of the outcrop, with the expectation of striking the lead at 130 feet, but at 41 feet what is believed to be a cross-ledge running north and south was entered, dip 60° west, and down to 51 feet the shaft was in concentrating ore, that by tests made by Mr. Callahan, concentrating 5 to 1, yielded 123 ounces of silver per ton and 62% lead. This cross-lead is now thought to be traceable for 800 feet. The shaft, equipped with requisite steam hoisting plant and pumps, will be now sunk 500 feet, with cross-cuts to the vein at every 100-foot station, and when sufficient development justifies it, a 150-ton concentrating plant will be built, for which the water from Eight-Mile and Gold Creeks is expected to supply 600 inches under a 500-foot head. The ore is essentially a milling ore, but a test shipment of assorted assayed 98 ounces of silver per ton and 57% lead. A good waggon road, 1½ miles long, has been constructed from the mine to Silverton, whence the concentrated ore will be shipped to the smelters, and suitable bunk-houses, etc., have been erected. D. J. McDonald, a Californian, a mining man of long experience, is in charge of the work as superintendent, and was employing 20 men in the proper exploitation of this valuable property.

OTHER CLAIMS.—Many claims have since been located about the Currie group and many are being prospected. To the east the *Noonday* is thought to have the extension of the Currie vein, but here the formation is the small area of highly altered slates. The *Baby Ruth*, *Los Vegas*, *Mountain View*, *Granite Mountain*, and *Daisy*, on Eight-Mile Creek, occurring, according to Mr. McConnell, in an inlier of hard, rusty slate several miles in extent and enclosed, the granite, reached by trail from Silverton *via* the Galena Farm, were not visited, but assessment work was being done. The *L. H.*, also one of this group, is situated high up on a very steep ridge, and Mr. McConnell (Summary Report, 1895, p. 26) says: "The slates are fissured along an east and west line, and the schistose rock adjoining the line of fracture on the south, has been altered, silicified, and impregnated in places with ore, along a zone varying in width from 20 to 40 feet. The ore appears to consist mostly of native arsenic, mispickite, pyrite, and pyrrhotite, distributed through the vein in an irregular manner." Four hundred feet up the steep face of the bluff a tunnel had been driven in 22 feet into this zone, but very little mineralization was apparent there. Mr. J. M. M. Benedum, one of the owners, has obtained several assays high in silver and gold from samples taken from this vein, on which only assessment work has been done.

#### TEN-MILE CREEK.

An excellent waggon road has been built from the landing eight miles up this creek, through a valley of fine timber, to the Enterprise mine, and thence trails pass over to Springer and Lemon Creeks and back to Slocan City, and also farther east to the head waters of Kokanee or Yuill Creek and the south fork of Kaslo Creek, where a great deal of prospecting has been done during the past season, with good results.

#### THE ENTERPRISE.

The success attending the development of this vein, has, to a great degree, demonstrated the possibilities and the value of this granite area. The *Enterprise* and *Slocan Queen*, situated on the slope south of the creek, were located in 1894 by R. Kirkwood and Jno. McKinnon, then bonded to Jno. A. Finch, who recently sold these to David M. Hyman, *et al.*, Colorado, for \$300,000, on the advice of D. W. Brunton, of Aspen, Colo., one of most eminent Mining Engineers in the West.



This vein on the surface, while small, can be easily traced for two claims, and runs N. 55° E. and S. 55° W., and dips S. E. 70°-80°. The gangue is quartz, the enclosing walls are a dark coloured micaceous granite, that shades into the typical syenitic granite of this area, and the ore is fine and coarse grained galena, with a large amount of zinc blende, which, it was stated by the management, carried the best and very high silver values, and is found generally along the foot-wall, with bands of galena and quartz. In July last, a shipment to the smelter of 40 tons of ore yielded 172.7 ounces of silver per ton, and 18% lead, and during December in three shipments, or 120½ tons, the silver values ran from 153.7 to 179.5 ounces per ton, and the lead from 17.5 to 30%, and now 2 or 3 carloads of ore are being shipped every week.

Three tunnels were being driven in on the vein, with the fourth just being started, and in the lowest or No. 1, 120 feet long, the vein of solid blende and galena varied from 2 and 3 inches, to 8 and 10 inches in width, and as in the other workings, the tunnel was being driven along the ore, leaving it standing to be broken down clean. Tunnel No. 2, 170 feet vertically above No. 1, was in 400 feet, with continuous ore for 300 feet, where an upraise 100 feet to surface, followed ore over 8 inches thick for 80 feet, but at 330 feet a fault had been encountered, beyond which the vein had not been picked up, but cross-cuts were being driven with the probability of finding it in the south-west. In this tunnel the ore was 8 to 18 inches wide, with very little gangue matter, and overhand stopes were being started. In tunnel No. 3, 25 feet above No. 2 and 310 long, for 260 feet the vein carried continuously 6 to 12 inches of ore, with more or less quartz, with one small fault to the S. E., but for the last 20 feet the vein was pinched. In the opening cut for tunnel No. 4, 90 feet above No. 3, were 6 to 14 inches of solid ore, and thus, by these workings, for about 1,000 feet along the strike, had been exposed an almost continuous shute of ore for this distance. Bunk-houses, cabins and ore-sheds had been built, and the ore will be shipped by the road to the lake, and thence by steamer to the C. P. R. R. Number of men employed, 20.

OTHER CLAIMS.—The *Iron Horse* and *United Empire* are located on the N. E. extension of the vein, and still further N. E., but on the north slope of the creek, this vein is said to have been found on the *Alexandria*. On another claim on the north slope, the *Oregon City*, owned by Jno. Thompson, L. Parkinson *et al*, in a 50-foot tunnel, it was reported that 7 to 8 inches of galena ore had been struck, and that ore was found on the *Westmount*, owned by F. Griffiths, N. West, *et al*, who were running a cross-cut tunnel.

#### NEEPAWA.

About one-half mile west of the *Enterprise*, and on the same slope, lie the *Neepawa*, *Argenta*, *Bossimain* and *Baker Fraction*, owned by E. Shannon and A. McGillvary, and since bonded to H. Bell-Irving, of Vancouver, of the Alliance Prospecting Syndicate, for \$30,000. The vein running N. 20° E. by S. 20° W., and dipping easterly 60°, had been prospected by open cuts and a tunnel, and in one cut there were 10-16 inches of solid fine-grained galena and zinc blende, with 3 to 4 feet of concentrating ore, and since then ore has been found in a lower tunnel, and a trial shipment has been made to Tacoma.

A cabin was being built, and only a few hundred yards of road will be necessary to connect with the *Enterprise* wagon road.

#### DALHOUSIE GROUP.

These claims, still further west, were not seen, but the *Silver-Joe*, *Dalhousie*, *Glad Tidings*, *Sayger* and *Iaccamock*, are owned by Jno. Angrignon, Jos. Pilon, M. McLean, *et al*, who had driven a tunnel 110 feet on the vein, with 2½ feet of concentrating galena ore reported, and with 4 men were driving a cross-cut tunnel to the ledge, which runs N. E. by S. W., and stands nearly vertical.

#### THE BONDHOLDER GROUP.

The *Bondholder*, *Pine Log*, *Lone Star* and *Rose Bud* are located on a vein supposed to be the same as the *Enterprise*, high up in the basin near the ridge south of Ten-Mile Creek and are bonded to the Bondholder Mining Co. of Vancouver. Capital stock \$1,000,000; Gen. Manager, R. C. Campbell-Johnson, M.E.

This vein, running N.E. by S.W. (mag.) and with a dip of 50° to 60° S.E. in the granite, had been traced by cuts and out-croppings for 4,000 feet through nearly the entire length of the claims, and at the time of visit, in September, commodious cabins for the men, stables, &c., were being erected, and development had just begun, but little could be then seen of the vein, as the work had hardly progressed far enough to expose other than the surface influenced part,



where it was in places 12 to 16 inches wide of blended quartz, iron oxides and galena, and in others more solid galena with some blende. On the Pine Log a short cross-cut tunnel, then in 25 feet, was nearing the vein, down which an incline was to be sunk, and to the S.W. over a thousand feet distant, and near the ridge, an open cut showed an 8-inch vein, while to the N.E. on the Bondholder, where the vein can be easily seen for several hundred feet cutting across the face of the steep bluff, tunnel No. 2 was in just 12 feet and showing mixed ore in the face. Excellent facilities are here for the extensive development of this vein, and when the extraction of the ore begins a trail for rawhiding will have been built down to the road along Ten-Mile Creek, 2,600 feet below the mine, and a waggon road may be built. This property can be also reached by trail from Slocan City, *via* Springer Creek. Foreman B. C. Bradshaw was in charge of 15 men.

#### KALISPELL.

The *Kalispell*, Crown-granted, 37.1 acres, is located on Ten Mile-Creek one mile from the lake, in a small area of stratified rocks, *i.e.*, altered slate quartzites &c., and is owned by Wm. Lardner, Deadwood, South Dakota. In a 75-foot tunnel on the south bank of the Creek is seen evidence of a shear zone and later faulting, and along this is quartz, crushed country rocks, galena and silver minerals, such as ruby silver. Some stoping has been done along this lead that has a strike of N. & S. (mag.) and a dip easterly of 70°, and several tons of high grade silver ore have been shipped, of which 8 tons assayed 289 ozs. of silver per ton and 3 tons 212 ounces. There is ample water in the creek, and a large amount of fine timber on the property, and a short trail connects with the waggon road. No work was being done at time of visit in September.

#### Springer and Lemon Creeks.

From the rival towns of Slocan City and Brandon at the foot of the lake, trails lead off to the country drained by Twelve-Mile, Springer and Lemon Creeks, and in this part of the district many locations have been made, some on galena veins, but many others on the "dry ore" veins and the gold-bearing quartz leads, all in the granite. Much prospecting was being done and considerable development work; but as many investors have recently been securing bonds and options on many locations, the coming season promises much greater activity, and certainly the careful attention of mining men is warranted by the very favourable results already attained by the as yet very small amount of work. The Howard Fraction, Two Friends Group and the Arlington were visited, besides these properties on Ten-Mile Creek already described, and the writer is much indebted to Messrs. Gwillim and Johnson, Mining Engineers, Slocan City, for information concerning other claims it was impossible to visit this season.

#### THE TWO FRIENDS.

This claim, 1,500 by 1,500 feet, is 7 or 8 miles east of Slocan City, on the divide between Springer and Lemon Creeks, and is bonded to the Two Friends Mine Co. Ltd.; Pres. F. C. Innis, Sec. C. C. Bennett, Vancouver. Capital stock \$240,000 in 800,000 shares at 30 cents each.

By the discovery near a small spring, of a little honey-combed quartz sprinkled with zinc blende, another vein in the granite of very high grade galena had been located, and was being opened up in an excellent manner by Capt. J. A. Wood when visited in Sept. With a good supply of timber close at hand, good mine buildings were being completed and all the underground workings carefully timbered up where necessary. This vein strikes N.E. by S.W. (mag.) and dips S.E. 80°, and Tunnel No. 1, after cross-cutting 25 feet, ran 50 feet along the vein which was stoped up 10 or 12 feet to the surface, and about 100 feet below. Tunnel No. 2 was driven 206 feet in 60 days to the ledge where the solid galena in large crystals lies next the smooth well defined foot-wall, or with a narrow seam of iron oxides between, while next to the hanging wall of dark, fine-grained altered granite was segregated more or less of zinc blende. To the S.W. a narrow dyke crosses the vein, beyond which no work had been done, and in the drift, then about 40 feet long, the vein varied from a narrow streak to 12 to 14 inches of solid blende and galena ore, which in a raise up 20 feet and 8 feet wide there were 12 to 16 inches of this solid, clean, very rich ore.

ORE was then being shipped by pack-horses to Slocan City, at a cost of \$15 per ton, which rate will be made less when the rawhiding season has begun after the fall of the snow. Up to the end of the year shipments of over 40 tons of silicious high grade ore had been made that yielded, as per smelter returns, from 250 to 380 ounces of silver per ton and 38% to 52% lead, and ore, after deducting all charges, showed net to the owners the high value of \$150 to \$160 per ton. Number of men 20.



## THE ARLINGTON.

The vein found on the *Arlington* and the *Burlington*, owned by R. Cooper and C. Fielding, of Slocan City, and located 6 miles from that place, on the north slope of Springer Creek, on the trail leading over the divide to the Enterprise mine, has attracted much attention by reason of the rich specimens of native silver found along the cracks and crevices in a zone of shattered granite, in which also are small stringers of fine-grained galena and zinc blende, the native silver evidently being deposited in this state within the region of surface influences. This zone of crushed, and more or less altered, mineralised granite, 4 to 6 feet wide, has a strike N.E. by S.W. (mag.) and dip to the N.W.  $55^{\circ}$ , and has been traced, it is claimed, through several claims. About 30 feet of tunnelling had been made on either side of a shaft, then down 55 feet on the vein, with drifts at a depth of 35 feet, of 45 feet showing this broken country rock with stringers of ore and quartz, and on the dump were piled 70 to 80 tons of ore, the value of which could not be learned as none had been shipped to the smelters. This winter the owners are continuing the development work.

## THE HOWARD FRACTION.

This was the only "dry ore" property examined, and on the south slope of the divide, or Gold Hill, between Springer and Lemon Creeks, 8 miles from Slocan City, lie, besides many other claims, the *Howard Fraction*, *Tiger Fraction*, *Altgeld*, *Deadwood*, *Bland*, and *Free Gold*, owned by A. E. Teeter, Wm. Price, V. T. Ratcliffe, *et al.*, Slocan City.

The granite is traversed by many porphyry dykes, some of considerable width, and also by quartz veins carrying argentite, or silver sulphide, and varying values in gold.

This vein, running about east and west, was dipping northerly into the mountain at a very low angle, or at a dip of  $10^{\circ}$  to  $15^{\circ}$ , and an incline had been sunk about 115 feet, but not all along the vein, as this was found to be faulted up 3 feet, and 15 feet further again faulted 8 feet along the same direction of throw, while a third fault had been struck. The vein was 12 to 20 inches wide, of honeycombed quartz, with argentite disseminated through it in crystalline form, and considerable ore had been stoped, hand-sorted, and shipped to the smelters, which returned high values in silver and good gold values, as 7 tons shipped to Pilot Bay in 1895 gave 163 ounces silver and \$16 in gold per ton, and 12 tons more recently, 206 ounces of silver and \$26 in gold per ton. This winter work is being carried on, but little has been done to develop the veins found on the other claims.

## OTHER CLAIMS.

*The Meteor*,  $\frac{1}{4}$  mile north-east of the Howard Fraction, and bonded to Jno. A. Finch and Sheran, has also a good vein of this "dry ore," which was being opened up and prospected during the last fall.

*The Silver King*, 1 mile south-east of the Howard Fraction, owned by C. Faas and M. Heckmann, has a 120-foot cross-cut tunnel heading for a vein.

The *Crusader Group*, owned by C. Faas, R. N. Clay, *et al.*, Slocan City, comprises the Crusader, Boulder, and Hidden Treasure, up the first north fork of Lemon Creek. Float having been found, trenching was resorted to, resulting in the discovery, within the walls of decomposed granite, of a vein  $2\frac{1}{2}$  feet wide of cellular, coarsely-grained crystalline quartz, with coarse particles of silver glance and iron pyrites, some native silver and gold. A shaft has been sunk 33 feet along this vein, and this autumn one-half interest was sold to W. H. Hellyar and W. H. Smith for \$12,500, and supplies were to be packed up to keep 4 or 5 men at work all winter.

