

ANNUAL REPORT

OF THE

MINISTER OF MINES

FOR THE

YEAR ENDING 31ST DECEMBER,

1886,

BEING AN ACCOUNT OF

MINING OPERATIONS FOR GOLD, COAL, &C.,

IN THE

Province of British Columbia.



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REPORT
OF THE
MINISTER OF MINES.
1886.

To His Honour CLEMENT FRANCIS CORNWALL,

Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mining Industries of the Province for the year 1886,
is herewith respectfully submitted.

JNO. ROBSON,

Provincial Secretary and Minister of Mines.

Provincial Secretary's Office,

26th January, 1887.

REPORT.

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GOLD.

The value of the Gold exported by the Banks at Victoria during the year 1886, is as follows:—

Bank of British Columbia	\$ 374,398
Bank of British North America.....	48,518
Garesche, Green & Co	330,127
	\$753,043

This shows a bank export of nearly \$160,000 in excess of 1885, and adding one-fifth as the estimated value of the gold leaving the Province otherwise than through the Victoria banks, gives a total yield of over \$903,000 for the past year,—a very substantial and gratifying increase.

The reports of the Gold Commissioners, Cariboo and Lillooet Districts, show that the greatest activity prevails, and the most sanguine hopes are entertained with regard to the profitable working of gold quartz. In fact, information from every source irresistably leads to the conclusion that the era of quartz mining is at hand.

A preliminary report by Mr. Amos Bowman, Mining Engineer, and a report by Mr. Koch, Mining Expert, on ledges examined by them in the Cariboo District, during last summer, are published herewith, and will be read with interest.

CARIBOO.

MR. BOWRON'S REPORT.

" RICHFIELD, November 29th, 1886.

" SIR,—I have the honour herewith to submit my twelfth annual report on the mining industry of this district, accompanied by the usual statistics in tabular form.

" In alluvial mining there is but little worthy of mention.

" Another remarkably dry season, with a further decrease in our mining population, has had the effect of further diminishing the annual yield of gold, but the product of the year is, perhaps, not less than in 1885 in proportion to the number engaged and the time consumed in working as, for a considerable portion of the year, quite a number of white men have been engaged upon quartz ledges which are, as yet, non-productive; besides, not a few miners left the district in the spring for Granite Creek mines.

" A number of these, however, have recently returned, who are, probably, the harbingers of more.

" It will be observed from the statistics that there is a decrease in the number of Chinese engaged in mining.

" On Williams Creek and its tributaries the output of gold from the different claims has been nearly equal to that of last year.

"The Forest Rose Company, which yielded largely as a drifting claim in years gone by, and which has been at great expense for the past six or seven years in opening up so as to work as a hydraulic claim, has at last reached bed-rock with their cut, and this season obtained very good pay.

"No doubt but this claim will yield good returns for the next fifteen or twenty years, as they have a large extent of ground

"There are a number of claims in the district similarly situated, but which have not, as yet, their works in a sufficiently advanced stage to reap a reward therefrom. To such companies the past two dry seasons have been particularly disappointing, and have caused some of the companies on Grouse and Mosquito Creeks to make surveys, with a view to bringing in water from the adjacent streams by ditches, thereby adding to the natural flow of water on those creeks.

"On Lower Antler Creek there has not been nearly so much mining by the Chinese on the benches as in former years. The deep ground, however, ten miles below Grouse Creek has not yet been proven.

"A company of white men sunk a shaft where, years ago, a body of clay was found, but were unable to reach bed-rock, a stratum of gravel at a depth of over fifty feet supplying more water than they were able to manage without machinery, and, it being late in the fall, work was suspended.

"The success of one company here would mean the opening of a new mining camp, as there are miles of the creek of similar formation which has never been bottomed.

"The company will, probably, put up machinery in the spring.

"On Upper Antler the Nason Company, from which important developments have been expected in proving the deep ground, has not as yet, I regret to say, succeeded in getting into their claim. The pressure of water is so great that every time they break through into the gravel they are driven out. Each time, however, on clearing up the debris caused by the rush of water they have had satisfactory proof of the existence of gold in such quantities as to encourage them to proceed.

"It is now generally believed that the only way to successfully work the deep ground is by fluming the creek for a considerable distance above and below the shaft.

"This company has decided to put up a saw-mill to cut lumber for a flume, and next year will probably see the problem solved.

"On Cunningham Creek the ubiquitous Chinese made a fortunate strike during the summer in the hill, and a company of four men have been taking out from twenty to fifty dollars per day to the hand.

"Investigation, however, goes to show that the discovery is not of importance, their location being on a point across which the old bed of the creek passed at a much higher level than the present bed of the stream.

"What, after further prospecting, may prove to be an important discovery, was made late in the season about eighty miles to the north-east of Barkerville by Geo. Isaacs, Robert Buchanan, Arthur Johnston, K. McLeod, and N. Wilson.

"From persons who had been out in that direction much had been heard of the favourable appearance of the country, and of the presence of gold in some of the creeks.

"Messrs. Isaacs and Buchanan were engaged to blaze a trail to the Fraser, striking that river about one hundred miles below Tête Jaune Cache. These men subsequently associated with the other three men that they might have time to test the ground before returning.

"The result of the expedition has been most satisfactory, and if the report is confirmed by an actual working test, a rush in that direction will take place before another year has passed.

"One of the conditions upon which the men were engaged was that a report should be made giving as accurately as possible a description of the country traversed and of any discoveries of gold, which report is subjoined hereto and speaks for itself.

"These parties will return early in the spring prepared to prove the value of the discoveries made.

"This section of country is entirely disconnected from the present Cariboo mines by a high granite range known as the Cariboo Mountains, the gold being found on the north of these mountains, and a stretch of thirty miles of granite formation intervening before the auriferous slate again makes its appearance.

"This region is most probably the source from which the bars on the Upper Fraser derive their deposits of gold.

"Yield of Gold.

"I estimate the gold yield of the district for the year as follows:—

Barkerville Polling Division	\$ 96,000
Lightning " "	54,800
Quesnellemouth " "	45,500
Keithley Creek " "	62,000
Amount from time of collecting statistics to Dec. 31st,	15,000
Amount of which no account was obtainable	15,000

\$288,300

"Quartz.

"In this most important branch of our mining industry the developments made by Mr. Bowman, of the Geological Survey, supported by the opinions based upon practical tests of Messrs. Koch and Craib, mining experts from California, have at last, let us hope, resulted in placing the value of our ledges fairly before the public, so that capitalists will no longer hesitate to invest when such promising returns are held out.

"The great depth of alluvial deposits which cover the bed-rock has, no doubt, been one of the primary causes hitherto against the discovery and development of the numerous quartz veins now known to exist throughout the district.

"The question then remains: 'Can these sulphuret veins be worked at such a cost as to leave a fair profit to investors?'

"This question is, I think, satisfactorily answered by Mr. Koch in his report to the Government. His opinion on this point is confirmed by Messrs. Bowman, Craib, and others having experience in working sulphuret ores.

"These gentlemen are quite agreed as to the manner of treatment to be pursued in the reduction of our ores, and when we consider the time, labour, and capital expended in the attempt made in 1878 to work our ledges, it seems almost incredible that those men who were placed in positions of trust as experienced quartz miners, did not introduce either concentrator or chlorinator a '*sine qua non*,' we are now informed, to the successful working of these ores.

"Mr. Koch's report to the Government is generally received as a fair and impartial resumé of the facts relating to the ledges of the district; and much interest is manifested in the publication of Mr. Bowman's report, as the nature of that gentleman's work the past season gave him an opportunity to make a more minute examination of the quartz veins than he has hitherto had. His report will, no doubt, corroborate that of Mr. Koch in all important particulars.

"Mr. Craib, who is at present in the district in charge of the Island Mountain and British Columbia mining properties, was interviewed with the object of getting his opinion on certain questions, and he has kindly sent me an answer, which is appended, and it will be seen that his opinion corroborates the testimony of Mr. Koch in regard to the richness of the ores, and the manner of working them.

"Mr. P. C. Dunlevy, of Soda Creek, proprietor of the Island Mountain mine, was the first, apparently, to grasp the new order of things, and believing that a quartz mine in Cariboo was no longer to be a place in which to sink capital without a probable chance for a return, has commenced the vigorous prosecution of work on his mine, continuing the tunnel into the mountain on the ledge, which improves as depth under the mountain is reached.

"He has a mill site cleared and graded near the north end of Jack of Clubs Lake, and will, I understand, remove during the winter the old Enterprise mill and machinery of which he is now the owner.

"The British Columbia Milling and Mining Company having re-located the old Cariboo location on the Bonanza Lode, have called for tenders for the sinking of fifty feet in the old shaft.

"This company during the summer had 1,000 pounds of their ore taken from the bottom of the shaft (100-foot level) and shipped to San Francisco for a milling test, the result of which I am not aware.

"The Burns Mountain Quartz Mining Company have during a great part of the season had men under charge of Mr. Jaques, of Victoria, at work running drives in search of the main lode, but of the result of their labour I am not informed further than that they have now driven in over eight hundred feet, and consider the indications good.

"The Dominion Company have re-located the old Steadman Lode of Richfield, and are sinking on the ledge which shows a remarkably firm body of ore and a well defined ledge, within good casings.

"The Quesnelle Quartz Mining Company of Hixon Creek have persevered uninterruptedly for the past year in the development of their mine, and word has just come to hand that they have at last succeeded in finding a fine body of ore.

"Some sixty odd quartz locations have been recorded within the last three months upon which more or less work has been done.

"I have, &c.,

(Signed)

"JNO. BOWRON,

"Gold Commissioner.

"To the Honourable

"The Minister of Mines."

REPORT OF MR. ROBERT BUCHANAN AND OTHERS.

"BARKERVILLE, 19th Nov., 1886.

"SIR,—We, the undersigned, beg to submit the result of our expedition to the north-east of Barkerville.

"We started out from Barkerville on the 15th day of July and proceeded to Bear Lake, a distance of twenty-two miles, after which we continued our course in a north-east direction to Big Lake, a distance of about fourteen miles, and followed the shore of the Lake on the north-east side for about eight miles. Leaving the Lake at this point, we followed up a stream to the summit or divide, between Big Lake and the Upper Fraser, having to cut our way through a heavy growth of brush and fallen timber so as to enable us to get our animals and packs along.

"After passing over the summit (which we think is not more than 500 feet higher than Big Lake) at a distance of about four miles we came to a stream, which we called "Goat River," and followed it down about eight miles and struck a stream coming into it from a northerly direction. We crossed this stream and built a cache to leave our provisions in, eleven days from Barkerville.

"Left the cache on the 29th July and followed Goat River down, prospecting on the bars and also on the streams emptying into it and got some fine gold. We were now getting into a slate formation again, similar to that on which the paying creeks are situate in Cariboo proper. As we proceeded down the river we got what we considered fair paying prospects of coarse gold on the bars. Still further down we got good prospects in the cañon. Left next day for the Fraser, which we considered to be about twelve miles distant. Prospected on a bar of the Fraser; got a few colours of gold to the pan. Made a raft and crossed the Fraser and went up a creek about a mile, which from its formation looked favourable for gold; but our provisions being about done we were obliged to return. We think that by a direct trail from Barkerville it would be about seventy-five miles to the Fraser, with a level country from Bear Lake to build a trail through.

"From the indications that have been found, if a trail was brushed out so that miners could get through with pack animals to take their provisions and tools in, it is highly probable that next year a new camp would be established which would tend greatly to advance the prosperity of the district.

"We cut brush and blazed trees the whole distance after leaving the old trail beyond Bear Lake, so that no difficulty will be found in following our route; but in some places cut-offs may be made to advantage, thereby shortening the distance when a permanent trail is made.

"We are yours, respectfully,

(Signed)

"ROBERT BUCHANAN,

"GEORGE ISAACS,

"ARTHUR JOHNSTON,

"KENNETH McLEOD,

"N. WILSON.

"To John Bowron,

"Gold Commissioner Cariboo."

REPORT OF MR. WM. CRAIB.

" BARKERVILLE, B. C., Nov. 30th, 1886.

" DEAR SIR,—In answer to your questions as to the quartz of this district, viz.:—1st, What is the average assay of the ores assayed by me since I have been here? 2nd, The general character of the ores treated; and, 3rd, What would I suggest as the best method to introduce our quartz interests to capitalists in order that they might be induced to advance the means to prospect and open up the same?

" In answer to your first inquiry: I have been but a short time here and, as you are aware, most of my time has been devoted to preparing for winter work in the mines that I am at present associated with. However, up to date I have made twenty-two (22) assays of ore from the different ledges in this vicinity, and the lowest assay was \$27 and the highest \$75.23. The average of the total is \$46.30; but remember the assays have not been made from specimens, for, with one exception, the pulp for the assay was taken from the crushings of from 4lbs. to 6lbs.

" Your second question—As to the character of the ores treated. I would state that the ore is heavily charged with auriferous pyrites, termed in mining sulpherets, and from tests I have made I find that there is from 30% to 50% of the sulpherets in most of the quartz of the district, and that being the case, the only method that can be applied to extract the gold from them on a large scale will be by chlorination until some more improved system may be discovered.

" Your third and last question would require a Wiggins to answer correctly. My theory of introducing and soliciting capital would be: 1st, Have one or more mills and a chlorination works started up here, and I have no doubt that in sixty days thereafter the result will be so satisfactory that it will serve for an introduction, and the capital will necessarily follow.

" Respectfully yours.

(Signed) " WM. CRAIB.

" To John Bowron, Esq.,
Gold Commissioner, Cariboo."

Keithley Division.

REPORT OF MR. W. STEPHENSON.

" FORKS QUESNELLE, 8th Nov., 1886.

" SIR,—I have the honour to forward herewith the estimated yield of gold for the Keithley and Williams Lake Divisions, Cariboo District, for 1886.

" The amount is a little less than last year's figures, although apparently the yield should have been about the same, and as far as the mining population is concerned I cannot see much, if any, difference. The season has been an unusually dry one and the water in the streams consequently light, which has been very much against the success of the hydraulic and ground-slucing claims; but, upon the other hand, the low stage of the water has enabled the miners to get into the beds of the streams and also to do more river work than usual, and at the present time there are a great many miners (Chinese) scattered along the rivers, where they will continue to work until the cold weather compels them to stop. So far, this fall has been extremely favourable for river work, which makes a considerable difference in the amount of gold taken out, and it is the kind of mining the celestials prefer, as they can take all their outfit upon their shoulders and go off independently, although generally working in pairs. In my section of the Fraser River there has been a considerable number of companies formed during the last year for the purpose of bringing the water from the nearest streams for working the benches of the Fraser, in fact, from the Mouth of Quesnelle as far down the Fraser as I go, every stream of water that is possible to get is recorded and conveyed in ditch or flume to some of the benches along the river and there used for mining purposes.

" This has not been a favourable season for those claims situated on the benches of the Fraser as, owing to the dryness of the season, their supply of water gave out early in the season, in many cases stopping work by the 1st July.

" In the Horsefly section the parties prospecting there last winter did not succeed very well in finding paying claims, and about all the gold from Horsefly came out of the old Horn King claim (Chinese), although there has been five or six men prospecting all summer and there is a company of three white men in there for the winter; also, Mr. Harper has men at

present fitting up winter quarters for men and teams, and I hear it is his intention to have all necessary machinery on the ground next spring and it is to be hoped another season may give a better report from the Horsefly section. Sam. Kyse and E. Hilton have again been out during the summer in the vicinity of South Fork Lake. They do not report that they have found paying diggings, but they have found gold and think that they may yet find it in quantities to pay; they propose going back again next season.

“From Keithley and Harvey Creeks there is nothing new to report, but I think as a general thing they have done quite as well as for the previous season, while Snowshoe Creek looks decidedly more encouraging than for several years past, as the Great Snowshoe Company (better known as the long tunnel) after five years’ hard work have got into the bottom of the creek and found gold in paying quantities. The claim has now been paying for the last four months, with every prospect of being a good claim.

“Concerning quartz there is little to be said, as there is very little interest taken in the matter in this section. There has only been one location made on this side of the mountains, that by Veith & Borland, upon Snowshoe Mountain on the old Hayward ledge. They have cleaned out the old tunnel, taken some rock out of the face of the drive and shipped the rock down country to have it worked as a test of the ledge.

“I have, &c.,

(Signed)

“W. STEPHENSON,

“Government Agent.

“The Honourable

“The Minister of Mines.”

CASSIAR.

Stickeen Division.

MR. CRIMP'S REPORT

“LAKETON, CASSIAR,

“12th October, 1886.

“SIR,—I have the honour herewith to transmit the mining statistics of the Cassiar District for the current year, and for your further information to submit the following report:—

“The accompanying statistics will be found to shew an increase in the product of the mines the present year over last year. There have been fewer white miners in the district this year than last, but more Chinese; and it is chiefly owing to them that the increase in the yield of gold has taken place, and if it had not been for the continued rains during the month of September, the increase would have been considerably larger. During that month the several creeks were very high, and in consequence carried away many of their wing-dams, thereby causing a severe loss to them. Although these creeks have been worked over—some portions of them two or three times—the Chinese, by their excellent management and industry, are enabled to take out small wages. On Dease Creek, the increase was the largest. More Chinese were on that creek than any of the others, and most of them worked in the bed of the stream. All of the white men on the same creek have been working in the hills, and some of them have done very well; and the same may be said of the other creeks, for the beds of those streams having been worked over so many times, there is no inducement for the white miners to open claims in the old worked out creeks.

“The yield for this past season, as far as I can ascertain, is as follows:—

Laketon Division	\$41,460
McDame Division	22,150
Total	\$63,610

“There has been but little prospecting done in this district the past summer. There has been four white men prospecting on Mosquito Creek the past year, and although they have found very encouraging prospects, they have not found gold in sufficient quantities to pay; but are still in great hopes of striking good pay when they reach more favourable bed-rock, for the rock is so hard and smooth where they are working that it is impossible for gold to lodge.

"There were also three white men, Messrs. Hilton, Sainsbury, and Beedy, prospecting on the Muddy River, a large stream to the east from the present mining district, situated about ninety miles east of Sylvester's Landing. The stream is a large one, running through a very wide valley, and emptying into the Laird River, about eighty miles below Mr. Sylvester's trading post. Mr. Hilton informs me that if it had not been for the high state of the river, he thought they would have done very well. In consequence of the high water most of the bars were covered; but wherever they found bars, at the head of them they prospected very well. On one occasion, two of them rocked out \$100 in one day; and on another, one man rocked out \$140 in seven days. The character of the gold is fine, and has to be saved with quicksilver. In 1874, there were eight men on the same river, some distance above, where the mountains come much closer together, and I have been informed by one of the parties a few days ago, that they found coarse gold, which he thought would pay five dollars per day; but at that time wages were eight dollars per day on Dease Creek, so they concluded that it would not justify them to remain there. He tells me, also, that he thinks the distance from Dease Lake to where they got these prospects is from 90 to 100 miles, in an easterly direction from Dease Lake. Taking into consideration the excellent prospects found on the bars, of fine gold, it leads to the conclusion that its source is in the mountains. I would strongly recommend that the Government make a small appropriation to assist, say three or four men to get an outfit next summer to proceed there and prospect this stream, or creeks emptying into it, for unless some new discoveries are made, this district will be soon reduced to a very small number of miners.

"The number of men wintering in the mining portion of the district is 29 white men and about 70 Chinamen. The health of the miners during the past season has been generally good, and good order has prevailed all over the district.

"The supplies on hand in the stores of the traders are, I think, sufficient for the wants of those that winter here. With the exception of rice, of which there is but a small supply on hand, and unless the pack trains make another trip, which I think they will, for there is a good supply at Telegraph Creek, the market will soon be exhausted of that article. The prices of provisions are as follows:—Flour, \$14 per 100 lbs.; rice, 17 cents per lb.; sugar, 30 cents per lb.; hams, 37½ cents per lb.; bacon, 35 cents per lb.; potatoes, 9 cents per lb.; corn beef, \$10 per case; roast mutton and beef, \$10 per dozen; wild meat—moose and cariboo—20 cents per lb.; and the market pretty well supplied.

"I have, &c.,
(Signed)

"J. L. CRIMP,
"Gold Commissioner.

"To the Hon. the Minister of Mines,
"Victoria."

Skeena Division.

MR. GRAHAM'S REPORT.

"LORNE CREEK, B. C., 6th November, 1886.

"SIR,—I have the honour to enclose statement of proceeds of this season's mining. I regret to have to report so small a yield. The season has been very unfavourable for working Lorne Creek; high water continued till late in July. The channel of the creek is so narrow, that flumes have to be constructed to carry the whole creek, which require from four to six weeks to build, having all lumber dressed on the ground. Half the season was passed before any gold was 'cleaned up.' Had the season been similar to 1885, twice the amount of gold would have been taken out. The hill claims could not work to advantage, owing to creek claims not being worked out. The prospects are favourable for next season in hill claims. Considerable work was done on Douglas Creek, Kitsumqualum, but gold in paying quantities was not found.

"There are two streams on the Upper Skeena, on which Indians report having seen gold. I had hopes last spring of having them prospected during the summer, but our mining season being so short, all the companies were anxious to work all the ground they had flumed, and means being short, could not be induced to take a prospecting trip. On one stream near 'Kiskagas,' from all I can learn of the formation—slate, with quartz—I believe there is gold in paying quantities. Eleven miners intend wintering here. Hoping to have a more favourable report before spring,

I have, &c.

(Signed) "ALLAN GRAHAM.

"To the Hon. the Minister of Mines,
"Victoria,"

KOOTENAY.

Northern Division.

MR. SPROAT'S REPORT.

" FARWELL, KOOTENAY, 20th Dec., 1886.

" SIR,—There is little doubt that the Big Bend subdivision of this district will prove to be valuable, both for placer and quartz mining, gold probably being the principal product.

" The region was not opened, practically, until so late a time as last August, owing to the unusually high water and the want of a through trail, so that it is hardly correct to speak of a 'season's' mining in the usual sense of the term. The trail since that date has been opened; it is cut for over sixty miles through the forest. The want of horse feed for the first thirty miles has made packing very dear—10 cents a pound through—about as much as the rate from Ashcroft to Cariboo.

" Notwithstanding these disadvantages I think I am justified in saying that the outlook is good. This opinion is shared by many visitors to the district who are well able to judge. The miners themselves are well pleased with their prospects. I did not meet a despondent miner during my Gold Commissioner's visit, which occupied from 12th August to 13th September.

" The general opinion of the miners is that Downie Creek is the proper place for a record office, being accessible from McCulloch and French Creeks as well as from Carnes Creek, and they expressed a wish that the Gold Commissioner next season would be more among them. I was able to settle disputes during my trip without holding a formal court. I found many claims irregularly held and thought it well to issue a cautionary notice to prevent disputes next season.

" In the Big Bend subdivision there are recorded 58 placer and 77 mineral claims.

" Quartz Mining—Big Bend Subdivision.

" Beyond work necessary to hold the claims the quartz mining in the Big Bend region is at a standstill. This industry cannot be developed without some means of introducing machinery. A small prospecting stamp mill is lying here unused as it cannot be packed through on the trail.

" The region is practically unprospected, but the mineral claims recorded lie, for the most part, around the headwaters of McCulloch and French Creeks. The numerous gulches and ravines generally run in an easterly and westerly direction and have cut the ore in the belt often at right angles. In other places there are outcrops on the hillsides. Specimens from both these occurring ores have proved to be rich; some show gold to the eye. Most of the ore seems to be auriferous milling ore, but whether it will preserve that character when sunk into or turn to less tractable ores, or, as some conjecture, to silver-bearing ore of some kind, possibly argentiferous galena, cannot be stated at present. Nor is it known, of course, yet, how many, or whether any, of these recorded mineral claims are veins of a kind and quality that would pay for working. The general opinion of men experienced in quartz mining elsewhere is that some of these Big Bend prospects are likely to prove good, but I have no information before me that would enable me to test that opinion. It is quite possible that the province has great wealth there, and I hope that the capital, organization and intelligence necessary in the business of quartz mining will soon be brought to bear on that portion of the district. Very remarkable results are obtained in this business from the improved methods of modern days. For instance, it is found that in the colony of Victoria, Australia, crushing auriferous quartz pays if it contains as much as 5 dwts. of free gold per ton—that is of gold not associated with pyrites. When it is associated with the less tractable forms of pyrites $1\frac{1}{2}$ oz. to 3 oz. are required; but speaking broadly Victoria has made its fortune out of gold deposits which yield on an average less than *half an ounce* a ton.

