

BRITISH COLUMBIA DEPARTMENT OF MINES

Hon. G. S. PEARSON, Minister.

ROBT. DUNN, Deputy Minister.

J. D. GALLOWAY, Provincial Mineralogist.

J. DICKSON, Chief Inspector of Mines.

D. E. WHITTAKER, Provincial Assayer.

BULLETIN No. 3

PRELIMINARY REPORT

ON THE

MINERAL INDUSTRY OF BRITISH
COLUMBIA

FOR THE YEAR 1933

COMPILED BY

JOHN D. GALLOWAY, Provincial Mineralogist.



PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:

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*To the Hon. G. S. Pearson,
Minister of Mines, Victoria, B.C.*

SIR,—I beg to submit herewith Bulletin No. 3, "Preliminary Report on the Mineral Industry of British Columbia for the Year 1933." The object of this bulletin is to summarize briefly the condition of the industry and give approximately the statistics of mineral production for the year.

Included are reports on each of the Mineral Survey Districts of the Province by the Resident Mining Engineers and details of coal production by the Chief Inspector of Mines.

I am, Sir,

Yours faithfully,

JOHN D. GALLOWAY,
Provincial Mineralogist.

*Bureau of Mines,
Victoria, B.C., January 15th, 1934.*

PRELIMINARY REPORT ON THE MINERAL INDUSTRY OF BRITISH COLUMBIA FOR THE YEAR 1933.

GENERAL SUMMARY.

BY JOHN D. GALLOWAY, PROVINCIAL MINERALOGIST.

PRODUCTION.

The gross value of the mineral production of the Province for 1933 is estimated at \$29,080,489, an increase of \$838,871 as compared with the output in 1932, or 2.9 per cent. Slightly higher metal prices assisted in achieving a higher output value than in the preceding year. Quantity production in the aggregate was about the same as in 1932. The following table shows the estimated output of metals and minerals for 1933 and corresponding figures for 1932:—

ESTIMATED MINERAL PRODUCTION FOR THE YEAR 1933 AS COMPARED WITH 1932.

Product.	QUANTITY.		VALUE.		1933.	
	1932.	1933.	1932.	1933.	Increase.	Decrease.
Gold, placer *oz.	20,400	21,000	\$346,800	\$357,000	\$10,200	.....
Gold, lode .....oz.	181,564	217,000	3,753,261	4,485,780	732,519	.....
Silver .....oz.	7,130,838	6,900,000	2,258,453	2,593,503	335,050	.....
Copper .....lb.	49,841,009	43,000,000	3,179,956	3,197,910	17,954	.....
Lead .....lb.	254,488,952	265,000,000	5,378,878	6,353,640	974,762	.....
Zinc .....lb.	192,120,091	156,000,000	4,621,641	5,011,656	390,015	.....
Coal (2,240 lb.).....tons	1,534,975	1,252,000	6,523,644	5,321,000	.....	\$1,202,644
Structural materials .....	.....	.....	1,698,839	900,000	.....	798,839
Miscellaneous metals and minerals .....	.....	.....	480,146	860,000	379,854	.....
Totals .....	.....	.....	\$28,241,618	\$29,080,489	\$838,871	.....

* Placer gold valued at \$17 per ounce.

The metallic production—gold, silver, lead, zinc, and copper—amounted to \$21,999,489, an increase of \$2,460,500 as compared with 1932. Coal shows a decline in quantity and price and there was a heavy falling-off in the value of structural materials produced. Miscellaneous metals and minerals registered a considerable increase.

Mineral production in the first half of 1933 recorded a decline of 13.4 per cent., so that the increase for the full year is very satisfactory and shows that a definite uptrend—the first since 1929—has now commenced. The metallic production has been responsible for the upturn, and, when general business improves, similar progress may be hoped for in the coal and structural materials branches.

The tonnage of ore mined was approximately 4,300,000, or almost the same as in 1932. The average grade at \$5 per ton compares with \$4.32 per ton in 1932; the increase being mainly due to a relatively larger proportion of gold ore.

As expected, gold production showed an increase both in placer and lode. The combined gold-output totalled \$4,857,780 (gold at \$20.67 per fine ounce). To this figure the mines obtained an additional estimated "premium" of \$1,860,110, or a total gold return in Canadian funds of \$6,702,890. The average price of gold in Canada for the year was \$28.61.

The following table shows the standard statistics and approximate actual returns in Canadian funds to British Columbia gold-producers in the last three years:—

	Standard Statistics.	Approximate Value in Canadian Funds.
1931	\$3,310,886	\$3,351,000
1932	4,100,061	4,656,000
1933 (estimated)	4,857,780	6,702,890

The increasing importance to British Columbia of the gold-mining industry is thereby clearly indicated.