*The Alpine Group*, embracing the Swiss, Highland Chief, Burn, and Kootenay Pass, is located high up on the mountain side above Summit Creek, the south fork of Lemon Creek, and has a strong gold-bearing quartz vein 2 to 3 feet wide, lying very flat, and traceable through three basins. But little work other than assessment has been done, and the owners, C. Faas, H. Cleaver, *et al.*, have lately bonded these properties to A. B. McKenzie and A. Dick, of Rossland.

The *Monument Group* of claims is located near these properties.

*The Ocean Group* is located  $3\frac{1}{2}$  miles north-east of the Crusader group, and west of the glaciers on the summit from which flow Kokanee Creek, south fork of Kaslo Creek, east fork of Ten-Mile Creek, up which runs the trail from the Enterprise mine road, and the main branch of Lemon Creek. This group of three claims lies at an altitude of over 8,000 feet, and of course above timber line, and the ledge is said to be a dyke mineralized with silver glance and



galena. The owners, W. R. Young, W. R. Richmond, *et al.*, New Denver, have bonded  $\frac{3}{4}$  of the claim to Alex. Dick, of Rossland. Many other claims are located in this vicinity, such as the Magnet, Big Four, Heather Bell, Three Guardsmen, Clipper, Boomerang, and U and I, upon the latter of which is reported to be a vein 3 to 4 feet wide of concentrating ore carrying argentite, grey copper, and galena.

The *Ottawa Group*, north of Springer Creek, is being developed by F. C. Reilly for a Winnipeg Company.

*Evening Star No. 8*, owned by Geo. A. Petty, of the "Monitor" mine, Three Forks, situated on Dayton Creek, a south branch of Springer Creek, sent out five tons of ore this Autumn, and 2 or 3 men are at work.

The *Victoria Group*, also near Dayton Creek, and  $2\frac{1}{2}$  miles from Slocan City, is under bond to D. Bremner for \$26,000, and has a vein of "dry ore."

*Republic Group*, embracing the Republic, Bell No. 2, and American Eagle, located  $1\frac{1}{2}$  miles N. E. of Slocan City, is under bond to W. L. Parrish and W. J. Lindsay for \$25,000, and a shaft is being sunk on the vein,  $1\frac{1}{2}$  to  $2\frac{1}{2}$  feet wide, of quartz, carrying silver galena and iron pyrites, and also gold.

The *Slocan Bob*,  $\frac{1}{2}$  mile east of the Republic, has sent out a ton of ore for trial test, and is being worked by the owners, who live in Vancouver.

The *Chapleau*, near Dayton Creek, has shipped out 4 tons of sorted dry ore to the smelter, that returned 3.6 ozs. of gold, and 94.7 ozs. of silver per ton.

The *Skylark and Ranger* adjoining it, are bonded for \$40,000 to Alex. Dick *et al.*, of Rossland.

Other claims are under bond, and considerable work is being done this winter to prospect them.

On the Divide, at the head of Yuill Creek, reached by a trail  $12\frac{1}{2}$  miles long, up that creek from Kootenay River, between Nelson and Balfour, a large number of claims were located during the past season, and prospectors are awaiting the coming summer to resume the search for veins of both galena and "dry ore," now being found there in the granite.

The *Florence*, *Molly Gibson*, *Aspen* and *Achilles 200*, have been bonded to the Hon. Rufus H. Pope, Cookshire, Que., and this winter 12 men are engaged prospecting these new finds.

#### MAPS.

An excellent sketch map of this part of the Slocan District has been prepared by Mr. Wm. Thomlinson, of New Denver.

#### Cariboo Creek.

Twenty miles south of Nakusp, Cariboo Creek, on the east side of the river, flows into the Columbia at a small settlement, Burton City. A trail leads thence through an area of granite 6 miles to the junction of Mineral Creek, at point known as Mineral City, and thence trails lead farther on up Cariboo Creek, crossing over to Snow Creek, and also up both sides of Mineral Creek, one crossing over the divide to Blue Grouse Creek. Most of the area is the regular Slocan granite, but isolated areas of stratified rocks as slates, etc., can be seen, especially up Mineral City. A number of properties are reported to have been sold during the past season, and much more work will be done this year, to prospect many of the claims now located.

The *Promistoria*, owned by B. C. Rod *et al.*, Nakusp, is located high up on the west bank of Mineral Creek,  $2\frac{1}{2}$  miles from Madden's Hotel at the junction, and it is in slates, silicious limestones, etc., is a quartz vein, strike east and west, dip  $80^{\circ}$  S., carrying pyrrhotite, iron and copper-pyrites and gold, of which high assays have been obtained; the returns from a nine-ton lot sent to the Trail Smelter, being authoritatively stated to have yielded \$60 per ton in gold. This vein can be traced for between one and two thousand feet, and in a 75-foot tunnel it occurs as a small vein, with stringers running into the country rock, but in an open cut a short distance above, appear to be two quartz veins, one  $4\frac{1}{2}$  feet, the other 3 feet wide, coming together just at the surface, or else to be a horse of the country rock with this amount of mineralized quartz on either side. Considerable of the ore was piled up, some sacked for shipment, and near by these workings was a cabin.

The *Gopher* is the western extension of the vein, and the *Oro Grande* the eastern, but little work had been done on either claim.

Located along the trail on the east of Mineral Creek are:—

The *B. C.*, owned by Louis Sherrier, Hugh Madden, *et al.*, on which a narrow quartz vein is found in a line of break in the slates, along which break the country rock has been ground



and crushed into a black mass, in which are small stringers of quartz. A shaft had been sunk 25 feet in this material, and then drifted in for 12 feet, showing some sulphide-bearing quartz, the value of which was not learned.

Several claims along this ridge were being prospected, and on the top of the ridge, 6,500-6,800 feet altitude, in the granite were several quartz veins carrying but a small amount of sulphides, and whose value had never really been determined.

The *Heather Bell*, owned by H. McLennan, *et al.*, had a small vein of white quartz, 3 to 12 inches wide, and on the—

*Bonanza*, owned by A. McPherson, F. G. Farquier, *et al.*, in an 8-foot hole, were two small quartz veins, carrying coarse crystalline pyrrhotite, but no values were ascertained.

The *Flora Mac* has two parallel quartz veins carrying very little mineral, with a strike north and south, and on the—

*Noble Four* a little work had been done in a mass of decomposed material, in the granite, but little idea could be then formed as to what this indicated. Both of these claims lie on the slope above Blue Grouse Creek, and are owned by H. McLennan and Alex. McDonald.

The *Hardy*, alias Golden Eagle, one-half mile east of Mineral City, has a quartz vein 8 to 10 feet wide, strike N. W. and S. E., with a mineralized streak 10 by 18 inches wide, along the hanging wall. An opening, about 20 feet deep, had been made, but the material extracted was said to assay very low in gold.

The country further east was not seen, but a large number of claims have been staked, on some of which the discovery of galena was reported, such as—

The *Independance*, four miles up Cariboo Creek beyond Mineral City, owned by A. Moore, Burton City, on which is said to be a large body of quartz, interspersed with pyrrhotite, iron pyrites and galena. No work was being done.

The *Eureka*,  $2\frac{1}{2}$  miles farther up the creek, owned by Jas. Durham and Wm. Swan, who were preparing to run a 100-foot tunnel on a ledge showing 6 feet of quartz and sulphides, on the northern extension of which vein are the *Shamrock* and *Black Dwarf*.

Many locations have been made on Snow Creek, but all of this part of the district is awaiting the results of further work and prospecting, and at present not much more can be reported.



## Nelson Mining Division.

The Town of Nelson is not only the oldest in this part of West Kootenay, but one of the most important by reason of its situation on the West Arm of Kootenay Lake, and its railroad facilities, by which, coupled with those afforded by the steamboat lines, any point in these regions can now be quickly reached. Besides the Government offices, Court house, and Customs house, there are two banks, the Bank of British Columbia, and the Bank of Montreal, post-office, express office, two newspaper offices—the “Miner” and “Tribune,”—hotels, schools, churches, &c., and during the past year many new buildings, for business purposes and residence, have been erected. The smelter of the Hall Mines Co., Ltd., is also located here.

### THE NORTH FORK OF THE SALMON RIVER.

Being desirous of giving some information in this Bulletin concerning this recently prospected country, Mr. McConnell, of the Dominion Geological Survey, was requested by the writer to give a sketch of the geological formations and the character of the ore deposits, and the following is his kind response :—

“The ore-bearing rocks on the North Fork of the Salmon, consists of porphyrites, gabbro diabases, and slates, cut by numerous dykes, the whole forming a complex series somewhat similar to that of Rossland. The ores resemble the Rossland ores, but no large body had been opened up at time of my visit. A small opening on the ‘Mersey,’ showed several inches of nearly pure pyrrhotite with some chalcopryite next the hanging wall, bordered by 3-4 feet of mixed ore and country rock. At the ‘Ben Hassen,’ the development work consists of a shaft 25 feet deep, and a drift of 8-10 feet to the east; the ore here is principally pyrite and galena, with some chalcopryite, and occurs disseminated in grains, small pockets and stringers, through slates and porphyrites, along a zone 12-15 feet in width. At the ‘Arnold,’ a shaft 25 feet deep, has been sunk through altered and silicified porphyrites, carrying galena, pyrite, blende, and chalcopryite; the lead is not well defined. A large number of claims have been staked out in this district, but with the exception of those given above, but little work has so far been done on them.

“On Wild Horse Creek, east of the Nelson and Fort Sheppard R. R., the conditions are somewhat different, the volcanic rocks being largely replaced by argillites striking in a north and south direction; the slates are cut by a number of quartz leads, but the only one of note visited was the ‘Elise,’ situated on Huckleberry Creek, a tributary of the Wild Horse Creek. An open cut on this claim, about 35 feet long and from 8-10 feet deep, shows a well-defined quartz lead from 3-5 feet in width, striking about N. 25° E., and dipping to the north at an angle of 65°. The quartz carries galena, iron, and copper pyrites, blende, and native silver. Several tons of the ore have been shipped from this mine, and is reported to have yielded 60 ounces in silver and a few dollars in gold to the ton. Claims have been staked on a number of the other tributaries of the Salmon, but I had no time to examine them.”

### THE HALL MINES COMPANY, LIMITED.

#### SILVER KING.

This company now owns 18 claims, of which 9, or 196.6 acres, are Crown-granted, and the remainder, or 312.8 acres, mineral locations. Not all these claims are on the silver-copper belt, but the *Silver King*, *Kootenay Bonanza*, *American Flag*, and *Koh-i-nor*, or 56.9 acres, constitute the group upon which the extensive mining operations are being prosecuted, to be described below, while the *Britannia*, *Eureka*, *J.B.D.*, *Grand*, *Rose*, *Thistle*, and *Shamrock* are locations close by on the gold belt, in the same geological formation. The main group of four being old locations, or made in 1886-7, possess apex rights, and are located on Toad Mountain, 5 miles from Nelson, or  $8\frac{1}{2}$  miles by waggon road.

Owned by the Hall Mines Co., Limited, London, Eng. Capital, £300,000, of which 50,000 £1 shares are cumulative preference shares, one-half of which were issued when the company was formed, and 250,000 of £1 ordinary shares. Sir Joseph Trutch, K.C.M.G., chairman; F. Ramsay, 111, Wool Exchange, Coleman St., London, E. C., secretary.



Canadian officers: Gen. Manager, H. E. Croasdaile; Mine Superintendent, M. S. Davis; Smelter Superintendent, Paul Johnson; Foreman, W. A. Turner, Nelson, B. C.

**FORMATION.**—This copper-silver lode is situated in the greenish diabases that, in proximity to the vein, are generally massive, but also schistose, the planes of the schistose lamination being nearly vertical, and also nearly parallel with the trend of the ore zones that strike east and west, magnetic, and dip south  $70^{\circ}$ . In the main workings of the big lode no distinct walls can be seen, but in the largest stope the highest grade ore had lower grade ore receding from it on either side, indicating that probably the ore-bearing solutions had permeated and impregnated the country rock on both sides of the channel or crevice up which they had risen. In several places could be seen where the solutions had evidently followed divergent crevices and formed local impregnations leading off from the main ore body. Several fault planes of different strike and pitch traverse the lode, but with, as yet apparent, a very small amount of dislocation.

As yet but one large ore-shute, 200-225 feet long, extending right to the surface, has been developed by the present workings, but smaller ones have been found, that on further exploitation, hardly yet begun, may expand to much larger dimensions.

Towards the east, on the Kootenay Bonanza, surface showings lead to the inference that the vein may have branched, one continuing along the main direction into the Grizzly Bear ground, the other turning more to the south-east along the Kootenay Bonanza, but having apparently a dip opposite to that of the main lead. However, further work this winter to thoroughly explore this particular part of the property, may serve to show up the true conditions. This lode has been traced almost continuously throughout the length of the Silver King and Kootenay Bonanza claims, or nearly 3,000 feet, into the claims at either end, but the width of course varies greatly, from 1 or 2 feet up to the maximum, so far shown, of 50 feet.

**ORE.**—The ore may be graded into two classes; (a) into that carrying a high percentage of value-bearing sulphides, and (b) lower grade country rock impregnated with a much smaller amount. In the upper workings of the mine, down through a rich zone in the shute, the ore consists of bornite, or "pea-cock copper," with some tetrahedrite, also copper- and iron-pyrites, and small amounts of galena and blende, and of this ore the former owners shipped 206 tons, that averaged 190.9 ozs. in silver, and 18.17 % copper; one lot of 18.7 tons yielding 286 ozs. silver, and 27.2 % copper; and another of 13.5 tons, 321.5 ozs. silver, and 31 % copper. The present company, before the erection of their own smelter, shipped 1,160 tons of sorted ore that averaged 119 ozs. silver, and 12.9 % copper.

When the company's smelter, at Nelson, was put in blast, there were accumulated several thousand tons of good grade ore, of which over 5,000 tons assayed at the mine 46.44 ozs. silver, and 5.92 % copper, which yielded a very high grade matte when smelted. Since then, as will be seen by the total of production below, the grade of the ore has fallen considerably for two reasons:—(a.) As much lower grade ore can now be profitably treated, much rock hitherto profitless has been and is mined, increasing the tonnage but pulling down the average value, or for 15,000 tons mined in 1896, the mine assays were 20.52 ozs. silver per ton, and 3.64 % copper. (b.) The bulk of the highest grade ore in the present ore-shute, so far developed and accessible to mining, has been mined out leaving a large body of the lower grade, but still a considerable amount of the rich ore. The thorough development and prospecting of this property can be said to be now well inaugurated, and the exploitation of the present ore shute and other shutes, in depth disclosed by the diamond drill, can now be properly undertaken and vigorously carried on.

In the lowest workings of the mine the ore appears to be changing in that chalco-pyrite is replacing the bornite. The diabase country rock in the ore shute is impregnated with the metalliferous sulphides and some quartz. With an increased amount of gray copper in the ore, the silver value rises. At the surface the sulphides have been oxidised to a brown or black gossan, stained by the green and blue copper carbonates, and this gossan evidently contains much manganese, as the ore carries a good percentage of this metal. (See smelter analyses.)