" There are many apparently mineral veins at Big Bend; small parcels have assayed from \$50 to \$150 a ton; the mining region is near a great navigable river crossed by the Canadian Pacific Railway; the climate is not severe; there are arable and hay lands and three months summer hill pasture, also abundance of wood. With a steamer on the Columbia the mines would be within two days' reach of the above railway. Under these circumstances, every effort should be made to ascertain the true character of the ores and the size of the mineral veins in a district in which all mining conditions are so good. No quartz area in the province is so well situated.

“Placer Mining—Big Bend Subdivision.

“Notwithstanding the short, broken season and expense of packing, placer mining has made great progress, though, of course, the product cannot be large yet.

“There is one bedrock flume, but the placer mining is chiefly carried on by tunnels and shafts, though some miners are making good or fair wages by sluicing and shovelling into boxes. As a rule, the diggings on the creeks now being worked are deep diggings, requiring companies with capital, but a great area is quite unprospected, and more ‘poor men’s diggings’ may exist than we know of. The creeks now being worked were pretty well turned over when occupied twenty years ago, at least the lower portions of them were so.

“The localities of work at present in the Big Bend subdivision are at Carnes, McCulloch and French Creeks. There is plenty of untried ground, partly for shallow but chiefly for deep placer diggings, on Carnes and French Creeks with their affluents, and numerous creeks in the region are unprospected and believed to be very likely mining creeks. Smiths Creek, a large broad-mouthed tributary flowing from the west into the Columbia, about opposite the mouth of Gold Creek, was struck towards the close of the season, and three companies are sluicing there and getting fair wages.

“The three creeks above named, all of which yielded well twenty years ago, promise well now, but so far the work during the late short, broken season has been preparatory rather than actual. It is almost certain they will yield largely next season and that good new creeks will be found.

“Carnes Creek.

“This creek from mouth to forks is six to seven miles long, and the forks are supposed to be each about the same length.

“The miners much want a trail up to the forks; they have cut a trail two miles up.

“It is a good-sized creek, larger than Antler Creek at Cariboo, probably about the size of Thibert Creek, Cassiar. The cañon is a quarter of a mile from mouth; wide gravel banks below cañon; above cañon, narrow, 50 ft. to 150 ft., generally sloping V-shaped sides, but a few benches, all densely wooded. Good drifting timber haudy; bottom, gravel with comparatively small boulders interspersed.

“Climate good, much the same as Farwell, 29 miles off. This year the miners are working open diggings up to this date; could begin to prepare for work probably end of March.

“Carnes Creek being more accessible, cheaply, by boat or trail than McCulloch or French Creeks, has yielded most during the short, broken season. One company since striking shallow bedrock has made \$8 to \$10 a day per man on an average, and occasionally three times that pay. Two companies without reaching bedrock have made good wages by shovelling gravel. One company have done very well on a hill claim immediately above the cañon. A party is fluming the cañon. Two companies about a mile and a half above the cañon are sinking for bedrock, but having struck water at about 40 feet are preparing hoisting gear. A short distance below a miner is putting in a dam and is going to flume. On the south fork a company have sunk a shaft of 53 feet. A strong company have taken a set of claims at the mouth of the creek and propose to turn the creek and work the present bed, and also have leased bar diggings in the Columbia River near the mouth of Carnes Creek.

“Between the mouth of Carnes Creek and the forks I estimate roughly that there are about four miles of unoccupied ground and the forks are open, except the set of claims on the south fork above mentioned. The general character of the Carnes Creek diggings is deep—on a conjecture, say from 40 ft. to 75 ft. to bedrock. All the miners are hopeful and interests have been sold at good prices. There will be much work on this creek next season.

“French Creek.

“This creek, the well known creek of twenty years ago, has been re-attacked and promises as well as Carnes Creek. It is a northern affluent of Gold Creek, coming in about eleven miles from the mouth of the latter. Gold during the season has been found in paying quantities both on hill and creek. Its distance and the late opening of the trail have checked development this year, but the two companies at work have done well and are hopeful; one of them proposes to work all winter. Two additional companies have been formed, but too late to do any effective work. The Creek Company is working on old ground near the mouth

from a shaft with hoisting gear for dirt. They use a bedrock drain from old workings. Having struck bedrock they got gold in good paying quantities last August, but shut down to put in machinery. They have lately completed this and resumed work, but I have not been able to hear with what results. The hill company, lower down, are working from a tunnel and have been making an average of \$7 to \$9 per day per man, though working with only a little water that came out of the tunnel. Next spring they propose to bring a ditch level with the tunnel. These are two very good claims. A company has been formed to work a set of claims recorded immediately above the first named, and another company is making preparations for work higher up. These are the only companies on French Creek, and the result of their work is most encouraging, considering the shortness of the season, the high prices and difficulties of access. French Creek, with its affluents, offers about 25 miles of ground. I need not describe a creek so well known to old miners.

McCulloch Creek.

"This Creek is nearly all occupied by the Gray's Bedrock Flume Co., which has one and a half miles at the mouth, and the Bald Head, Blue Bell, Ericson and Selkirk Companies above. It is a short creek about five miles long, flowing from a grassy amphitheatre among the hills called Ground Hog Basin, southerly into Gold Creek, which it enters about three miles west of French Creek. Its channel towards the mouth is a boulder-strewn gorge, with a considerable descent. The bedrock, except in the upper part, is believed to be deep; it has not been reached, in one place, at 85 feet. These companies are running tunnels, one is in now about 1,000 feet, but bedrock has not been got yet; they are going to work during the winter. Gray's, or the Ophir Bedrock Flume Company, have just put in a considerable length of flume, but by last accounts had not reached bedrock. The boulders make their work very heavy. I have been expecting to hear the result of their washup. It is said Mr. Gray proposes to run a tunnel during the winter.

"More work has been done in the past season on McCulloch Creek than on any of the other creeks, and the persistent energy of the miners here, as elsewhere, is worthy of commendation and imitation. They are confident that the bedrock when struck will prove rich. The work continues during the winter. If necessary I will make a supplementary report respecting work on McCulloch and French Creeks should information reach me during the winter.

Ille-cille-waet Subdivision.

"The country around Farwell, and I think most of it between Carnes Creek and Farwell, is, probably, not a mineral section. The mineral belt runs south-easterly behind Farwell, crossing the Ille-cille-waet valley some distance up it, between Farwell and the summit of the Selkirks, which latter, for anything I know, it may include. Sixty mineral claims have been recorded in this section and settlement work done on many of them. No placer mines have been recorded; I do not think the section has been prospected much, if at all, for placers. The ores seem to be rather silver than gold-bearing and, for the most part, smelting ores. The belt generally has not been examined closely, but is said to consist generally of slates or schists. Some rock brought here lately from the Ille-cille-waet, however, is described as either black limestone or lime shale. This rock is that in which most of the big carbonate and galena silver mines in the United States are found, with few exceptions. The Ille-cille-waet section, consequently, has attracted much notice lately from men possessing or backed by capital. Considerable quantities of ore have been sent to England and different parts of the United States, but there has not been time for me to learn the returns. The veins are both low down and high up, but those promising most, so far, are high up, and could not be well examined this season for the snow. This will be undertaken in the early part of next season, when it is expected the result will be satisfactory. To utilize these mines a local smelter is essential.

"The following is a copy of an assay of ores from a group of these veins made here last month by an American capitalist, who proposes to return in the spring:—

No. 1	\$126.25	Silver per ton.	No. 6	\$ 60.08	Silver per ton.
" 2	175.83	" "	" 7	59.00	" "
" 3	34.05	" "	" 8	609.00	" "
" 4	50.00	" "	" 9	41.68	" "
" 5	84.08	" "	" 10	384.77	" "

"The Southern Subdivision.

"This includes the Arrow Lakes, Lardo River and down to the boundary, but not Big Kootenay Lake. Eight mineral and two placer claims are recorded in this section. Prospectors turned their attention more to the Big Bend and Ille-cille-waet divisions and the extensive southern section consequently was somewhat neglected. The few miners who visited the Lardo for placer mines returned disappointed. There are indications of silver-bearing galena on the Arrow Lakes, but the country is unprospected. Those who recorded mineral claims on the Pend d'Oreilles near the United States boundary spoke well of them as 'prospects,' but there being no steamboat on the Columbia I shall probably not know this winter how they are getting on. The block of country about Fort Shepherd, chiefly on the east side of the Columbia, bounded by that river, the Kootenay and the U. S. boundary, a country in which the well-known Forty-nine Creek and Salmon Creek head, will I think prove to be a mineral section, but at present, without a steamboat on the Columbia, that corner is an appendage of Colville.

"I enclose the tabular form of mining statistics. In a district so lately opened these hardly give a satisfactory notion of the work being done. Other duties prevented my visiting much of the district in the short time since the trail to Big Bend was opened.

"About 223 men were employed in the mines, and I estimate that about 150 additionally traversed the district prospecting

"No Chinese are employed in this district in mining or in any other occupation.

"A party left here late in the season to winter on Canoe River as hunters and prospectors.

"The trail made by the Government from Farwell to Gold Creek is of the greatest value, indeed essential to any mining work in the Big Bend subdivision. The promptitude of the Government in making it is highly appreciated in the district.

"The survey party under A. P. Cummins, C. E., charged with the duty of making an exploratory survey for a waggon road from Downie Creek to Gold Creek has not yet returned.

"The result of their survey will be embodied in my report to the Hon: the Chief Commissioner of Lands and Works.

"I have, etc.,

"The Honorable

"The Minister of Mines, Victoria."

(Signed)

"G. M. SPROAT, G. C.

Southern Division.

MR. VOWELL'S REPORT.

"KOOTENAY, B. C., 31st December, 1886.

"SIR,—I have the honour herewith to forward for the information of the Government my annual report, which includes mining statistics, etc., for the year ending 31st December, 1886.

"Owing to the great drought that prevailed during the past season the hydraulic claims on Wild Horse Creek could not be worked to advantage, and in other localities the scarcity of water materially affected the general output of gold.

"The total yield for 1886 amounts to about \$50,000, a sum which might have been doubled had the season been more favourable. Next year, however, it is hoped that a better account will be given of our placer and hydraulic mines, as arrangements have been made by many claim-holders for the placing of improved machinery, etc., upon their mining ground early next spring, when every advantage can be taken of the superabundance of water available at that time of the year.

"Desultory mining on outside and upon small creeks has been much the same as last year, except as regards the supply of water which, as stated, has not been at all equal to the requirements of the miners.

"So far as I am aware no discoveries of placer mines have been made during the present year in the district, though as affects quartz containing respectively silver, gold, and other minerals, many new locations have been made from which fair assays have been obtained. As, however, no capital has as yet been invested in such enterprises it is impossible to arrive at anything bordering upon a correct estimate of the value of such mining properties.

"There is every probability that during the coming year the attention of capitalists will be directed towards the development of some of the rich mineral deposits known to exist in the district when the advancement and prosperity of this portion of the Province will, it is hoped, be established.

"On Perry Creek, west of Wild Horse Creek, considerable mining has been done in early days, and much gold taken from the lower portion, below the falls, of that creek. Several attempts have been made to work the deep ground, but owing to the difficulties to be encountered, and the want of capital, these efforts ended in abandonment.

"There is no doubt in the minds of those who, from their experience, are capable of forming an opinion as to the richness of Perry Creek, especially in the upper and deep ground, and that could some company with sufficient capital be induced to take an interest in its development a prosperous mining camp would be the result. On Findlay Creek Cochrane & Bradley have had a number of men employed in making roads, building houses, and in the construction of an extensive ditch in connection with their hydraulic works.

"Hydraulic pipes, giant, etc., and a saw-mill have been placed on the ground, and it is expected that the works will be in full operation next summer.

"At Kootenay Lake nothing more than the work necessary for legal representation has been done upon the mineral claims in that vicinity, and although the prospects are as good as ever very little interest is manifested by those immediately concerned. * * *

"I have, &c.,

(Signed) "A. W. VOWELL,

"The Hon. the Minister of Mines."

"G. C. & S. M., &c.

LILLOOET.

MR. SOUES' REPORT.

"GOVERNMENT OFFICE, CLINTON,

"December 8th, 1886.

"SIR,—I have the honour to enclose herewith the mining statistics and my annual mining report for the District of Lillooet for 1886.

"The total yield of gold for the district is largely in excess of former years that I have had the honour to report on, and may be itemized thus:—

A. W. Smith	\$ 57,900
F. W. Foster	16,517
E. Bell	13,700
All other sources	43,883
	\$132,000

"Referring to the large amount bought by Mr. Smith, I cannot do better than quote his letter to me, containing, as it does, valuable information and matter of import bearing upon the comparative industry of the Chinese and Indians as against that of the white miners.

"He writes * * * 'The amount of gold which I have taken in during the year from 18th October, 1885, to the present (16th October, 1886,) is 3,620 ounces; value, \$57,900. The localities from which the above has been taken are as follows:—

'Bridge River	1,440 ounces
'Cayoosh Creek	725 "
'Fraser River	1,455 "

'The gold from Cayoosh Creek is the most valuable, and I believe that there is as much of it in the hands of the Chinese miners as I have bought. The mining on Cayoosh Creek has all been Chinese work except, say, \$100 by Indians and whites. I do not think I have seen over \$300 in dust that has been taken out by white men during 1886. The other traders here have sent away some gold, no doubt, although not more than \$10,000. Also private parties have taken more or less, two Cayoosh Creek miners (Chinese) left a few days ago with \$3,000.'

"Mr. Phair, Mining Recorder, has made several visits to Cayoosh Creek this season on official duty, and reports to me that 'The diggings on Cayoosh Creek were discovered in the spring of this year by Chinese, and they recorded 190 claims on it, and white miners 16. Some

'of the claims have paid well, but some recorded during high water have been abandoned. The gold is very coarse, and sells for \$16.50.'

"It seems almost incredible that this creek within an hour's walk of the town of Lillooet should have been passed by for a quarter of a century by hundreds, aye thousands, of the best practical white miners and prospectors on the Pacific Coast, and now at this late date the prize falls into the hands of the Chinese. Mr. Smith has purchased dust from it this year about \$12,000, and estimates an equal amount in the miners' hands, in all say \$24,000 for this season alone, and, of course, the creek is not worked out, and is one instance, at least, that may be placed on record that prospectors and miners in the past have not been by any means thorough in their search. Bridge River has done well this season, but must express my regret that white miners did not return there to the number I expected when reporting to you last year. Mr. Phair has also made several official visits to this section this year, and reports to me that—'On Cadwalder Creek, Bridge River, 10 whites and about 40 Chinese were mining. Three white men sank three shafts 14, 42 and 47 feet respectively, and found gold in every pan. Hydraulic claims will be opened in the spring on this creek. There is abundance of room for this sort of mining on it, as there is one flat alone of about 25 acres. There are well-defined quartz ledges on the South Fork and tributaries of Cadwalder Creek.'

"Quartz.

"Commencing with the N. E. portion of the district, one or two parties have been prospecting in that section, and mineral claims have been located on a ledge near Mahood Lake. A ledge has also been discovered on Deception Creek, and two claims located on it. In both cases the parties owning the claims inform me that they have had assay returns from surface croppings showing the presence of gold and silver. I regret to say that the locators have decided not to do preliminary work on these ledges until next spring, which means in that portion of the district next May—a loss of six months at least. It is to be sincerely desired that this system of Hibernation, the result, in a great measure, of the customs of our early alluvial mining history, by which labour of every kind is annually paralyzed for from four to seven months, will cease. As a people we never can have material prosperity while it prevails to such an extent in all industries, and so far as quartz mining is concerned there can be no valid reason for continuing it. The mica ledges on Clearwater have, I am informed, been visited by an expert in that mineral in the past summer; he advises sinking on the ledge to ascertain whether the mineral improves in quality and is free from fracture. Quartz prospecting west of the Fraser River has been vigorously pursued in the past summer by Messrs. Gould and Ward. They have handed in a report of their season's work, a copy of which I enclose herewith. These men have prospected faithfully, and worked hard, and are most deserving of success. They have discovered and located claims on a sulphuret ledge situate about two miles below the Big Slide, on the west side of Fraser River, and at the present writing are still engaged prospecting on it. The ore is exactly similar to that of the Big Slide; assays have been made from surface croppings, \$20.62 gold and \$2 silver being the highest. Specimens of a Jasper quartz containing free gold, and assaying \$300 to the ton, were found in the early part of the year in three different places within the surveyed bounds of the town of Clinton. A portion of these were forwarded to Mr. Elwyn, Deputy Provincial Secretary, who sent them on to Dr. Dawson, of the Geological Survey, at Ottawa, who in reply remarked that the specimen 'is quite interesting, and as there is comparatively little northern or general drift met with in the vicinity of Clinton, I think it would be quite worth while to make careful search in the vicinity for the deposit from which the auriferous specimens must have come.'

"The drift to which Dr. Dawson alludes will, I am afraid, be the great barrier to the discovery of the ledge. The glacial deposit covering the ledge may be five or five hundred feet deep, and the former would be just as effectual as the latter in concealing it, as there is not the slightest guide to its locality. The opinion prevails that this valley (about 20 miles in length) has at some period in the world's history been the bed of a river, and that by sinking rich auriferous deposits would be found. I have no doubt this will yet be done, but am afraid it would be too much of an undertaking for any ordinary company of prospectors. From the nature of the surroundings, I imagine, water would be the great obstacle to reaching bed-rock without the aid of powerful machinery. The great incentive to quartz prospecting in this district during the past season is the opening of the Big Slide mine—referred to in my reports of the past five years—by a duly incorporated company, and known as the Foster

Gold Mining and Milling Co. For years past we have been told that nothing can be done with our quartz ledges unless foreign capitalists can be induced to take hold of them. I have no doubt foreign capital and capitalists will have a very great deal to say in the opening of our quartz ledges all over the Province in the near future. But so far as the Pioneer Ledge (I must claim this title for it) is concerned, the Big Slide mine is, I am glad to say, owned entirely by British Columbians; every cent of expenditure is British Columbia capital, and it is most sincerely to be hoped that the parties who have invested in this enterprise will reap a rich reward.

"The Incorporated Company own three claims, each 1,500 feet along the line of ledge, commencing at the junction of Kelly's Creek with Fraser River and running thence S. E. 4,500 feet. In the past season the ledge has been traced to the Grotto Gulch on Pavilion Mountain, a distance in all of nearly $2\frac{1}{2}$ miles. Six new claims have been located on it, preliminary prospective work will be commenced on them at the close of the present laying over season. Before reporting to you on the work done on the Big Slide mine now opened I deemed it advisable to make a personal inspection of the premises, and to that end paid a visit there ten days ago.

"In opening out this mine the natural difficulties in the way were enormous, and at the very outset would have proved an effectual barrier to a less determined and energetic man than Mr. Henderson, the company's superintendent, who evidently does not know the meaning of the word 'fail.'

"No amount of written explanation would ever convey even a faint idea of the nature of these difficulties, nor the vast amount of work that has been done to surmount them.

"The road into the Big Slide mine diverts from the Clinton-Lillooet waggon road at a point near the 35-Mile Post, twelve miles from Clinton, and follows the line of the Kelly Creek Cañon, a distance of five miles. The construction of this road has cost the company \$5,000. The grades on the first three miles are fairly moderate, the fall being about 400 feet. At this point the company's sawmill is located, in a tract of excellent fir timber. Logging, sawing cordwood, and charcoal are all under contract and in active preparation. Mr. Eagan, the contractor, kindly gave me every information and all particulars concerning his camp. The engine of 16 H. P. and sawmill of a capacity for cutting 5,000 feet per day are both well housed, and unless in extreme cold snaps will run all winter. Mr. Eagan informs me that his contract is for 400,000 feet of lumber, of which he had then cut about 160,000 feet, 5,000 bushels of charcoal, and 1,000 cords of wood. He has a force of 15 men at work and eight powerful horses. From the sawmill camp to the end of the waggon road (two miles) the grades are enormous, the fall being nearly 1,700 feet. From the end of the waggon road to the mill site at high water mark on Fraser River, is a distance of 1,000 yards, with a fall of 700 feet, (the altitude measurements are mine, by aneroid barometer, and may be taken as approximately correct). A roadway from this point, from the nature of the surroundingings, was out of the question. This obstacle has, however, been overcome by the construction of a tramway the entire distance of 3,000 feet to the mill, down which everything is lowered. The tramway is constructed of two rails of sawn fir timber 8" by 10" laid on substantial trestlework, over which a load of 5,000 lbs. at a time can be safely and quickly lowered. At the date of my visit the whole of the mill machinery and chlorinating appliances were on the ground, at the end of the waggon road, and the various uses and the method to be adopted for the extraction of the precious metals from the ore were clearly explained to me by Mr. Henderson. Since then I understand timbers and lumber for the mill, and brick for the furnaces, have been lowered over the tramway at the rate of from 6 to 7 tons daily.

"The ledge has been tapped by three tunnels at different levels. The lowest or long tunnel is 240 feet in length from the mouth to the point at which it cross-cuts the ledge. From this tunnel all ore from the mine will be conveyed to the mill. Active work, day and night, is in progress on all three levels drifting east along the line of ledge, by taking out the country rock and leaving the ledge standing until the mill is ready. Upraises from one tunnel to the other have also been driven, thus insuring an abundant supply of pure air in the mine.

"Mr. Henderson has handed in a report on the mine to me, with list of test assays made by him from different places on the ledge, copies of which I enclose herewith.

"Quoting from my report to the Hon. the Minister of Mines in 1881 is this reference to the auriferous value of the ore in the Big Slide ledge: 'Testing the ore on the ground was 'tried by roasting and then grinding in an arastra of the most primitive nature, with a result 'of \$12.50 to the ton of 2,000 pounds.'

"With every confidence in the scientific assays that have been made from the Big Slide ore in San Francisco, New York, London and other places, and also those of Mr. Henderson, I have always placed my faith in the value of the Big Slide ledge on the very crude test made in 1881 by the Cornish miner, John Chenhall, and his arastra and quicksilver process.

"Since then science has demonstrated the fact that the infinitesimally fine gold locked up in sulphuret ore can be nearly all extracted and saved without the unsatisfactory and expensive aid of arastra wheels and quicksilver.

"The ledge running through the company's three claims is practically inexhaustible, showing on the surface hundreds of feet above the level of the tunnels, and may extend to unknown depths below that level. Mr. Henderson informs me that it is his intention, as soon as the mine is fairly opened, to sink down on the ledge below the level of the lowest tunnel, to determine the width and value of the ledge as it deepens.

"Up to the present I understand the company have expended nearly \$30,000, which includes the mill on the ground.

"To the Hon. Jno. Robson,
"Minister of Mines, Victoria.

"I have, &c.,
(Signed)

"F. SOUES,
"Gold Commissioner."

MESSRS. WARD AND GOULD'S REPORT.

"BIG BAR, 5th November, 1886.