The estimated output of the leading gold-producers is shown in the following table:—

	Oz.
Pioneer	84,000
Premier	50,000
Bralorne	26,000
Reno	12,000
Cariboo	8,000
	180,000
Miscellaneous producers	37,000
	217,000

By-product gold amounted to approximately 18,000 oz., or 8.3 per cent. of the total. About thirty-five different properties were shippers of gold ore. Lode-gold output increased because of larger production by *Pioneer*, *Bralorne*, *Reno*, and *Yankee Girl* mines and new production from the *Cariboo Gold* and many small mines. Offsetting to some extent these increases were considerable declines by the *Premier* and *Union* mines.

The placer-output, estimated at \$357,000, shows an increase of \$10,200 as compared with 1932. When complete returns are available later on this figure may be exceeded. Many individuals were at work during the year and some large development enterprises may be productive in 1934. The outlook is for further increased annual production in ensuing years.

Silver production, estimated at 6,900,000 oz., shows a slight decrease in quantity from that of 1932, but owing to a higher average price for the metal the output had a value approximately \$335,000 greater. The *Sullivan* and *Premier* mines are the principal producers, but an increased output was made from the Beaverdell camp, where there are half a dozen small silver-mines. With the improved price and outlook for silver it is expected that certain silver-mining operations will be resumed in 1934.

Copper production for the year is estimated at 43,000,000 lb., a decline of nearly 7,000,000 lb. from the 1932 figure. The copper valuation was, however, slightly higher at \$3,197,910 owing to a higher average price for the metal. The principal production was made by the *Hidden Creek* mine of the Granby Company, *Britannia* mine being curtailed very considerably. Not much interest will be shown in new copper-mining enterprises until the price of copper and marketing outlook improve materially.

Lead production shows an increase in quantity and nearly a million dollars in value as compared with 1932. The bulk of the output comes from the *Sullivan* mine of the Consolidated Company, but this was supplemented this year by the reopening in August of the *Monarch* mine of the Base Metals Company at Field. This is an important lead-zinc property and a considerable output is expected in 1934. The Sloean district is still quite inactive owing to low metal prices for silver, lead, and zinc, but operations by leasers are increasing.

Zinc-output shows a considerable decline as compared with 1932, but a higher average price for the metal gave a production value of \$5,011,656, as compared with \$4,621,641 in 1932. The main production is from the *Sullivan* mine, supplemented by four months' output from the *Monarch* mine.

Coal production declined from 1,534,975 long tons in 1932 to 1,252,000 long tons in 1933. The output is valued at \$4.25 per ton, as compared with \$4.50 in the preceding year. The value therefore shows a decrease of \$1,202,644, or 22.6 per cent. The generally depressed state of industry throughout 1933 and economy measures by householders were responsible for this serious decline. Fuel-oil is the chief competitor of the Provincial coal industry, as the bringing-

in of coal from without the Province has been declining somewhat in recent years. The recent validation by the Privy Council of the Provincial "Fuel-oil Tax Act" should gradually assist the coal industry, but it will probably take some time before this effect is marked.

The valuation of structural materials produced is estimated at \$900,000, approximately a 60-per-cent. decline from the figure of \$1,698,839 for 1932. Building and construction work was at a low ebb in the Province and the small output of structural materials represents mainly the requirements for renewals and maintenance, together with some dwelling-house construction.

Miscellaneous metals and minerals recorded a satisfactory increase, the production being valued at \$860,000, as compared with \$480,146 in 1932. The principal cause for the increase was the higher valuation for sulphur, produced in the form of pyrite at the *Britannia* mine and as sulphuric acid at the Trail plant of the Consolidated Company.

METAL PRICES.

Metal prices generally showed some improvement, particularly for silver and zinc. The following table shows the average metal prices for 1932 and 1933 in Canadian funds:—

	1932.	1933 (estimated).
	Cents.	Cents.
Silver (New York), per oz.	31.671	37.587
Copper (London), per lb.	6.3802	7.437
Lead (London), per lb.	2.1136	2.3976
Zinc (London), per lb.	2.4056	3.2126

METALLURGICAL DEVELOPMENTS.

During the year no important plant-construction was under way at any of the major metallurgical operations of the Province. Improved recoveries and all-round efficiencies in existing plants were the main objectives and satisfactory progress was made along these lines.

The *Bralorne* mill capacity was increased from 120 tons to 200 tons per day. The old *Motherlode* mill, acquired by the Reno Gold Mines and reconstructed, was brought into full operation on a 75-ton-a-day basis. A 25-ton mill was constructed at the *Surf Point* mine and production commenced. The small pilot-mill at the *Vidette* mine was reconstructed during the year so as to have a capacity of 40 tons a day. Operation of the mill commenced about the middle of December. Other small mills were under construction during the year.