## PRODUCTION OF MINE.

The following table gives very closely the total production of the mine from the beginning of work to January 1st, 1897 :—

	Tons.	Ozs. per Ton Silver.	% Copper.	Silver—ozs.	Copper—lb.
Amount shipped by former owners...	200	190.0	18.7	38,000	74,800
do " to outside smelters.	1,160	119.0	12.9	138,331	299,400
do " to Company smelter	29,860	21.0	3.7	627,060	2,209,640
Total production of mine....	31,220			803,391	2,583,840

## PRODUCTION OF SMELTER.

Mr. Paul Johnson, Superintendant of the smelter, reports that from Jan. 14th to Jan. 1st, 1897, the smelter has been in blast for 255½ days, and that with the one 42 by 100-inch blast furnace there have been smelted :—

## ORE SMELTED.

Silver King ore.....	59,720,335 lbs. or 29,860 tons of 2,000 lbs.
Outside ores .....	542,070 " 271 " "
Total ore.....	60,262,405 " 30,131 " "

## PRODUCTION.

	Pounds.	Silver—ozs.	Gold—ozs.	Copper—lbs.
Matte and metallics....	4,775,355 containing	628,125	575.2	2,247,891
Flue dust.....	240,000 "	4,836	2.9	15,030
Totals .....	5,015,355	632,960	578.1	2,262,921

*The average value of the ore.* From the above returns the average silver and copper contents yielded per ton, as calculated from the product obtained in smelting nearly 30,000 tons of the Silver King ore are nearly :—21 ounces of silver per ton, and 3.7% copper.

## DIVIDENDS.

No dividends have been paid by this company. As in all other mining propositions, the strictest economy and the most careful and experienced management will have to be exercised before profitable returns will accrue to the stockholders.

## MINING OPERATIONS.

All mining work, apart from prospecting, has been done on the Silver King lode which runs through the Kootenay Bonanza and Silver King claims, and especially upon the large ore shute on the latter claim. Further and extensive underground development work now in progress, should serve to locate and determine the size and value of the ore-shute, and to give more points of attack, with the consequent increased daily tonnage of ore.

About \$104,000 were spent by the former owners, the Kootenay Bonanza Co., in prospecting this main ore-shute near the eastern end of the Silver King, by driving three tunnels, or 1,100 feet, numerous cross-cuts or 345 feet, and sinking winzes, etc., and the present company has utilised and extended these workings, exploring also extensively with the diamond drill. The following will give some idea of the present workings, and the size and extent of ore bodies now disclosed :—

**SILVER KING.**—Tunnel No. 1, 85 feet long, near the crown of the hill, is not being used, but some very good ore was disclosed, particularly in some short winzes.

Tunnel No. 2, 132 feet, is a short distance below No. 1, and 44 feet above No. 4, to the large stopes, from which it is connected by two winzes, down which the ore is sent in mill-holes to the main haulage system. A large amount of very high grade ore has been taken from this level, and at present a considerable amount of medium grade ore is being mined, but the bulk of the ore now exposed is below.



TUNNEL No. 4, or MAIN TUNNEL, 6 by 7 ft., is at present the main artery of the mine, and was run by the former company 912 ft. easterly, in a straight line, nearly along the course of the ledge, but directly through the main ore-shute, at 720 feet it passes into the Kootenay Bonanza ground, 270 ft. vertically below the surface, while its face is still 600 ft. west of a shaft on this claim, to be described below, where are excellent surface indications of ore, 290 ft. above the tunnel level.

In driving this tunnel no ore was found for 85 feet, when a small amount of mixed ore was followed until, at 175 feet, 3-4 feet of good ore came in, down in which a winze is now sunk 70 feet, along which, and a 100-foot drift, are 2-3 feet of good grade ore, belonging, apparently, to a different shute from the main one. At this point a hoist, run by compressed air, was being installed to facilitate sinking, as this will form an important connection with the new tunnel, No. 5, by the time this reaches this point over 200 feet below, beside permitting in the mean time the opening up of this section of the lode. From this on there is little ore showing in the tunnel, until at 345 feet it enters and traverses for over 200 feet the magnificent ore-shute that extends right to the surface through upper tunnels, but appears to have its greatest width at this level. At first a core of 6-9 feet of very high grade ore was mined, but since then ore of lower, but very profitable, has been mined on either side, until this stope is now 35-50 feet wide and up 35-40 feet, showing a large amount of the medium to good grade ore 15-30 feet wide in the roof, besides that below the floor, but at either end this shute is narrowing down to a width of a few feet.

This large stope is being very well timbered up with square sets of 12-inch squared timbers, 6 by 6 by 8 feet, with strong floors; and this will not only make this ground safe, but render easy the catching up of the ground when the ore is stoped out from below this level, but so far the ground is very solid, and no timbering is required, except in these large openings or at the tunnel entrances.

From this main tunnel level another winze or incline, 135 feet deep, 250 east of the first ore described, is being sunk near the hanging wall and about half way along this large stope (by the aid of machine drills and a compressed air hoist) from which run two levels; No. 2 at 30 feet, with 170 feet of drifts and 60 feet of cross-cut; No. 3 at 60 feet with 75 feet of drift and 110 feet of cross-cut. Both of these levels are connected by another winze from the tunnel level, and up from each considerable high grade ore has been stoped out, leaving 12 to 15 feet of the lower grade. At the bottom the winze has run into the foot-wall, and at 135 feet prospecting at this level was just being commenced.

Thus the ore-shute, developed to a depth of 260 feet, has been shown to be in the present workings, about 225 feet long and 50 feet at its widest, and it is believed to have on its dip a trend to the east, as the workings and bore holes seem to indicate.

In the continuation of tunnel No. 4 there is no ore, this working being south of the lode, but 30 feet in one cross-cut north and 50 feet from the big stope, is a body of good ore, 10-12 feet thick, which is again struck in a diamond drill-hole in another cross-cut north, 100 feet east of this, and is there about 6 feet thick. This tunnel, after being deflected into the course of the lode, should be continued through the Kootenay-Bonanza, at least 6-800 feet.

*Tunnel No. 5*, or New Tunnel, 300 feet west of the No. 4, and 210 feet vertically below, or 230 feet on dip of the lode, follows for some distance a zone 2-3 feet wide of mixed ore, carrying more galena than found in other workings on the Silver King. This vein has a strong outcrop and runs through the Dandy claim, and in all probability is the extension of the Silver King lode, only it appears to be located about 150 feet north of where this lode should be by continuing its course as indicated in the upper workings. This tunnel, 6 by 7, double-tracked, now in 360 feet (Oct. 17th), is being advanced by using two machine drills, one Ingersoll-Sargeant, and one Rand, and 5-600 feet yet intervene before it will be into the big ore shute, but a large amount of ground can be prospected by this working, and much stoping done above it, while the handling of the ore will be rendered very simple, as the cars from this tunnel are run directly to the top of the ore bins of the aerial tramway.

#### KOOTENAY BONANZA.

On this claim a shaft 65 feet deep, with 120 feet of cross-cuts, now being enlarged for extended prospect work this winter, disclosed a considerable amount of good ore, and 100 feet east, in a small open cut, is some high grade ore believed to be in the continuation east of the Silver King lode, while south of this shaft, extending to the east end of this claim, exposed by a number of trenches, runs a mineralized zone, S. 40° E. (mag.), cutting across the stratification of the schists S. 80° E. (mag.) The rock in this zone is solid, light coloured, fine grained,



and impregnated with copper pyrites, bornite, and a little galena and grey copper, with quartz stringers, while the country rock is very schistose. It was here that the first copper-stained surface rock was found by the locators, and although drill-holes have been put down here, more satisfactory knowledge is expected to be gained this winter by drifting from the shaft, and if with favourable results, tunnels Nos. 4 and 5 can be pushed on into this ground.

#### MINING MACHINERY.

Large and commodious buildings at the mouth of No. 4 tunnel were being completed, in which were engine, compressor and boiler rooms, sorting floors and blacksmith shops, &c. The plant consists of:—

- (a.) 1 Corliss steam engine, 16 by 36, made by Albion Iron Works, Victoria, B.C. ;
- 2 60-H.P. boilers made by Ingersoll-Sargeant Rock Drill Co., Montreal ; and
- 1 35-H.P. boiler with boiler feed pumps ;
- 1 10-drill air compressor, 18 by 24, Ingersoll-Sargeant, Montreal ;
- 1 2-drill " " " "

(The engine fly-wheel is 12 ft. by 22 inches, with belting to pulley on shaft, whence another belt from the driving pulley runs back to fly-wheel of compressor, 10 ft. by 18 inches.)

- (b.) Work shop, with lathe, &c. :

- (c.) 1 No. 3 Gates rock-breaker, in which large stuff is thrown from sorting floor, thence to bins for the 3-rail gravity tramway ; also a small Dodge crusher for breaking the samples for assay :

- (d.) Saw-mill, with planer, &c.

The compressed air, at 80 lbs. pressure, is conveyed through the tunnel in an 8-inch spiral riveted steel pipe, thence by iron pipes and hose to the drills, which are used in driving headings, all stoping being done by single-hand work. The fuel, or cord-wood, costing \$1.25 per cord, is cut on the property.

#### TRANSPORTATION.

- (a.) Ore from Tunnel No. 2 is trammed in cars to the shute down to Tunnel No. 4 :

- (b.) From shutes on No. 4 level all ore is trammed out to the sorting floor, from the bins below which—

- (c.) The ore is loaded into trains of three cars, each holding 1,350 lbs., which are pushed out by two men and attached to the rope of the gravity tramway :

- (d.) This 3-rail tramway, equipped with  $\frac{3}{4}$ -inch steel cable and a 3-brake drum, runs down a trestle 700 feet long, dropping 190 feet, to the ore bins, 3,000 tons capacity, of the aerial rope-way, into which bins the cars from Tunnel No. 5 empty directly :

- (e.) The Hallidie Aerial Rope Tramway had to be divided into two sections, as the total length and drop were so great that the rope, as it went over the pulleys on the bents, cut right through these and also cut off the bucket-clips so that sometimes 25 to 30 buckets could be seen lying in the snow. By division this trouble has been greatly obviated, and this simple rope system is now doing very satisfactory work, while its length and amount of fall should be of interest to all mining men concerned with the transport of ore. The following are the data:—

#### TOTAL LENGTH—23,250 feet, or 4.4 miles.

Length of upper section . . . . .	10,200 feet.
" lower " . . . . .	13,050 "
Total difference in elevation between terminals . . . . .	3,750 "
No. of bents . . . . .	145
Longest span . . . . .	700 feet.
Diameter of steel rope . . . . .	1 inch.
No. of buckets . . . . .	850
Capacity of each bucket . . . . .	150 to 165 lbs.
Best capacity of tramway to date for 10 hours . . . . .	145 tons.
Average . . . . .	132 "
Total cost, about . . . . .	\$50,000.

As there are no automatic devices for loading or unloading buckets, a large number of men is required, or at upper end 6, division station 7, lower end 2, line workers 2, total ; 17 men.

The life of the present rope will be about one year, or guaranteed by the builders for 35,000 tons.



## TIMBER.

There is a considerable amount of good mine timber below the mine on the Company's property, but not much above.

## WATER.

Water, so far, gives but little trouble in the mine, but at the face of No. 4 tunnel, water under a high pressure, was struck in a drill hole, into which is now fastened a 2-inch pipe, through which very good water, under a pressure of 120 lbs per square inch, is carried to the boilers and other places outside. The mine water is non-corrosive and quite fit for boilers. The supply of surface water is limited but adequate.

## DIAMOND DRILLING.

It is stated that over 22,000 feet of holes have been drilled by this company by means of the steam-actuated diamond drills, and of this 11,000 feet by the present management (Mr. Fred. Stone), who are now contracting all this work at \$1.15 per foot. The rock is very suitable for this work, and very long cores are extracted except when passing through ore or rock containing a large amount of sulphides, and then all the material grinds to sludge. This lode has been prospected by setting up the machine on the surface, then drilling 2 or 3 holes at right angles to the strike of the lode, but at angles of 45° to 70° from the horizontal, thus intersecting the ore body in 2 or 3 points from this one set up. Also the drill has been used with greater satisfaction in the under ground workings, where the work can be done at more direct angles to the ore body, or rather ore bodies, as this prospecting has shown the existence of 2 and in some sections 3 parallel lenses of ore of some thickness.

The writer did not ascertain fully the results of these borings, but they are reported by the management to be very favourable.

## MINE BUILDINGS.

Besides the engine buildings, the log boarding and living houses have been this year replaced by new buildings built of material cut at the mine saw-mill, and among these are the following :—

- (1.) Offices and superintendent's residence.
- (2.) Assay and chemical laboratory.
- (3.) Powder magazines.
- (4.) House for foreman.
- (5.) 3 double houses to be rented to the miners with families.
- (6.) A large boarding house, 100 by 32½ feet, with kitchen, 17 by 32½ feet, three stories high with large basement. Masonry foundation, lathed and plastered, heated by furnace, and supplied with hot and cold water. For rooms and accommodation in this most commodious building the miners will be charged, besides the rate for board, which will be under the control of the company.

- (7.) Stables, sheds, out-houses, &c.

## WAGES AND COSTS OF MINING.

The number of men engaged at the mine was 160, but on completion of the buildings, this was to be reduced to 120. For 10-hour shifts miners are paid \$3.00; topmen and rustlers, \$2.50; bosses, \$4.00 to \$4.50; blacksmiths, \$3.50 to \$4.00; engineers, \$100 per month.

Cost of driving tunnels, \$9 to \$10 per foot; cost of breaking and delivering ore at upper terminal of aerial rope tramway, \$2.50 per ton; cost of transport of ore by tramway, including cost of rope, wear and tear, &c., 75 cents to \$1.00.

## THE SMELTER AT NELSON.

The smelter built by this company near the lower end of the tramway, on the outskirts of Nelson, and ¼ mile from the Kootenay River, was first blown in Jan. 14th, 1896, and has been in blast for 255½ days. At tramway terminal are 7 bins of 1,000 tons each, from which ore is lowered by a 2-car gravity tramway 400 feet long to the smelter ore-bins.



**FURNACE ROOM.**—There is one water-jacketted blast furnace, 42 by 100 inches at the tuyeres; tuyeres 3 ft. 8 in. from floor; feed floor 17 ft. from floor; water jackets 4 ft. 6 in. high and of steel; 6 tuyeres of 3 in. nozzle on each side. At the time of visit the ordinary solid foundation hearth had been replaced with a removable crucible, consisting of a steel plate frame 21 inches high, on a strongly braced cast-iron bottom, laid with cold water pipes in the tightly rammed steep, on which are laid fire bricks on end, 3 inches below the water-jacketted tapping-hole. This crucible is mounted on jack-screws with a 6-inch play, on a strong carriage on rails running lengthwise under the furnace and extending each way, the track at the back of the furnace carrying a duplicate hearth, while covered in front with iron plates, thus permitting the quick replacement of a hearth that is pushed under and jacked up snugly against the water-jackets, suspended by legs and hangers from the I-beams.