"SIR,—We beg to report the result of our various prospecting trips in Lillooet District this year. Starting from Clinton on the 16th June last, went to the Big Slide and prospected from that point up Fraser River, 8 miles. Near to Wood's Ranch, in the mountains, found a ledge of quartz, about 5 feet wide, carrying sulphurets—a well defined ledge—and as we thought, very good rock. Returned to Clinton and sent some samples to Victoria for assay. Got powder and tools and returned to the ledge, and spent 5 days' work cutting into the ledge, but getting no favourable returns, we suspended operations. Crossed Fraser River to the west side and went up Watson Creek about 7 miles; here, on the south side of the creek, we found some very heavy, lead coloured, rock, which we thought contained lead and silver. Sent some of it to Victoria for assay—got returns—no gold or silver, but a very large percentage of arsenic, and were requested to get two large cube specimens of it for the Provincial Museum and the Geological Department at Ottawa. We now returned to get our outfit at Clinton for Bridge River, and left 6th August. Crossed Fraser at Big Bar, went in the mountains until we came on to Ward's Creek; followed this stream up until we came to French Bar-Creek, about 8 miles from its mouth. We prospected here, and found a small prospect of heavy shot gold in a bank of gravel, about 15 feet above the level of French Bar Creek. We followed this stream up about 6 miles in a S. W. direction, crossed over the mountain, and camped on a small creek emptying into Lone Cabin Creek. Next day we came to a small creek running through a cement formation; prospected here for gold, but could not get a colour. We went from here in a westerly direction, and camped on a branch of St. Mary's Creek. We tried a few pans of gravel taken from the lower flats on this creek, and got small prospects of heavy, fine gold, but not in sufficient quantity to pay for working. We followed down this creek until we came to St. Mary's Creek, crossed it and went up in the mountains, and camped at Ground Hog Corral. The waters from this mountain flow to the west into Bridge River, and to the east into Fraser River, this being the dividing ridge. There is a very large quartz ledge about 3 miles east from here, which we will spend some time on, when we return. We went from here down a small tributary of Bridge River, prospected, and got a few colours of gold. Found float rock in this creek, which is a mass of sulphurets, and brought back specimens of it. Went from here to a large creek, which we take to be the head waters of the North Fork of Bridge River. This is a very rough-looking creek, full of large boulders. In it we could get a small prospect of heavy scale gold, but did not find anything that would pay. We also found two quartz ledges on this creek, samples of which we brought in. We followed an old Indian trail from here and crossed a low divide, and came on to a large creek, which we called the West Branch of the North Fork of Bridge River. We stayed here a number of days prospecting for quartz; could get some pretty fair prospects in the bed of the creek, and from a bench 60 feet above the level of the creek, got a prospect of heavy shot gold, which we think would pay to hydraulic. We believe there are a number of

claims in the bed and on the benches of this creek, that would pay fair wages. We came across no quartz ledges in our explorations on this creek. We then crossed the creek and proceeded in a westerly direction up in the mountains, intending to make our way to the head waters of the South Fork of Bridge River. We found an old trail, very difficult to get our horses over; but made our way to the summit among the snow banks of last winter, and camped. Got some quartz here, and started ahead next day, but had to return to our last camp, as it commenced to snow very heavily. We lay over here for one day for more favourable weather, but on rising the following morning the ground was covered with a fresh fall of snow 8 inches deep, and concluded that it was better not to cross the mountains, as it was now too late in the season (Sept. 7th), so we turned our backs on this snow camp and returned to the West Fork of Bridge River, up which we travelled for 18 or 20 miles in a north-west course to a high peak, which we called Castle Mountain. We camped a short distance from this peak and spent several days in the locality, but could find no quartz to amount to anything. We think the water from here runs into Gun Creek, a tributary of Bridge River. We went 5 miles north from here, and on a small creek picked up some small stones of a dark colour, perfectly round, ranging in size from a buckshot to that of a hen's egg, specimens of which we sent in to you. We followed up the side of the mountain to trace them. On the summit we came to a large body of cement, and as ages had crumbled away this formation, the stone bullets dropped and rolled down to the creek. We now started back for Ground Hog Corral, about 2 miles east of Castle Mountain. We picked up a number of petrified shells near the top of the mountain, shewing that this part of the country has at some time, in past ages, been under water; and we estimate the elevation above sea level now at between 6,000 and 10,000 feet. As our horses were packed for the move, we did not succeed in getting as good specimens of this kind as we wished. We think this part of the district would be very interesting for a Geologist to spend a couple of months in, and we hope before long it will be visited by one. We arrived back at Ground Hog Corral all right, and spent 10 days here prospecting an enormous ledge of green and purple looking quartz, which is from 80 to 100 feet wide, and we have traced it for a distance of 16 miles; its course is north-west and south-east. We spent considerable time on this ledge, as we thought if we could but get a small assay from it, it would prove to be the Comstock of B. C. We sent some of this in to you for assay, but so far we were doomed to disappointment, as the returns you sent us from Victoria were *nil*. However, we brought in a lot of samples from different parts of this gigantic ledge, which we intend having tested. We went from here about 15 miles south-west, and found a large and well-defined ledge of green and yellow quartz, about 40 feet wide. We brought some samples back with us, but had no time to thoroughly examine the ledge, as we encountered one of the heaviest snow storms we had passed through since leaving Fraser River. We left our camp right among the snow peaks, and in crossing the summit got into the terrible gale of 24th September. It was hard work to get our horses along, as the wind almost took them off their feet, and the drifting snow blinded both them and us. However, we got into the valley all right and pitched our tents in 6 inches of snow, but stayed here only one night, and then made our way back to Ground Hog Mountain.

"The view from here is magnificent: to the east you can see the Limestone Range, near Clinton; to the south the Saw-tooth Range, across the Main Bridge River; and to the north-west the Castle Peak Mountain.

"We now packed our horses and started back for Clinton, September 29th, arriving there 7th October, and bringing with us over 100 lbs. of rock samples from different ledges. We laid over at Clinton one day, and then started for Bridge River, *via* Lillooet. Went up the river to the North Fork prospecting, and brought back some silver-bearing rock. Returned to Lillooet and went up to Cayoosh Creek 5 miles, where we got samples from a ledge carrying large quantities of sulphurets, which we shall have assayed. We then proceeded up Fraser River on the west side, some 30 miles, where we found a small vein of very good looking sulphuret ore, close to the river. The vein is narrow, but on assay, has been proved to be very good. We now returned to Clinton, October 24th, stayed there two days, and started for the west side of Fraser River. We went up Leon's Creek eight miles; found no quartz here. The top of the mountain here is a bed of lava, about 100 feet thick, resting on a bed of fine red gravel, some of it very loose. We packed some of this gravel down to the creek and panned it out; could get no gold, but abundance of black sand. We now went 6 miles below this creek, on Fraser River, opposite the Big Slide, found a small ledge of good looking sulphurets; brought a lot of it back with us for assay, for which we expect to have good returns. We

now returned to Big Bar. Our prospecting for this season is at an end, with what results we do not yet know. If unsuccessful, it is not our fault. We have done our level best in trying to find paying quartz ledges, and whatever the result, we believe British Columbia to be second to no place on this continent for minerals, and have no doubt in the near future rich quartz ledges will be discovered. We have prospected but little on our different trips for alluvial diggings, as our object in going out was to look for quartz. In our explorations on head waters of Bridge River, we saw no signs of any mining done by whites or Chinese, as we were far above them. We have, through the kindness of Mr. McLellan, had 15 samples of quartz sent for assay, of which, up to this date, we have no returns.

"In closing this report we desire to tender you our thanks for sending a number of our specimens to Victoria for assay, and sending the result of these assays to us.

"We have, &c.,
(Signed)

"P. H. WARD,
"H. GOULD.

"To F. Soues, Esquire, Gold Commissioner,
"Lillooet District, Clinton."

MR. HENDERSON'S REPORT.

"BIG SLIDE, November 26th, 1886.

"SIR,—At your request I give you a short history of the Big Slide Mines, together with a report of the development so far done.

"These mines, situated on the Fraser River, at the north-west foot of Pavilion Mountain, now comprising the properties of the Foster Gold Milling & Mining Company, were discovered through the enterprise of Mr. F. W. Foster, of Clinton. A piece of heavy sulphuret ore was given him by an Indian, in 1872, which assayed \$28.50. Mr. Foster sent an old miner to try and find the ledge and locate it; this he was successful in doing; work was begun, and tunnels run to tap the ledge. In the lower tunnel this was done at a distance of 243 feet, and in the upper tunnel at 80 feet, at each point of contact a strong ledge of good quality was found. Mr. Chenhall, a practical Cornish miner, erected an arastra, with which to work the ore; it was not built correctly and the limited supply of quicksilver was lost. 900 pounds of the ore were crushed at this time, the small portion of remaining quicksilver and amalgam yielded in gold \$12.50, and a prospect could be got of the tailings nearly as good as before milling. This was the last work done on the mine until the past summer, when I put a few men to work taking out ore for shipment to San Francisco for treatment, to determine the value and best modes of working.

"The tests made in San Francisco were deemed sufficiently encouraging to organize a company and go to work in earnest. The approach to the mine being very difficult, a large outlay of money was necessary to build a road, over which to haul machinery, &c. This road is now completed, and the machinery for a modern ten stamp gold mill and chlorination works are now on the ground; by the new year, if no unforeseen delays occur, the mill will be erected and running.

"The mines are now being opened up for permanent work. The levels are being connected by upraises to insure a good circulation. Drifts are being driven on each level. In all parts of the mine so far worked, fine paying ore has been found, which improves as the mountain is pierced. Everything gives promise of an immense body of ore. The main vein is from 15 inches to 5 feet in width. The average value per ton is about \$20 gold and \$2.50 silver. By the method of reducing that will be used, 90% of the gold and silver in the ore will be saved, at a cost of mining and milling of about \$5 per ton.

"Work goes on in the mine day and night, and by the time the mill is ready, the mine will be sufficiently opened to furnish all the ore necessary to keep the mill constantly at work.

"It is the intention of the company to enlarge the mill as soon in the spring as possible—the grading for the additional stamps is completed.

"Two desulphurizing furnaces are now in course of construction. There are on the pay roll of the company 50 men, employed as miners, carpenters, and men employed at the saw-mill.

"We have burnt a kiln of 67,000 brick; they are of a very fair quality, and will be used in the construction of our furnaces, &c.

"It will afford me much pleasure to make my next annual report, when I shall have the satisfaction of giving you the bullion product, which will demonstrate the fact of paying quartz lodes in British Columbia.

"Yours very truly,
(Signed)

"GEO. HENDERSON,
"Superintendent, Foster Gold M. & M. Co.

"F. Soues, Gold Commissioner,
"Clinton."

"Copy of Assay tests taken at the mine of The Foster Mining & Milling Co., Big Slide Ledge, by Geo. Henderson, Superintendent:—

No.	1. Front vein,	80 foot tunnel.....	\$ 68.00
"	2. Main ledge,	80 ".....	31.02
"	3. Best looking face,	240 ".....	118.91
"	4. Sample vein,	240 ".....	36.19
"	5. Sample, new strike,	80 ".....	15.50
"	6. " " "	80 ".....	10.24
"	7. Fine dirt, upper vein, free ore.....		8.24
"	8. Sample, best looking,	80 foot tunnel.....	36.19
"	9. Sample, poorest,	80 ".....	10.34
"	10. Fine dirt,	80 ".....	10.34
"	11. Upper drift,	Sky tunnel.....	8.24
"	12. Waste,	240 foot tunnel.....	6.20
"	13. Foot wall,	80 ".....	35.16
"	14. Pyrites,	240 ".....	70.27
"	15. Fine dirt,	Sky tunnel.....	19.38
"	16. Poorest,	240 foot tunnel.....	17.80
"	17. New find, 5 feet thick.....		41.36
"	18. New find, 3½ feet thick.....		23.26

YALE.

Kamloops Division.

MR. DODD'S REPORT.

"KAMLOOPS, B. C., 22nd December, 1886.

"SIR,—I have the honour to forward herewith the mining statistics for the Kamloops division of Yale district.

"Scotch Creek, falling into Shuswap Lake about 50 miles east of Kamloops, and referred to in my report last year, has become a new mining camp with prospects of future improvement. The creek is steep and contains large rocks which make the working expensive. The supply of water is abundant. The gold is bright and heavy and sells for \$17 an ounce here. My estimate of \$22,000 as the yield of this creek during the past season may be taken as approximately correct.

"Louis Creek, 35 miles from Kamloops on the North Thompson River, caused some excitement early in July, but after a few weeks' trial the prospect did not continue.

"At Stump Lake, near Nicola, thirty miles from Kamloops, there are upwards of thirty quartz claims located, with very encouraging prospects. Considerable work has been done on some of the claims.

"Mr. Beeton, of London, England, has succeeded in inducing capitalists to invest in some of the above mines. They have a manager of many years' experience, and it is probable that at no distant date the Stump Lake mines will be extensively and profitably worked and prove a source of wealth to the province generally and to this district in particular.

"I have, &c.,
(Signed)

"The Hon. the Minister of Mines,
"Victoria, B. C."

"WM. DODD,
"Government Agent.

Okanagan Division.

MR. DEWDNEY'S REPORT.

" GOVERNMENT OFFICE,

" PRIEST'S VALLEY, 4th December, 1886.

" SIR,—I have the honour to enclose herewith the mining statistics and my annual report for the district of Okanagan.

" Mining on Cherry Creek appears to have revived a little during the past summer. Some thirty Chinese have been taking out gold, with what results it is impossible to tell; but I am informed by a reliable party who resides on the creek that only a few are taking out wages, whilst the remainder are only making a bare subsistence.

" A Cherry Creek Mining Company has been formed (Mr. John Merrett, foreman), to try and find the lost lead, and who is under the impression that by running a tunnel some 1700 ft. into the bench and hill he will in all probability strike the channel. The company's means are limited, and I would suggest that every encouragement be afforded them by the Government to carry out their undertaking.

" Messrs. Hollingworth and McMillan, who have been prospecting the Kettle River and tributaries this past summer for placer diggings, returned with a very good prospect and recorded a discovery claim on Kettle River, returning to cut out 16 miles of a trail from the Monashee mountain to their claims, so as to enable them to pack in their winter supplies and prepare to work their claims early in the spring.

" I hear very favourable reports from the Monashee quartz ledge, and from reliable authority I am informed that machinery will be put on the claim to commence active operations next summer.

" The Mission Creek Hydraulic Company has made good progress this season, but owing to the winter having set in they had to abandon work until next spring. I am informed that they intend running tunnels this winter to prospect the benches, with a view of finding out if it will pay them to put a superior class of hydraulic apparatus on the ground next summer.

" They have been working to a very great disadvantage, having to bring the water a long distance by ditch and flume on to the benches.

" The company intend to thoroughly prospect their claim, which will necessitate the expenditure of a considerable sum of money, which they estimate at from ten to fifteen thousand dollars.

" If this company is successful in their undertaking I have no doubt that others will be formed, as there is a large extent of gravel benches which may give small returns for capital invested.

" A step in the right direction has been taken by the Government in having a survey made this fall for the construction of a waggon road from Blue Springs, Okanagan, to the quartz mines, and when constructed will open up that rich portion of the district which abounds both in minerals and a vast extent of good agricultural land.

" I have, &c.,

" The Honourable

" The Minister of Mines, Victoria."

(Signed)

" W. DEWDNEY, G. A.

Similkameen Division.

MR. TUNSTALL'S REPORT.

" NICOLA, December 23rd, 1886.

" SIR,—I have the honour to forward the mining statistics for the past year connected with the Similkameen District, showing a total yield of \$203,000.

" I regret to state that the favourable expectations entertained have not been realized. The prospects said to have been found in the Tulameen River and some of its tributaries were probably, in some instances, exaggerated, but in most cases were in accordance with facts, and well calculated to deceive the most experienced miners. Many of the most favourable localities proved to be limited in extent, and so 'spotted' as to render the labour expended thereon unremunerative, whilst some of the adjoining claims paid moderately well.

"This irregularity in the pay-streak may be attributed to the fact that the gravel benches situated at a higher level indicate the position occupied by these streams in the remote past when the gold was first deposited in their beds, from which, through the effects of erosion, they subsequently receded, leaving behind the precious metal in varying quantities until they reached their present location more or less exhausted of their wealth. Next summer will, probably, see these deposits prospected and their value determined.

"Granite Creek throughout a length of four miles, with some exceptions, has paid from \$3 to \$20 per day to the man. Accordingly as the creek becomes worked out the benches, which have all been taken up, will be mined. Since my departure from Granite City three of these claims have yielded from thirty to fifty ounces per week, and many more will be in operation so soon as dumping ground can be secured without interfering with the companies working in the creek.

"On South Fork, which is a continuation of Granite Creek, the various companies were compelled to suspend work, the heavy body of water encountered at a certain depth being more than they could contend against with the pumping appliances at their disposal. In sinking favourable prospects were found which would warrant the opinion that the same run of gold found lower down existed in this portion of the creek.

"The Mainland Company is engaged in drifting through a flat situated at the mouth of Granite Creek. The pay dirt is about two feet deep and thirty feet wide, lying on a bed of coarse sand, and pays from three to four ounces to the set of timbers. At the opposite side of the creek, intersecting the latter at right angles, the same gravel is found, extending under the town of Granite City, clearly indicating that it lies in one of the ancient channels of the Tulameen River formed at an early stage of its existence.

"This is a discovery which will lead to important results in tracing the location of this valuable deposit, which must extend several miles up the valley of the Tulameen, and which mining operations on the river have so far been unable to find. Mining on the above stream during the past season has not been, generally speaking, successful. The Homestake Company, about five miles above Otter Flat, obtained good pay for about three or four weeks in the spring, when it suddenly gave out and led to a suspension of further work.

"The Beaver Company attempted to test the deep ground, but the large quantity of water they had to pump prevented the shareholders from reaching the bed-rock. I understand it is Major Downie's intention to return in the spring with powerful machinery capable of overcoming all obstacles of this nature.

"The California Company has struck gravel on a bar below the mouth of Slate Creek, which yields from four to five dollars per day to the hand. The work accomplished by the San Francisco, European, Consolidated, and other mining companies has not been attended with favourable results. The Chinese, however, working below the mouth of Granite Creek, seem to have received satisfactory returns for their labour.

"Collins, Cedar, Slate and Bear Creeks have not turned out as well as expected, although they will attract a considerable number of miners next season, encouraged by the prospects previously obtained. The largest nugget found was taken out of Bear Creek, and weighed \$320. The next in point of value, from Slate Creek, was worth \$215, and several pieces from Granite Creek averaged from \$90 to \$100 each.

"Mixed with the gold found in this district, and possessed of a greater specific gravity, is a whitish metal which, at first, was thrown away under the impression that it was worthless. For a considerable time no definite idea could be procured as to its value. Mr. Jensen, of Granite City, who forwarded a sample to a cousin of his at Manchester, England, for analysis, has kindly supplied me with the desired information. The metal is principally platinum, containing small quantities of iridium, osmium, and palladium. Its value depends on the percentage of the platinum, which varies in quantity, and may be considered as worth about \$2.50 per ounce. The selling price at Granite City was 50 cents per ounce; so the purchasers will reap a handsome return from their investment. Little work has been done on the mineral claims recorded at the Government Office. Mr. Stevenson has cut a road to the silver mine on Hope Mountain, and he will carry on active operations next spring as soon as the snow disappears. A tunnel is being run to intersect the Paradis Lode at a considerable depth from where it crops out on the surface; but as yet sufficient work has not been done to give any definite opinion as to its importance.

"The Small Debts Court has proved a great convenience to business men and others as offering a speedy and an efficient remedy to creditors for the recovery of amounts to \$100.

Before its existence, persons residing in localities remote from where a County Court was held frequently preferred losing the moneys due than incur the great expense and loss of time in attending to prosecute their claims. I would, therefore, recommend that its provisions be extended to the more distant portions of the district, and enable litigants residing beyond the distance over which it has authority to participate in its advantages.

"In conclusion, I may add that the health of the camp has been very good. Only two deaths occurred, the result of typhoid fever. About one hundred white men and one hundred and fifty Chinese will winter in the mines, which will probably afford remunerative employment the coming year to over four hundred men.

"I have, &c.,
 (Signed) "G. C. TUNSTALL, G. C. & S. M.
 "The Honourable
 "The Minister of Mines."

REPORT ON THE CARIBOO QUARTZ LEDGES BY MR. KOCH, MINING EXPERT.

"To John Bowron, Esq.,
 Gold Commissioner, Cariboo.

"SIR,—At your request, on behalf of the Government, I have made as careful an examination of that portion of your mining district, lying within a radius of about six miles from Barkerville, as my time would admit of.

"The time expended and expenses incurred are far in excess of the Government appropriations; but I became so deeply interested in the very encouraging outlook for the future, and the earnest anxiety of the residents of the district, together with the knowledge so fresh in my mind of the failure that was made in your laudable efforts to develop the quartz interests of the district during the year 1878, through the incompetency and jealousy of those under you, that I could not possibly terminate my survey with a cursory examination.

"I, therefore, have the honour to submit the following:—

"GEOLOGICAL FORMATION.

"I find the formation identical with that of California. Slate predominates, with belts of limestone, porphyry, granite, and perhaps syenite, with stratification tending north and south, with variations north-west and south-east, showing a continuation of the formation of the gold-bearing belt of California.

"The surface is somewhat broken and displaced, traceable, however, to glacial disturbances. The formation, I should say, was of the tertiary period; that, however, I shall leave for such eminent men as Professors Dawson, Bowman and others to decide.

"MINERAL-BEARING VEINS.

"While a large amount was done and money expended during the years 1878-9, but little has been done towards developing the veins. But two shafts have been sunk to a depth of 100 feet each, and several others 50 feet deep, while several tunnels have been run in on the veins, at a depth of from 20 to 80 feet from the surface; yet sufficient can be seen to come to the conclusion that many true fissure veins traverse the country, while even contact veins will, in my judgment, be discovered, as already evidenced. All veins prospected will not prove to be permanent and paying veins; in fact, some of the prospects will prove, as in all countries, to be spurs or feeders to a true vein; or they may be slips, slides or broken and detached pieces from true veins. In some cases they may be so encouraging to the prospector that much time and money may be expended on them before the fact is made plain that there is no vein, but only a feeder or detached mass.

"To avoid such unhappy experience as far as possible, I will suggest a possible, or partial, remedy further on. (See Mineral Survey.) Most of the mines that have been prospected to any extent have a north-west and south-east trend, dipping towards the north-east.

"While other veins deviate somewhat from that course, they also show well-defined walls and abundance of ore, notably the Island Mountain mines.

"Breaks, or slips, have occurred on the veins on Island Mountain as on other veins; but, so far as my examination extended, I think I am safe in saying that those slips and faults, as in other veins, do not extend to any great depth. The veins I have examined run from four and a half to twenty feet in width, while in some cases it is fair to presume that they are much wider than they seem; as, in some veins, so far developed, one wall is of a loose and broken nature, and may be only a stratum of slate interlined or separating one portion of the vein from another. In other words, a mine to all appearances carrying a vein of four and a half feet may, in reality, be a vein ten or more feet in width.

"COURSE OF VEINS COMPARED WITH PLACER DIGGINGS.

"In my topographical examination of the country, I could not help observing that, without exception, your extremely rich placers lay immediately below the quartz veins; as, for instance, if we start at the Lord Dufferin claim and follow the croppings, passing the old Proserpine, now called the California, and continuing along the vein in a north-west course, you will find, immediately below, or at the base of the mountain to our left, runs Williams Creek, which has yielded many millions of gold, much of it extremely coarse, intermingled with quartz; while to our right, at the base of the same mountain, runs Conklin Gulch, which also yielded large quantities of gold, as, indeed, both places are yet doing.

"Continuing along the course of the vein and crossing Williams Creek at the cañon until the summit going towards Lowhee is reached, we find Stout's Gulch lying to the left and below the vein. All know how extremely rich that gulch has been, while it is, even now, being hydrauliced far up the mountain side towards the vein. Following the vein over the summit dividing Stout's Gulch from Lowhee Creek, we find the latter has been rich; and within a very few days samples of heavy gold have been pounded out of quartz found while sluicing.

"In the vicinity of the Pinkerton claim the vein crosses Lowhee Creek and pierces the mountain, continuing towards the Jack of Clubs Lake, taking in the Enterprise, now called the 'Senator Jones,' and extension, 'Governor Perkins.'

"The vein, extending up and through the mountain, no doubt supplied Lowhee Creek with the coarse gold mentioned above; and as the vein crosses through the mountain, the gold found on the banks of the lake perhaps came from the same source.

"I think I shall warn venturesome spirits from attempting to pump the lake out in their anxiety to find gold.

"In continuing my survey, I find no source from which the rich diggings of Mosquito Creek derive their gold except from the large, well-defined, and continuous vein and cross-veins passing through Island Mountain. Returning to the Lord Dufferin, I was not surprised to find that Grouse Creek could not possibly have received its bounteous supply of gold from any other source than from the Bonanza vein, where it crosses Grouse Creek as it passes from the California claim and continues through the Lord Dufferin ground towards Antler Creek; and surely no one will question the source whence that creek derived its gold, when not a dollar is being mined above where the vein crosses either Grouse or Antler Creeks.