It is expected that in 1934 several new mills for gold properties will be constructed, including the *Wayside*, in the Bridge River district, and the Dentonia Mines Company near Greenwood, both of 100 tons daily capacity. Other smaller mills are planned, including partial re-equipment of the *Dunwell* mill to have a capacity of 25 tons a day.

Production of zinc concentrates was started during the year by the *Britannia* mine, the output in pounds being about the same as that of copper. This operation can now be classed as a copper-zinc mine, making also by-products of gold, silver, and pyrite.

Production from the chemical-fertilizer plant of the Consolidated Company at Trail increased during the year, a satisfactory export market having been developed for ammonium sulphate.

GENERAL SITUATION.

With the close of 1933, it is fairly definitely evident that the mineral industry of the Province has entered a period of renewed activity, and that the decline of the depression years has given way to a distinct uptrend. The major cause is the greater production of gold and the extensive exploration and development in connection with the search for gold-mines. During the last half of the year, however, other forms of metal-mining began to awaken from their previous lethargy. Stepping-up of production from the *Sullivan* mine and the reopening of the *Monarch* mine at Field caused increased outputs of lead and zinc. Silver-mining attracted renewed attention, at first by leasers and later certain companies commenced development of silver properties. The increased price of silver has stimulated development at Beaverdell camp, where the *Bell*, *Highland Lass*, *Sally*, and other properties give promise of increased output in 1934. The more hopeful outlook for silver may result in renewed mining operations in the Slocan and Stewart districts.

Although the position of copper, with a low price and large stocks of the metal on hand, is still not particularly satisfactory, it is a little better than a year ago. Capacity production

was maintained by the *Hidden Creek* mine of the Granby Company. The *Britannia* mine, which produced very little copper in the first half of the year, increased the output gradually during the last three months.

It is estimated that 12,000 men were directly engaged in the mineral industry, as compared with 10,524 in 1932. This does not include the thousands that were prospecting and engaged in small-scale individual placer-mining. Dividends for the year are estimated at approximately \$3,000,000, as compared with \$3,042,213 in 1932.

The interest by the public in gold-mining is shown by the number of new mining companies incorporated. This is shown in the following table:—

MINING COMPANIES INCORPORATED DURING THE YEAR 1933.

Month.	Gold.	Other.	Private.	Public.	Total.
January.....	3	....	1	2	3
February.....	9	....	5	4	9
March.....	10	2	8	4	12
April.....	5	1	4	2	6
May.....	20	2	11	11	22
June.....	35	2	15	22	37
July.....	13	3	9	7	16
August.....	14	....	7	7	14
September.....	15	....	8	7	15
October.....	8	....	5	3	8
November.....	7	....	2	5	7
December.....	6	....	2	4	6
Totals.....	145	10	77	78	155

This extreme activity in acquiring and searching for gold properties assures that many meritorious prospects that have lain dormant for years will be adequately explored and developed. All over the Province, wherever there are indications of mineralization, gold properties are being looked for. It is quite evident that the gold-producing potentialities of British Columbia have not been heretofore thoroughly realized.

During 1932 forty-six new companies were incorporated, of which forty were for acquiring gold properties. Thus in two years 185 new companies have been started with the objective of making gold-mines. It must of course be expected that only a small percentage will ultimately realize continuous profitable production, but nevertheless some new mines are assured. And in the meantime considerable employment and circulation of capital is obtained for the benefit of the Province generally. The total production of gold in 1934, exclusive of premium, may amount to \$5,500,000, and an additional \$2,000,000 in premium is quite possible.

The production of placer gold is relatively small—\$357,000; but is important as providing a living for many. A considerable proportion of the amount is made up of hundreds of small lots of gold recovered by individuals, who in many instances would otherwise have required relief allowances. Some of the fortunate ones did well, others made wages, and many more recovered enough gold to cover living expenses. There is scope in British Columbia for many men to go placer prospecting and mining, but those contemplating this work should realize that training and experience are a prerequisite and that every creek does not yield placer gold. Inexperienced men should either get an experienced partner or get some elementary training before going in the field.