The fore-hearth is mounted, 5 feet square, 2 ft. 6 in. deep, lined with common red brick, and the slag runs into a large wheeled slag pot, which traps a small amount of matte, but more especially provides for accident, in case there is delay in tapping the fore-hearth, and thence drops 4 feet from a long iron spout into an iron-lined water box to be granulated and swept out to the dump by the rapid stream of water. From the tap-hole of the fore-hearth, the matte runs along an 8 ft. solid iron gutter, to a series of moulds on a carriage, 18 in. by 12 in. by 8 in., holding 220 lbs. of matte each, into which, while molten, is stuck an iron hook, for convenience in lifting afterwards.

Another furnace, designed by Mr. Johnson, with same kind of movable hearth 44 by 144 inches at tuyeres, capacity over 200 tons per 24 hours, 8 tuyeres on each side, with a bosh both in the stack and the water-jackets, is being erected, while the building is so arranged that 5 stacks in all may be put in easily.

This new furnace, by means of the mounted hearths, may be utilised for lead smelting, by replacing, in a very short time, the crucible for copper work by one suitable for lead smelting.

**DUST CHAMBERS** are of brick on a stone foundation, 175 feet long, 8 feet wide, 10 feet high, leading to a stack 177 feet high from the base, but nearly 200 feet above the furnaces, built of red brick (from Spokane) on a granite foundation. Most of the dust collects in the front part of the chamber, and in the two pyramidal hoppers in the iron down-take. (*See below for analysis of flue dust.*)

**ENGINE ROOM** contains at present a temporary plant of an 80 h. p. engine, 14 in. by 18 in., operating a No. 6 Root Blower; a 5 by 16 feet tubular boiler, feed pumps, etc. This building is to be extended for the installation of another engine and blower, that are to be so combined as to be on the same bed-plate. By the C. P. R. trestle, the fuel (wood) is brought to the door.

**WATER.**—A solid masonry reservoir, built in a very favourable basin in the granite, capacity, 150,000 gallons, 50 feet above the smelter floor, is fed by a small stream, but to insure a proper supply of water—in case this source should fail, a large wooden tank stands on the end of the railway trestle, and is kept full by a small steam pump down on the bank of a constant-flowing stream below.

**THE SAMPLING WORKS**, 40 by 60 ft. two stories high, have the upper floor so that barrows can be wheeled directly into the railway cars, to load matte for shipment, or unload ore from other mines. The crushers and rolls are placed up on the floor, so that all material has to be lifted by hand when feeding, and (a) for sampling matte there are a Blake crusher 15 in. by 24 in., made by Ingersoll-Sargeant Rock Drill Co., Montreal, and a Cornish rolls, 15 by 30, made by Jenckes Machine Co., Sherbrooke, Que.; and (b) for sampling ores a crusher 10 by 18, Fraser and Chalmers, and rolls 10 by 18, Jenckes Machine Co. The ore is wheeled to the sampling floor covered by iron plates and quartered down.

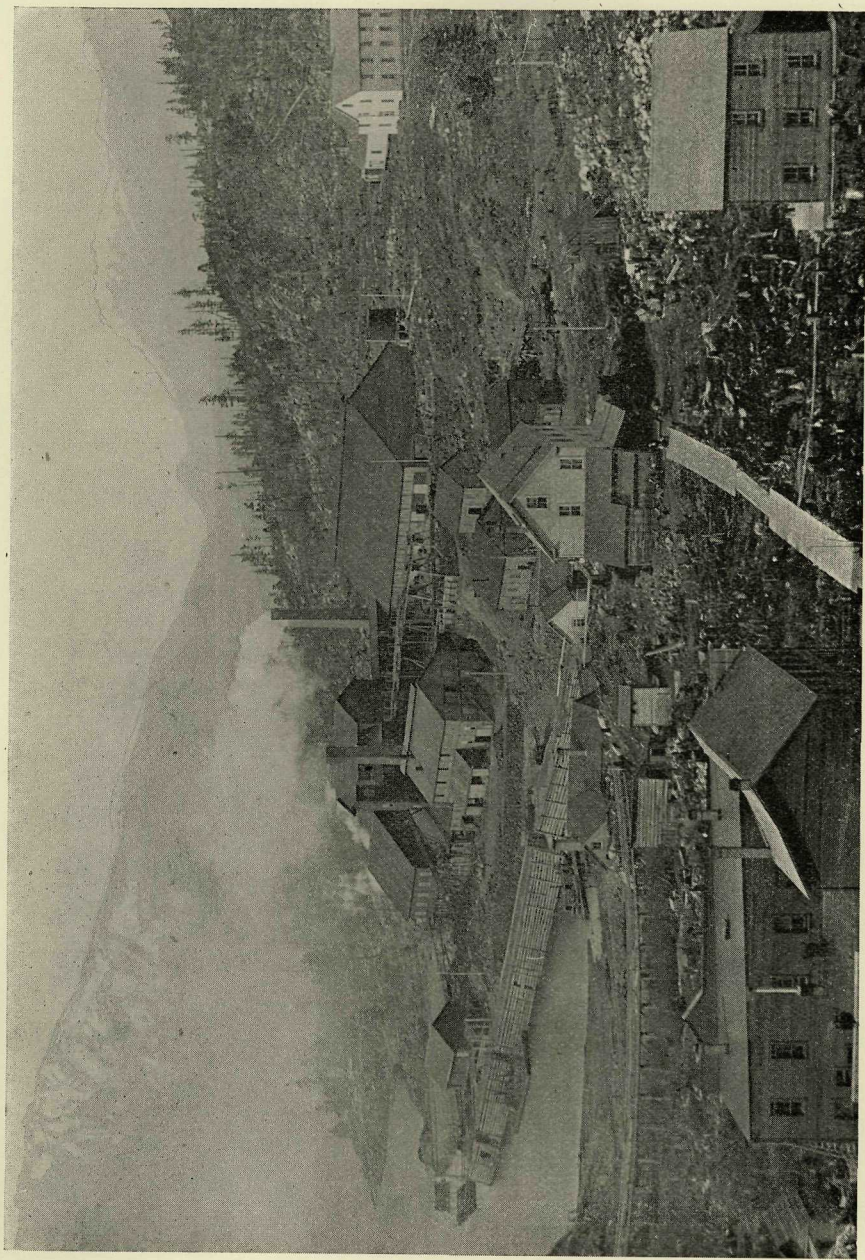
**BINS.**—Besides the bins at the tramway terminal, there are bins for the coke, iron ore, fluxes, limestone, ore from other mines, and for the mine ore.

**REFINERY.**—This part of the smelter will be included in a 60 by 100 foot building, 25 feet to the eaves, and comprise (a) a Reverberatory calcining furnace, hearth 16 by 50 feet, fuel, wood, and (b) a Reverberatory smelting furnace, hearth 13 by 17 feet, or 16 by 20 feet, outside measurement, both furnaces being built upon a foundation made by filling in excavations of the proper size with molten slag, and connecting with a 65-foot stack.

In the smelting furnace it is proposed to reduce the calcined matte to blister copper, or 95% copper, and 2% silver, the fuel to be soft coal.

On blowing out the furnace in September, prior to putting in the removable hearths, a large mass of metallic copper, very rich in silver, was found filling the bottom of the furnace and also eating into the bottom, extending down to the ground by replacing the mortar





PILOT BAY SMELTER, KOOTENAY LAKE.

*(See page 94.)*



between the fire bricks and a steel plate with metallic copper. This valuable mass was broken up, after a great deal of trouble, by using dynamite pop-shots, and now several large pieces will be easily handled by being put on the hearth of the furnace before the arch of the roof is turned, and then melted down.

The offices and laboratories are excellent, and with the completion of the additions now being made, the company will possess a very complete and excellent smelting plant, designed and constructed by Mr. Johnson, who has added to his already high reputation, by the success he has met with in his treatment of the Silver King ore, and further—with the mine well laid out and thoroughly equipped, and means of transportation good, this company should be in position to thoroughly explore their property and mine on a large scale.

**FUEL.**—Both American and European coke are being used, and of the latter quite a large quantity has been imported this fall.

(a.) The American coke, from Wilkington, Wash., contains, as nearly all similar coke made from the coal measures of the Cretaceous, a large amount of ash, or 18-19%, and costs delivered at the smelter \$13.40 per ton.

(b.) The Welsh or Cardiff coke is being delivered at the smelter for \$15 per ton, and over 4,000 tons were in stock. In the furnace on an average 11% of this required.

(c.) 700-800 tons of Westphalian coke has been imported and landed at the smelter at a little less cost than Cardiff; these cokes having been sent out by sea to Vancouver.

**FLUXES.**—A very pure limestone, crystalline, is brought down on scows from 9 miles above Kaslo, on Kootenay Lake.

**ANALYSES.**—The subjoined analyses of the ore, matte, etc., were kindly given by Mr. Johnson:—

ORE.	1	2	3	4
Insol.	48.00	40.60	40.50	46.50
SiO <sub>2</sub>	.....	32.30	29.70	33.70
S.	3.70	4.39	3.00	3.00
Al <sub>2</sub> O <sub>3</sub>	2.37(?)	12.50		
Fe.	6.18	6.92	8.01	8.12
MnO	10.97	9.11	6.80	8.30
CaO	6.40	10.50	7.20	5.70
MgO	1.04	3.56		
Cu.	5.06	5.59	4.40	4.30
Ag.	35.05 oz. per ton.	30.00 oz. per ton.	22.08 oz. per ton.	32.00 oz. per ton.

**MATTE.**—A typical matte assays: 175-310 ozs. of silver per ton, 45-50% copper.

Analysis:—Cu. 43.0, Fe. 19.7, S. 23.6, As. 0.06, Sb. 0.50, Mn. 4.90, Zn. 1.5, Ag. 1.0, Au. a trace (or .12 oz per ton).

The analysis of slag shows its very acidic character:—SiO<sub>2</sub> 41 to 44%, Al<sub>2</sub>O<sub>3</sub> 15 to 25%, Fe. 7 to 10%, MnO. 8 to 10%, CaO. 11 to 14%, Ag. .7 to .9 oz. per ton, Cu. .025 to .035%.

Analysis of flue-dust:—Insol. matter, *i.e.*, mineral 33.9, and carbon 7.8, Cu. 6.12, As. 3.2, Sb. 2.9, iron peroxyd. 10.3, CaO. 4.7, MgO. 5.8, Al<sub>2</sub>O<sub>3</sub> 1.9, S. 9.52, ZnO. 3.1, Mn. traces, and Ag. 37.6 oz per ton.

Analysis of coke from Fairhaven, Wash.:—Ash. 23.85, S. 0.52, H<sub>2</sub>O. 0.35, fixed carbon 75.28.

**TRANSPORTATION.**—(a.) The C.P.R. has a spur up to the smelter, by which cars can be run to the main line that leads out to Robson, or to the wharf, where the steamers from the Kootenay Lake land:

(b.) The Nelson and Fort Sheppard R.R. is about 1 mile distant, to which will be built a wagon road, as by this railroad ore can now be shipped direct from Rossland.

**CUSTOM SMELTING.**—This smelter has now entered the market at Rossland for the gold-copper ore that can be brought to this point. Also by means of the new furnace with removable crucibles, and especial flues to be erected for the condensation of lead fumes, it is intended to undertake the treatment of the silver-lead ores, and thus make this one of the smelting centres for Kootenay ores.



## ADJACENT CLAIMS.

The *Dandy*.—This claim Crown-granted, 19 acres, owned by A. H. Kelly, Nelson, lies immediately west of the Silver King, on the extension of this vein, and considerable work has been performed. About 400 feet below the new working tunnel of the Silver King, and not far from the end-line, a tunnel was in 75 feet along the vein, which is here  $3\frac{1}{2}$  to 4 feet wide, with quartz, copper-pyrites, bornite and galena, also spathic iron. About 80 feet westerly along this vein was a shaft, said to be 47 feet deep, but full of water, and below this was Tunnel No 2, which cross-cuts for 65 feet then follows continuously 170 feet along the vein, in which there is much quartz, brecciated country rock, the copper ores and galena as found above. Still further along the vein is an open cut, 50 feet long, exposing a 3 to 4-foot vein, and in Tunnel No. 3, 170 feet long, the vein is followed for 100 feet. Considerable ore is piled on the dumps, but its value was not learned, as no shipments have been made as far as could be ascertained.

The *Iroquois*, 500 feet south-westerly from the Silver King, appears to have a parallel lead of the same character of ore, but although exploration has been carried on by means of tunnels, open cuts and diamond drill holes, a body of sufficient size for profitable working has not yet been located. This claim is Crown-granted, 15.13 acres, to Mr. J. E. Boss, Spokane.

The *Grizzly Bear*, Crown-granted, 12.5 acres, owned by the Stadacona Silver-Copper Mining Co., of Victoria, B.C., lies easterly of the American Flag and Kootenay Bonanza and adjoins them. No work was being done, but in the shaft near the westerly end there is some very good ore, as this is evidently on the easterly extension of the Silver King vein, which is traced to this point by open cuts. Farther easterly considerable work has been done to intercept the vein, but this was not successful in 300 feet of tunnelling and cross-cutting. Good cabins are on the claim, and good timber, and further exploratory work is understood to be under advisement.

On the *Silver Queen*, title, Crown Grant, 20.25 acres, owned by the Silver Queen Mining Co., Victoria, B. C., a good deal of work had been done in exploring for the branch of the Silver King lode, that is believed to run through the Kootenay Bonanza into this property. In several cuts could be seen small traces of copper minerals, and in a shaft, now full of water, it was stated that some copper-silver ore had been found, but as no work was being done on the claim, satisfactory information was not obtainable. Since the time of visit, further prospecting has been begun by the sinking of holes with the diamond drill, by the same contractor, who has done much work upon the Silver King Group. Assessment work was being done on a number of other claims, and on some are small quartz veins, carrying gold values, but concerning which but little has been really ascertained.

## Gold Claims.

## POORMAN GROUP.

This group consists of six claims, the *Poorman*, *Hardscrabble*, *White*, *Myemer*, *Hardup* and *Electron*, of which the first is Crown-granted, the others mineral locations. Location, on Eagle Creek, 6 miles westerly from Nelson, and about 2 miles S. E. of the Kootenay River and the C. P. R. R. Owned by N. L. Davenport *et al.*, Nelson.

Most mining work has been done on the Poorman and White claims, on two distinct quartz veins, 1,200 feet apart, strike, about N. and S., dip, easterly  $40^{\circ}$ - $50^{\circ}$ , in a greenish coarse-grained hornblendic granite.

The POORMAN VEIN has the usual characteristics of quartz fissure veins in eruptive rock, being persistent, but very irregular in width, varying from a few inches to 5 and 6 feet of milky-white compact quartz, now holding a considerable amount of sulphides, or copper- and iron-pyrites, with, in parts, a little galena. In the upper workings the ore was found to be very free-milling, and several thousand dollars worth of magnificent gold-bearing quartz was taken from a part of the vein 5-6 feet wide, but now, as depth is attained, the ore has become less free-milling, and the value is going more into the sulphides that are saved by concentration. About \$100,000, it is reported by the owners, have been taken from the comparatively small area of the vein so far worked, and now the average value of the ore saved by amalgamation, is from \$12 to \$14 per ton, while the concentrates assay from \$26 to \$30 per ton, with the proportion of concentration about 10 tons to 1, so the total yield value of the ore is about \$16 per ton of ore mined.