"I find it impossible to embrace the Burns Mountain in this report; but from observation and information obtained from P. C. Dunlevy, of Soda Creek—a disinterested person, I think—I am led to think that the Burns Mountain veins supplied the millions mined from Lightning Creek, no gold being found above a point where Mr. Dunlevy supposed the veins crossed the creek.

"While I may seem to have been somewhat exhaustive in my report on the above veins, I will say I have been shown samples of ore from what, at present, may be termed outside veins—notably the Steadman, Sergeant Lindsay, and other veins, reaching so far away as Sugar Creek—and they, without exception, show well-defined walls, and invariably prospect well in gold. Those on Sugar Creek, however, carry a higher percentage of silver than gold; and, beyond doubt, many veins exist not yet discovered. The country is thickly covered with weeds and moss, which makes prospecting or following veins somewhat difficult; but the day is not far distant, in my judgment, when many prospectors will be found busily engaged in uncovering good paying veins. Some will meet with success, while the dreams of wealth of others will, unhappily, never be realized. Such is too often the fate of the prospector, which can, in a measure, be palliated by the Government, as I will explain further on. (See Mineral Survey).

"I must not neglect to account for *supposed* veins carrying free gold, in some cases lying higher up the mountains than the true veins, which have but little free gold; notably one which was discovered high up—in fact, on the summit of the mountain above the B. C. mines.

"During the glacial period all was chaos. The irresistible force did not always choose its course and destroy the tops of veins and carry them down to creeks below. On the contrary, portions of a vein were in some cases detached and carried many miles and landed on some mountain top hundreds of feet higher than its original bed, as in the case mentioned. Instead of being ground and crumbled sufficiently fine to admit of being gradually washed to the creeks below, it was carried in an unbroken mass and deposited on the top of the mountain, as is often seen in the case of a jam or drift of timber in a swollen stream, where trees may be seen piled up many feet, and beyond the line of the jam. In such cases the elements have but little effect on the supposed vein, and it lies there undisturbed, while thousands of tons broken and ground fine have at the same time been washed to the creeks below.

"PAY CHUTES.

"I find those interested in the development of the quartz veins somewhat surprised to learn that a gold quartz vein, found to be a paying one, should not continue paying to an indefinite depth and distance. In starting a tunnel, for instance, on a vein, the miner may have a vein that will pay a handsome profit above mining and milling expenses; that body of quartz may continue for twenty or perhaps five hundred feet; or the miner may, after drifting on the vein twenty or thirty feet, find he has come upon quartz that will not yield him one dollar per ton. I shall not advise him what to do in such a case, but will say that, in California, if his walls continued perfect, the miner would continue bravely on with his drift, testing his ore daily; and the chances are strongly in his favour of again drifting into a pay-chute which may continue hundreds of feet, and yield richer ore than he had hoped for. The same thing can be said of sinking shafts. The miner may start a shaft or incline on his vein and, as he sinks, to his chagrin he finds, while his quartz continues abundant, that only that portion covering half his shaft shows gold, and as depth is attained his pay-ore has disappeared entirely. And now, if he will stop and reason he will discover that he has sunk through his pay-chute, and he will either return to the point where he lost it and follow it, or continue his shaft as deep as he chooses, and then drift towards the course to which it dipped when he lost it.

"I will instance the old Eureka mine of Grass Valley, California. A large amount of gold was taken from their pay-chute, which gradually dipped towards and to the Idaho claim, the owners of which claim then took possession, and it has produced millions; while they, in their turn, must, according to late advices, soon yield up the rich chute to the owners of the adjoining ground.

"FREE GOLD AND SULPHURET VEINS.

"I have been asked for an explanation why most of the gold quartz veins of California were free-milling on the surface, and why some of them continue so, while the veins of this district show mainly sulphuret ore?

"I do not know that any scientific men have given a positive reason why such is the case, thus leaving me free to express my opinion on the subject, perhaps thereby drawing from a more scientific or practical engineer a better reason than I can give.

"Lying so much further north than California, your country was that much more subject to the terrible effects of the glaciers which undoubtedly swept over this country in their course southward. Scientific men point out their effects in California, and why not I point out their effects here?

"I am of the opinion that your veins here, at present, would have been worked hundreds of feet deep had they been attacked before the glacial period and worked to their present croppings. In other words, I think the veins were, originally, free-milling, and that the original croppings stood hundreds of feet higher than the present level, and that the glaciers with their accompanying masses of rock, sweeping with wild and irresistible freedom, whirling and grinding through the country, have done for this country what stamp-mills have, to a great extent, done for California mines. I conclude that, with that powerful agency, the mountain tops, including the gold-bearing veins, were broken and ground down to the present level. The peaked snow-capped range lying to the north-east, and plainly in sight from the Prosperpine Mountain, helps to bear me out in my theory, it being, I take for granted, a hard rocky range, perhaps granite, and much higher than the gold-bearing range, withstood the

terrible charge from the far north much better than this range of mountains; yet even it has been battered against by some powerful agency, until its rocky spires reach, needle-like, far up into the clouds. If I am correct in my theory, we have accounted for the rich deposit of coarse gold intermingled with quartz found in the old and original bottoms of the creeks of the district; and while there is a difference of opinion as to whether more sulphurets were found in the old or the top channel, I find, from most reliable sources, that more were found in the top or present channel and side-hills than in the deep drifting claims, except in exceptional cases. That helps to bear me out in my theory that the tops of the veins were free-milling, that the glaciers ground and broke off the tops of the veins, deposited them in the creeks below with the gold in a rough and comparatively unwashed state, much of it being imbedded in quartz. The deposit was then covered with the great wash from the mountain sides, the gold seeking the bottom, the loam and soil floating to the meadows below, leaving the claim to form a new bottom for the creeks and benches and overlying the extremely rich deposits since drifted out. When the great maelstrom had ceased to whirl and grind, and the work of nature went quietly on, then the melting snows of winter and the summer rains continued the unfinished work of the glaciers by gradually washing the gold from the sides of the mountains, together with the decomposing sulphurets which the glaciers had reached and broken from the veins. The gold found in the present creek bottom on the clay, and that also found in the higher workings of the hydraulic claims, being, as a rule, much finer than that gathered from the old channel under the clay, made finer, no doubt, from its slow travelling down the mountain side. Of course, many large pieces are now found where they became lodged in the rocks or ravines during the glacial period.

"The same effect, I think, was produced in California; but the cause being less violent and the mountains not being so high, the veins were not broken and worn down to depth enough to reach the sulphurets, except in some instances.

"Why some veins in California continue to yield free-milling ore to a great depth, while, so far, none of any note have been found here, will be, in my judgment, as hard to explain as why, in some of the Comstock mines, the ore yields largely in gold with silver, while in mines on the same vein and not far distant the percentage of gold is small.

"I will cite some of the silver mines of Mexico, notably those on the peninsula fifty miles inland from the City of La Paz.

"On some of the veins the surface has been worked to a depth varying from ten to one hundred feet, for the purpose of getting the docile or so-called "patia" ore (an ore that is free milling and worked by an arastra), but at the above-named depths base ore, or so-called fire ore, is always encountered. That ore requires skill to extract the precious metals. And now that nature has been kind enough to mill the top or free milling ore from your veins, you must employ skill, combined with intelligence, in opening and working your mines and ore, in order to make mining one of the great industries of your country.

"With thirty-three years' underground experience in California, Nevada, Arizona, and Mexico, I will now state without any reserve that I have unlimited faith in the continuation of your veins to a great depth. My best guide in coming to that conclusion is the increase of the percentage of gold-bearing sulphurets as depth is attained; the ore in the two shafts that have attained a depth of one hundred feet being heavily charged with rich sulphurets, while the croppings showed but a small percentage, comparatively speaking, with more free gold visible.

"CONSOLIDATION OF COMPANIES.

"As all properties will not result in being mines, and to prospect any one of them properly requires time and money, I recommend that owners should, as far as practicable, consolidate and select any one of their claims, and unite their time and strength on it. When sufficiently developed, capital will then buy or incorporate with them and place the mine on a paying basis, and they can then attack another property. Owners of prospects must not sit idle and wait for capital to come and buy a quartz boulder or a ten-foot hole in the ground.

"REDUCTION OF REBELLIOUS ORES.

"Although I consider the reduction of your ores the only real matter at issue, I shall not dwell long on it; as the history of gold quartz mining and milling has been reduced to a science in California, and is well known by all metallurgists, and as such men must be employed, it is not essential that I should go into details.

"Your gold quartz is known as sulphuret ore—that is, from ten to seventy-five per cent. of the gold they contain is locked up in sulphurets.

"I will state that the only process so far found practicable by which they can be reduced is to wet-crush the ore as it comes from the mine; most of the free gold is saved passing over the silver plates in and outside of the battery. The pulp then passes over one of the several good concentrators, or vanners, now in use. The concentrator saves from seventy to ninety per cent. of the valuable sulphurets, fine gold, and amalgam that escape the plates while the gangue passes off. The concentrations thus saved then pass into skilled hands, and are desulphurized and chloridized, when the gold is readily obtained.

"Where the ore is rich in sulphurets an advantage is gained in the crushing capacity of the mills, as in milling ore for free gold a wire screen of from forty-five to fifty meshes to the square inch is generally used, which allows a crushing capacity of about two tons per stamp of eight hundred pounds every twenty-four hours, while in crushing ores rich in sulphurets a screen containing about thirty meshes to the square inch is used, which gives the stamps a much greater crushing capacity. Such ores are not crushed so fine as free milling ore, as the sulphurets are easily reduced in the battery; and if a screen of from forty to fifty is used, the sulphurets would be reduced to an almost impalpable pulp, and much would pass the concentrator as slum.

"Trials of the best concentrators failed recently to prevent a loss being sustained in working the silver ores of the Comstock vein, as the chlorides passed off as slum.

"Mills of twenty or more stamps would, no doubt, erect their own chlorination works, and they could always be employed to reduce the concentrations of smaller mills, and the skilled labour would always find useful employment about the mill when not so employed. Wood being abundant, the ores can be handled cheaply.

"I may make somewhat plainer the process of reducing your ores by chlorination. After the sulphurets are carefully concentrated they are roasted until they are thoroughly desulphurized. Through the agency of chlorine gas, per-chloride of gold is then produced. Sulphuric acid, per-oxide of manganese and common salt, are the agents by which the chlorine gas is produced. Pure water then dissolves the per-chloride of gold, which is readily precipitated into a powder or flour gold, by the aid of sulphate of iron.

"PATENT PROCESSES.

"I must give you warning by calling your attention to the many processes being placed before the public, or before men not skilled in such business as mining and milling ore, for they are the only ones who can be led astray into such wild and impracticable schemes as some of the processes are.

"I will refer you to some of the failures, and if your memory does not serve you well in the matter, you can get full particulars from Wm. Ireland, jr., State Geologist of California.

"The first one in my mind was introduced by a man, I think, named Mears, in Chili, ten or more years ago. He became the rage in that great mining country. His process was, of course, a secret. His trials, like all such, were, however, public; even those likely to fall into the trap were invited to make tests for themselves, all with good results.

"Many wealthy men became bankrupt by buying mines which were too poor to be worked by ordinary process. The promoter was presumably interested in such sales. The matter became so public, and so many had invested their all, that an investigation was had, which resulted in the fraud being exposed and the promoter sent to prison, and, if alive, is perhaps there yet.

"Among the more recent patent processes is the Frier process. Some twenty-two years ago Meadow Lake district was discovered in the Sierra Nevada Mountains, about thirty-five miles from the Central Pacific Railroad. The veins were extremely large and well-defined; many of them rich. A large town grew up, as it were, in a day; mills built and mines opened, when, to the consternation of all, the ores were found to be refractory, and up to this time they have baffled the most skillful manipulators. About ten years ago a man named Frier gave out that he had discovered a process by which the ore could be worked. I, with many others, think that he was honest in his belief; but after men of means had spent thousands of dollars in the erection of reduction works, it proved to be an utter failure, and to this day the rich veins of Meadow Lake lie dormant. A San Francisco Company, by latest advices, are shipping in and erecting a mill to cost one hundred and fifty thousand dollars. Let us hope the mystery has been solved as to the proper treatment of the ores.

"A more recent process is one started some five years ago in San Francisco, and lately revived in Victoria. I had the satisfaction of investigating it some time ago, soon after it was made public. Small works were erected in Sacramento, but never started. It was taken east, and I was told that Jay Gould and other monied men, all ignorant of such matters, took stock and erected works in Colorado. If so, they quietly closed them down; not one of them is at work either in California, or, to my knowledge, in any other country in the world. Every mining man in the world would hail with delight such a process, if it were feasible.

"I cannot well afford to make the effort I am now making on behalf of your people and Government, and see my work hampered by having some patent process sprung upon the public and proved to be an unmitigated failure, after costing individuals or the Government thousands of dollars, and the fault be laid on the mines as being valueless. I refer those that have witnessed the process, and feel anxious to investigate, to such men as Wm. Ireland, jr., State Geologist; Professor Price, Assayer and Chemist; C. A. Luckhardt, of Nevada Metallurgical Works, and H. Kustell, Assayer, all prominent men in that branch in San Francisco. Either will be pleased to give them information on the subject.

"I must not let any patent process escape me for fear you may deem it applicable to your ores because I neglected to report or state my views on the subject. I therefore call your attention to an article in the *Mainland Guardian* of July 31st, 1886.

"I do not deny the possibility of saving the gold by the process referred to in the article; but the very fact of the pulp or ground ore having to pass over a bath of melted copper explains at once that the ore must be dry-crushed, that process at once reduces the crushing capacity of the mill over one-fourth as compared with wet-crushing; and the same per diem cost of fuel and skilled labour goes on. Next, in order to reach the gold, all the crushed ore, sulphurets, and vein gangue alike must pass over the molten bath, which requires fuel and skill to keep to the requisite temperature; as well also does it require skill to keep the pulp passing evenly over the bath; and lastly, when your gold is gathered you must resort to the expensive method of parting the precious metals from the copper, which process alone would go far towards desulphurizing and chloridizing as now done in California.

"DIFFERENCE IN COST OF MINING IN BRITISH COLUMBIA AS COMPARED WITH CALIFORNIA.

"In the absence of statistics, I will attempt to show the difference in the cost of mining and milling in California as compared with Cariboo, and the very probable results to be obtained from the energetic, careful, and scientific handling of your large and well-defined gold-bearing veins.

"Skilled labour, which includes mechanical engineers, smiths, mill-men, and chloridizers, costs, in California, about four dollars per diem. First-class miners and blasters cost \$3, and second-class from \$2.75 to \$2.50; outside labour, including Chinese, averages \$2 per diem. Wood, for steam purposes, will, no doubt, average at this time \$5.50 per cord, while the ores milled do not, in my opinion, yield to exceed eight and a half dollars per ton. That estimate may seem small to a California miner, but when it is remembered the enormous quantities of low-grade ores milled by such companies as the Plumas-Eureka, Sierra Butts, Douglas Island, Doctor Zielie Mine, and many others, it greatly reduces the average as compared with the few stamps milling \$12 to \$20 ore. And yet the far-seeing capitalist of California finds investment in a quartz mine one of his best investments, and does not hesitate to erect the best machinery that skill can invent, whereby mining may be made a legitimate branch of industry; and my examination of your veins has led me to carefully study the situation as compared with the above. I find skilled labour, as above, will, perhaps, cost \$6 per diem, good miners \$4, second-class \$3.50, while outside labour costs \$3, and wood not to exceed \$3 per cord.

"While I feel safe in placing the milling value of your ores at from \$17.50 to \$20 per ton, and I feel confident that those figures can be safely advanced from ten to twenty per cent., but I have endeavoured to be cautious in the examination of your mines and my statements to your people, and do not wish to cause them to feel over sanguine until milling results are reached. I have made the above estimates as to cost after talking with your most prominent citizens, and estimate the value of your ores after making over fifty assays from the different veins and carefully testing the feasibility of chloridizing the sulphurets contained in the ore.

"MINERALOGICAL SURVEY.

"I deem it of the greatest importance to the Province that a systematic mineralogical survey be made, not alone of this immediate vicinity, but of the outlying and surrounding

country. The survey should be so managed as to keep pace with the prospector, rather than neglect the work commenced by extending the examination too far beyond present work ; for, by extending the survey beyond present developments, you deprive the prospector of the assistance and advice of your engineer.

"As I have previously stated, the Government can materially aid and assist the prospector in his work of development, and often save him much time and money by having an intelligent and practical engineer near by to consult and to advise him as to the best method to prospect his ground, and as to the probability of reaching pay ore.

"In this connection I will state that I see a Bill is presented before the House in New Zealand whereby it is proposed to appropriate one hundred thousands pounds to aid in developing the mineral resources of the Colony ; while the United States has, perhaps, the most complete and extensive mineralogical survey system of any country in the world, and the result is what ? English and French capital come to the United States in preference to any other country. They read and have the mineral resources of the country explained to them constantly.

"Following upon the heels of the annual mineralogical report, enterprising men go to London and Paris well supplied with samples of ore and elaborate maps of mining property, and gifted with national go-ahead-itiveness and never-let-go, they annually induce a large amount of capital to come into California, Nevada, Colorado, Idaho, New Mexico, and Arizona. Not one of these States or Territories but have large English and French companies successfully at work ; and the more capital they invest the better they are pleased in case it yields from six to ten per cent. per annum.

"That capital can be turned hitherward ; not, however, by sitting supinely waiting for its coming

"Ask an Englishman which he would prefer, Canada or the United States, and why, and he will answer—'The United States, because there is more dash, enterprise, and go-ahead amongst the people.' Including Alaska, Oregon, California, Idaho and Montana, mining industries have almost surrounded you, and the outside world scarcely knows that you are the possessors of such promising and well-defined gold and silver-bearing veins.

"Several years ago so eminent a man as Professor Dawson took with him to Montreal samples of the quartz broken from the croppings of your veins, and reported to you from five to six dollars per ton, and encouraged you to hunt in those veins for richer ore, as they were, beyond doubt, the sources of the many millions of coarse gold intermixed with quartz taken from your creeks and benches, and no richer placer diggings were ever discovered than your creeks and benches through which the veins pass. Do not forget that the mountain will not come to you ; on the contrary, you must seek capital and give it encouragement, and the day will come when your district will again rank as formerly amongst the great gold producers.

"Capital at present is seeking investment in the most remote corners of the globe. All manufacturing industries are overdone. Silver is a drug upon the market and can scarcely hold its place as a circulating medium, while (including the product of the entire world) gold enough is not now produced to supply the arts and sciences. Then why not use energy and push enough to induce English capital to come to your district ?

"In referring to capital seeking investment, I may refer you to the circumstance of an English company formed to work the gold quartz found in South Africa. In order to be well equipped in every detail, their mill was built in San Francisco, shipped overland to New York, thence to England, and transhipped to Natal on the South Coast, where it had to be hauled by cattle seven hundred miles inland. Also one of a hundred stamps and necessary amalgamating pans was built in San Francisco and shipped to Peru, where, by rail and mules, it had to reach the giddy height of thirteen thousand feet, near the summit of the Andes Mountains, to work a silver mine.

"MANAGERS OF MILLS AND MINING PROPERTY.

"I cannot too strongly impress upon the minds of those proposing to invest in, or operate mines in this district, the great importance of selecting none but the most competent of men for their managers. They should come with good reference as to ability and integrity.

"Favoritism, friendship, partnership, good honest men, and too old to work, and such like considerations that can be advanced for making appointments, which might lead to the ruin of a company, or, at least, the useless expenditure of thousands of dollars, should all be discarded. The day is past for appointing ministers out of place, highly educated physicians and lawyers, or rich men's sons just out of college, because their fathers are largely interested. Appoint

some man who has had years of experience of vein mining, one who has cost some San Francisco or Eastern company half a million of dollars by some blunder made years ago. He has had experience, and blushes, and wonders how he could have made such mistakes as he has. He will, even now, make small mistakes, but he is quick to discover and remedy them. Good men can be procured, men that have worked in and helped to open the finest mines in the world.

"A manager should be able to run an engine, know how to run a mill in all its branches, know when each stamp is doing duty, detect a loose mortar bolt, cut out any kind of timbers for shaft, drift, or elsewhere, sharp a pick or drill, and, in fact, he must be a miniature encyclopedia, and he must be honest, temperate, and kind.

" TUNNELLING.

"Tunnelling, as a rule, has caused disaster and ruin to many a promising mining venture, and should only be resorted to when a mine has been proved to be valuable by shafts and drifts on the veins, and then only after a careful calculation as to the difference in cost as between hoisting and pumping, and the cost of making the tunnel, always bearing in mind that when machinery of sufficient power to sink deep enough to justify a tunnel is once in place that the same machinery may have to come in play again when the ore above the bottom adit is worked out, and the difference of continuing the hoist above the tunnel and to the surface will be so small that, in rare cases only, is the tunnel a benefit. I allude to deep, and not to prospecting, tunnels.

"There are cases where tunnelling would be proper, notably, on the Island Mountain mines, after they have been fully proven.

"Instances can be cited where millions have been squandered on the everlasting tunnel business.

"I will cite the Silver Mountain tunnels, Alturas County, California, run in to tap *supposed* rich mines at a great depth; when a few thousand dollars and a good horse-whim and work immediately on the vein would have proven the ground. Coming nearer home, I may refer to the Burns Mountain tunnel, the St. Laurent and American tunnels. Not one of these was started to tap a body of ore known to exist. Had the St. Laurent and American tunnels reached and tapped the vein at a pinched or barren point, Mr. R. B. Harper's statement, that the vein was a continuous and good one, would have been unjustly condemned, for it is fair to presume that drifts would not have been driven on the veins one foot in hopes of finding a pay-chute, and the owners would have, perhaps, abandoned the property. To say they were surface prospect tunnels is absurd, as a small engine could be purchased and a much greater depth reached for far less money than the tunnels could be run, with the plant in place for deeper developing.

"Let the prospector endeavour to find a pay-chute and sink on it, never leaving the vein; if he can find no pay-chute on his vein, select a place, sink as deep as possible and drift on the vein hoping to find one.

"All work done on the vein is useful; all work done outside of the vein has, eventually, to be paid for with cash, or out of the vein when reached.

" MILL SITES.

"Great care and forethought should be exercised in the selection of mill sites, always aiming to have the mill below the lowest contemplated opening of the mine, then making allowance for an ore-house with capacity of from 500 to 1,000 tons of ore, as, in case of accident to mine-machinery or mine, the mill will be well supplied with ore. Then, below that and the ore crusher should be bins with capacity of at least several hundred tons of ore, so as to give ample time to repair any accident to the ore crusher.

"Below the ore bins come the self-feeders, one of the most useful adjuncts of the mill. Below them, and in front of the battery, come the plates and sluices; and last of all come the concentrators for the saving of the rich sulphurets and amalgam that may escape from the plates; so that it is not hard to calculate the fall necessary to select a good mill site in this country.

" ASSAY OFFICE.

"An assay office is on absolute necessity in a mining country, and more especially in this district.

"No miner, however skilful, can tell what his ore is worth per ton by looking at the sulphurets, and he will be greatly guided by his assays. Also, in case chlorination works are erected, the purchaser and seller of sulphurets would both wish to have samples assayed.

"I would recommend that an assayer be appointed to officiate in your very well arranged assay office.

"SURVEYOR.

"One of the most necessary and useful men in a mining district is a surveyor, one appointed by the Government; and if an assistant is required, which will undoubtedly be the case, he should be appointed by and under the Government appointee. Without a surveyor no miner is sure that he is not developing his neighbour's, instead of his own, mine. The surveyor saves endless and costly litigation.

"It is true, as a rule, we did our own surveying in Nevada with shotguns, but it causes an unpleasant feeling in a mining camp.

"After the prospector has done his preliminary work, and is preparing to do permanent work, he must have a surveyor. When the manager for a company has opened his mine he wishes to have an office map, or working map, of his own, to which he can add his monthly work; and also his company will wish one at headquarters, to which they can add the work as it progresses. The veins, so far as known, should be run out, and a large map of the district should be kept in your office, and its fellow in Victoria.

"I cannot too strongly urge the appointment of a Government surveyor. He would draw a salary and reasonable rates be allowed him for work done for individuals or companies. In time I think the office, as well as the assay office, would be self-sustaining.