It is interesting to note that a new high record was made in 1933 for the issuance by the Department of Mines of free miners' certificates; approximately 16,000 were issued, including provisional free miners' certificates. These latter are issued free of charge and confer the right to locate a placer claim, as well as the ordinary right-of-way privileges of the regular free miners' certificates. This documentary evidence that many prospectors were in the field in 1933 is confirmed by the reports of the Resident Engineers, who consider that generally in their respective districts there were a larger number of prospectors than ever before. This, of course, includes those men working in many places with pan and rocker to recover placer gold. Another striking indication of the mining activity of the past year is shown in the number of locations recorded under the Mineral and Placer Acts. In the three Mining Divisions of Lillooet, Cariboo,

and Quesnel—centres of gold exploration and development—approximately 14,000 such records were made, and generally throughout the Province thousands of new locations were made.

The use of the aeroplane in connection with mining was considerably expanded during 1933. It is estimated that about ten times as much flying was done in the Province in connection with mining as in the year 1932. The Canadian Airways, Limited, maintained aircraft at Carcross, Yukon Territory, at Burns Lake, and three on the Coast, all of which were used extensively in connection with mining and prospecting in Northern British Columbia. The Wells Air Transport, Limited, carried on an air service from Vancouver to Seton Lake, serving the needs of fast transportation into the Bridge River district. Many trips were also made by mining-men by plane from Vancouver to points in the Cariboo district and north of Prince George. The Consolidated Mining and Smelting Company maintained its own plane at Burns Lake for service in the northern half of the Province. The Colonel Spencer interests maintained their own aeroplane service for scouting operations during the year. It is expected that the activity in gold-mining will result in the increasing use of aeroplanes in connection with mining operations in 1934.

Mining business proved a boon to the Pacific Great Eastern Railway, and was directly responsible for this railway making, for the first time, a substantial operating profit. Tonnage handled into the Bridge River district more than doubled, from 4,047 tons in 1932 to 8,400 tons in 1933. Tonnage to Quesnel, serving a part of the Cariboo district, increased from 2,137 tons in 1932 to 6,472 tons in 1933.

The mineral industry has always been of importance to the Province and it has again shown its usefulness in leading the way out of depression. The decline in silver and base-metal prices and concomitant rise in gold prices has been the means of directing greater attention to the extensive gold potentialities of British Columbia; and the energy of our mining-men has been shown in the way in which these possibilities and probabilities are being rapidly explored. The value of gold production has more than doubled in two years and a still larger output is assured in the future.

During 1933 more interest was taken by the people of the Province in all forms of mining than for some years past, and a continuance of this healthy state of affairs is expected. For 1934 a larger mineral production seems assured and, what is more important, greater employment will probably be provided for the people of the Province through the medium of the mining industry and its allied operations.

REPORTS OF RESIDENT MINING ENGINEERS.

NORTH-WESTERN MINERAL SURVEY DISTRICT (No. 1).

REPORT BY JOSEPH T. MANDY, RESIDENT MINING ENGINEER (HEADQUARTERS, PRINCE RUPERT).

GENERAL SUMMARY.

The feature of the mining industry in this district during 1933 has been the increasing interest and activity in gold-mining. This is largely the result of the policy adopted in 1930 by the British Columbia Department of Mines to intensify on this phase of the industry, and the energetic activity of the Department in this respect. Through these efforts the gold potentialities of the district are more definitely recognized and are receiving increasing attention from prospectors, capital, and operators.

New gold discoveries have been made, several new operations have been started on properties with gold possibilities, new gold production has materialized from several properties and is planned from several others, new virgin sections have been penetrated with good results, and attention has been directed to favourable virgin areas as yet unprospected. Active prospecting has increased and the efficiency of prospectors has been greatly aided through educational efforts of the British Columbia Department of Mines.

The large producers of the district, Granby Consolidated at Anyox and Premier Gold Mining Company at Stewart, have continued in active production. Creditable cost reduction and technical achievement have characterized these operations, which have adjusted their procedure to the changing economics of the situation.

Gold production from the *Premier* mine will probably be about 30 per cent. less, and silver about 26 per cent. less, than in 1932. Both the Granby and Premier Companies have maintained employment at the economic maximum and have thus directly supported communities aggregating some 3,000 people. Premier pay-roll amounts to about \$35,000 per month and that of the Granby to \$125,000 per month. The combined annual pay-rolls of the two companies is about \$2,000,000.

During the year six new lode-gold operations have been inaugurated. New small-scale gold production has materialized from the *Gold Harbour* property, Queen Charlotte islands; the *Surf Point* mine on Porcher island; the *Ben Ali* and *Dunwell* at Stewart; the *Hunter and Heather*, Khutze inlet; and the *Engineer* at Atlin. These are as yet small operations and, with the exception of the *Surf Point*, still in a prospective condition; they possess, however, possibilities for expansion. Small-scale gold production in the near future is planned from the *Skidegate-Sunrise* on Graham island, the *Haida Gold* on Moresby island, the *Homestake* at Alice Arm, and the Princess Royal Gold Mines property on Princess Royal island.