On the Poorman workings there are :—The main tunnel cross-cutting for 90 feet, following along a fault wall that faults the vein at intersection, 5 feet. To the south the drift runs about 180 feet, with ground stoped out nearly all the distance, and practically to the surface, the vein varying from a stringer of quartz to 5 and 6 feet in width, and now 6-8 inches wide in face of drift. To the north the drift is 325 feet long, with thus about 500 feet of work along the ledge, and at 30 feet is a winze 85 feet deep (full of water), in which the vein is said to average 2 ft. throughout its length, thus exploiting new ground.

There are several faults exposed in these workings, causing dislocations of a few feet, and at 110 feet, in the north drift, occurs one nearly parallel with the vein but steeper, up which the lower part of the vein has been lifted 6-8 feet. Other faults run transverse to the vein, but the throw has not been uniform in direction, being in one place to the east, in another to the west. Much stoping clear to the surface, 70-80 feet, has also been done along this drift, with an average width of about two feet, and at the face the vein is a few inches wide, but there is no reason why the vein, on continuing the drift either way, should not widen out again, as was the case several times before.

TUNNEL No. 2 was in about 140 feet, having passed through a small vein from which 50 tons have been mined from a 40-foot drift and stope along it, and at 450 feet it is calculated to strike the vein 300 feet on the pitch below the upper workings.

On the *White* claim another, but smaller, vein has been exploited by a tunnel along it, about S. 25° E., 140 feet long, from which about 200 tons of ore have been accumulated on the dump, consisting of white opaque quartz containing a good percentage of very coarse iron pyrites, some copper pyrites, and in parts galena. In the altered granite country rock, are developed cubes of iron pyrites. In one place the vein was 2 to 3 feet wide, while along part of the tunnel there were two small veins, with breccia between and small stringers of quartz running into the country rock. About 80 tons of ore have been milled, which yielded, it is said, somewhat higher returns than the Poorman ore; but this vein has not yet been really developed to an extent to give much idea of its size and value. No work was being done on the property at the time of examination.

#### STAMP MILL.

A waggon road,  $2\frac{1}{2}$  miles long, has been built from the railroad bridge over the Kootenay River, where is a magnificent water power, to the mill, and thence 2,000 feet to the main tunnel. From Eagle Creek, flowing down past the mine and mill, water is carried in an 8 by 20-inch flume to the penstock, and thence under a 200-foot head, in a 11-inch steel pipe, to the mill; but a sufficient amount of water to keep the mill working is now only obtained for part of the year, or for April, May, June, and July, when a 150 to 175 h.p. is available; but while more water can be got by building a flume 2 miles long to Sandy Creek, it is doubtful if a continuous mill run throughout the year can be got without erecting a mill at the Kootenay River, where are abundant water and power, easily accessible by waggon road. In the mill are (a) Blake crusher above the bins; (b) two automatic feeders; (c) two batteries of 5 stamps, each 850 lbs., made by Chicago Iron Works Co., with two outer copper plates 10 feet by 4 feet 8 inches, as well as the inside coppers, mercury traps, etc.; (d) three end-shake vanners, 12 feet by  $4\frac{1}{2}$  feet, smooth belts, made by the Joshua Hendy Co., San Francisco; (e) a 4-foot Pelton water wheel running the mill and air compressor; (f) a three-drill Rand air compressor, made at Sherbrooke, Que., with receiver and 2-inch pipe to tunnel No. 2. The mill, as well as several good cabins, stables, etc., are built of logs.

Costs of milling were not obtainable, but the ore is broken by contract for \$6 per ton, embracing, it was understood, the cost of drifting, upraising, etc. The concentrates have been shipped to the Hall Mines smelter at Nelson, with a freight and treatment charge of \$8 per ton, with 95% of the gold paid for.

As there was not enough water to run the compressor or mill, all work was suspended, but when tunnel No. 2 reaches the main vein a large area for development will thus be opened up, and in all probability the vein will be found to have the same character as to size as found above, only the sulphides will, it is expected, carry a larger percentage of the yield value, but as these are cheaply concentrated, and a smelter is but a short distance away, no serious results can follow this increasing refractoriness of the ore.

#### OTHER GOLD CLAIMS.

Other quartz veins have been discovered and developed to a small extent, in this same granite area on the mountain slope, south of the Kootenay River, also in the formation in



which is the Silver King lode. Much attention is now being paid to all such claims, and and before long many of these will receive a thorough testing. As the water supply in the small creeks is precarious, and too small to keep mills running throughout the whole year, the Kootenay river will prove the best site for stamp mills, as there is abundant water power, although special allowance and provision will have to be made for the great difference between the high and low water stages of that river. The transport of the ore to the riverside presents no difficulties. Probably the out-put of several of these veins may yet be controlled by one company, and sent to one mill, or the ore from different claims be treated at a custom mill, as is now so often done in the West, as in Gilpin County, Colo.

As this ore will, without doubt, in depth, carry a fair percentage of sulphides, which, in turn, will hold a part of the gold values, if such ores are shown to carry pay value in this metal, the question of treatment of these sulphide concentrates should be greatly simplified by the easy access to the smelters, where low smelting charges should be the rule, and the necessity of the erection of chlorination or cyanide works, although the amount of copper present may preclude the latter, may be thus obviated. In Gilpin County above mentioned, a large amount of such concentrates collected at the numerous mills at Blackhawk, yielding \$18 to \$90 in gold per ton, is yearly treated at the Denver smelters, at a cost that is below that of any wet or lixiviation process. In that County the ores carry a high percentage of sulphides, and after much nearly pure pyritous ore has been sorted out for direct shipment to the smelter, the ore then averages from 12 to 15% pyrites, or concentrates 7 to 1, after leaving the stamp-mill proper. However this district, apart from the experience of the Poorman mine, yet remains to be proved; but it must be borne in mind, that in modern mill practice the term "free-milling" ore now embraces much material, that not long since would have been considered "refractory," and also, the point desired to be made, that the proximity to smelters further simplifies conditions, as what gold will not amalgamate may be retained by some simple form of concentrator, the treatment of the product of which is at once available.

#### THE ROYAL CANADIAN GROUP.

About a mile west of the Poorman mine, a number of other quartz veins have been found, in the granite and on this group, the *Royal Canadian*, *Colorado* and *Nevada* claims, 600 by 1,500 feet, title, Crown Grants, have been located two such veins. These claims are along the main trail to Nelson, and about  $1\frac{1}{4}$  miles back from the Kootenay River, the tunnels being close to the trail. On the Colorado, a short tunnel has been run south on a small vein running north and south, dip, easterly, 2 to 20 inches wide, of white opaque quartz, carrying some iron and copper pyrites, 15 tons of which are reported to have yielded at the Poorman Mill, \$14.50 in gold per ton; the sulphides not being saved.

On the Royal Canadian, about 400 ft. west of the Colorado tunnel, another but much stronger vein has been developed by a tunnel running south 205 feet, the vein following under a very distinct and straight hanging-wall, with a width of 6 inches to  $3\frac{1}{2}$  feet, average perhaps 16 inches, and yielding an ore similar to that of the Poorman, or a white sugary quartz, with 8 to 12% of iron pyrites and some copper pyrites, 60 tons of which piled on the surface, I was informed, assaying \$12 to \$14 in gold, while 8 samples taken by a gentleman who has a bond on this group, assayed from \$8 to \$51 in gold. An upper tunnel, 50 feet up and 66 feet in, shows the same vein 4 to 12 inches wide. On the Nevada, sluicing, or the cutting of surface trenches by running water, has been tried to locate the source of the quartz float, but as the surface wash is thick over nearly all these mountain slopes, no vein has yet been found. No water is nearer than the Kootenay River.

The *Muldoon*, owner, M. Monahan, Nelson, title, Crown Grant, is the south extension of the Royal Canadian, and shows in a tunnel, a small quartz stringer, with same dip and strike as the vein on the claim described.

#### MAJESTIC.

Title Crown Grant, area 600 by 1,500 feet, owned by John Miles, Nelson, located south-east of Canadian and about a mile west of Poorman. In a tunnel running south 120 feet is another quartz vein, 8 inches to 3 feet wide, in the granite, of a white opaque quartz with only a small amount of pyrites, the values in which could not be ascertained. About 50 feet to the west is a second parallel vein, 12 to 16 inches wide, exposed to an open cut, from which it is claimed free-gold samples have been taken.



## STARLIGHT GROUP.

This group of claims, consisting of the Starlight, title Crown Grant, area 600 by 1,500 feet, and the mineral locations 1,500 by 1,500 feet, the *Golden Star*, *Kootenay Star*, *White Witch* and *Black Witch*, in all 224 acres, located 4,000 feet above Kootenay River, has been attracting attention by reason of the existence of two auriferous schistose bands, one of which, running through the Starlight, Golden Star and Kootenay Star, has been exploited by a tunnel 209 feet long.

This tunnel, crossing this band at right angles, discloses a width of 148 feet of schistose rock between two porphyry dykes, and the results of careful sampling of this width of rock by Mr. G. Grant Francis, M.E., of London, England, have given the assay value in gold of this rock to be \$3.00 per ton, of which 35% was recoverable by amalgamation, and the remainder in the pyrites that amount to  $2\frac{1}{2}$  to 3% of the whole rock.

At 158 feet a drift has been run 59 feet east and 72 feet west along a small quartz vein, parallel to the strike of this band, that can be traced on the surface, 90 feet above, for 700 to 800 feet, and in the drift is  $\frac{1}{2}$  to 3 feet wide and assays from \$2.50 to \$32.00 per ton.

On the White Witch and Black Witch is another wide band with a 50-foot tunnel, but no returns were got concerning the probable value of this rock. The property is about 3,500 feet N.W. from the Silver King mines, and close to the road leading to the mine. It is crossed by the small stream, or Give-out Creek that might be utilized for a test mill but would not be large enough to supply ample water for all the year round for a large plant which low grade ore of this character would demand.

As this large body of low grade material could be easily mined, experiments are projected to ascertain whether, after paying the cost of mining, hauling, milling, concentrating and chlorination, a margin of profit would still remain provided a large amount of several hundred tons was milled daily. At the Alaska-Treadwell Mine, Alaska, large dividends are paid from rock yielding \$2.65 per ton (1895) or a profit of \$1.28 per ton. At the Homestake, South Dakota, the ore yields about \$4.50 per ton, while at the Haile Mines, North Carolina, U.S.A., Mr. Thies has made a great success, treating by milling and chlorination, ore that assays \$4.00 per ton in gold, of which  $\frac{1}{3}$  is free gold, and yields 2 to 25% sulphides; but in this work he has been greatly aided by the low cost of labour, much less than obtains in the West.

## FERN GROUP.

This group comprises the *Fern* claim, Crown Grant, the *Eureka* and *Hidden Treasure*, 1,500 by 1,500 feet, Crown Grants applied for, and two fractional claims, the *Chicora* and *Foothill*, located 10 miles from Nelson, to Hall's Siding, on the Nelson and Fort Sheppard R.R., and then  $4\frac{1}{2}$  miles by trail to the mine, 3,500 feet above Nelson. Owned by Frank Fletcher, *et al.*, Nelson. This vein of white opaque quartz, carrying copper and iron-pyrites in the diabase porphyrites and the green schists, belonging to the series in which is the Silver King lode, is from 3 inches to  $3\frac{1}{2}$  feet wide, average perhaps 2 feet, strike N.E. by S.W., dip N.W.  $50^{\circ}$  to  $70^{\circ}$ .

MINE.—Beginning at the lowest workings, a 20-foot cross-cut tunnel intersects and then follows for 25 feet along the vein of 2 to 3 feet of decomposed quartz that will give good gold colours on panning. A 22-foot winze has been sunk on the vein, but was full of water. Above this an open cut again shows the vein, and 50 feet still higher up a 15-foot shaft is sunk along the vein, here 1 foot 9 inches wide; 50 feet further up the hill an open cut shows the vein to be  $1\frac{1}{2}$  to 2 feet wide, while about 200 feet above the first tunnel is Tunnel No. 2, 276 feet along the vein, that is variable in width from 4 inches to  $3\frac{1}{2}$  feet, and contains more sulphides as the zone of decomposition is passed. Tunnel No. 3 is 60 feet above No. 2, and 160 feet along the vein that at the beginning was 3 inches wide but widened out to  $3\frac{1}{2}$  feet. Near the mouth of No. 2 is the blacksmith shop and a Hammond 2-stamp prospecting mill, with stamps 850 lbs. each, drop 8 to 10 inches, 2 silver-plated amalgamating plates, punched metal screens and a small steam boiler. This mill was only run three days and the results were not learned. A small stream passes the mine, but a mill would be put up, probably, on Hall Creek,  $\frac{1}{2}$  mile distant. There is a good supply of good timber. On the Foothill another and parallel vein is now being opened up. Mr. Fletcher reports that 25 tons of ore, partly decomposed and partly unaltered rock, sent to the Pilot Bay smelter and sampled, assayed \$39 in gold per ton.



## THE ATHABASCA GROUP.

This group was not examined, but it consists of the *Athabasca*, *Alberta*, *Algoma*, and *Manitoba*, 175 acres, situated about two miles from Nelson, on Morning Mountain, and Mr. Albert J. Hill, M. E., has reported that "seven ledges of free-milling gold ore have been opened on the property, varying in thickness from one to eight feet, in every opening on which he detected free gold, the ore being quartz, with some iron and copper pyrites, and very little galena, and the veins in quartzite schists."

The Athabasca Gold Mining Co., Ltd., New Westminster, Pres. B. W. Shiles, Sec. G. O. M. Dockrill, with a capital stock of \$1,000,000 in \$1 shares, has been organised to acquire and exploit these claims, and development work is being proceeded with, with the intention of erecting a stamp mill.

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## Ainsworth Mining Division.

In this, the pioneer mining district of West Kootenay, in which Dr. Dawson, in 1889, found mining being actively carried on; this industry for some time back has been quietly progressing, but not with that advance the success of the present mines and the mineral indications would seem to warrant. This is due to several facts, one of which is that many were attracted to the high-grade silver-lead veins of the Slocan, whose early prospectors of 1891-2 flocked in from the town of Ainsworth after Eli Carpenter and John Seaton, making their difficult way up Kaslo Creek, located the Payne claim September, 1891. Again, many good properties, Crown-granted, owned by men who can afford to wait, now lie dormant, like others that carried ore of such a grade that was in earlier days hardly profitable, but now, with cheaper rates and easier means of shipment, should pay well if developed. Disastrous forest fires destroyed several good mining plants on claims on which work had fairly started, but has not since been resumed, and again, many have had an unwarranted lack of faith in the probable permanence of these veins and ore bodies, especially of those in the limestones, which have been considered as merely "pockets" and local, but to one who has worked in silver ore-bodies in limestone, as in Colorado, this pocket theory is not so alarming a bug-bear, as the general experience is that when one ore-shute is found others are almost invariably discovered on prospecting further along the line of break, up and along which have come from greater depths, the ore-bearing solutions that have impregnated the country rock in favourable places and formed ore-shutes.

The fact that at Ainsworth (or Hot Springs), where most work has been done, good veins of very profitable ore, are found in all the different geological horizons, and also that while many seem to be conformable to some extent to the stratification of these rocks, many cut through these formations, should strengthen one's belief in the probable persistence of these veins, and give greater confidence in beginning work on a good and liberal scale.