"EFFORTS MADE TO WORK QUARTZ MINES IN 1878 AND 1879.

"The effort made to inaugurate quartz mining in 1878 was certainly laudable, and justified by so many large and gold-bearing quartz veins exposed, and while a more competent mining engineer could perhaps have been chosen, yet, I am pleased to say that Mr. R. B. Harper told you many plain truths in reference to your veins, and notwithstanding that it is possible he lacked experience as a manager he would eventually have piloted you to success. Being a mining community his mismanagement in reference to tunnels, mill sites, &c., would easily have been remedied, and I cannot possibly understand why the quartz mining industry was so suddenly dropped because another man employed by private parties condemned Harper and disdained his statements. That person was formerly connected with C. A. Luckhardt, a very eminent assayer in San Francisco, and it is fair to presume was a good metallurgist, and, in fact, he is at present conducting an extensive assay office in New York. I cannot understand why he attempted and continued to mill large quantities of ore by free-milling process when he undoubtedly knew that it was impossible to save the gold by such process. Nor can I understand why he erected a cupola furnace previous to his free-milling attempt.

"In examining the furnace, I find that he roasted the ore in bulk, or broken to the size of nut coal.

"All he could do, at best, would be to desulphurize the outside of each piece; but suppose he had crushed it, as he should, and desulphurized all the ore, even then he would not have succeeded in saving the gold by grinding in the amalgamating pans, simply because he failed to chloridize the ore after desulphurizing it. From my personal knowledge of the gentleman I cannot believe he was ignorant of the method required and universally adopted in California.

"Yet eminent Frieburgh students were, as a rule, complete failures in California and Nevada.

"I think it unfortunate that Mr. Harper was not sustained, and, while I am not aware that he has had the experience, or is capable of managing a mining property, yet I am well enough acquainted with him to say that a mining company might do much worse than employ him as underground manager of their mine.

"I refer to the failure of 1878-79, in order to point out that it was not the fault of the veins that such failures came about.

"EXTENT OF GOLD-BEARING DISTRICT.

"Owing to the short time allowed for this examination I can say but little as to the extent of your gold and silver-bearing district, and must confine myself to hearsay and my personal experience on Hixon Creek (some fifty miles north-west from this point), together with my

examination in this immediate vicinity. At Hixon Creek the formation is very similar to that of this district. A large quantity of float quartz is found in the porphyry formation, and has formed itself into the semblance of a vein in many places without, however, taking the precaution to encase itself in regular walls, as all well-regulated veins should; in other words the surplus or overflow from the vein proper is found as above described.

"Much gold has been found in that quartz; but in bunches or in small deposits.

"At the bottom of a shaft sunk to a depth of one hundred feet, a *contact* was found; that is to say, the point of conjunction of a slate belt and porphyry. True, no vein of quartz existed at that point, but it gave encouragement to seek further. A shaft sunk to a depth of fifty feet at a distance of one hundred and sixty feet from the former shaft, was pumped out, and, on examination, showed that while much work had been done on the quartz scattered through the porphyry, they had also drifted and tapped a true fissure, or contact vein, at a point of contact of slate and porphyry.

"It was quite encouraging, and it was decided to prospect further in hopes of finding a pay-chute of quartz.

"Being near the creek it was deemed best to sink and prospect at another point distant about fifty feet. A shaft was sunk, and at a depth of sixty feet a drift was started, and the vein was found at the exact point where it was estimated to be, and no vein in California has truer or better defined walls. It is quite possible a greater depth must be reached before paying quartz in large quantities will be obtained. Recent advices, however, are exceedingly encouraging, much rich quartz being now raised.

"I have dwelt to some extent on this special property in order to show to the satisfaction of all that your gold-quartz deposits of this district are not local, but that a regular and unbroken formation exists, and continues for many miles, and that true fissure and even contact veins of gold and silver ore can be found by intelligent prospectors.

"Mining, when conducted on the same principles of economy, and with the same business caution and foresight as are necessary in manufacturing ventures and other enterprises requiring investment of capital, is not more risky than other branches of industry, and I predict that the result of intelligent planning, patient and energetic work, will demonstrate that that branch of industry can be as successfully carried on in Cariboo district as in any other district on the Pacific coast.

"With timber in abundance and a climate equally good with that of Idaho and Montana, and veins of ore from five to twenty-two feet in width, what should prevent your district from being ranked among the gold producers? Surely no reason can be assigned why such veins will not pay if they will yield ten dollars to the ton, where much lower grade ore is mined and milled in California at a profit, with the cost as between the two countries so evenly balanced.

"I will conclude by giving you an extract from a letter from C. A. Luckhardt, Esq., Nevada Metallurgical Works, San Francisco, now in the hands of Mr. Joseph Mason, Barkerville, showing that after having worked samples of the ore sent from this district, he coincides with my statement as to the proper method of working your ores:—

"It is impracticable to amalgamate the ore raw. This ore wants to be run through a battery (crushed), concentrated on a 'Frue' or other concentrator, and the concentrations 'want to be roasted and the gold extracted by chlorination to obtain a good practical result.'

"I remain very respectfully yours,

(Signed)

"GEO. A. KOCH."

PRELIMINARY REPORT ON ORES COLLECTED AND QUARTZ LOCALITIES
EXAMINED DURING FIELD WORK OF 1886, IN CARIBOO DISTRICT,

BY AMOS BOWMAN, MINING ENGINEER.

"Entering our field of work in Cariboo this season by way of Quesnelle Forks and the North Fork of Quesnelle River and Keithley Creek, we followed the course of the gold discoveries in 1860.

"As it is impossible to avail myself of the assays of ores collected from about fifty different localities, which are in progress, or to make any systematic detailed report on quartz in general at this stage - while I am engaged in preparing such report - I can simply note for the information of those who are particularly interested, in a brief way, the veins noted or examined in connection with the placer mining districts to which they have a degree of relationship; and to make such remarks of a general nature as may be pertinent.

"PUBLISHED INFORMATION IN REGARD TO CARIBOO QUARTZ VEINS.

"Before 1871, when British Columbia became a part of the Confederation, no cognizance was taken of Cariboo, whether quartz or placer, by the officers of the Geological Survey. In that year Mr. Richardson visited Cariboo cursorily.

"In 1875 Dr. Selwyn passed near it on his way to Peace River without stopping to make any examination of the gold-bearing rocks. In 1876, while returning from an exploration of the northern interior plateau, where the railway surveys were then in progress, Dr. G. M. Dawson, accompanied by myself, made a passing visit to Barkerville, when the first specimens of Cariboo quartz were collected and analyzed by an officer of the survey - Dr. Harrington (Report of 1876-7, p. 477). In 1878, commonly referred to in Cariboo District as 'the time of the quartz excitement,' only one specimen from the district reached the laboratory of the survey through private hands.

"In the same way Cariboo quartz remained at the mining centre of San Francisco, on the outskirts of public interest and sympathy. The provincial record of quartz development in Cariboo so far made was during the 'excitement' and its collapse in 1878. It is to be found in the report of Mr. Harper and others to the Minister of Mines, and in the journals of the day.

"THE QUARTZ QUESTION.

"Generally speaking, the public attention was directed to placer mining exclusively, and to quartz only casually. The records of the Government assayers at Barkerville and New Westminster, in their time, whether intelligently kept, or kept at all, have not been published, nor preserved in any public bureau so far as I am aware. The quartz question may be said to have remained uninvestigated to a conclusion. Certain members of the British Columbia Milling and Mining Company, of the Burns Mountain, the Island Mountain, the Enterprise, and the Hixon Creek Companies, who might be creditably named for their interest in this connection, and others in their individual capacity, have studied the question with a degree of faith. Several experts have contributed to the information extant, mostly in private reports to companies and individuals.

"The present catalogue will show, amongst other things,

"WHERE DEVELOPMENTS HAVE BEEN MADE.

"It will be noticed that it is in situations accessible to the largest numbers of people around Barkerville and Stanley. With the exception of Hixon Creek, outlying districts which have yielded considerable quantities of placer gold, and are known to possess good looking ledges in abundance, have not received the same attention. I leave out of consideration the well-known occurrence of profitable ledges frequently in mountainous regions where there never have been any extensive placers. All the undeveloped districts that are named were overrun by intelligent men during the flush times of the placers; and the ledges existing were undoubtedly noted; but the men who made quartz discoveries could do nothing with them, and they are mostly long since gone out of the country.

“LEDGES NOTED.

“The numbers attached are the assay tags. Our specimens reached Ottawa a little before Christmas, and were given into the hands of the assayer early in January.

“It is to be understood that the ledges here numerated do not comprise, probably, half the number noted, nor a hundredth part of the really good ledges that a prospector might find in the Cariboo country.

“Bearings are all from the true meridian, the variation allowed being N. $26\frac{1}{2}$ degrees E., as found by observation.

“QUESNELLE RIVER.

“No. 1.—*South Fork of Quesnelle*; mining flat at mouth of Rose Gulch. Iron pyrites, and hydrated peroxide of iron, in quartz boulders of placer mines. On the two forks of Quesnelle River there were many profitable placers not on bedrock.

“No. 2.—Quartz pebble containing fragment of oxidised pyrites, from gravel and cement bluff, quarter mile above bridge over North Fork of Quesnelle River.

“These two fragments while having little local significance, having drifted from their original position, will serve to point to the fact that boulders of *good quartz ore* are universal throughout the placer mines of Cariboo. *How far and in what direction* they have travelled can only be guessed at, however shrewdly. Were it otherwise the placer miner could walk at once to the original sources of the gold, which it is the object of the quartz miner to trace.

“No. 15.—*North Fork of Quesnelle*, a little below mouth of Spanish Creek. Chinese hydraulic diggings, near old tunnel into point (run for quartz). Ledges exposed in washing. Decomposed pyrites and yellow oxides. Assay not completed; body, 1 to 4 feet; irregular as to continuation.

“Above the mouth of Spanish Creek it is well known to all old miners that the placers never ‘paid.’

“A mile and a half below it, there is a good sized ledge on which Mr. Stephenson and others have expended money; and which I failed to find.

“SPANISH CREEK,

“On Spanish Creek, Mr. James Moore informs me there is a ledge from 5 to 7 feet in width, about $1\frac{1}{2}$ miles above the mouth, at the meadows, near the entrance of Black Bear Creek. It contains galena in streaks about an inch wide, and strikes N.N.E. Another, a mile up Black Bear Creek, is 6 inches wide, and consists of decomposed quartz. Above that, $1\frac{1}{2}$ miles, on Black Bear Creek, is another, 4 feet wide, containing iron pyrites. These veins run in the same general direction. While working placers on Black Bear Creek, Mr. Moore frequently found pieces of pure galena weighing from 1 ounce to 10 lbs., and many quartz boulders containing galena. On Spanish Creek, only a mile above its mouth, there is a ledge 2 feet wide, not containing any sulphurets. A hundred yards above its mouth, crossing the North Fork of Quesnelle at right angles, there is a 3 foot ledge, visible at low water; contents unknown.

“Still another ledge is visible a little below the mouth of Spanish Creek, on the left bank of the North Fork of Quesnelle. Thus there are 7 or 8 of these ledges in the Spanish Creek country known to Moore, yet undeveloped and unprospected.

“ON DUCK CREEK.

“No. 19.—*300 feet above Forks Trail Crossing*—Galena with white and yellow oxides.

“No. 20.—Duplicate, with red oxide and opaline hornstone.

“Strike of ledge S. W.; attitude, vertical. Strike of country rock in the vicinity E. and W., dip N. A surface cut was made in 1878 on the north side of the creek, disclosing considerable quantities of galena. Body of quartz 2 to 4 feet wide. On an adjacent, discoloured bluff of country rock something of an excitement was raised 25 years ago, owing to placer finds supposed to have been traced to that vicinity.

“No. 14.—*Borland Ledge*, Duck Creek, two miles above trail crossing—Pyrites and quartz. Assay not returned. Assay by Mr. Hoffman of specimen containing a little iron pyrites, and, in parts, a little chlorite, gave of gold a distinct trace; silver, none.

“In the winter of 1878, the Chinese, supported by the merchant Ching at Quesnelle Forks, took great interest in this ledge and worked at and around it the greater part of the winter

without accomplishing much. After the 'collapse'—referring to the quartz excitement of 1878—Messrs. Borland and McNab went up to look at it, but did nothing further. It was believed to be rich.

"A body of quartz crops out, into which surface cuts have been made, on the north side of the creek. Strike, S.W.; attitude, vertical; strike of slates in the vicinity, S.E.; dip, southerly 25°.

"SNOWSHOE BRANCH OF KEITHLEY CREEK.

"On Wednesday, July 21st, I left camp at Barr's on Little Snowshoe Creek, accompanied by Thos. Haywood, an old English-Australian sailor, 22 years a resident, and visited the several ledges and placer mines between that point and 'Yank's.' Thence accompanied by Messrs. Haywood and Smith, we put in the balance of the day in circling around the head of Little Snowshoe, including 'Yank's' peak.

"Specimens 3 to 10, represent ledges around Little Snowshoe Creek, which furnished two miles of rich placer ground.

"The quartz seen in this vicinity is in bunches of considerable size, sometimes not continuous or only in small veins.

"The ledges were found in the main unprospected; their volume, richness, and strike having been left pretty much undetermined. Something of a test was made at the Arastra Ledge by Mr. Haywood, in 1863. A tunnel was run in 90 feet, to within 18 feet of a shaft which was sunk down 10 feet. Mr. Haywood found gold in this shaft all the way down, from the day he commenced to work; the shaft was on the richest place found at the surface. His tunnel was on one side of the ledge, crossed it diagonally, and then kept alongside. About 40 feet in, was obtained the material seen on the two dumps. Various stringers, 3 or 4 inches in thickness, were crossed, besides the main ledge.

"Horseshoe Gulch Ledge was the second visited. The third ledge visited, is identical with the one on the little quartz knoll, noted by me in 1885, and may be called the Steele Ledge. The fourth ledge visited is near this, southward, under a cliff. It was never recorded. It may be called the Galena Ledge, from the fact that chunks of galena are found on the surface, immediately below. Mr. Haywood supposes that the galena in the Little Snowshoe placer mines is derived from it. The fifth was the 'Big Ledge' on the south-west side of Yank's or Snowshoe Peak, which may be called the Haywood Ledge from the fact that he took it up, and staked off 1,500 feet for himself, and 1,500 feet more for Joe Rawley.

"The only ledge ever found on Little Snowshoe, besides the Arastra in close proximity to the placers, is that on the point below Smith and Anderson's hydraulic diggings, where there is a Chinese cabin, 200 yards below Smith's. In 1874, Mr. Haywood ran a tunnel to find the high bed-rock bench of the channel; and found this ledge. It contained a good deal of galena, and he thinks gold. What struck him was, that it appeared to be the same kind of rock as the very rich quartz boulders for which the Little Snowshoe Creek placer diggings have been noted—containing galena and gold.

"The Arastra Ledge did not contain exactly the same kind of rock as these boulders; galena was lacking. Other ledges and stringers near, however, above and below the Arastra, contained galena. About 200 yards west of the Arastra, a ledge was found running southwest, which contained galena.

"A mile below the Arastra, and about 100 yards below Haywood's present house, on the east side of the creek, Haywood, in 1876, found a seam of galena an inch thick, in plumbagenous black slate along with a scraggly, sparry quartz, of little account. It was in the strike of the rock, running from S.E. to N.W.

"No. 81.—Little Snowshoe, head of Smith and Anderson's diggings, *boulder* containing free gold, visibly.

"No. 3.—Little Snowshoe Creek, a little *below our camp at Barr's place*. Pyrites with a felspar (?) weathering red. This occurs in small veins in rocks cut through by the creek at this place.

"No. 4.—*The Arastra, Haywood's discovery claim* above referred to, at the head of the Little Snowshoe. Decomposed pyrites in quartz and chloritic slate. Assay by Mr. Hoffman of specimen containing a little iron pyrites and chlorite, gave of gold only a distinct trace, and silver none. The same quartz honey-combed in places. Strike of ledge S.S.E., dip E.N.E. 45°, with rock, which is a gray slate. A tunnel has been run in to tap the ledge, something over 90 feet; direction, N. 6 E. This is known as the Arastra ledge, from the fact that an arastra was operated here by 'Live Yank' many years ago. Gold is visible occasionally.

"There is an abundance of quartz in sight. As the tunnel did not follow the quartz throughout, the developments are still insufficient to determine the continuousness and regularity of the ledge. In a hole 8 feet wide by 6 feet deep, there is chiefly quartz without any definite trend.

"This vein is the furthest up which is in direct connection with the rich placer ground.

"No. 5—Same locality, quartz, dark red mineral, is simply oxide of iron (?). Assay in hand.

"No. 6—Arastra dump; same locality as 4 and 5. Ferruginous quartz with chlorite and talc.

"The Arastra ledge was originally recorded as the Douglas ledge, after Sir James Douglas.

"No. 9—*The top of the hill*, 1,400 feet N.N.W. from the Arastra ledge, following the strike of the rock. This point is about half a mile east of 'Yank's ledge.' Galena, with whitish and yellow oxides.

"No. 10—Same location. Looking north, you see into the valley of the North Fork of Little Snowshoe. There is quartz scattered all over the top of the hill.

"No. 79—"*Snowshoe Plateau*, 'Yank's ledge,' westward and probably parallel to Arastra. A meagre ore; large body.

"No. 7—*Horseshoe Gulch*, forming the extreme north-easterly head of Little Snowshoe Creek. There are several ledges and stringers crossing this gulch diagonally in the strike of the slates; course, N. 30 W.; contents of ledge, quartz and galena.

"No. 92—*Steele ledge*. Quartz noted on track survey along ridge between Little Snowshoe and French Snowshoe in 1885. Honey-combed quartz, and brown iron oxide, with blackish parts. Several bodies of quartz a few feet wide show on the surface, without much appearance of continuity, nor containing much mineral visibly. Developments, about 18 inches, sunk on ledge. This locality is about 200 yards east of No. 8.

"No. 8—"*Galena ledge*.' Supposed by Haywood to be in line with the Arastra ledge. S. 21 E. from Arastra ledge three-quarters of a mile. On a spur forming the north-west side of Yank's peak, one-fourth of a mile from summit. This is close to the Steele ledge, and is supposed by Mr. Haywood to be on the same ledge, and in line with the Skye tunnel ledge on French Snowshoe, which figured during the quartz excitement of 1878. It is a barren-looking white quartz. Specimen contains red and yellow oxides with quartz.

" AROUND SNOWSHOE PLATEAU.

"No. 91—*Holmes ledge*, Breakneck Ridge, head of Six-Mile Creek, Snowshoe Plateau. Zincblende and galena along with iron pyrites occur in black slates associated with gray slates. Strike east and west, attitude nearly vertical. It is in a comb of slate extending down from the mountain, the country rock striking N.W., dip N.E. 70°. Cleavage lines of large masses appear to correspond with the strike of the rock. Body of ore very considerable in the shape of nests from 3 to 6 feet in width, the continuity of which has not apparently been determined by openings.

"A little surface scratching was done many years ago. A sack of the ore was sent to San Francisco for a working test, which resulted very favourably, having yielded, it is said, a profit to the owner above costs of test.

"No. 93—Same locality. Galena and zincblende with white oxide. Assay in hand.

"No. 11—*Cunningham-Harvey summit*, camp near trail. Charley Fenton's find. Fine-looking iron pyrites and brown oxide with blackish nests in quartz. Bunches of quartz and small ledges without apparent continuity.

" HARVEY CREEK.

"No. 12.—*Harvey Creek Ironstone Ledge*, below falls of Harvey Creek one-quarter mile. Olive and bluish feldspar with iron pyrites. Over three feet in width.

"No. 13.—Same locality, 200 feet further down the creek; 3 to 10 feet wide.

"There is an immense body of mineral in these two places. Massive bodies of iron pyrites, weathered red on the surface, projecting on and crossing the creek. Breaking off, form large boulders, found in the placer mines below. Strike E. and W., dip N. 60° with slates apparently.

"BETWEEN THE HEAD OF KEITHLEY, MAIN QUESNELLE AND SWIFT RIVER.

"No. 94.—*Cariboo Mountain*, near transit station, on western end. A very barren looking white quartz, in some places stained light yellow. Specimen contains some brown oxide of iron and a black brown mineral not further determined. Specks of free gold are visible occasionally.

"No. 95.—Ditto. Strike N. 85 E., dip southward 80°, or, in other words, nearly vertical. It plunges down, and follows midway the steep northern escarpment of Cariboo Mountain, and is conspicuous above the surface from 6 to 12 feet in width for one-third of a mile. Beyond that, to westward and eastward, its identity becomes less certain by reason of neighbouring croppings. Although broken fragments are found to westward in the line of strike, the appearance is that of a diminution in strength in that direction. Cross stringers, however, occur plentifully. Country rock, grey slate. Three-quarters of a mile to the westward black slate succeeds the grey. Several miles to the westward, on or near the strike of the vein, Mr. Porter panned gold out of the surface dirt at a point where the mountain slopes down into the valley of Swift River.

"ROUND TOP MOUNTAIN AND CUNNINGHAM CREEK.

"No. 96.—*On Round Top Mountain*, comb of quartz or quartzite at transit station. Evidently too massive to be anything else than barren. The summit itself is mostly quartz or quartzite, which rises into peaks and strikes with the rest of the country rock; strike N. 80 W., dip northward 40°.

"No. 97.—*Big ledge or comb of quartz*, or quartzite, on the eastern member of Round Top Mountain one mile S.E. of last. Oxides of iron in small quantity with very little pyrites. Strike more to the S. E. than on the main summit transit station; dip also northerly, but steeper. Country rock, slate.

"This comb runs from one-quarter to three-quarters of a mile E. S. E. from our Round Top camp, striking over the summit of the eastern mountain. Slides from it on the north side form parallel bands of quartz, or quartzite, show oxides of iron in sufficient quantity to colour the side hill of the northern escarpment red; visible at a mile's distance.

"No. 28.—*Cunningham Creek*, near the *head of Sharp's Ditch*, two miles west of Round Top, and 100 feet above ditch. Iron pyrites nearly pure. Assay in hand.

"No. 29.—Same locality; ore more or less decomposed, with quartz; course, N. W. and S. E. with the rock; dip northerly less than 48°. In quantity there is considerable, but the continuosness of the ore body has not been proved.

"On *Cunningham Creek* a quartz vein *crosses the creek* just below the trail, crossing between *Sharp's* and the *Harvey Creek* summit. This was not seen by me.

"No. 21.—*Sharp's Diggings*, *Cunningham Creek*. In bed of creek iron 'rock,' with quartz and feldspar; assay not completed. It is called the 'Big Iron ledge,' and is an iron stained dyke containing pyrites.

"No. 22.—*Chinaman's Diggings*, *on hill-side*, west side of *Creek*, half a mile below *Sharp's* on *Cunningham Creek*. Decomposed pyrites; hornstone with iron oxide cement.

"Great numbers of quartz boulders like specimen are found scattered, indicating proximity to a ledge of good character, both as to quality and quantity. The diggings in 1886 yielded well. It is a side-hill gravel deposit of local origin.

"ON ANTLER CREEK.

"No. 24.—*Antler Creek*, "*Limestone Ledge*," one-quarter of a mile above Alex. Porter's cabin. Quartz with yellow ferruginous oxide. Assay in hand.

"Nearly opposite to this locality is *Nugget Gulch*, the name of which sufficiently indicates its origin. Quartz runs in the strike, or bedding of the rock. It is in small seams, except at the *Limestone Ledge*, where it is several feet thick. *Nugget Gulch* has been mined 1,000 feet up, but not prospected to bed-rock beyond. It runs in the direction of *Cunningham Creek* at a point one-third of a mile above *Sharp's* in the line of pay, Mr. Porter thinks, which strikes through *McCallum's Gulch* on *Williams Creek*.

"No. 25.—*Porter's Last Prospect*, middle *Antler Creek*; a little below the old town of *Antler*, on west side. Pyrites and brown oxides, with black parts in quartz. Assay in hand.