Exploratory work has been carried out on many lode-gold properties throughout the district and interest in silver and base-metal properties is reviving. Prospecting has been very active, particularly in connection with lode and placer gold.

Producing placer-gold operations in the district have expanded and sound financial interests are being increasingly attracted to this field. Many individuals have also earned a livelihood at individual operations on gold-bearing gravels. Approximately 140 individual placer operations in which about 350 men and some women were engaged have been active on thirty-four different creeks in the district during the year. Dormant placer-gold possibilities are being efficiently probed and new likely areas are being opened up. Placer-gold production will probably show an increase as compared with that for the previous two years.

At a time when the commercial aspects of silver and base metals were depressed, this activity in gold-mining has very materially aided in stabilizing the industrial, financial, domestic, and social affairs of the district and has greatly mitigated the relative effects of a general industrial depression.

Although activity in silver and base metals has been subdued, some very sound and constructive work has been carried out by prospectors on this type of deposit. This has materially increased the chances for these properties to attract development capital when these metals reach a reasonable and stable price. As this district possesses very important resources in

silver and base metals, this work is laying a sound foundation for future mining expansion relative to these metals. Commendable enterprise by individuals in this respect has also been shown in the undertaking of leasing operations on properties possessing aspects of high-grade shipping-ore.

During the latter part of the year signs of interest and revival in silver and base metals have been more definitely indicated by increasing inquiries from sound financial interests for likely properties of this type. In this category extensive exploration and development of the *United Empire* property at Stewart has already been undertaken and other similar operations are in the offing. The future for silver and base metals is gradually becoming increasingly bright.

During 1933 about 2,000 individuals have earned a direct livelihood from approximately 160 separate mining operations in the district, and it is estimated that the total direct mining pay-roll for the district during the year has amounted to about \$3,000,000. These operations have directly supported twenty-one separate communities aggregating about 5,000 people. The mining industry of this district is in a sound condition and well set for steady progress. The future can be faced with well-founded optimism.

LODE-MINING.

SKEENA MINING DIVISION.

Surf Point. On this property, situated on Porcher island, construction of the 25-ton mill was completed and milling commenced in the beginning of July. By the end of September 106 dry tons of concentrates assaying 6.6 oz. gold per ton was shipped. Mill-heads for this period assayed 0.78 oz. gold per ton. Another lot of approximately 80 tons of about the same grade concentrates was shipped in the beginning of October. The adjoining *Jeannie* claim, formerly owned by Frank Patterson, has been taken over. Additional Diesel power equipment which will permit increased development ahead of mining is being installed. A crew of twenty men is employed under the management of R. E. Legg.

Hunter and Heather. These groups, situated in the Khutze River area, are described in detail in Bulletin No. 1, 1932. During the season superficial work was carried out by the owners with three men, and about 3 tons of ore mined from the surface outcrops was back-packed out and shipped. Plans are being formulated for the more intensive development of this property and increased small-scale shipments.

Princess Royal Gold Mines, Ltd. This company was incorporated during the year for the purpose of carrying on mining operations on the old *Surf Inlet* and *Pugsley* mines, formerly operated by the Belmont Surf Inlet Mines, Limited, and developing the adjoining *Wells* group, which latter property has been optioned. Initial work entailed repairs to the wharf and buildings, and it is understood that mining has commenced with a small crew and some ore for shipment extracted.

QUEEN CHARLOTTE MINING DIVISION.

Interest in this Division is undergoing a marked revival and is evidenced in new operations. Prospecting activity is also increasing markedly.

Gold Harbour Mining Co., Ltd. This company was incorporated during the year to carry out exploration and development of the *Early Bird* group on the west coast of Moresby island. The property is described in detail in the 1932 Annual Report. A small mill has been installed for the purpose of estimating gold values in the veins and fracture-zones. Two gold bricks aggregating about 140 oz. have been shipped; the bulk of which, it is understood, came from the milling of the old dump. Detailed sampling, assaying, mill-tonnage estimates, checking, underground surveying, and tabulation of mill-lot locations are essential for the appraisal of this property.

Cumshewa.—This group is described in detail in the 1932 Annual Report. Plans are reported for the further exploration of this property in the near future.

Kitsault-Eagle Mines, Ltd. Operations on the *Skidegate-Sunrise* group, Graham island, were suspended early in May. Plans are being laid for further exploration of the veins on and below the 100-foot level by diamond-drilling. Installation of a small mill to treat the ore tonnage estimated in shoots between the 50-foot level and surface (see 1932 Annual Report) is also under consideration.