The tide of prospectors is spreading over this district, and from the territory at the north end of Kootenay Lake, along the Lardo and Duncan Rivers and their tributaries, and from Crawford and Hooker Creeks, and white Grouse Mountain, back from the east shores of the lake, came reports of locations of veins of high grade ore, while at Ainsworth itself new properties are being found and opened up. By the way, it will be seen that this district embraces a wide territory, and that in reality but a small part of it has become familiar to the prospector or explorer.

With large smelting plants in British Columbia, the demand will vastly increase for dry ores, or ore carrying a small or no percentage of lead to mix with the galena ores; and such dry ores as are found at Ainsworth will be in special demand and command favourable smelting rates when shipped in bulk, *i. e.*, not sacked, and there will be yet shipped large quantities of low grade ore now not very profitable.

### GEOLOGY.

All the formations of the series detailed above, are found in this district, and in each formation of this series have been discovered valuable ore-bearing veins and deposits, mostly of silver or silver-lead, but also of gold-silver ores.

## Ores and Ore-Deposits.

### ORE-DEPOSITS.

In the immediate vicinity of Ainsworth, and at the Blue Bell mine on the other side of the lake, many of the veins or ore-deposits appear to be conformable in most part with the very marked stratification of the metamorphic rocks but many others cut across the formation, and in many cases the veins present the usual characteristics of the typical cavity-filled fissure vein, while in others, as at the Skyline and Number One, the deposits have been formed by the impregnation and replacement of the country rock by ore and quartz, and sometimes by calcite.

However, on none of the mines west of the lake has there been done more than a comparatively small amount of work by which to form positive opinions doubtful of the permanence of these ledges, and certainly not enough yet to condemn them as being likely to soon play out, for even if one ore shute should be exhausted, further work on this horizon, nearly always indicated by slicken-sided walls, a narrow seam of gouge or other evidences of a fault fissure, will, in very many cases, disclose other ore-shutes.



ORES.—There is a considerable variety in the different grades of ore, there being:—

(a.) Solid galena ores carry a good silver value, as the little Phil, Black Diamond, Highland, Tariff, in which there is not enough zinc to bring the percentage above the smelter limit, or 10%. In some of the properties not now being worked, can be seen a large amount of blende that concentration would remove:

(b.) In the Number One, there is little galena or blende, but the chief and important sulphide is iron-pyrites, with white quartz and calcite, a very desirable smelting ore:

(c.) The Skyline ore is again different, being a quartz and lime matrix, carrying silver compounds, but a very small amount of sulphides:

(d.) In some claims the sulphides, as galena, are not found solid, but disseminated, usually through quartz, and in the case of the Silver Glance and the Wakefield veins, with the presence of gold:

(e.) From Crawford and Hooker Creeks, from samples seen and by report, the high silver-gold values are carried in tetrahedrite or grey copper in quartz with galena:

(f.) At the Blue Bell mine, these large low grade ore-bodies consist of a calcareous matrix, with a small percentage of galena, iron and copper pyrites and pyrrhotite.

#### COSTS, ETC.

MINING.—The cost of mining is small, *i. e.*, for drifting or tunnelling \$6 to \$9 per foot, of sinking \$10 to \$16 per foot.

(b.) LABOR AND SUPPLIES can be got at the best figures, or about the same as in other parts of West Kootenay:

(c.) TRANSPORTATION of course is immensely aided by the main water-way of the lake, and from nearly all parts waggon roads or aerial cable trams can be built to the water front:

(d.) SMELTER CHARGES for the dry ores, *i. e.*, with little or no lead, run from \$4 to \$7 per ton, the maximum price being on account of an occasional excess of zinc; for the purely lead ores \$12.00 per ton, with a freight charge on all classes of ore to smelter of \$8. Of the lead 90%, and of the silver 95%, are paid for at New York prices at time of settlement. For gold all paid for, if at least \$2.00 in value are present.

#### NUMBER ONE.

This claim, 600 by 1,500 feet, Crown-granted, and a 5-acre mill-site, also Crown-granted, together with No. 3 claim, and interests in the E. W. R. North Extension and Oneida locations, form the property of the Britannia Mining Co., of Windsor, N. S., Pres., Chas. DeW. Smith, and Sec., A. E. Shaw, Windsor, N. S., Superintendent, Leander Shaw, Ainsworth. This mine, located  $2\frac{1}{2}$  miles west of Ainsworth, or  $4\frac{1}{2}$  miles by waggon road, and 2,500 feet above the lake, is one of the earliest worked mines in West Kootenay, considerable work having been done at the time of Dr. Dawson's visit in 1889, and up to the present time about 1,000 tons of ore and concentrates have been shipped. The ore body, as now developed by large stopes that are from 4 to 12 feet between walls, and nearly 300 feet long, would require very careful study with complete maps and models to explain its formation and relation to the enclosing rocks which belong to the Slocan slates series that at this point consists of limestones and shales and slates. The existence of many faults of very differing strikes and dips has certainly served to increase the apparent irregularity of the ore body, which, while having a general dip throughout the workings, is in places lying flat or dipping in exactly the opposite direction to the main direction, while in one part of the mine the ore-shute, divided into two flat-lying shutes, which the men worked out, leaving but a few feet of barren rock between. At the time of examination there was a good amount of ore in sight (Oct. 22nd), but the stoppage of the concentrator by lack of water was retarding mining, and some development work only was in progress. The ore is almost unique in its character. In the early workings considerable rich "carbonate" ore was mined, or the decomposed part of the ore-body immediately amenable to surface influences, but now the ore has a quartz and calcite gangue, or rather, the country rock is replaced in part by quartz and iron pyrites and some zinc blende, but very little galena, the silver value being in direct ratio to the amount of iron pyrites present, first-class, or shipping ore, averaging 75 ounces of silver, 3 to 8% lead, and seldom over the 10% zinc limit. The mine is now worked through a tunnel running N. 75° W. 375 feet, when it turns and follows along a fault wall 157 feet (W. 15° E.) and connects with a winze to the stopes, 35 feet above. This drift is to be continued, and when in 100 or 120 feet, will probably intersect the ore zone, and by connecting with an incline from the



stope, now down 35 feet along the foot-wall, which here has a 45° pitch, the further exploration of the property should be made much easier, while giving a much better outlet for the ore, the present means, by the rapid advance of work, having become unhandy. The mill ore-bins are just below this tunnel level. No work is being done to exploit this property beyond the work under way in this ore-shute, but there can be little doubt that as the ground is further opened up along the ore-bearing horizon, as soon as this is definitely determined, if not too much obscured by faulting, or along the fault fissure through which the ore-bearing solutions have found access, and then a place of lodgment in this formation, that more ore and other ore-shutes will be developed and mined.

The surface improvements consist of several log cabins, boarding house, office, assay laboratory, stables, and the concentrating mill that has cost \$16,000 to \$17,000.

**CONCENTRATOR.**—For six months of the year sufficient water for milling purposes is available, and by putting in a flume to tap another small stream, it is expected that then there will be water for the whole year for the mill, with enough, part of the time, to supply power generated in the low-water season by the present steam engines. While some first-class ore is shipped direct, most of the product of the mine goes to the mill, the capacity of which is 18-20 tons per 24 hours, concentrating 8 to 1, yielding concentrates that average 295 to 300 ounces in silver, 4-8% lead, and usually less than 10% zinc. Experiments have shown that ore assaying 15 to 20 ounces silver per ton can be mined and concentrated with a good margin of profit.

The mill is 45 by 75 feet, with an addition along one side 15 feet by 75 feet, and is supplied with (a) 100-ton ore bins, (b) 1 Dodge ore crusher, (c) 2 7-foot trommels giving 3 sizes, (d) 3 geared rolls, (e) 4 4-compartment Hartz jigs and 2 4-compartment slime jigs (Hartz), (f) elevators and hydraulic classifiers, (g) 1 Frue Vanner 6 by 12 feet, and one Embrey or end-shake vanner 4 by 12 feet, and settling tanks. This machinery was supplied by Fraser and Chalmers, of Chicago, and the Colorado Iron Works, Denver, while (h) the 35 h.p. engine and boiler came from the Phoenix Iron Works, Meadowsville, Pa.

**COSTS OF TRANSPORTATION** of ore or concentrates in sacks, 160 lbs. each, to the lake landing at Ainsworth is \$3.00 per ton; from thence to the smelter in the U.S., \$8.00 per ton, while smelting charges are \$6.50 for crude ores, and \$4 per ton for concentrates, with a zinc penalty of 50 cents per unit over the 10% limit.

**OTHER CLAIMS** in this vicinity are:—*Lilly May*, and the *Dellie* which is now being actively developed by Mr. S. S. Bailey, late owner in the Payne group, near Sandon, who is running a 300-foot tunnel to connect with a shaft 100 feet deep, 10 men being at work. This claim is in the Slocan Slates series and about 1 mile N.W. of Number One mine.

The *Lilly May*, through which runs the *Dellie* vein, is under bond to Mr. Max. Stevenson of the Highlander, and Mr. T. J. Lendrum. In 1895 a shipment of 12 tons of ore is reported to have returned 160 ozs. of silver per ton. East and south of this claim may be mentioned:—*United*, title Crown Grant, with a vein, in green schists, of coarsely crystallized galena—not working, having had all the buildings destroyed by a forest fire—but at the top of the 190-foot shaft are piled 400 to 500 tons of concentrating galena ore, carrying a large percentage of zinc blende; the *Old Timer*, the southern extension of the *United*, with the same kind of ore. The *Krao*, title Crown Grant, owner A. W. McCune, suffered by the loss of all the buildings by fire and is not being worked. There is a shaft sunk on the vein, which lies in a greyish or bluish marble, or limestone, carrying more or less coarse cubed galena.

The *Neosha* is being worked with a force of 8 to 10 men, engaged in running a tunnel to connect with a shaft from which 100-oz. dry ore is said to have been mined. It is now being worked by an Exploration Co., Nelson, title Crown Grant.

The claim to the north of this one, the *Ontario*, is owned by the Braden Bros., of Kaslo, who have 3 men at work on the same vein as in the *Neosha* ground.

#### SKYLINE.

The *Skyline*, *Perhaps*, Crown-granted, and the *Morning Star*, 600 to 1,500 ft. claims located on the Slocan Slates series, near the granite area, 1 mile west of the Number One mine, and 6 miles by road from Ainsworth, are owned by A. W. McCune, of Salt Lake City, Utah.

As this property had stopped work for this year and all was closed down, with water said to be in the mine, I was unable to examine it, but during the year over 1,100 tons of ore were shipped. Mr. McConnell reports (Summary Report for 1895, pp. 33, 34):—

“The *Skyline* and No. 1 occur in limestone bands associated with the Slocan Slates, and are situated, the former about 200 yards and the latter about one and a half miles east of the



granite area. The deposits worked in these mines are of a somewhat puzzling character, and would require extended study before conclusions of value could be arrived at concerning them. They appear to occupy fractured zones of considerable but unknown width, traversing the limestones and slates in a nearly north and south direction, and dipping to the west. The zones have been silicified, and impregnated with ore in a selective manner, by ascending solutions.

"The ore occurs in flattened ore-bodies, occasionally 10 to 12 feet in thickness, which, in the case of the Skyline, according to Mr. Scott McDonald, the manager, often cross nearly horizontally from the foot to the hanging wall. The workings in the Skyline include an incline 87 feet deep, sunk on the lead, and a shaft farther to the west, 200 feet deep, from the bottom of which a drift 120 feet in length and an upraise of 40 feet lead to the incline and the chambers of ore now being worked. The Skyline ore consists of a porous silicious rock, carrying a dark mineral, probably mostly argentite, native silver and galena, along with some grey copper (tetrahedrite) and iron and copper pyrites. It averages from 45 to 50 ozs. in silver per ton. The present out-put of from 10 to 15 tons per day is shipped directly to the Pilot Bay smelter, its silicious character rendering it valuable as a flux for the basic ores of the district."

During the past year, the ore has been shipped partly to the Pilot Bay and partly to the American smelters, and at a lower rate of transportation to the lakeside, by reason of the larger quantity of ore hauled, than for the Number One ore, although a mile farther up the road. The smelter returns from 74 lots, or over 2,000 tons in 1895-6, assayed from 35 to 149 ozs. in silver, or an average of 54 ounces per ton, and less than 5 % lead, and of the large amount shipped during 1896, the silver varied from 51.5 to 74.5 ounces of silver per ton, or an average of 58 ounces per ton.

#### TARIFF.

Title, min. location. Area 600 by 1,500 feet. Located 1 mile south of Ainsworth,  $\frac{1}{3}$  mile west and about 550 feet above Kootenay Lake. Owned by Wm. Braden, Helena, Montana. On this property 6 men were working in the mine and 6 on the waggon road,  $\frac{3}{4}$  mile long, being built from the mine to the lake side. The ore is (a) a very solid galena with fine and coarse crystals, with a little zinc blende, and (b) also in considerable amount, concentrating ore in a quartzose gangue. From an open cut Daniel Clark mined and shipped about 45 tons, in 1896, that yielded 30 ozs. of silver and 55 % lead, and at this point an incline has been sunk 100 feet, 80 ft. under cover, and for this 80 ft. solid galena ore 1-2 $\frac{1}{2}$  ft. wide, has been followed all the way down, while also in a drift 45 ft. northerly, the ore still continues, being 2-3 ft. wide. The vein, strike magnetic north and south or N. 25° E, and S. 25° W., dip west (mag.) 25°-30° is apparently conformable to the stratification of the schists and quartzites of the country rock, but in places there were evidences that the vein was slightly flatter and crossing the formation, the hanging wall being schist and the foot wall a bed of quartzite, 25-30 ft. thick, in which could also be seen more or less brecciated matter, under which has been found in an open cut another vein of galena, small as yet but of a very good grade. It is thought by some that all this bed of quartzite is mineralized, and may be concentrated, but as yet no work is done to test this. The vein is traced through the claim by cuts and strippings, and is said to be found in the extension claims on either end. On the dump was a large pile of first-class ore; and when the present exploratory work has sufficiently shown up the probable extent and value of this promising property, a more convenient system of mining will be inaugurated.

#### MILE POINT.

The *Mile Point* near the lake shore, south of Ainsworth, is under lease and bond to Mr. A. Stalberg, assayer, who is now working the property and shipping ore that runs 106 ozs. in silver and 4 % lead. Title, Crown Grant.

#### HIGHLANDER.

Title, Crown Grant. Located on a bluff below the main waggon road  $1\frac{1}{4}$  miles S. W. of Ainsworth, on a parallel vein about 600 feet east of the Black Diamond, about 1000 ft. above the lake. Owned by Max. Stevenson, Philadelphia, Pa. A cross-cut tunnel has been run in a bluff of gneiss 120 ft. S. 30° W. intersecting at 80 ft. in schist and quartzites a small vein of fine grained galena and zinc blende, with a little arsenopyrites, 4 to 18 inches wide, along which are short drifts, 20 ft. N. 30° W and 10 feet S. 30° E. At 120 ft. was found the main vein (that outcrops on the surface along in close proximity to a dyke)



along which is a drift 270 feet long, to be extended by contract 50 ft. farther N. 15° W. and S. 15° E. following under as a hanging wall a smooth striated fault plane, dipping west 45° or apparently at a slightly steeper angle than the dip of the planes of stratification. Below the wall the country rock has been much shattered and then cemented with quartz carrying galena and blende, forming a fair amount of concentrating ore. 27 feet from the tunnel a winze now nearly full of water was sunk 67 feet, from the bottom of which a cross-cut was run 52 ft. to the first vein, where it is said 5-6 ft. of low grade concentrating ore were cut. From the drift an upraise of 91 ft. to surface showed in places 8" to 10" of good ore and 2-4 feet of concentrating rock. Should sufficient ore be found to warrant the construction of a concentrator, there is a very good site for an aerial tramway down to the lake. During the year 1896, a small lot of 12 tons carrying very little lead, but 70 ozs. silver per ton, was sent to Everett, Wash., the smelter charge being \$12, and freight \$8.