"Two ledges here shown within 50 feet of each other. This one is best seen above the trail,

several hundred feet back. Strike E.S.E., dip to southward 80°. These ledges show also in the creek, and beyond it several hundred yards E. S. E.

"No. 26.—Same locality. Quartz with yellow and white oxides.

"No. 27.—Same locality, ledge situated lowest down. Iron pyrites and brown oxide.

"Assay by Mr. Hoffman of quartz coated with oxide of iron, gave of gold distinct trace; silver none.

"Here is a large body of ferruginous material containing some fine looking quartz. Body and character of ledge cannot be determined without digging.

"No. 98.—*Pebble of ironstone* found in sluices of Yellow Lion Company, McBean's Flat. It is a jasper approaching in purity to hematite, but was probably derived from a pyrituous ledge. Wherever these pebbles are found on Antler Creek it is said there is gold found with them.

"ON GROUSE CREEK.

"No. 53.—'*Fountain Head*' Ledge, Grouse Creek. Pyrites weathered out of honey-combed quartz. Assay not completed. Strike, N. 50 to 55 W., dip northward 60° to 70° with bedding apparently. Width, 10 feet, in parallel stringers, separated by selvages. The vein does not show on the east side, but ought to go through the Ottawa Company's placer claim.

"No. 53-1.—*Lady Dufferin* Ledge, Grouse Creek. Quartz pyrites and iron oxide. Assay in hand. Strike, S. 65 E., dip northward 70° with the rock. Exposed by a tunnel 65 feet deep running S. 75 W. Width, 5 feet 9 inches. Rather barren looking quartz with iron sulphurets in stringers running into the hanging walls.

"On the east side of the creek the ledge is called the Lord Dufferin, and is exposed by a tunnel running S. 25 E. to a depth of 175 feet. Its strike, as seen at the surface, appears to be S. 25 E., dip northward 60°; but on entering the tunnel it is S. 80 to 85 E., dipping from nearly vertical to 50° northward—showing a displacement by a twisting movement. A porphyry streak of 6 inches divides the ledge. From loose pieces it is supposed that additional porphyry dykes exist, and had, probably, a good deal to do with the disturbance.

"The country rock is a spotted blue slate which falls down in large angular blocks, often knotty in appearance.

"The Dufferin and the Fountain Head are well toward the head of Grouse Creek, half a mile above the placer mines. Adjacent to the placers at least one promising ledge is reported, now buried under gravel.

"AROUND WILLIAMS CREEK, NEAR BARKERVILLE.

"No. 54.—*Proserpine* ledge at Wilkinson House, near Barkerville. Quartz and pyrites with chlorite.

"No. 55.—Strike and dip, etc., not visible on account of the filling up of the shaft; supposed to be in line with Mason Avenue, which runs N. 47 W.; to Bonanza ledge N. 43 W. The strike of the soft black slates, taken 200 feet west of the Wilkinson shaft, was found to be N. 43 W., dip about vertical; hence the ledge here may be considered to be between beds. The shaft is 50 feet deep, and was sunk in 1864-6 by Wilkinson.

At a distance of 630 feet W.S.W. is the supposed Steadman ledge, a body of quartz striking east and west, with a southerly dip of 75°. It is in slates striking N. 33 W. and dipping north-eastward 65°, showing local irregularity in the attitude of the country rock, and an intersecting vein system.

No. 56.—*Proserpine* ledge at Proserpine shaft-house, Williams Creek, Barkerville. Galena and iron pyrites mixed with chloritic slates and oxides.

"Assay by Mr. Hoffman of specimen containing iron pyrites and galena in a gangue of quartz and chlorite, gave gold, .787, silver, 20.738 ounces to the ton.

"No. 57.—Same locality, brown oxides with iron pyrites, bluish feldspar (?) and chlorite. No galena. Assay in progress.

"No. 58.—Same locality. Pyrites in 'slate,' said to have assayed very high.

"No. 60.—On the same ledge 700 feet east of the Wilkinson shaft is the Proserpine house, and 200 feet farther the Proserpine shaft-house. The shaft is 97 feet deep, and also filled with water. Mr. Forest states that the vein dips S. 75°, and is 10 feet wide. An average assay of the dump is said to have given \$20.

"*Stouts Gulch* Hydraulic Diggings, near Barkerville. An assay by Dr. Harrington in 1876-7 of a specimen collected by Dr. Dawson from a 5-foot cross vein containing white quartz with iron pyrites, gave gold .335, silver, .131 ounces to the ton.

"No. 100—*Bonanza* ledge divide, between Stout's Gulch and Lowhee Creek, near Barkerville. Quartz, with polished 'slickenside' wall containing iron pyrites.

"No. 99—Same locality; quartz and iron pyrites, with graphite.

"An assay of south casing of *Bonanza* ledge by Dr. Harrington (Report of 1876-77, p. 477), gave gold, .064 ounces, silver, .023 ounces to the ton; of north casing, only traces of gold; and of blue quartz, containing slaty matter, only traces of gold.

"Specimens received at the survey office in 1878, containing white quartz, pyrites and some carbonaceous matter, gave gold, .554 ounces (\$11.45); and gold .073, silver .335 ounces to the ton. It had been reported as containing \$90. [Rep. 1876-7, p. 478.]

"A tunnel several hundred feet in length strikes the ledge 55 feet below the surface, and a shaft from its inner end 50 feet deep shows the ledge to a depth of 105 feet below the surface. Counting in the side stringers it is estimated to be 23 feet in width. Some galena is found in hanging wall; in the foot wall it is all pyrites. Country rock, slate; having evidence in places of fragmental origin. Mr. Forest also states that this rock was assayed in 1878 and reported to contain \$90 a ton; and that subsequently the assays were reported erroneous. Mr. Harper worked some tons at Nason's mill and claimed that it paid \$3 to \$4 a ton, but did not get gold enough to make a bar. No rock from the *Bonanza* was crushed in Riotte's time, nor subsequently, beyond test samples.

"Strike of ledge, N. 48 to 63 W.; dip northward, 45° to 60°; strike of slates in tunnel, N. 65 to 80 W.; dip northward, 45° to 60°. The above are repeated trials at different places. Taking an average, that of the ledge would be N. 55½ W., and of the rock N. 72½ W. The strike of a large body of quartz on the surface several hundred yards east of the tunnel known as the Big Blowout, agrees, in the main, with that of the ledge in the tunnel. It is plotted on my track survey as W. N. W.; but Mr. Craib, who observed instrumentally at my request, reports it strikes N. 49 W. On the whole, I am inclined to think the *Bonanza* ledge runs in the bedding of the rock.

"*Steadman Ledge*, Richfield, Williams Creek. A body of about 4 feet in width can be seen near the bed of the creek, where it has been exposed by an open cut. Strike, N. 48 W., standing about vertical. Fifty feet from it the slate rock strikes S. 35 E. and dips north-easterly 70°; apparently in broken ground, as a hundred yards above it and about the same distance below it on Williams Creek, the slate rock strikes S. 65 E. and dips northward from 70° to vertical.

"A specimen sent to me by James Reid in December, 1886, obtained from a depth of 30 feet, assayed by Mr. Hoffman, contained, of gold, a distinct trace; silver, none.

"No. 101—*Hines Ledge*, Williams Creek, above Richfield. Quartz with pyrites and mineral resembling zinc blende. Assay in progress.

"A body of quartz several feet or more in width was sunk upon by the occupant of the adjacent cabin and Mr. Walker; depth of shaft, 6 feet; body of ore, 4 feet; direction of strike and continuance unknown. It is at the head of the profitable placer mining on Williams Creek. The rock contained little or nothing.

"No. 68—*Sergeant Lindsay* ledge, Cariscraig, Richfield mountain. A uniformly white barren-looking quartz specimen, has fragmental quartz, with brown iron oxide in layer or band.

"Strike of main ledge N. 69 to 76 W.; side ledge, N. 81 W. Width of main ledge, 4½ feet; side ledge 2½ to 5½ feet. The main ledge dips S. 50°, and the side ledge is vertical. These two bodies form a single ledge at the foot of the hill, where the ledge has been opened, and diverge at a small angle to the westward. Country rock, grey slate, with an apparently flattish dip. It has a cleavage striking S.S.E., dip, easterly, 60°.

"Great bodies of similar quartz crop on all sides near this ledge, and show a continuance in many different directions by smaller croppings.

"No. 61—*Home Rule* ledge, O'Neill, Barkerville, Williams Creek, half mile west of lower town. Very yellow oxide, with dark, pitchy-looking mineral.

"No. 62—Same locality, duplicate with similar yellow earth, pyrites, and pitchy mass, along with limonite.

"Assay by Hoffman of a specimen containing an association of galena, iron pyrites and limonite, gave, gold, .020; silver, 6.562 ounces to the ton.

"No. 64—Same locality. Galena, with a reddish-brown oxide.

"No. 65—Same locality. Galena and pyrites, with other oxides white and yellow. Also, a horny-like mineral.

"The opening on this ledge is a hole less than 10 feet wide and deep, leaving the strike

and dip uncertain. Mr. Dooley, the first locator, considered it as running east and west. Mr. O'Neill, the present owner, considers it as running north and south, similar croppings occurring in both directions, basing his conclusions on appearances in the opening. These would indicate a ledge of about 5 feet in width, dipping east 80° , having porphyry in the foot and hanging walls. There is, however, a stringer of quartz extending through this porphyry in an easterly and westerly direction, dipping S. 75° , which may represent the Dooley ledge.

"The principal characteristics of the Home Rule ledge is its abundance of mineral in the shape of galena, limonite, pyrites, and their oxides. In these respects it is not excelled by anything I have seen in the district.

"At a distance of 250 feet south of Mr. O'Neill's opening there is a body of mineralized quartz from 5 to 6 feet in width, striking N. 41° E. and dipping north-westerly 80° . Twenty feet to the east of that there is a confused body of quartz separated from it by porphyry. In the general direction from the Home Rule opening Mr. O'Neill has found other similar croppings between this and the mouth of Conklin Gulch.

"No. 66.—*Dooley Ledge*, Barkerville, Williams Creek, being easterly extension of last. Galena, pyrites, and limonite, with white oxide (of lead or zinc?) also greenish mineral (copper?) Assay in progress.

"Mr. Dooley's principal opening is about 500 feet east of the Home Rule opening, and the body of quartz disclosed, strikes N. 75° W., dip S. 70° ; width, 3 feet. It does not show as much mineral. What there is resembles that of the Home Rule opening, except in the lesser degree of decomposition. The country rock in the vicinity, a spotted slate, strikes N. 80° west, and stands vertical. Probably, on further developments, the ledge will be found to run with the slate. On the brow of the hill, back of Sincox's dwelling, the latter strikes N. 75° W., and dips N. 75° .

"No. 85.—*Clear Grit* claim, Canadian Creek; 9 specimens collected by Mr. McEvoy, and 6 by Mr. Porter. Body, 5 feet. Strike apparently with rock—N.W.; attitude, vertical.

"ON LOWHEE CREEK

"*Enterprise Ledge*, Lowhee Creek. Assay of a specimen sent by W. Pollard to the Survey Office in 1878, containing white quartz pyrites, iron oxide, and slaty matter, gave gold, 20.096; silver, 4.929 ounces to the ton. Opened by a tunnel, about 350 feet long; body, 8 to 10 feet; strike, N. 62° W., vertical.

"No. 67.—*Jack Pinkerton's Ledge*, Lowhee Creek, near *Enterprise Ledge*. Quartz not containing anything, visibly. Polished vein wall. Strike, N. 59° W.; dip, northerly 85° ; width, 9 feet. The ledge is about 200 feet north-west and parallel to the *Enterprise*; both running with the slate, which dips, however, S. 70° in this vicinity. They cross Lowhee Creek, about 2,000 feet below the *Victoria* upper shaft house. Strikes near the position of the *Ralph Ledge*, on *Barkerville Mountain*. The country rock is a finely laminated chloritic slate.

"These ledges, accordingly, do not lie in the extension of the *Cariboo*, or *Bonanza*; which, according to Mr. Jack Pinkerton, crosses this mountain about 800 feet to the south-eastward.

"On *Lowhee Gulch*, where the *Enterprise* and *Pinkerton* Ledges cross it, the slates have the same strike, S. 60° E., showing an unbroken country between; but the dip is less, being only about 40° , and the colour more greyish. Sincox, Jr., George Byrnes & Co., in 1878, drifted in quite a distance on a ledge at or near this crossing.

"The walls are remarkable for their perfectly polished slickensides.

"No. 83.—*Victoria Shaft Ledge*, Lowhee Creek. Peculiar quartz crystals, encased in galena. Supposed by Mr. Forrest to be the western extension of the *Bonanza*. The *Victoria* was tapped 100 feet west of the shaft-house, by a tunnel running magnetic north, which cut a body of sulphurets 2 feet in width, breaking off abruptly to eastward, in the direction of *Bonanza*.

"*Sam Crane's Old Store*—Stringers yielding \$20 a ton.

"ON ISLAND MOUNTAIN.

"No. 52.—'*Lady of the Lake Ledge*,' on west shore of *Jack of Club's Lake*. Pyrites and quartz. Assay not completed.

"A tunnel was run in by *Forest, Dunlevy & Co.*, some years ago; course, W. to N.W.; continuity undetermined; body in places, 8 feet. Vein lost.

"No. 102.—*Fox Ledge*, *Island Mountain*. Iron pyrites, and quartz.

"No. 103.—Same; heavy with pyrites. Yielded colours of gold in oven after roasting. Strike of little ledge, W.S.W.; dip, southward 85°; strike of country rock, S.W.; dip, northward 40°. Assays of selected ore are said to have yielded \$60 and \$70 to the ton.

"No. 104.—At the *Wright Ledge*, near by, the tunnel runs in S.W., in the strike of the rock 150 feet, then S. 5 W. 170 feet; total, 320 feet. The ledge lies along the tunnel for the first 20 feet after entering it, then leaves the tunnel to the left. Country rock in tunnel strikes S.W.; dip, northward 30°. Assays said to have yielded \$50 to the ton.

"*Atcheson ledge*, between Fox and Wright Ledges. Galena.

"About 200 feet to the eastward from the mouth of the Wright and Atcheson openings, Mr. Walker, in 1869, run a tunnel S., 124 feet in length, nearly at right angles to these ledges, without striking them, showing that they pass more to the north; and, further, that the Walker ledge does not, as it should not, pass in that vicinity.

"No. 105.—*Walker Ledge*, Island Mountain. Honey-combed quartz, and brown iron oxide from decomposition, with glistening white talcose mineral, resembling mica. Assay in hand.

"No. 106.—Same locality. Quartz, iron pyrites and greenish talc.

"The cut into the Walker ledge runs S. 50 feet, striking the ledge nearly at right angles. The ledge here strikes S. 75 W., and dips to southward 60°. A heavy body of quartz is in sight, varying in thickness from 3 to 6 feet. Strike of rock in cut near ledge, S. 60 to 65 E.; dip, N. 45°. A quantity of rock milled by Riotte in 1878 yielded \$19.03 to the ton; but it appears to have been imperfectly roasted. The bulk of the rock worked was hauled to the Lane and Kurtz mill and not roasted at all. As it is pyrites, with very little or no free gold, it yielded only a few dollars to the ton.

"During the winter of 1885-6 Mr. Nason worked 3,000 lbs. of ore from this ledge taken from the dump at the ore-house and obtained \$19.70. Mr. Dunlevy sent a sample of the tailings to Pittsburgh for assay and got a yield of \$61 to the ton.

The *Sadou* ledge is opened by a short tunnel, several hundred feet to the westward from Walker's opening. It is a ledge crossing the above-named; strike, S. 30 to 45 W.; attitude, nearly vertical. Mr. Walker observed it as S. 14 W. magnetic, which agrees approximately with my observation. In 1878 a large smoke seen at Burns mountain ledge was in line. Strike of country rock, S. 55 W.; dip, northward 45°.

"Assay by Harrington, in 1876-7, of rusty quartz with mica slate from the *Sadou* ledge gave, gold, .175; silver, .802 ounces to the ton. A milk-white quartz coated with hydrated peroxide and pyrituous cavities gave, gold, .658; silver, .233 ounces to the ton.

"The *Sadou* claim runs 600 feet in the general direction of the ledge up into the mountain, taking in a width of 100 feet. It is owned in Paris. At the bottom of the cut there is evidence of a fault, in quartz lying near to, if not belonging to the ledge.

"West of the *Sadou* ledge, crossing in the south-west corner of the clearing, another cut, ending in a short tunnel, has been run into the *Walker* ledge. It is 420 feet westward from the ore-house. The slate rock strikes N. 75 W., and dips northward 45°; perhaps is a little disturbed. A bearing taken along its strike, as indicated by Mr. Walker from his developments here and elsewhere, was S. 79 W.

"About 500 feet further west, in this direction, the ledge is again opened by a cut which discloses a body 3½ feet in width, nearly vertical, or dipping slightly to the south. Mr. Dunlevy here owns an extension of 1,500 feet. The ledge is traced another 1,500 feet west, where it is known as Joe. Mason's extension. About a mile beyond that, to the westward, are the ledges elsewhere noted, having a similar strike at the head of Mosquito Creek placer diggings.

"Mr. Walker informs me that about 2,000 feet west of the Dunlevy cut, Flynn & Co., under the name of the Soda Co., have located a ledge which crosses the Walker, striking N.W. magnetic (= N.N.W. true), which is 4 feet wide, and yields an assay of \$38 to the ton.

"No. 107.—*The John's or Island Mountain Ledge*. Iron pyrites and quartz. Assay not completed.

"This is supposed to be identical with the Walker ledge. It is 830 feet east of the Walker opening, and within 1,500 feet of Jack of Clubs Lake. Strike, as observed in tunnel, N. 83 W.; dip, southward, 60° to 75°. Mr. Walker gives the strike as S. 50 W. magnetic, = S. 75 W. true, or 22 degrees more to the south than I found it in the John's tunnel.

"The rock strikes W.S.W. to S.W.; dip to northward, 25 or 30 degrees.

"A well-defined pyrites ledge of 41 to 51 inches has been followed in about 50 feet.

"Following the strike of ledge at the John's tunnel eastward about 1,200 feet on Mr.

McEvoy's line of survey, in sight of Jack of Clubs Lake, and 300 feet back from it, additional bodies of quartz have been found, having a similar strike, but no continuity in the developments so far made. This extension of the Island Mountain or Walker ledge is claimed by Robt. J. Walker. The rock near the lake strikes S. 65 W., dipping northward 45°, accordingly agreeing with that of the John's tunnel.

"For several thousand feet here the quartz opened to sight, it will be observed, while not departing very widely from the strike of the slates, distinctly does not follow their bedding.

"The Walker ledge shows, wherever opened, every appearance of regularity, and continuousness in force. Its eastern extension at the John's tunnel or Island Mountain ledge, varies in strike from that in the neighbourhood of the Walker ore-house to the extent of 20°.

"The Island Mountain Company's operations during 1886 included the purchase of the Lane and Kurtz mill, and the grading of a mill site on Jack of Clubs Lake, at a point where the course of the western portion of the ledge would strike the lake, but 600 feet north of Mr. McEvoy's line of survey, where the John's tunnel ledge would strike it.

"From the John's tunnel it was proposed to deliver, during the winter, 1,000 tons of quartz and to add to the mill concentrators, and roasting and leaching appliances for its treatment. A working test of a sample lot from the John's tunnel, I am informed, yielded Mr. Craib over \$30 to the ton.

"I have been asked the question: Whether the heavy expense of erecting a roasting furnace, along with concentrators, would be justified by the quantity of ore in sight? With tolerably good assurance this may be answered in the affirmative, other considerations being favourable.

"ON MOSQUITO CREEK.

"No. 48.—*Saunders' Diggings*, Mosquito Creek. Quartz ledge in placer diggings. Brown iron oxide and white mica in quartz with a weathering feldspar.

"No. 49.—Duplicate. Iron ochre and pyrites, with nests of pitchy mineral and white mica. Assay not returned. Strike, N. 62 E., dip north-westerly, very steep. Strike of country rock, S. 75 W., dip northward 80°.

"No. 50.—*Flynn's Diggings*, Mosquito Creek. Float galena, supposed to come from adjacent ledges in diggings, or near them; accompanied by iron pyrites and iron ochre. Assay not returned.

"No. 51.—*Flynn's Upper Diggings*, Mosquito Creek. Quartz ledge or body, irregular in shape. Containing a white talcose mineral.

"These are the uppermost placer diggings on Mosquito Creek. Six hundred feet further up Mosquito Creek forks; in the forks a tunnel has been run into the hill 500 feet, intersecting two or three quartz ledges of moderate size. Their course is easterly and westerly. One contains a great deal of galena, and is probably the source of the numerous specimens of that mineral found in Flynn's placer mine. Another contains much sulphuret of iron.

"No. 52.—*Head of Mosquito Creek*, one mile above Flynn's cabin. Supposed Island Mountain or Walker Ledge. Galena with white and yellow oxides. Assay not returned. Course of ledge E. and W. magnetic = N. 64 W., dip S. Body about five feet.

"ON SUGAR CREEK.

"No. 30.—*Upper Ledge*, in cañon above Wiley's house, Sugar Creek. Quartz and iron pyrites. Assay not returned. Strike of ledge N. 80 E., dip northward 75°. On the south side of Sugar Creek a body of quartz 6 to 8 feet in thickness stands above the surrounding surface. On the north side there is a bench fifty feet above the creek, which was worked by Mr. Wiley 10 years ago. It yielded \$4 a day near the ledge, and \$2 a day away from it.

"No. 31.—*Lower Ledge*, in cañon, 150 feet from last, Sugar Creek. Contains little visible mineral, but a peculiar red weathering feldspar. Assay not returned.

"No. 32.—Same locality. Iron oxide and white mica or talc. Assay not returned.

"This strikes N.W. and S.E., and dips to southward 70°; accordingly crosses the last mentioned on the bench. At the edge of the creek on the east side there is a body of fully 3 feet in width, which appears to be a bunch; continuity doubtful.

"No. 33.—*Bench Ledge*, on east side of cañon, near Wileys, Sugar Creek. Iron and copper pyrites with malachite and pitchy mineral.

"No. 35.—*At ditch water-fall*, above Wiley's house, Sugar Creek. Brown iron oxide in moderate quantity. Body two feet; strike, with slates, S. 55 E., but not following their bedding. It dips S. 60, while the slates dip north about the same amount. It yielded gold

appreciably in the sluices of the placer mines adjacent. Does not contain much mineral visible to the eye.

"No. 36.—Ledge at *Wiley's cabin*, Sugar Creek, passing under wood-shed. About 200 feet below last. Dirt from its vicinity thrown into Wiley's sluices yielded a different gold from that of the placers overlying, although invisible to the eye in specimens. Pure iron pyrites, with black coating. Body 2 to 2½ feet. Continuous thorough the diggings. It runs with the slate, apparently crossing the creek into the hydraulic diggings at Walker's tunnel.

"No. 37.—Same locality, stringer of pure pyrites about 5 inches wide found between last and preceeding ledges.

"No. 43.—Still another ledge crosses Sugar Creek about the middle of the *lowest placer bench* worked to bedrock, a quarter of a mile below Wiley's house. It is 4 feet thick, and contains an abundance of sulphurets. Strike, N.W. and S.E., vertical. Body 2½ feet.

"No. 38.—On south side of Sugar Creek, opposite Sam. Walker's cabin, in *Wiley's old diggings*, at mouth of Cooper's Creek, containing some conglomerate cement boulders. Quartz pyrites and brown iron oxide. A ledge of good body, 2 or 3 feet, and fine looking ore, but undetermined continuity. Placer ground was rich in its vicinity. Mr. Wiley attributes it to the ledge.

"No. 44.—Near Sugar Creek, about 2,500 feet up *Cooper's Creek*, there is a '*galena ledge*,' 2½ feet wide, weathered into a hollow which runs up the mountain side. It may be identical with the galena ledge crossing Sugar Creek a mile above Cooper's Creek. Galena and pyrites. Assay in progress.

"No. 45.—Same locality, white coating.

"No. 46.—Sugar Creek, towards *head of Cooper's Creek*, near last. Barren looking quartz with white mica or talc. Strike, S. 80 E., dip, N., nearly vertical.