NASS RIVER MINING DIVISION.

Granby C.M.S. & P. Co. During the first period of the year a strike at Anyox unfortunately necessitated the suspension of operations for a short period. With very creditable energy and organization, operations were, however, again quickly resumed and have continued on a normal capacity basis, with the mill treating about 5,000 tons of ore daily. At the close of the year employees numbered slightly over 1,000, with a pay-roll of about \$125,000 per month.

Alice Arm Section.

Although the Alice Arm section has been dormant from an operating standpoint, some very constructive work has been done on several claims by prospectors, especially on the *Tyee*, *Highland*, and *Summit* groups. The gold aspects of the west side of the upper Kitsault valley have become more definitely apparent, especially on the *Homestake* group, where sampling is reported to show good gold values across appreciable widths, and plans are being laid for further development in the spring. With a stable and reasonable price for silver, the many promising properties in the Alice Arm area are certain to attract attention.

PORTLAND CANAL MINING DIVISION.

Activities in this Division have shown a steady and sound advance, and, besides new gold aspects, opportunities for small-scale operations on high-grade silver or silver-gold ore-bodies are being taken advantage of and are expanding.

Premier Gold Mining Co. Operations at this property have been adjusted to an all-milling programme. Exploration has been continued adjacent to the producing areas, but no new ore of importance has been located. Further exploration of the sixth level horizon has so far proved disappointing. During the first six months of the year 9,647 tons of crude ore was shipped to Tacoma and Anyox. Ore milled during the year (estimated for December) amounted to 174,459 tons. Total output for the year (December estimated) amounted to approximately 50,000 oz. gold and 1,050,000 oz. silver. Men employed during the year averaged 200 and the pay-roll will approximate \$375,000.

Big Missouri. A reorganization in the structure of this company has been effected and exploratory operations have been resumed with a crew of twenty-five men employed. Drifting off Nos. 306 and 343 is being carried on and further diamond-drilling will be undertaken.

Unicorn. Seasonal exploratory operations both on the surface and underground have been continued on this property, with two men employed. Surface-stripping and open-cutting have clarified structural conditions and indicated what appears to be a new parallel zone with promising values about 180 feet above No. 2 tunnel, and which was originally presumed to be the continuation of the Unity zone opened up in the lower tunnel.

Salmon Gold Mining Co. This company was formed to carry on further development of the *Salmon Gold* group, located on the west side of Summit lake, Salmon River valley. During the season surface prospecting resulted in additional discoveries of importance. The recession of the ice for a further 200 feet above the main zone also disclosed a continuation of the massive pyrrhotite in this direction to elevation 3,900 feet. Several smaller veins from which encouraging gold assays are reported have also been uncovered on the bluff about 200 feet above this point.

At altitude 3,475 feet, and northerly of the main zone, a new zone, about 30 feet wide, striking N. 60° E. (mag.) and composed of calcite and quartz stringers with intervening replacement, mineralized with pyrite, pyrrhotite, and some chalcopyrite and occasionally specks of galena, has been uncovered. A selected chip-sample across about 20 feet of this zone assayed 0.7 oz. gold per ton and 0.7 oz. silver per ton.

At altitude 3,600 feet a similar parallel zone well sheared between defined walls for about 9 feet wide, but showing stringers and replacement for an additional 12 feet into the hanging-wall, has been discovered. A patch of spectacular free-gold ore was found on the foot-wall side of this zone, but the general mineralization consists of mainly arsenopyrite, pyrrhotite, and pyrite. Although no free gold could be identified in place at this location, the mineralization and vein character is identical to that of the specimens seen. A chip-sample on the foot-wall side assayed: Gold, trace; silver, trace.

To determine the possibility for surface enrichment due to oxidation, samples of selected oxidized and unoxidized pyrrhotite were taken from an open-cut on No. 1 vein at elevation 3,800 feet. The oxidized ore assayed 1.46 oz. gold per ton and 1.3 oz. silver per ton. The unoxidized ore assayed 0.7 oz. gold per ton and 0.1 oz. silver per ton. Although there is a difference of 50 per cent. in values from these two samples, because they were from different sections of ore, the result cannot be taken as conclusive of enrichment.

Extensive exploration by diamond-drilling and underground work is required to prove the commercial possibilities of the numerous promising showings on the property. It is understood that finances are in hand for the initiation of this work early next season.