#### LITTLE PHIL.

Title, Crown Grant. Location, on the main waggon road  $1\frac{1}{2}$  miles from Ainsworth. Owned by T. McGovern and Capt. Hayward, Ainsworth. This fractional claim of about 4.1 acres has been bonded to the Hon. N. Clark Wallace, Ontario, for \$20,000, 10 % cash down. This vein out-cropping on the surface in the schists, was tapped by running in a cross-cut tunnel 442 feet along the line between the Little Phil and Black Diamond claims, intersecting at 72 ft., the above vein, strike about N. 55° W., dip S.W. 70°-80°, along which a drift is run 200 feet, showing solid large cubed galena ore, averaging 30 ounces in silver per ton for most of the distance, from 6 inches to 2 feet wide, with some "carbonate." In a short upraise was a fine showing of solid ore 3 ft. wide. In the main tunnel 282 ft. farther in, a second vein along a wall developed fissure wall, having a more northerly trend and south-westerly dip, has been followed to the north 100 feet disclosing a small amount of mixed galena ore. Considerable concentrating ore is seen, or galena in a matrix of quartz, some calcite and crushed country rock. At the time of visit no work was being done.

#### BLACK DIAMOND.

The *Black Diamond* and *Little Donald* claims, the southerly extension of the Little Phil, the former 282 by 300 ft., and the latter 600 by 1,500 ft., owned by Jno. F. Stevens, of the Great Northern R. R., St. Paul, have had considerable work done upon them, but were also idle, so that the underground workings were not examined, but it is reported that in 1895, 250 tons of ore were shipped that returned 33 ozs. silver and 66-70% lead. Other claims, believed to be located along this lead, as the *Maestro*, *Paymaster*, *Spokane* and *Trinket*, were lying unworked, although the last two have shipped ore in the past.

#### HIGHLAND.

Title, Crown Grant, area 600 by 1,500 ft. Located  $1\frac{1}{2}$  miles north of Ainsworth,  $\frac{1}{5}$  mile north of Cedar Creek, and about 3,000 feet west, and 1,100 feet above Kootenay Lake. Owner, E. D. Carter, *et al.*, Ainsworth. A tunnel has been driven 680 ft., N. 35° W., along a well-defined fissure plane, dip S. W. 70°-80°. At the face is exposed a width of about 10 feet of concentrating galena ore, in a white sugary quartz, that with fragments of country rock forms a breccia. Going towards the mouth, for 50 ft., some ore is in sight, and at this point is an upraise 120 ft., with an 80° slope, with nearly solid galena ore  $\frac{1}{2}$  to 2 feet thick, most of the way for 105 ft. 90 ft. above is being sunk a shaft, then 59 ft. deep, to connect with this raise, and good ore is also found in this working. For 285 ft. more along the tunnel more or less ore is seen, and at this point is another raise of 160 ft. to the surface. Thence out to surface but little ore has been found, but on the dump are several tons of first-class ore, of coarse and fine solid galena, carrying a little blende, and also considerable concentrating ore or galena and blende, in a matrix of quartz and fragments of country rock, which is a mica-gneiss of the Shuswap series. A mill-site has been located at the mouth of Cedar Creek, and a line surveyed thence for an aerial tramway, while in Cedar Creek is a fair amount of water. From a small shipment of several tons of the best ore, the returns were 40 ozs. in silver, and 75% lead. Number of men at work, 3. Superintendent, E. D. Carter.

OTHER CLAIMS in this vicinity are:—"Josephine," title Crown Grant, or the northern extension, on which this vein is found in some cuts throughout the length of the claim. A fractional claim, the "*Little Maggie*," and also to the S. E. the "*Libbie*," 600 by 1,500 feet, Crown Grant, owned by Mr. A. W. McCune, on which is a 40-ft. shaft, and a ledge of low grade ore, but with no work being done. The Josephine and the *Maggie* and *Esther May*, are the property of the owners of the Highland.



## CANADIAN PACIFIC M. AND M. CO.

Canadian Pacific Mining and Milling Co., of Minneapolis. This company owns four Crown-granted claims, of which the *Amazon*, *Budweiser* and *Superior*, are 600 by 1,500 feet, and the *Wakefield*, 1,500 by 1,500 ft., situated at the mouth of Woodbury Creek,  $3\frac{1}{2}$  miles up the lake north of Ainsworth. Capital stock, 500,000 shares at \$1.00 each. Superintendent, J. R. Hardie, Ainsworth.

Woodbury Creek, carrying a good volume of water all the year round, runs down through a narrow gorge in the very hard gneiss, that has a strike north and south and a dip of about  $30^\circ$  to the west. Passing at nearly right angles, with a dip of  $70^\circ$ - $80^\circ$  S. to the formation, are several well-defined fissure veins, 4 inches to 2, and in some places 4 feet wide of galena, with both large and fine crystals, and zinc blende in a quartz and calcite gangue, the ore in places being solid and 6-16 inches thick. High on the face of the cliff on the west side of the stream, is believed to be a ledge lying conformable with the formation, and of course nearly at right angles to these galena veins described, and now two tunnels are being driven in with Ingersoll-Sargeant machine drills, to the west along these veins, to intersect in depth the last-mentioned ledge.

Down this gorge there has been built, at a cost of \$6,000, a splendid flume 1,200 feet long,  $3\frac{1}{2}$  by 4 feet, to the mouth of the creek, where the water enters a 36-inch penstock or pipe, which at the bottom has a Y-connection to two Pelton wheels, under a head of 75 feet. A 42-inch Pelton is now running a 12-drill air compressor, made by the Ingersoll-Sargeant Drill Co., Montreal, while the mill will be run by a 6-ft. wheel, both wheels having a 5-multiple nozzle. Along the top of the covered flume run the air-pipe and track, and 500 feet farther to the farthest present workings from the mill.

*Budweiser*.—One of the tunnels was in 65 feet, and following along a fault plane above which the rock is much fractured and seamed with little quartz veins, carrying a small amount of copper and iron pyrites and some galena, also \$3-5 in gold. Upon the face of the cliff could be seen a quartz vein, following along this line of break, while 25 feet to the north is a small parallel vein of galena. Between these two veins, or 25 feet, this rock, carrying a small percentage of sulphides, is said to be concentrating ore but this has yet to be proven by mill tests.

Two other prospecting tunnels are on this claim, one 60 feet long, in the wash, from which large boulders of brecciated rock have been taken, carrying a very fine grained galena, assaying 30-40 ozs. in silver. Another tunnel, 45 feet, followed a small vein of large cubed galena.

*Amazon*.—This tunnel, being run with a machine drill, was in 120 feet, following a galena-blende vein dipping also southerly  $70^\circ$  to  $75^\circ$ , with, in places, 8 to 14 inches of solid ore in quartz and calcite. This vein can be seen running up the face of the cliff, and in places is four feet wide, and what is rather unusual the ore carries considerable pyrrhotite. On another vein, 14 to 20 inches wide, two tunnels have been run in on either side of the creek, one for 140 feet the other for 120 feet.

*Wakefield*.—On the top of the bluff a shaft has been sunk 140 feet in another vein of mixed galena ore, 4 to 24 inches wide, that gives good assays in gold.

CONCENTRATOR.—This mill, situated  $\frac{1}{4}$  mile from the lake, is being built by Mr. M. A. Halman, of Carterville, Missouri, U. S., who is equipping the mill with crushers, rolls, jigs, &c., from that place, and is following the Missouri method, or by exclusive use of jigs without vanners or slime tables. The ore bins are immediately below the tramway, and the capacity of the mill will be 75 tons per 24 hours. A tramway has been built for 1,400 feet to the lake side where is deep water, and ore and concentrates will be easily loaded into the steamers. Cost of mill, \$12,000. Number of men employed, 20.

SILVER GLANCE, title, Min. location. Located 2 miles up Woodbury Creek, or  $3\frac{1}{2}$  miles by trail N. W. of Ainsworth. This claim was located Aug. 5th, 1896, by Wm. Franklin, Alex. McLeod, and F. L. Fitch, Ainsworth, the vein being discovered in the stream bed where it cuts through the schists. A good cabin has been built near the tunnel, which starts in on the vein just above high water mark, and follows it for 20 feet, at time of visit. This vein, strike east and west, magnetic, dip  $60^\circ$  S., has from 4 to 16 inches of ore with, in places, 2 to 3 feet of mineralized brecciated country rock and quartz, and has been disclosed for 2-300 feet by stripping. The ore is white sugary quartz, with galena, iron pyrites, and marcasite disseminated through, and assays (from samples) 50 to 232 ozs. silver, and \$18 to \$20 in gold. About 15 tons of ore are now at the tunnel mouth, and this winter the owners will proceed with development, also build a trail down the creek to the lake, above which it is about 1,200 feet. There is an abundance of water in the creek, and good timber on the claim.



## BLUE BELL MINE AND PILOT BAY SMELTER.

Neither the Blue Bell mines or the Pilot Bay smelter was visited, as mining operations had been suspended, and the smelter was not in blast; however the following information is given as it may prove of interest to many. In the Summary Report for 1895, p. 33, Mr. McConnell states:—

“At Hendryx, the Blue Bell is in active operation. This mine is situated on a band of crystalline limestone interbedded with the Shuswap schists, which has been fractured in various directions. The ore, consisting mostly of low-grade galena and pyrrhotite with some blende, iron and copper pyrites, and their decomposition products, occurs either pure or disseminated through a calcareous and occasionally a silicious matrix.

It occupies irregular chambers in the limestone, some of which are of huge dimensions. The ore body being worked at present, including some large horses of limestone, measures approximately 70 feet in width by 200 feet in length and 150 feet in height. Forty thousand tons of pure and concentrated ores have been shipped from this mine during the year, and prodigious quantities remain in sight.

PILOT BAY SMELTER.—This plant is located on a small peninsula on the same side (or the east) of Kootenay Lake as the mine, but about 8 miles south. There are three main buildings, the roast house, smelter and concentrator, besides the smaller ones for offices, laboratories, workshops, etc. The concentrator contains two Blake crushers, 9 by 15 inches, 4 4-compartment jigs, 2 double Collum jigs, 2 two-table slime tables, and 2 Frue Vanners, and has a capacity of 200 tons of ore per 24 hours. There are four 17 by 65-foot reverberatory furnaces in the roast house of 12 tons capacity each per 24 hours, while in the smelter is one 100-ton water-jacketed blast furnace. In the engine room is a 150 h.p. Corliss engine for the concentrator and sampling works, an 85 h.p. engine for the blower, and a 30 h.p. engine for the dynamo, for the electric lighting of the whole works.

The ore is brought down from the mine on large scows and then hoisted up on an incline plane to a point whence it can be taken to any point desired. Mr. Hendryx states (*see* Minister of Mines Report, 1895):—“Since commencing operations to the finish of the works, July 10th, 1894, to December 31st, 1895, the Kootenay Mining and Smelting Co. has expended in cash for purchase of machinery, labour, ores, etc., a sum exceeding \$650,000. During the year 1895 the company has employed daily on the average 200 men, and has paid from their office on labour account, \$170,000; for supplies, \$85,622; for duties, \$70,000; for freight, \$92,500; for ores purchased, over \$150,000.”

The above-described Blue Bell property, consisting, in part, of the Blue Bell, Surprise, Black Hawk, and Silver King claims, and the smelter plant, equipment, etc., are the property of the Kootenay Mining and Smelting Co., Ltd. Capital stock, \$2,300,000; general manager, A. B. Hendryx, Pilot Bay, B. C.

## SOUTH FORK OF KASLO CREEK.

No examination was made of this part of the district, but mining work is now being done on several properties, such as those owned by the Gibson Mining Co., and others, on which it is reported veins of high grade silver-lead ore are being developed. On the “Montezuma,” under bond to Messrs. C. L. Webb and E. C. Hughes, of Seattle, two tunnels are being driven, from the upper one of which a winze is being sunk on a vein of galena ore to the lower tunnel, 100 feet below and 270 feet long, in the face of which are said to be  $1\frac{1}{2}$  feet of solid galena ore, assaying 120 to 140 ounces of silver per ton.

## CRAWFORD AND HOOKER CREEKS.

A trail now runs from Crawford Bay, on the east of Kootenay Lake, near Pilot Bay up Crawford Creek to the divide, and thence down the St. Mary's River to Fort Steele, in East Kootenay. Six miles from the lake a branch trail runs up Hooker Creek to the claims there located, and at the head of this creek, or 10 or 12 miles from the lake, at an altitude of 4,500 feet above the lake, is the Commonwealth group, comprising the *Commonwealth*, *Sultan* and *Republic*, now bonded to the London and British Columbia Gold Fields Co., Ltd. A tunnel is now in 150 feet along a ledge, said to be 4 to 16 feet wide, in which is quartz disseminated with galena, grey copper, silver sulphides and some gold. Plenty of timber and



water are available close by. On the adjacent claim, the *Express*, a cross-cut tunnel is now in 90 feet, being run to cut two quartz veins, 2 to 2½ feet wide, carrying galena and grey copper.

From the *California* 3 tons of ore, taken from the surface, were shipped to the Pilot Bay smelter, 2 tons of which assayed 170 ounces of silver per ton and 37% lead.

The *Hidden Treasure* shipped 5 tons of similar grade of ore to the same smelter.

A number of claims have been staked off on Crawford Creek.

#### MAGNETIC VARIATION.

The magnetic north is on the average about 25° east of the true north.

#### WEIGHTS.

The ton in all weights given contains 2,000 lbs.

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The earlier publication of this report has been prevented by the delay in receiving important smelter returns, the copying of which has entailed considerable labour upon those who have so kindly assisted by sending exact and complete returns.

I have the honour to be,

Sir,

Your obedient servant,

WILLIAM A. CARLYLE,

*Provincial Mineralogist.*

*Bureau of Mines,*

*Victoria, B. C.,*

*January 15th, 1897.*

---

VICTORIA, B. C.:

Printed by RICHARD WOLFENDEN, Printer to the Queen's Most Excellent Majesty.

1897.





○ METEOROLOGICAL STATION.  
X CHIEF STATION.  
+ FIRST CLASS STATION.  
# SECOND CLASS STATION.  
\* THIRD CLASS STATION.  
○ SUNSHINE.

SKETCH MAP  
OF THE SOUTHERN PORTION OF  
**BRITISH COLUMBIA**  
indicating  
CHIEF MEANS OF COMMUNICATION  
and  
AGRICULTURAL AND PASTORAL LOCALITIES  
DEPARTMENT OF LANDS AND WORKS  
VICTORIA 1897.