"Cooper's Creek forks here. Up the S. S. E. branch one-quarter mile another ledge crosses, striking S. 50 E., and dipping southward 70°, in which there is nothing visible at the point of crossing. Mr. Wiley thinks it is the same ledge which shows on the point of the mountain about half a mile to W.N.W. in good body, containing at that place abundance of iron sulphurets.

"No. 49.—*Cooper's Creek*, a little over half a mile above its mouth. A 2½-foot vein containing plenty of mineral, pyrites, and galena.

"On *Mustang Creek*, which enters Sugar Creek half a mile below Wiley's, there are several quartz ledges seen crossing Isaac's placer diggings diagonally. They are two miles above its mouth. Mr. Wiley supposes them to be the continuation of the upper Cooper's Creek ledges,

" ON LIGHTNING CREEK.

"No. 78.—*Sam. Montgomery's Ledge*, Lightning Creek, near Stanley. Barren looking quartz. Assay not completed. Strike (from information), about S. 30 E. Body, 2 to 4 feet.

"Mr. Montgomery reports a ledge uncovered in the diggings at this place about 1876, which had a strike of S. 30 E., as nearly as he can recall it, and a width of 4 feet. It is, probably, identical with the ledge from which the specimen was obtained, cropping under the bluff on the south side of the creek, a little above Montgomery's cabin.

"At the timber shaft, about 100 feet farther up, there was uncovered a '*rotten ledge*,' from 4 to 6 inches in width, which crossed the creek in the same direction. The diggers went down into the '*rotten ledge*' 4 feet, all along its course, and washed the loose stuff. It yielded the best prospects in the claim. Montgomery got coarse gold out of it, \$4, \$6, and an ounce (\$18) in weight. About 600 ounces of the coarsest gold in the claim was gotten out of the rotten ledge.

"No. 69.—*Lightning Creek, south side*, opposite lower end of Van Winkle Dump. A small ledge, or stringer of 6 inches, in strike of rock. Brown iron oxide in quartz, with chlorite and white mica or talc. Assay not returned.

"Strike, S. 72 W.; dip, southerly 40°. From this point, 300 feet down Lightning Creek was the richest placer ground on the creek. David Edwards, who cleaned the bed-rock after drifting, states that quartz was visible in considerable quantities in this claim. A large mass of it was found on the bench on the north side, about 200 feet below; but no ledge was visible under the creek, so far as he knows.

"No. 70.—*Lightning Creek, north side*, near Van Winkle Co.'s headquarters. Ledge on north side of road. Brown iron oxide, light yellow oxide of iron; and black substance. Assay not completed.

"Strike, N.W.; dip, N.E. 55°; thickness, 2 feet, with parallel seams of smaller size. This is on an island of bed-rock between the Point Claim (in the deep ground under the point) and the present Van Winkle Creek. Mr. Edwards thinks it is not in place. The rich placer ground included the Point Claim. In 1875, four picks here, working in two shifts, took out 500 ounces a week. There was considerable quartz in the Point.

"Above this, there are three or four more small ledges crossing Lightning Creek.

"No. 72.—*Perkins Ledge*, Burns Mountain. Galena and honey-combed quartz.

"No. 73.—Same locality. Nearly pure galena, with white and dirty yellow oxides.

"No. 87.—Same. Honey-combed quartz and chloritic slate; pyrites dissolved out. Dark brown, bluish, and black oxides.

"An assay by Mr. Hoffman of quartz carrying a little galena, gave gold, 2.625; silver, 3.033 ounces to the ton.

"Cropping at numerous places between the Reid Tunnel, Perkins Shaft, and the Burns Mountain Company's Tunnel, on Burns Mountain, there is a series of ledges, commonly from 6 inches to 18 inches, but often 3 feet or over in width, striking from N.N.E. to E.N.E., and generally, nearly vertical. The country rock in the locality varies in strike as much as 90°, while the ledges are rather uniform, keeping the general direction of the group or family of parallel ledges to which they respectively belong.

"The country rock graduates from slate to shale, altered from sandstone. It is a soft rock in places, silicified in others; and in the Burns Mountain Company's Tunnel is hard to drill.

"No. 90.—*Burns Mountain Company's Shaft*. Iron (and arsenical?) pyrites in honey-combed quartz; yellow iron oxide. Assay in hand. Strike of ledge N. 36 E., as staked off by Mr. Jacques; attitude, vertical; strike of country rock, N. 35 E.; dip, south-easterly 30°.

"At their principal shaft the Burns Mountain Co. has sunk on a ledge 5 feet wide at the surface, to a depth of about 50 feet. In the last half of that distance the ledge suffered a break; the quartz diminished to 2½ feet, pinched out and came in again in considerable force; but its further continuity has not been determined. Selvage lines and gouge, with broken rock, filled the place of the broken vein.

"From a point on the northern slope of the mountain, 174 feet lower than the shaft-house, a tunnel has been brought in over 800 feet in length, to a point vertically under the shaft. Two series of veins were intersected, running N.E. and N. 30 to 36 E. respectively.

"During the season of 1886 they were drifted on, and prospected under the superintendance of Mr. Jacques, with a fair promise, as I understand, of finding a good body and paying ore as soon as the necessary connections are made.

"No. 71.—Burns Mountain Co. 'Silver Ledge.' Galena and pyrites. Strike, N. 30 E.; body, 2 feet; in tunnel very small.

"No. 74.—*Chisholm Creek*, near Stanley. Lowest ledges or stringers found near rich placer ground—just above Sam. Montgomery's placer diggings. Small veins of barren looking quartz. Assay not completed.

"Strike E.S.E., dip northerly 50°; body 10 to 20 inches. The diggings were worked in 1863-4, and paid \$50 a day to the hand—the richest on the creek. While those ledges may have contributed to that result in part, the probability is that most of the pay was due to ledges farther up.

"Two or three series with a similar strike are found between this locality and the junction of Oregon Gulch. Here a narrow vertical ledge crosses the gulch at its outlet, in a northerly and southerly direction, showing excellent ore.

"The 'Foster ledge' is in this vicinity. It is tapped by a tunnel a hundred feet further up Chisholm Creek, and is not accessible. It was at one time the subject of considerable attention, founded on facts reported in connection with the placers in the immediate vicinity. Its strike is said to be south-westerly.

"ON HIXON CREEK.

"No. 110.—*Quesnelle Company's* main shaft on *Washburn ledge*. Pyrites, grey copper, and oxides, with free gold in some pieces. Strike N. 46 W., dip north-easterly 70°, with country rock. Body from 6 feet to a few inches. Cross veins of less body, striking N.E. vertical, contain rich ores. The main shaft is 115 feet deep. The Mason shaft, several hundred feet N.W., at the base of the hill, is 40 feet deep; and the Koch shaft is 70 feet deep. Three more or less crooked and winding drifts have been run north-westward into the hill,

searching for a continuous ore body. Following bodies of quartz in several instances, their general course is in the strike of the slates, as given above. The oldest of these was run by Messrs. Buckley and Washburn, the next by Messrs. G. B. Wright and Coleman, and the last by the present company, under the superintendence of Mr. George Koch. The last mentioned is the only one open to inspection; starts from the bottom of the Koch shaft, and is 174 feet long. The others start in at the surface level, and are about two-thirds of that distance in length.

"From the main shaft drifts have been run along the strike in opposite directions, and also along the cross veins in opposite directions, and in other directions at different depths and in different places, amounting to a large aggregate of exploration. The lack of continuousness of the ore bodies heretofore found, and the smallness of the richer cross stringers, has been baffling; but the main shaft having been deepened, the company at last accounts was 'in bonanza.'

"RELATIONS OF QUARTZ VEINS TO PLACER MINES.

"Some striking facts will be noticed by the position of most of the ledges mentioned, with reference to the placer mines. It is impossible, however, to do justice to this subject in a summary way. Every old Cariboo miner has noticed the significance of the Bonanza and Proserpine zone of ledges with reference to the Williams and Lowhee Creek placers. The same relation exists in the Island Mountain ledges to the placers of Mosquito Creek; in the Fountain Head, Dufferin, and other ledges lower down, to the placers of Grouse Creek; and in the network of ledges enumerated to the placers on Sugar Creek. A similar system of ledges crosses the head of the paying portion of Hixon Creek and Little Snowshoe Creek. About the relations of these ledges to the wealth of the adjacent placers, it would seem there can be no reasonable doubt.

"Antler and Cunningham Creeks, it will be seen, have their ledges in suspicious contiguity, to say the least, to the placers of those creeks. The Duck Creek placers have a pretty distinct relation to the crossing ledges; and the same appears to be the fact with reference to the North Fork of Quesnelle and Spanish Creek.

"If the quartz prospector could be placed in possession of all the facts known to the successful placer miners, so many of whom have left the country, doubtless instances would be multiplied where the ledges plainly had a relation to the placers. As a general proposition this will scarcely be questioned. But there exists a supposed mystery, which formulates itself into the question—Why are the ledges which have been found so poor in the vicinity of such rich placers?

"REGARDING ASSAYS OF QUARTZ.

"This question can be answered, perhaps, in several different ways. The best way is to ascertain the precise facts, which will throw a good deal of light on the subject.

"It will not be amiss in this connection to mention the general fact that a pound sample of quartz found at or near the surface of a ledge is not conclusive evidence that the adjoining cubic yard (or ton) of quartz contains a like proportion. An assay button of such a sample of rock, containing \$9 to the ton, would weigh 1/4000 of an ounce, and be almost microscopic. Yet ore of that description, under fairly favourable conditions and good management, is capable of yielding hundreds of thousands of dollars per annum.

"It is also a fact not generally known, except to assayers, in regard to Cariboo quartz, that where there is an abundance of pyrites there is generally a good-sized button of gold. Where there is plenty of red dirt derived from decomposed pyrites the assay will most probably show plenty of gold. Where this has been knocked off from the specimen to be assayed and lost, there will be little. This may account for some low assays. Where the gold is not free the percentage of pyrites should be ascertained per ton, and the assay made of the concentrated pyrites.

"The creeks give the most reliable assays; and the reason for it is plain. As ores run in chutes and chimneys, with barren spaces intervening, the creeks have not tired in their work of exploration until they have torn out the necessary amount of rock to reach the richer portions of the veins, which contain the pay-ore.

"EXTENT OF DEVELOPMENT WORK.

"At the Proserpine and Wilkinson shafts little over a hundred feet of sinking has been done; at the Bonanza, a little over a hundred. At the Dufferin ledge, between two and three

hundred feet of drift has been run ; at the Enterprise, about three hundred ; at the John's ledge, about sixty ; at the Burns Mountain, eight hundred. All the other openings in ledges, leaving out Hixon Creek some distance to the westward, amounts to a shaft or tunnel of generally less than fifty feet. In many cases these developments strike only at one point in the ledge. The number of ledges, in addition to those named on which developments have been made, is about half-a-dozen.

“ REGARDING BODY AND CONTINUOUSNESS OF QUARTZ VEINS.

“The width or body of the quartz ledges in Cariboo is as great as in any other mining country. On Round Top mountain there is a body of quartz several hundred feet or more in width. On the north-west side of Yank's peak there is a belt many hundred feet in width, which shows great combs of quartz projecting above the surface and running in parallel lines down the mountain side. On Cariboo Mountain there is a similar comb, known as the Dominion ledge, standing prominently enough to be seen from Mt. Agnes, eleven miles away. Indeed, from almost any mountain in Cariboo ledges of this sort can be seen on other mountains many miles distant. It cannot be said that the quartz is lacking, nor that the ledges are *not wide*.

“It has been pointed out, however, as another mystery, if the gold is derived from the quartz veins, that the body or continuousness of the ledges in the placer belt appears to be lacking. To this, again, the best explanation and answer I can give is the actual size of the veins, as found, in connection with the facts regarding their strike and that of the accompanying country rock. Where so little has been done in drifting on individual ledges it is unsafe to build any theories on this subject or to accept any in regard to what we cannot see. The evidence, as it stands, is that in the line of strike, or within the narrow zone of slates accompanying the ledges, quartz reappears on the surface, in some instances for a number of miles. Most of the ledges show lines of croppings, traceable for several hundred yards to half a mile. I am not aware that the ledges of any other mining country whose reputation is established can do any better with as little search work as has been done in Cariboo.

“ STRIKE OF THE LEDGES AND OF THE COUNTRY ROCK.

“One cannot expect a ledge to be continuous in a direction in which it does not run.

“If any one should wish to trace on the ground, or on paper, the strike of any given ledge, or of the accompanying rock in advance of what I shall attempt to do in my report, in order to arrive at any conclusions of interest to himself I have here given the more important data for comparison. A proper treatment of this subject requires much care, extensive observation, and a quantity of map work.

“The prospector who has not the means of following a lost ledge by developments underground, steers his course by the country rock, rather than by the compass. For though the quartz is *later in date of formation*, it follows fissures in the rock previously existing whose course is influenced, if not governed, by the material through which they pass.

“The courses of the Proserpine and the Bonanza, along with the Enterprise and the Island Mountain Ledges, are well known in Cariboo. They appear to be in the same general line of strike. It is certainly easier, as well as more gratifying, to arrive at the conclusion that they are one and the same ledge than it is to discover any more precise facts which might not tally. A ruler laid on the map only shows them roughly in line, including the diggings of Sugar Creek to the westward, and of Antler Creek to the eastward. It will be seen that there are divergences in detail, along with the general uniformity, which are of interest, as well as of importance, to the practical miner.

“ THE ACCOMPANYING MINERALS

“Have not been given the attention they deserve, and are subject to revision, being only a transcript of the naming adopted on cursory inspection in the field. An examination with the appliances of the laboratory is in progress.

“ CERTAIN CHANGES

“In the aspect of the quartz mining industry may be noted very appropriately. In 1876 when I first visited Cariboo the yield of the placers was falling off. The out-going stages were carrying away not only all the gold, but the best energies of the country. This process has been going on to the lowest stage. A few of the plucky adventurers of Cariboo willingly

remained. Some of them interested themselves in quartz. In 1878 the Provincial Government, out of regard for this interest, sent a Cornish miner of good name as such into the district to develop the ledges. In 1878-9 followed the 'collapse.' It may be attributed, 1st, To the metallurgical difficulty encountered at the beginning without the necessary knowledge or experience. 2nd. To the pernicious influence of the Virginia City bonanza excitement of that time, which made stock dealing the basis of investment. 3rd. To the great cost of getting to Cariboo, and conducting the prospecting, and other initial mining operations. 4th. To a limited knowledge of the precise character of the resources of the country, resulting in a lack of confidence.

"Commercial depression ruled, and Cariboo was forgotten for a while. In its northern remoteness, its isolation in winter, the population seemed to be deserted by the rest of the world. In spite of the great discouragement to permanent mining, Cariboo has retained a considerable white population of the intelligence and energy characteristic of the better days of a gold mining country. Problems of development have been working towards a solution under conditions that may be described as heroic. A Chinese population, in quality far superior to that of the coast, grew in numbers and prosperity, until it became the mainstay of the country. At the present time perhaps the Chinese wave is receding. Railway investment has become justified. It is taking the initial steps to bringing Cariboo into the world of industry, peculiar to the Cordillera, in which it is destined to take a foremost rank.

"Contemplating these changes it is not difficult to see the improved conditions of the present time.

"TRANSPORTATION

"Of materials and supplies in connection with mining developments is a factor of the first importance. Hixon Creek is easily reached by steamboat connecting at the mouth of Cañon Creek with a nine miles sled road, constructed in 1885-6. Lightning Creek, Island Mountain, Williams Creek, and Mosquito Creek are already connected with the waggon road system of the interior, Grouse Creek and Antler Creek are easily reached by an existing sled road of four and nine miles respectively from Barkerville. Both of the sled roads mentioned can be made into waggon roads at a moderate cost.

"Sugar Creek can be reached with easy grades by a waggon road of six miles from Mosquito Creek, where there is a good trail. Snowshoe, Keithley, and Spanish Creeks, and the North Fork of Quesnelle, at present connected with the 150-Mile House from the south, and Antler Creek from the north, by first-class trails, present no serious obstacles to the construction of waggon roads in either direction; but from the south would have to be approached by way of Horsefly Valley and Hazeltine Creek.

COAL.

The following table shows the output of each year from 1874 to 1886, inclusive:—

Year.	No. of Tons.
1874.....	81,000
1875.....	110,000
1876.....	139,000
1877.....	154,000
1878.....	171,000
1879.....	241,000
1880.....	268,000
1881.....	228,000
1882.....	282,000
1883.....	213,000
1884.....	394,070
1885.....	365,000
1886.....	326,636

REPORT OF THE INSPECTOR OF MINES.

“NANAIMO, B. C.,
“1st February, 1887.

“SIR,—I have the honour to lay before you my report as Inspector of Mines, for the year ending 31st December, 1886, as required by the ‘Coal Mines Regulation Act, 1877.’

“The collieries operated in the year 1886, are the following:—

“Nanaimo Colliery, of the Vancouver Coal Mining and Land Company, Limited.

“Wellington Colliery, belonging to Messrs. Robert Dunsmuir & Sons.

“East Wellington Colliery, owned by R. D. Chandler, Esq., of San Francisco.

“There has not been any work done at the Alexandra Colliery, which was started in 1884, in Cranberry District, by the Esquimalt and Nanaimo Railway Company.

“The output of coal for the year 1886 amounted to 326,636 tons, as follows:—

Nanaimo Colliery.....	112,761 tons.
Wellington Colliery.....	185,846 ”
East Wellington Colliery.....	28,029 ”
<hr/>	
Total output in 1886.....	326,636 ”
Add coal in stock 1st January, 1886.....	25,653 ”
<hr/>	
Total coal for disposal in 1886.....	352,289 ”

“The exports of coal for the year 1886 amounted to 249,205 tons, as follows:—

Nanaimo Colliery.....	79,637 tons.
Wellington Colliery.....	144,526 ”
East Wellington Colliery.....	25,042 ”
<hr/>	
Total exports for 1886.....	249,205 ”

"This quarter of a million tons of coal was shipped principally to California, but shipments were also made to Portland, Oregon; Alaska, Petropavloski, Mexico, and the Hawaiian Islands; besides which, coal for fuel has been regularly supplied to the ocean mail steamers, gunboats, and vessels calling.

"In order to arrive at the total amount of sales for the year, the sales of coal for use in this Province must be added to the tonnage of the exports; but as these local sales are included in the returns of coal under the heading of 'home consumption,' aggregating 85,787 tons, which comprises the coal consumed in the colliery furnaces (excepting in the East Wellington return), I can only refer you to the returns.

"The following comparison of the aggregate output and export of coal for the years 1884, 1885, and 1886, will give at a glance an idea of the fluctuating character of our coal operations:—

	Output.	Export.
1884	394,070 tons	306,478 tons.
1885	365,596 „	237,797 „
1886	326,636 „	249,205 „

"From the above it will be seen that the output of 1886 is below that of 1884 and 1885, considerably below the former; and, also, that the exports of 1886, while exceeding that of 1885, is far less than that of 1884.

"The year 1884 was one of unprecedented prosperity in our coal industry, both in volume of trade and prices realized; but the drooping figures of the succeeding years, with the lower rates which our collieries have had to submit to in return for their product, urge me to again bring before your attention the necessity for the adoption of some active measures for the relief of our collieries from the imposition of 75 cents per ton levied in the United States upon our coal when it enters their ports. With the removal of this inequitable tax by a judicious reciprocity treaty, our coal industry will at once recover itself, and years unexampled in activity and progress will become our happy lot. We begin the year 1887 with 25,653 tons of coal 'stock in hand' at the collieries.

"The following statement shows the position of British Columbia in the chief market for the produce of our mines for the past four years, and according to the outlook the position of our Province as an exporter to California will be fully maintained during the year 1887:—

	1883.	1884.	1885.	1886.
	Tons.	Tons.	Tons.	Tons.
British Columbia	128,503	291,546	224,298	253,819*
Australia	174,143	190,497	206,751	287,293
England and Wales	131,355	108,808	170,656	160,869
Scotland	21,942	21,143	20,228	19,795
Eastern States (Anthracite, &c.)	43,861	38,124	29,834	19,517
Seattle	139,600	125,000	75,112	57,552
Carbon Hill	140,135	122,060	157,241	124,527
Green River and Mount Diablo	76,162	77,485	71,615	90,664
Renton, Newport and South Prairie	43,600	60,413	67,604	73,654
	899,301	1,035,076	1,023,339	1,087,690

"It will be seen that the importations of the State of California in 1886, were larger than for any previous year; the market there for coal is steadily increasing in capacity for absorbing our product, which is a most encouraging feature in our future prospects.

"Our collieries are equal to the supply of coal of first-class quality for steam, gas, or household purposes, sufficient in quantity to meet the requirements of all markets at present within our reach; with harbour accommodation, wharves, and dispatch in loading, second to none.

"We are looking also to the establishment of the great ocean mail service between this Province and Australia, China and Japan, as introducing an additional customer for our superior coal, and I trust our expectation in this respect will soon be realized.

*These totals represent the quantity of coal actually received in San Francisco, and other ports in California, during the years indicated, not necessarily the quantities shipped to those ports in the years named.

“NANAIMO COLLIERY.

“This colliery, as has been the case with all the other collieries in this district, has not been worked very steadily during the past year, on account of the dullness in the coal market.

“The Douglas Pit and the New Douglas or Chase River Mine, have ‘stopped working,’ and the machinery, rails, and dumps are all taken out. These mines are now filling, or are full of water.

“No. 1 PIT, ESPLANADE, NANAIMO.

“This is a mine mentioned in a previous report, and belonging to the Vancouver Coal Mining and Land Company (Limited). Everything about this mine, both on the surface and underground, is done in the strongest and most workmanlike manner. The workings about the bottom of this shaft having been already reported upon by me, I need not again describe them.

“The level on the south side of the shaft is yet standing idle.

“The level on the other side, known as the North No. 1 Level, has not been working steadily during the past year, except when it was necessary to make repairs. The company have had great difficulties to contend with in this level, in the shape of faults and wants in the coal, yet they persevered until they have got this level at the face over 1,500 yards in from the shaft, and under the water of the harbour nearly all the way. They have not yet got good coal in the face of the level, as they are trying to get through a fault; but the stalls, in a few yards after they leave the level, get over the fault and get into good coal, where the company have now got quite a large piece of it opened out, which proves to be very good and hard, varying in thickness from 6 to 10 feet, so that once the level, or main gangway, gets clear of the faults and into the good coal they will soon be able to make a large opening, which will greatly increase the output of coal.

“There is also a slope in this mine (mentioned in a former report). This slope is now down over 1,000 yards, going direct under the water of Nanaimo Harbour, with about 850 feet of rock, etc., intervening, so that little or no water comes from the roof, and what does come is free from salt. In this slope, as in the No. 1 Level, there is much ground which will not be profitable to work, and at present the coal is not very thick at the face of the slope. In this slope have been three levels on each side; those on the north side are known as No. 2, 3, and 4, north levels, and from those levels the company take a large amount of coal daily; although there are many bad places, yet when the coal is good it is generally very thick, and turns out well. On the south side the levels are known as No. 2, 3, and 4, south levels. About 50 yards down the slope to the south side there branches off what is called the Diagonal Slope at an angle from the Main Slope of fifty-four degrees; this slope intersects with No. 2 and 3 levels. The engine at the top of the slope takes away the coal from these places, causing a great saving of labour in not running the coal to the main slope. The coal down here is very thick sometimes; at one time they could not tell how thick it was, as they could neither see top nor bottom; this slope is being pushed ahead, so, also, is the No. 4 Level, which is near to the bottom of the main slope, and eventually this level will intersect the Diagonal Slope, when the engine at the top will also take away the coal in place of running it out to the Main Slope by men or mules. As you will have observed there is very much ground that is not workable, yet the company are now sending out over 800 tons of coal per day, with prospects of improving.

“Ventilation is good; the motive power has been a furnace in connection with a steam jet, and the engine at the top of the slope exhausting into the No. 2, or upcast shaft. When I was down on the 23rd December there were 45,000 cubic feet of air in circulation per minute for the use of 118 men and boys; here the ventilation is on the separate split system, the main division being from the slope, taking the levels on either side as the intake returning by the way of the stalls, and as the pure air gets to the lowest place first, it is gradually on the ascend after it leaves the slope.