**Georgia River
Gold Mining
Co., Ltd.**

This company carried out seasonal exploration with a crew of eleven men, starting at the end of June and suspending operations in October. The work consisted of nine diamond-drill holes aggregating about 3,050 feet, in which it is understood no values of importance were encountered. Underground work was concentrated in drifting on the south-west vein intersected in the crosscut on No. 2 level. The south drift, about 90 feet, shows an erratic quartz vein from 1 to 14 inches wide, with fair but erratically distributed mineralization in a few places, and the face showing a fracture about 3 inches wide. The north drift shows better, but still erratic structure and mineralization for about 125 feet, varying from 3 to 30 inches wide. In some places along this length in the north drift good mineralization from which good gold values are reported can be seen. From this point to the face, at the time of examination (September 29th), the vein consists of small lenses of barren quartz with calcite stringers and gradually diminishes to about 2 inches of barren quartz in the face. The north drift was being continued to penetrate the andesitic formation and explore for the mineralization showing on surface in the creek to the north.

Since the last work reported in Bulletin No. 1, 1932, the No. 3 tunnel has been extended about 300 feet north of the raise along the shear-structure. The work has been very efficiently carried out under the superintendency of J. C. McCutcheon.

Dunwell.

Leasing operations have been successfully continued on this property by individuals and additional ore possibilities have become evident. This work has resulted in the shipment of over 500 tons of high-grade silver-gold ore from the old *Dunwell*. From the *Ben Ali* 102 tons of ore assaying 1.4 oz. gold per ton and 23 oz. silver per ton have been shipped and an appreciable tonnage is on hand awaiting shipment.

With reference to the interest being taken in the possibilities for the resumption of mining operations by the company on this property, those interested should refer to the Annual Report for 1932, page 58. Examinations during 1932 and 1933 indicate that structural and genetic conditions governing the ore-bodies were not recognized in the plan and course of former operations. Coupled with this, the operation was ill-advisedly burdened with premature construction of a mill of capacity much in excess of developed ore.

There is, in the writer's opinion, an excellent chance for bringing this property back into profitable production, initially on a small scale, with a comparatively small expenditure and in a short time, providing the operation is conducted economically and in a technically sound and efficient manner. It is also indicated that such initial small-scale operation, say of 25 tons daily, could probably be expanded. It is urged that in this expected resuscitation of the *Dunwell* a competent and experienced mining engineer be employed to direct the operations.

Generally speaking, examinations of the *Dunwell* have indicated an ore-horizon in the known veins of from 300 to 400 feet deep, raking from north to south at possibly 50° through practically the entire *Dunwell* property. In this horizon ore-shoots are distributed lenticularly. A remarkable feature of the ore is the high gold content in places. This will run anywhere from ¼ to 2 oz. and in places selective samples have yielded 11 oz. of gold per ton. In the vein system lying to the north of No. 3 tunnel-workings, and going upward along the rake to the north boundary of the property on the *Sunbeam* claim, there is an excellent chance for the development of further ore. Southerly from No. 3 and downward along the rake there is an extensive virgin territory with some very interesting showings, in which there is a strong probability that appreciable bodies of commercial ore could be developed. At several places in both No. 4 and No. 3 levels and in the old stopes between and above these levels there are places where operations could be started on actual ore. In the southerly area in the canyon, as yet totally undeveloped, definite ore-shoots are also indicated.

On the *Ben Ali*, about 4,000 feet north-westerly of the No. 3 workings, there is a very nice gold-bearing pyrite vein in granitic rock which could be developed to deliver a small tonnage of ore assaying from, say, $\frac{1}{2}$ to 1 oz. of gold per ton. This vein apparently has the possibility of being developed into a self-containing little proposition of about 10 tons per day, but it would possibly be more economical to deliver the ore to an operating mill at the main workings of the *Dunwell* by means of a cheaply constructed aerial tramway. In the *Ben Ali* area there is also a good possibility, with exploration, for the discovery of other similar veins in this granitic area.

After completing negotiations with the Bayview Mining Company for taking **United Empire.** over the *Lucille*, *Third Fraction*, and *Beth* claims, extensive exploration was commenced by the United Empire Company. With assistance from the Department of Mines a new and more practical trail to the property was completed. Surface-stripping and open-cutting on several veins exposed good widths of mainly galena, zinc-blende mineralization carrying high silver values. Open-cutting of the siliceous zone mentioned in the Annual Report for 1929 also exposed promising mineralization across appreciable widths. Several new discoveries have also been made. Underground, the Trites tunnel was faced S. 77° W. (mag.) and is reported to have intersected the Thompson vein, showing 9 feet of good ore.

A crew of about thirty men was employed on the preliminary work and up to the middle of October about 1,300 sacks of high-grade silver ore were sacked. A ground power-line from the *Dunwell* power-house has been laid to the property and a compressor is in process of installation. During the winter a crosscut tunnel will be driven from about elevation 2,720 feet. It is estimated this will be about 1,600 feet in length to the Thompson vein at the Trites tunnel. This will be carried on with a crew of about fifteen, working three shifts.