SCALE OF STATUTE MILES  
0 10 20 30 40 50 60 70 80 90 100  
GOTFRED JORGENSEN DRAUGHTSMAN.

*J. J. K. Jorgensen*  
SURVEYOR GENERAL.



# INDEX.

NOTE.—Pages 1 to 95 comprise the Bulletins Nos. 1, 2 and 3 appended to this Report.

	PAGE
ACCIDENTS in Collieries .....	591
Achilles .....	73
Acton .....	75
Adams Group .....	56
AINSWORTH Division .....	88
Alamo .....	54
Alameda .....	32
ALBERNI District, Bulletin No. 1 .....	1
Barclay Sound .....	4
China Creek .....	6
Coleman Creek .....	5
Copper Island .....	4
Effingham Inlet .....	5
Granite Creek .....	5
Placer Mining .....	7
Santa Maria Island .....	4
Sarita .....	4
Alexandria Colliery .....	589
Alpha .....	67
Alpine .....	72
American Boy .....	58
Antoine .....	63
Argo .....	53
Arlington .....	72
ASSAY OFFICE AND FEES .....	506
ASSISTANCE OF STEAMBOAT LINES .....	42
Athabasca Group .....	87
Bell .....	64
Best .....	61
Big Slide Mine .....	550
Black Bear .....	20
Black Diamond .....	92
Black Dwarf .....	74
Black Prince .....	542
Blue Bell .....	94
Blue Bird .....	31, 59
Bonanza .....	74, 547
Bondholder .....	70
Bon Ton .....	64
Bonaparte Valley .....	550
Boston Bar .....	569
BOUNDARY CREEK .....	580
Broadview .....	541
British Columbia S. R. Co., Trail .....	18
Bridge River .....	550
BULLETIN No. 1.—Alberni .....	1
No. 2.—Trail Creek .....	9
No. 3.—Slocan, Nelson and Ainsworth .....	33



	PAGE.
BUREAU OF MINES .....	504
Acknowledgments .....	507
Assay Office .....	506
Bulletins .....	504
Library .....	505
Lode Mining .....	507
Mineral Collection .....	506
Operations of .....	504
Statistics .....	506
Byron N. White Co .....	47
C. & C .....	27
California .....	24
Camp Hewett M. & D. Co .....	579
Canadian Pacific M. & M. Co .....	93
Canadian Group .....	56
Cariboo Creek .....	73
Cariboo Hydraulic M. Co .....	515
CARIBOO .....	507
Cariboo Gold Fields Co .....	513
Creek Diggings .....	508
Cyanide Process .....	512
Hydraulic Elevator .....	509
Hydraulic Mines .....	508
Keithley Division .....	515
New Mines .....	509
River Dredging .....	510
Quartz Leads .....	510
Slough Creek M. Co .....	512
Willow River Lease .....	511
CASSIAR .....	516
Cayoosh Creek .....	547
Celtic Queen .....	30
Central Camp .....	578
Centre Star .....	23
Chambers Group .....	59
Chapleau .....	73
Charleston .....	65
CHEMICALS .....	507
CINNABAR MINES .....	568, 571
Cinnabar M. Co .....	571
City of Spokane .....	25
Cliff .....	25
COAL .....	524
Crow's Nest Pass .....	524
Kamloops .....	564
Kettle River .....	582
Production .....	501
Vancouver Island .....	584
COAL MINES .....	584
COLLIERY RETURNS .....	594
Colorado .....	65
Columbia & Kootenay .....	28
Commander .....	32
Commonwealth .....	94
COKE, Comox, Union Colliery .....	584
Crow's Nest Pass .....	524
Foreign for Smelters .....	19, 182



CONCENTRATING MILLS:	PAGE.
Alamo Mill .....	54
Canadian Pacific M. & M. Co. ....	93
Noble Five .....	58
No. One Mine .....	90
Slocan Star .....	51
Thunder Hill .....	530
Washington .....	61
Copper Camp .....	577
COPPER ORES .....	499, 537, 541, 546, 550, 553, 566, 577, 578, 579, 4, 16-32, 37, 75
Corean .....	65
CORRECTIONS .....	46
COST of Roads and Trails .....	40
Transportation, Smelting, &c .....	18, 48, 89
Stopping .....	48
Crawford Creek .....	94
CROWN GRANTS issued for Mineral Claims .....	556
Crown Point .....	29
Crusader .....	72
Cumberland M. Co. ....	54
CYANIDE PROCESS .....	512
Daisy .....	69
Dalhousie .....	75
Dandy .....	83
Dardanelles .....	63
Deane .....	520
Deer Park .....	31
Dellie .....	90
Downie Creek .....	536
DREDGING, RIVER .....	509, 514, 550, 570
Eldon .....	65
Elkhorn .....	65
Enterprise .....	27, 69
Eureka .....	51, 74
Evening Star .....	27
EXPLOSIVES .....	507
Fairview Camp .....	
Fern Group .....	86
Fisher Maiden .....	68
Flora Mac .....	74
Florence .....	32, 73
FORT STEELE DIVISION .....	518
Freeburn .....	31
FOWLER, S. S., Report on Boundary Creek .....	580
French Creek .....	536
Galena Claim .....	58
Galena Farm .....	68
Gem .....	30
GENERAL GEOLOGY .....	16, 43
Georgia .....	28
Gertrude .....	24
GOAT RIVER DIVISION .....	546
Golden Cache .....	547
Golden Rule Mines Co. ....	547
Golden Chariot .....	27
Gold claims .....	83
GOLD COMMISSIONERS' ADDRESSES .....	564
GOLD ORES ( <i>see</i> Placers) .....	499, 510, 522, 536, 541, 546, 547, 550, 553, 566, 573, 574, 575, 578-579, 581, 5, 16-32, 53, 71, 75, 83



	PAGE.
Goodenough .....	59
Gopher .....	30, 73
GOVERNMENT AID FOR TRAILS, ETC. ....	40
Granite Mountain .....	69
Great Western .....	27
Greenwood Camp .....	578
Grizzly Bear .....	83
GYP SUM .....	567
Hall Mines Co .....	75
Hardy .....	74
HARRISON LAKE .....	572
Hewitt .....	68
Heather Belle .....	74
Highland .....	92
Highlander .....	91
Hill's Bar .....	569
Horsefly Hydraulic M. Co. ....	515
Hooker Creek .....	94
Howard Fraction .....	72
Homestake .....	30
Hustler .....	55
HYDRAULIC ELEVATOR .....	509, 515
Idaho .....	23, 54
Idler .....	54
ILLECILLEWAET DIV. ....	538
Importance to coast cities of mining centres. ....	42
Independence .....	74
INSPECTOR OF COAL MINES' REPORT .....	584
Invicta Gold M. Co .....	523
Iron Hill .....	30
Iron Horse .....	28
Iron House .....	70
Iron Mask .....	22
IRON ORE .....	567, 4
Iroquois .....	83
Ivanhoe .....	56
Jay Gould .....	59
Josie .....	23
Jumbo .....	26
Kalespell .....	71
KAMLOOPS DIVISION .....	565
Kaslo Creek, South Fork .....	94
KASLO & SLOCAN R. R. ....	41
KEITHLEY DIVISION .....	515
KETTLE RIVER DIV. ....	576
Kettle River, North Fork .....	578
Kootenay Lake .....	41
Krao .....	90
KOOTENAY, EAST .....	517
Coal, Coke, and Oil .....	524
Fort Steele Division .....	518
Gold Properties .....	522
Invicta Gold M. Co .....	523
Means and Communications .....	531
Mining Operations, Records .....	533
Moyie and Queen of the Hills .....	521
Nip & Tuck M. Co. ....	524
North Star Mine .....	518



KOOTENAY EAST.— <i>Concluded.</i>	PAGE.
Perry Creek .....	522
St. Eugene Group .....	521
Sullivan " .....	520
Tracy Creek .....	522
Transportation .....	517
Windermere, Golden and Donald .....	530
KOOTENAY, WEST.	
Ainsworth Division .....	88
Goat River " .....	546
Illecillewaet " .....	538
Lardeau " .....	537
Revelstoke " .....	534
Slocan " .....	33
Trail Creek " .....	541, 9
Trout Lake " .....	541
Lake Shore .....	522
Lanark .....	538
LARDEAU MINING DIV. ....	537
Last Chance .....	30, 68
LEAD ORES .....	499, 518-522, 536, 538, 37, 46-75, 88-95
Lee, R. E. ....	30, 60
Lemon Creek .....	71
Le Roi .....	20
LILLOOET DISTRICT .....	546
Lilly May .....	31, 90
Little Phil .....	92
LOCATION OF AND TITLE MINERAL CLAIMS .....	43
LODE MINING .....	500, 507
London Hill Group .....	66
Lone Star .....	65
Lucky Jim .....	66
Maid of Erin .....	30
MAGNETIC VARIATION .....	95
Majestic .....	85
MAPS .....	73
Mayflower .....	23
McCullough Creek .....	535
McKinney Camp .....	575, 583
MERCURY .....	568, 571, 5
Meteor .....	72
Midnight .....	520
Mile Point .....	91
MINERAL PRODUCTION .....	497
MINING RECORDERS .....	564
Mitchell, T. L. ....	51
Molly Gibson .....	73
Monita .....	24
Monitor .....	53
Monte Christo .....	23
Mountain Chief .....	67
Mountain Group .....	72
Mountain View .....	26, 69
Moyie and Queen of the Hills .....	521
Mug Wump .....	24
Nanaimo Colliery .....	585
NANAIMO DISTRICT .....	553
Neepawa .....	70



	PAGE.
NELSON DIVISION .....	46, 75
Claims .....	75
Geology .....	46
Production .....	38
Smelter .....	80
Neosha .....	90
NEW RAILWAY LINES .....	42
NEW WESTMINSTER DIVISION .....	555
Nest Egg .....	31
Nickel Plate .....	24
Nip & Tuck M. Co. ....	524
No. 1 .....	24
Noble Five .....	57
Noble Four .....	74
Noonday .....	68
North Fork Salmon River .....	75
North Star M. Co., Ltd .....	518
Northern Belle .....	63
Number One .....	89
Ocean Group .....	72
OIL FIELDS .....	529
O. K. ....	26
Old Timer .....	90
Omega .....	60
Ontario .....	90
Oregon City .....	70
Oro Grande .....	73
OSOYOOS DIVISION .....	574
Ottawa Group .....	72
Palo Alto .....	32
Payne Group .....	60
Peak .....	26
Perry Creek .....	522
Phoenix .....	31
Pilgrim .....	24
PLACER MINING .....	499, 508-16, 523, 534, 546, 565, 569, 573,
Poole Creek .....	519
Poorman .....	22
Poorman Group .....	60
PRODUCTION OF MINERALS .....	497
Promistoria .....	73
Python .....	566
Quantrelle .....	520
Rabbit Paw .....	51
RAILROADS .....	14, 41, 42
Rambler Group .....	62
Ranger .....	73
Reco Group .....	58
Red Mountain .....	26
Reed & Robertson .....	67
Republic Group .....	73
REVELSTOKE DIVISION .....	534
Rise and fall of water in West Kootenay:	
RIVER DREDGING ( <i>see</i> DREDGING).	
ROSSLAND .....	9
Cost of Mining .....	32
Early History .....	15
Location .....	13



ROSSLAND.— <i>Concluded.</i> —	PAGE.
Ores .....	17
Ore Deposits .....	16
Production .....	13
Transportation .....	14
Treatment of Ores .....	17
Round Hill Mine .....	539
Royal Canadian .....	85
Ruby Silver .....	58, 63
Ruth .....	53
Sam Hayes .....	26
San Joaquin .....	32
Shamrock .....	74
Silver Bell .....	55
Silver Cup .....	542
Silver King .....	64, 72-75
Silver Queen .....	83
SILVER ORES .....	499, 518-22, 536, 537, 538, 541, 550, 573, 569, 37, 46-73, 75-88, 85
SIMILKAMEEN .....	573
Skylark .....	73
Skylark Camp .....	577
Skyline .....	90
Slocan Bob .....	73
Slocan Boy .....	60
SLOCAN DIVISION .....	35
Claims .....	
Cost of mining and smelting .....	48
Geology .....	
Ores and ore deposits .....	
Production .....	
Transportation .....	
SLOCAN LAKE .....	66
Slocan Star .....	49
SMELTERS :	
Golden .....	518
Nelson .....	80
Pilot Bay .....	94
Trail .....	18
SMELTING, COST OF .....	18, 48, 89
Sovereign G. R. .....	29
Southern Cross .....	30
Spring and Lemon Creeks .....	71
STAMP MILLS :	
Camp McKinney .....	575
Cariboo .....	512
O. K. Mine .....	26
Poorman .....	84
Starlight Group .....	86
STATISTICS .....	497
St. Elmo .....	23
St. Eugene .....	521
Sullivan Group .....	520
Sunset .....	64
Surprise .....	24, 63
Tariff .....	91
Texada Island .....	553
Ten-Mile Creek .....	69
Thompson .....	68
Tiger .....	30



	PAGE.
TRAIL CREEK DIVISION ( <i>see</i> Rossland) .....	9
Trail Creek Mining Co. ....	28
Tramway. ....	32
Trilby .....	30
TROUT LAKE DIVISION .....	541
Two Friends .....	71
Van Anda .....	553
Vancouver .....	68
VERNON DIVISION .....	579
Victoria Consolidated Co. (Cariboo) .....	516
VICTORIA DISTRICT .....	554
Victoria Group .....	73
View .....	26
Virginia .....	22
Uncle Sam .....	30
Union Colliery .....	590
United .....	90
United Empire .....	70
Utopia .....	520
War Eagle .....	22
Washington .....	61
WEIGHTS .....	95
Wellington .....	59, 65
Wellington Colliery .....	587
Westmount .....	70
Whitewater .....	64
Wolverine No. 2. ....	30
Wonderful .....	52
Zilor .....	31

### ERRATA IN BULLETINS.

#### BULLETIN No. 2—TRAIL CREEK.

- (a.) Page 32. The capital stock of the Commander Mining and Smelting Co., Spokane, Pres., W. J. Harris, should be stated as \$500,000 in \$1 shares, instead of \$1,000,000.
- (b.) Page 32. The Palo Alto Mining Co. is registered at Victoria, B. C., and not at Spokane, Wash. Pres., L. F. Solly; Sec., C. Dubois Mason, Victoria.

#### BULLETIN No. 3—SLOCAN, NELSON AND AINSWORTH DIVISIONS.

- (a.) Pages 63, 64, 65, and 66. The following mines, the Wellington, Whitewater, Charleston, London Hill (in part), Bon Ton, Northern Belle, and other claims adjacent, were inadvertently stated as being located in the Slocan Mining Division, instead of in Ainsworth Mining Division. This will make a considerable difference in the mineral output of the Ainsworth Division, making the decrease for 1896 \$56,000 instead of \$198,000, as indicated in the tables given, this decrease being due, as stated, to the cessation of work on the Blue Bell Mine.
- (b.) Page 50, line 47. "Silver King" should be "Slocan King."
- (c.) Page 70, line 17. Direction of faulting should be to the south-east, as noted at time of visit, and not to the south-west, as stated.
- (d.) Page 95, line 1. "Express" should be "Empress."