“There is now very little gas seen in this mine, but sometimes the firemen come across a little of it, and the appearance of a little reminds them of the necessity of being very careful.

“You will have noticed that I stated that the motive power of the ventilation has been a furnace and steam jet, but now it is a suction fan of the largest size. This fan has been erected about 100 feet from the upcast shaft, where an excavation has been made to the depth of about 18 feet, and continuing the excavation from the fan to the upcast shaft with a down grade going to the shaft. This part of the airway has been heavily timbered and planked, and

covered over with fine ashes, so that everything may be closely sealed. This fan has been put up at a great expense to the company, but they could see that it was what their extensive mine required, and they have got a machine which, I expect, will ever do the requirements of this mine. The diameter of the fan is 36 feet, and its width 12 feet; it is worked by an engine of 26-inch cylinder with 30-inch stroke; the engine, and nearly all the machinery in connection with the ponderous machine, came from England, and it is a relief to the company, and also to the manager, to know that they have got appliances to keep in motion all the air that will be required to dilute all noxious gases that this extensive mine is likely to give off. This fan is now a running machine. I know this, but have not tested it. The manager, Mr. W. McGregor, has, however, tried its power on different occasions, while running quite slow, and he never found less than 60,000 cubic feet per minute.

"Everything about the mine is kept in good order, and no expense is spared to make it safe (as far as can be seen); there is always plenty of timber and every other material on hand that is necessary. It is to be hoped that this valuable mine, after all the expense the company have been put to, will yet be a financial success, which will be good for the Company, the people of Nanaimo, and the Province in general.

"It will be interesting for me to add that in this mine, at the bottom of the No. 2 or air shaft, the Company have been prospecting by putting down a bore-hole with diamond drilling machinery. Here they have been very successful, for at a depth of 70 feet below the bottom of the shaft, or 700 feet from the surface they struck coal, which this bore-hole proves to be 6 feet thick, good and hard; and on testing some of the coal that was got out of the hole as to its gas making qualities, it was found that it was equal to the Douglas coal. This bore is being continued and is now down 100 feet, and there are yet very encouraging prospects of finding another seam of coal. I have good authority to say that when this hole is stopped, at no distant date thereafter the Company will start to sink the shaft and push it with all haste down to the coal or coals that may yet be got at, and it is to be hoped when they get their shaft down that the coal will exceed their expectations, both as regards quality and regularity. This is a valuable discovery to the city, and a place where a great many will be employed; it will also be beneficial to every person about the town and in the Province generally. Last, though not least, it may be a reward to the Vancouver Coal Company, which has been so liberal in furnishing the means to search for and find such hidden treasures.

"SOUTH FIELD MINE.

"This is also one of the Vancouver Coal Company's mines. During the past year this mine has been about at a stand, except so far as the keeping out of the water; but that is no fault of the mine; the officers of the Company found they could supply the demand from their other mine. The mine stands to-day almost as it stood a year ago, when the miners brought their tools out, and when the market revives, which I hope will be soon, the Company will be well prepared, as they will be able, to start work with two days' notice and have an output of coal the first day.

"WELLINGTON COLLIERY,

"Belonging to Messrs. Robert Dunsmuir & Sons. The Wellington mine is the original of the Wellington Colliery; this mine has been in operation for about 16 or 17 years, and now it is getting nearly worked out, not on account of the coal being done, but owing to other mines cutting off all round.

"This has been a valuable property, and is yet. During the year that is past the work has been principally at the pillars (of coal) and other coal along the outcrop; all the lower levels are now finished and they are now working at the pillars in the upper levels, which will continue to give a good supply of coal for quite a long time yet. The coal that is being got out is of the best quality of the Wellington coal and similar to what was got out 12 or 14 years ago, this being the coal they went through and left to support the workings behind them.

"Ventilation is good; motive power, a large furnace, with two air shafts or outlets; gas is seldom or never seen here, except on some occasions, as when a large 'cave' takes place. The fireman examines all the mine, by night as well as by day, to see if any of the caves let off any gas, and that none collects, and to report to the workmen whether or not the mine is in a safe condition for them to proceed to work. In connection with this mine there is what is

known as the Adit level, that is a level going out into the valley of the Millstone River; the coal being taken out that way. Here there has been considerable idle time, as the coal trade has not been in a condition to work it steadily; but here, as in all the other mines belonging to Messrs. Dunsmuir & Sons, they only work when there is a demand and means of taking away the coal.

"Ventilation is good. This part is partly ventilated by the Wellington mine and partly by an air shaft with a furnace. At either of the above mines I always saw plenty of timber and other things necessary for general use about the mines.

"No. 3 PIT, WELLINGTON COLLIERY.

"This is the only shaft worked in the valley of the Millstone by Messrs. Robert Dunsmuir & Sons, with the exception of the air shaft. This mine is worked by a slope, with the top of it near the bottom of the shaft, with the levels from either side. Here the coal is worked on the pillar and stall system, and as the workings are under the valley they leave large pillars to support the roof. In this mine there is a long stretch of coal in sight, and as good as any coal that has ever been opened out in the Wellington Colliery, from 7 to 11 feet thick, all hard and good.

"Ventilation is very good; when I was down in December there were 43,875 cubic feet per minute in circulation for the use of 70 men. This mine is also ventilated on the separate split system, and as the workings are from both sides of the slope the main divisions of the air are also from the slope to either side; on the one side going in the level and returning by the way of the faces or stalls, and on the other, going around the faces of stalls and coming out in the level, thence to the upcast shaft; the motive power here is a fan on the top of the upcast shaft. This being the first fan that was erected in this Province on a large scale for ventilating of our mines, which has done such good service and gives such good satisfaction, so that in this colliery there are three of them working. There is now little or no gas seen in this pit. Everything is kept in good order, with plenty of everything that may be required for the successful working of a mine.

"No. 4 PIT, WELLINGTON COLLIERY.

"This is the pit overlooking the valley of the Millstone. Mining in this pit is carried on very extensively; but here, as in all the other mines, there has been considerable idle time during the past year, and that owing to the depression in the coal trade. The coal is worked from this pit by what is known as the North and South side workings. The coal in this mine is very good, although they meet with a small fault occasionally, but not enough to hinder them much. Here in this pit they have a large area of good coal in sight, which will last for years to come. This mine is now connected with the shaft previously mentioned as the No. 6 Pit, and which is now the No. 4 Air-shaft, and on this shaft there is a large ventilating fan. Ventilation is good, and is conducted on the separate split system, the main division being at the bottom of the shaft to each side, and other divisions further in the workings. When I tested the air, one of the last times I was in the mine, I found there was 75,500 cubic feet per minute for the use of 112 men. This was when all the divisions had again united in one, and going towards the upcast shaft. This mine continues to give off gas at times in different places; but it is seldom the fireman finds any, as it is carried away as given off. In connection with this mine, and on the top of the upcast shaft, there is a large ventilating fan, 30x10 feet wide, worked by a large steam engine; and here there is also a large steam jet in readiness at any time to turn on steam, in case of any accident to either fan or engine. At this mine I have never found less than 400 cubic feet per minute for each man or boy.

"No. 5 PIT, WELLINGTON COLLIERY.

"In this pit there has also been considerable idle time, for the same reason as that which caused the dullness in the other mines. At one time this mine did not look as well for getting out coal as may have been wished, but for some time back it has taken a change for the better. At present it looks well, and if the coal trade and prices would justify them to do so, they have places here standing idle, where they could employ 50 more miners than they are working at present. This mine is worked on the pillar and stall system, as are all the mines belonging to Messrs. R. Dunsmuir & Sons. The coal is of the usual good quality of the Wellington seam.

“Ventilation is very good. You will observe in my previous report that they were sinking a shaft about 80 yards south of this, the No. 5 Pit. This shaft was got down early in the year, and connected with the workings here; and now that shaft is the upcast and return for the No. 5 Pit. Motive power here is a steam engine with a fan on the top of the upcast shaft, and the last time I was down there was 54,250 cubic feet of air per minute, for the use of 70 men and 3 mules. This mine is also ventilated on the separate split system, the main divisions at the bottom of the shaft taking the levels on the east and west sides, and returning by way of the faces to the upcast shaft. Here there is also a steam jet standing in readiness to turn on steam to ventilate the mine, if any accident should happen to either engine or fan. Here, as at all the other mines in this colliery, there is always plenty of timber on hand, and every other thing which may be thought necessary to the use and working of a coal mine.

“EAST WELLINGTON COLLIERY,

“The property of R. D. Chandler, Esq., San Francisco. There is only one mine in this colliery, and that is in the valley of the Millstone River, and south-east of the Wellington Colliery. In this mine they have been very much troubled with wants and faults in the coal, and at the best the coal has been thin. The coal worked here is what is known as the Wellington coal. The mine has been worked steadily the most of the past year. Although not taking out much coal, yet what they do get is very hard and of good quality.

“You will have seen in my previous report that in the level going west they were in about 400 yards, and at the face they got a fault which put the coal 34 feet above the level. They went up over the fault, and continuing their level for nearly 300 yards on the upper side of the fault, with the coal varying from 5 to 6½ feet thick, good and hard, and improving as they go in. This is a good prospect, and to all appearances there will yet be a good and profitable mine here. The place where they have got the coal is a long way from the shaft, and it will be very expensive to make a good road up to get the coal down; but Mr. Wm. Chandler, the Manager, told me that if the coal keeps as good as at present, there is a likelihood of their putting down another shaft in the spring. The coal in the lower side of the fault is being worked on the long-wall system, and they are very successful with it, the coal averaging about 2½ feet thick. The refuse, and the rock taken out of the roof to make the roadway, fill the waste works full, so that the roof does not settle much, the roof being a strong hard rock bending down gradually behind them as they work out the coal. As the roof does not break at the face, the workman hardly knows that it is settling.

“Ventilation is good; motive power, a furnace. The last time I was down, the air in circulation was 250 cubic feet per minute for each man employed. Owing to this being long-wall work, there is very little powder used, and in most of the places none at all. Sometimes the breaks in the roof, out a considerable distance from the face, give off a little gas, but at the face they never see any. There are not many men employed here, and as there is only one single shaft, they work what men they have on two shifts, sometimes three shifts, a day. It is to be hoped that the coal will continue to keep good on the upper side of the fault previously mentioned, and also that it may get thicker on the lower side. Such improved prospects would be beneficial to all about the district, and the proprietor in particular. He is deserving of such success, seeing the perseverance and push he has made here in bringing about the present position and prospects of the mine.

“ALEXANDRA COLLIERY,

“Belonging to the Esquimalt and Nanaimo Railway Company. There has not been any work done here during the past year.

“PROSPECTING.

“Thomas D. Jones & Company have put down a hole with the above company's diamond drilling machine, in the land of Mr. Charles York, in Cedar District. This hole was commenced late in the summer, and continued till the depth of 967 feet was reached, making it the deepest bore-hole in this district. This company have been rewarded by finding good and encouraging prospects. Thanks to Mr. Jones for the above information.

"GENERALLY.

All the above works I have frequently inspected during the past year, and I found them generally in good order, with plenty of timber and every other thing necessary on hand that was required, or may have been wanted for the carrying on and working of a mine. In the course of my inspection of the several mines, I sometimes have drawn the attention of the overman, or whoever happened to be with me at the time, to something I thought necessary to be done; and whatever it may have been, it was attended to at once. I nearly always found the brattice as close to the face as it was convenient to have it, and it was no uncommon occurrence to get it broken down when blasting; and very often the miners complain on that account, as they do not like to break it. But in the places that are suspected of giving off gas they keep the brattice boards as close to the face as possible, if it should be broken down; and then for a few feet further they have a canvas or brattice cloth hanging from the roof, not being so much in the way as boards and serves the purpose of brattice equally well.

" ACCIDENTS

" IN AND ABOUT THE COAL MINES OF BRITISH COLUMBIA FOR THE YEAR 1886.

" February 15th—Charles Martin, miner, was bruised by a fall from the roof while working in his stall in the East Wellington Colliery.

" March 9th—Thomas White was injured by a crowbar slipping and striking him while at work in the Wellington Colliery.

" March 11th—John Culligan, miner, was slightly burned about the face and arm by an explosion of powder when charging a shot in No 1 Shaft, Nanaimo Colliery.

" March 31st—William Lukey, miner, was slightly burned about his arms by an explosion of gas while at work in his stall in No. 1 Shaft, Nanaimo Colliery.

" May 23rd—William Baker, miner, while in the act of putting in a prop, got the small bone of his arm broken by a piece of rock falling on it.

" May 31st—A Chinaman working with John Hughes, miner, was injured about the head by a piece of rock striking him while at work in No. 3 Pit, Wellington Colliery.

" June 10th—John Bullock and a Chinaman were slightly burned by an explosion of gas while at work in their stalls in the East Wellington Colliery.

" July 5th—Joseph Watson, miner, had his arm and one side of his face slightly burned by an explosion of gas while at work in his stall in No. 1 Shaft, Nanaimo Colliery.

" July 23rd—Samuel H. Myers, miner, was slightly hurt about the body by falling from a ladder while at work in his stall in the No. 1 Shaft, Nanaimo Colliery.

" July 26th—Joseph Livesley cut his leg with an axe; he was using it in the Adit Level, Wellington Colliery.

" July 31st—Thomas Evans, miner, was slightly burned about the arms by an explosion of gas while at work in his stall in the East Wellington Colliery.

" August 11th—William Merrell, miner, was slightly burned about the head and arms by an explosion of gas in the East Wellington Colliery.

" August 23rd—Charles Jones, miner, was slightly injured by a fall of rock from the roof while at work in his stall in the Adit Level, Wellington Colliery.

" September 7th—William Bone, miner, got one of his arms broken by a fall of coal while at work in his stall in the No. 1 Shaft, Nanaimo Colliery.

" September 20th—Ah Yong, Chinese labourer, had one of his arms dislocated while at work in the No. 1 Shaft, Nanaimo Colliery.

" September 21st—May, a Chinaman, was injured about the body by a fall of rock and coal from the face of a stall in No. 1 Shaft, Nanaimo Colliery.

" October 9th—Charley, a Chinaman, was injured by a fall of coal while at work in the Adit Level, Wellington Colliery.

" October 20th—Tong, a Chinaman, had his arm broken by the caving of a bank where he was working, near the Wellington Colliery.

" October 29th—James Williams, miner, was injured by a fall of rock while at work in his stall in the No. 1 Shaft, Nanaimo Colliery.

" November 8th—William Baker and a Chinaman were slightly burned by the igniting of powder while charging a shot in No. 3 Pit, Wellington Colliery.

" November 22nd—Two Chinamen, No. 288 and 376, were killed by a fall of rock while running cars in the No. 1 Shaft, Nanaimo Colliery.

" December 7th—Two Chinamen were very slightly burned by an explosion of gas while at work in the No. 1 Shaft, Nanaimo Colliery.

" December 16th—John Whitfield, miner, was burned about the face and hands by the explosion of loose powder while at work in No. 1 Shaft, Nanaimo Colliery.

" December 28th—John Abernethy, miner, was killed by a fall of coal while at work in his stall in the No. 1 Shaft, Nanaimo Colliery.

" I am sorry to have to make a list of so many accidents for the year that is closed, both serious and fatal, as some of them were ; while others were slight, yet they were of such a nature that they had to be reported.

" Of the accidents in the above list, you will notice that six of them were by falls of rock ; six by coal ; four by explosions of powder ; eight by explosions of gas ; one by a car ; one by a cave of gravel on the surface ; one by a crowbar ; one by a cut from an axe, and one by a fall from a ladder.

" On looking over the list of accidents, you will see that three of them were fatal ; two by a fall of rock, and one by a fall of coal.

" I have enquired into all the accidents which have happened, and a public inquest was held in the two fatal cases from fall of rock, in which all the evidence that it was possible to get was taken ; and the depositions and proceedings of the inquest so held are filed in the office of the Honourable the Attorney-General. I beg leave to refer you to the same. Of the fatal cases, the accident which was caused by a fall of coal, did not call for an inquest. I was at the place of the accident shortly after it occurred, and from the result of my inspection and enquiry, I consider it was a pure mischance. The deceased was a miner of great experience, very careful and steady, and I did not think there was anything to be gained from a public enquiry.

" With respect to all the accidents that have happened I have not discovered that any blame or negligence could be attached to any one. In all places where the miner is set to work he is supposed to be skilful enough to know when and where there is danger, and to judge for himself, subject, however, to the overman and fireman, and if they should consider anything dangerous it is their duty to point it out to the workmen, and make, or have the same made, safe. There are, however, besides the practical miner, a great many men employed in the mines who never were in a coal mine until they came to this district, yet some of these men are the most careful of workmen, and will listen and take warning as to their danger from any of their officers ; then there are those that are not miners, who will not be advised by any one, although they are ignorant of the dangers they are exposed to any minute ; they give the manager and all the officers under him anxious thoughts about them and the other men employed in the mine.

" Now that we have entered on another year I hope we shall enjoy still greater immunity from accidents, and that every one engaged in and about the collieries will use the greatest caution, so that, if possible, no list will be required for accidents, and in making out my report at the end of the year it will be a chapter short, and that the chapter of accidents, as they will have ceased to happen ; and I trust that the year before us will be a prosperous year to the mining industry and workmen in common.

" Appended hereto are the annual colliery returns.

" I have &c,

(Signed)

" ARCHIBALD DICK,

" Government Inspector of Mines.

" To the Hon.

" The Minister of Mines."

COLLIERY RETURNS.

NANAIMO COLLIERIES.

Output of coal for 12 months ending December 31st, 1886.	No. of tons sold for home consumption.	No. of tons sold for exportation.	No. of tons on hand 1st January, 1886.	No. of tons unsold, including coal in stock, Jan. 1st, 1887.	
Tons. 112,761	Tons. cwt. 33,260 15	Tons cwt. 79,637 8	Tons. cwt. 1,119 13	Tons. cwt. 882 10	
Number of hands employed.			Wages per day.		
Boys and Indians.	Whites.	Chinese.	Whites.	Chinese.	Indians.
16	304	170	\$2 to \$3.50	\$1 to \$1.25	\$2
Total hands employed 490			Miners' earnings per day \$3 to \$4		

Name of Seams or Pits—South Field and No. 1 Shaft.

Value of Plant—\$350,000.

Descriptions of seams, tunnels, levels, shafts, &c., and number of same.—South Field worked by slope; seam, 6 to 10 feet. No. 1 Shaft, worked by shaft; seam, 5 to 12 feet.

Description and length of tranway, plant, &c.—Railway to South Field, 5 miles with sidings; railway to No. 1 Shaft, 1 mile with sidings; rails are of steel, 56 pounds per yard of standard gauge, viz.: 4 feet 8½ inches; 8 hauling and pumping engines; 10 steam pumps; 4 locomotives; 112 coal cars (6 tons), besides lumber and ballast cars; fitting shops for machinery repairs, with turning lathes, boring, drilling, screw-cutting machines, steam hammer, &c., &c.; diamond boring machinery for exploratory work (bores to 2,000 feet); wharves, 770 feet frontage, at which ships of the largest size can load at all stages of the tide.

SAMUEL M. ROBINS,

Superintendent of the Vancouver Coal Mining and Land Company, Limited.

WELLINGTON COLLIERIES.

Output of coal for 12 months ending December 31st, 1886.	No. of tons sold for home consumption.	No. of tons sold for exportation.	No. of tons on hand 1st January, 1886.	No. of tons unsold including coal in stock Jan. 1st, 1887.
185,846 tons	52,300	144,526	31,691	20,711

Number of hands employed.			Wages per day.		
Boys and Indians.	Whites.	Chinese.	Whites.	Chinese.	Indians.
None.	351	132 Employed by Miners, 135.	\$2 to \$3.75	\$1 to \$1.25	
Total hands employed..... 618			Miners' earnings per day..... \$3 to \$4.50		

Name of Seams or Pits—Wellington.

Value of Plant—\$250,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—Six to 10 feet thick ; 3 shafts working ; 1 slope working ; 1 adit level working ; 4 air shafts ; 1 of these with large furnace at bottom ; the other three ventilating fans driven by 2 pair of engines and 1 single engine.

Description and length of tramway, plant, &c.—10 miles railway ; 4 locomotives ; 200 waggons ; 9 stationary engines working ; 7 steam pumps ; 6 wharves for loading vessels at bunkers.

R. DUNSMUIR & SONS.

EAST WELLINGTON COLLIERY.

Output of coal for 12 months ending December 31st, 1886.	No. of tons sold for home consumption.	No. of tons sold for exportation.	No. of tons on hand 1st January, 1886.	No. of tons unsold including coal in stock, Jan. 1st, 1887.
28,029 tons	427	25,042	1,500	4,060

Number of hands.			Wages per day.		
Boys	Whites.	Chinese.	Whites.	Chinese.	Boys.
2	66	93	\$2 to \$3	\$1 to \$1.50	
Total hands employed..... 161			Miners' earnings per day..... \$3 to \$5		

Name of Seam or Pit—East Wellington.

Value of Plant—\$100,000.

Description of seams, tunnels, levels, shafts, &c., and number of same—1 seam $2\frac{1}{2}$ feet to 6 feet thick ; 1 shaft 8x18 feet, 240 feet deep ; 1 level 10x7 feet ; 3 levels $7x4\frac{1}{2}$ feet ; 1 slope 8x5 feet ; 1 slant, $7x4\frac{1}{2}$ feet (working).

Description and length of tramway, plant, &c.—Railroad, 3-foot narrow gauge, $3\frac{1}{2}$ miles ; 2 locomotives ; 20 $4\frac{1}{2}$ -ton coal cars ; 1 pair hoisting engines ; 1 large donkey engine ; 1 steam pile driver ; 1 steam saw-mill complete, capacity, 12,000 feet per day.

EAST WELLINGTON COAL CO.

TOTAL OF THE ABOVE RETURNS.

Output.	Home Consumption.	Export.	On hand 1st January, 1886.	On hand 1st January, 1887.
326,636 tons.	85,987 tons.	249,205 tons.	34,210 tons.	25,653 tons.

Hands employed, 1,269.

PROVINCE OF BRITISH COLUMBIA.

TABLE

Showing the actually known and estimated yield of gold; the number of miners employed; and their average earnings per man, per year, from 1858 to 1886.

Year.	Amount actually known to have been exported by Banks, &c.	Add one-third more, estimate of gold carried away in private hands.	Total.	Number of Miners employed.	Average yearly earnings per man.
1858 (6 months)	\$ 380,265	\$ 130,088	\$ 520,353	3,000	\$ 173
1859	1,211,304	403,768	1,615,072	4,000	403
1860	1,671,410	557,133	2,228,543	4,400	506
1861	1,999,589	666,529	2,666,118	4,200	634
1862	} 3,184,700	1,061,566	4,246,266	4,100	517
1863			4,400	482	
1864	2,301,388	933,962	3,235,350	4,400	549
1865	2,618,404	872,301	3,491,205	4,294	813
1866	1,996,530	665,526	2,662,106	2,982	893
1867	1,360,651	620,217	2,480,868	3,044	814
1868	1,779,729	593,243	2,372,972	2,390	992
1869	1,331,234	443,744	1,774,978	2,869	749
1870	1,002,717	334,239	1,336,956	2,343	569
1871	1,349,680	449,580	1,799,440	2,450	734
1872	1,203,229	402,743	1,610,972	2,400	671
1873	979,312	326,437	1,305,749	2,300	567
1874	1,383,464	461,154	1,844,618	2,868	643
1875	1,856,173	618,726	2,474,904	2,024	1,222
1876	1,339,936	446,662	1,786,648	2,282	783
1877	1,206,186	402,045	1,608,182	1,960	820
1878	1,062,870	1-5th 212,534	1,275,204	1,383	677
1879	1,075,049	,, 215,009	1,290,058	2,124	607
1880	844,356	,, 108,071	1,013,327	1,965	513
1881	872,281	,, 174,456	1,046,737	1,898	551
1882	795,071	,, 159,014	954,085	1,733	543
1883	661,877	,, 132,375	794,252	1,965	404
1884	513,304	,, 122,861	736,165	1,363	396
1885	594,732	,, 113,956	713,738	2,902	246
1886	753,043	,, 150,608	903,651	3,147	287
			60,259,517		