Commodious new quarters embracing sleeping-quarters, kitchen, dining and wash rooms have been erected convenient to the main tunnel. The property is also equipped with an efficient assay plant in charge of Neil Monro. Operations are being carried out under the supervision of W. Dann.

Spider. Leasing operations are being carried out on this property by O. McFadden and partner and will be continued during the winter. By November about $3\frac{1}{2}$ tons of ore had been shipped, which returned 1.01 oz. gold per ton and 294.03 oz. silver per ton.

In the Stewart area very constructive exploration has been carried out on several other properties, which include the *Kenneth* (Argentine Syndicate), *Ben Bolt, L.L. & H.*, *Troy*, and *Pioneer*.

In the Unuk River area very creditable exploration was continued on the *Unuk* group by T. McKay, H. Melville, and partners, of Stewart. Provisions and equipment, including an assay outfit, were flown in by aeroplane, and during the season a cabin was constructed, six open-cuts excavated, and stripping and general prospecting undertaken. No. 1 cut exposes a mineralized and silicified width of 48 feet averaging 0.16 oz. gold per ton, of which two sections, 9 feet and 4 feet wide, assay respectively 0.45 and 0.62 oz. per ton. Whereas the other cuts did not show the values indicated in No. 1, considerable work will be required to definitely determine the structural attitude of this replacement ore-body and possible ore-shoots in it. Further intensive exploration of this group, including diamond-drilling, is planned for the 1934 season.

ATLIN MINING DIVISION.

Exploratory work by the Alaska Juneau Gold Mining Company was carried out on several properties in the Taku River area. This included underground exploration of the *Whitewater*, which was optioned early in the year.

In the Atlin Lake section some superficial work was carried out at the *Engineer* mine and a small tonnage of high-grade gold ore from rich lenses on surface and underground was shipped. Interest in gold properties in the Big Horn Valley area shows signs of revival and more prospecting in this section was carried out. (See also report by A. M. Richmond, Assistant Resident Engineer, at the end of this bulletin.)

PLACER-GOLD MINING.

As is mentioned in the summary accompanying this report, operations in placer gold have been very active and are expanding. Exploration is on a much sounder basis with the introduction of capital under qualified technical direction. In the Atlin section two Keystone-

drilling outfits have been busy continuously and dormant possibilities are being thoroughly probed and some encouraging results achieved. Geological clarity relative to old-channel structures and location is emerging and evidence of further old-channel possibilities is developing. Future expansion of placer-mining in the Atlin section will probably tend towards the extension of drift-mining to include lower-grade gravels, the use of power scrapers and shovels, and possibly modern dredging equipment. Placer-gold production for 1933 will probably exceed that of 1932.

In the Tatshenshini River section of the Atlin Division operations on Squaw creek have extended to the upper section of the creek, with about forty men employed on the creek. Towards the end of September a new gold-bearing creek, called "Gold Run," that promises well was discovered near the junction of the Parton and Tatshenshini rivers.

In the Stikine Division the dredge on Barrington river was replaced by a gasoline tractor drag-line scraper and about 100 oz. gold recovered from test-work. It is planned to extend this operation in the 1934 season.

In the Liard Division good recoveries have been made on Gold Pan creek and activity is extending into the Little Muddy River area, in which work has been carried out on four new creeks. There is an immense virgin territory in this section, parts of which offer favourable opportunities for detailed prospecting.

NORTH-EASTERN MINERAL SURVEY DISTRICT (No. 2).

REPORT BY DOUGLAS LAY, RESIDENT MINING ENGINEER (HEADQUARTERS, HAZELTON).

GENERAL SUMMARY.

Activities in metal-mining during 1933 were confined almost entirely to gold properties. In lode-gold mining the dominant feature of the year was the interest evinced in the lode-gold potentialities of the Cariboo district, embracing both the Cariboo and Quesnel Mining Divisions; an interest which was first manifested at the close of 1932, mainly in the form of extensive blanket-staking of mineral claims after snowfall, and followed during the present year by active development at many different points by important existing mining companies, and by companies incorporated for the purpose of operating in this district. The constant recurrence of the word "Cariboo" in the names of the latter clearly indicates the grip this area has on public interest.

This interest, first resulting undoubtedly from the success of the Cariboo Gold Quartz Mining Company, Limited, duly chronicled in the reports of the Department of Mines, was further stimulated during the year by the continued success of the company mentioned and by the constantly increasing price of gold. The sequence of events, which may, without exaggeration, be termed "The Second Cariboo Gold-rush," illustrates very pointedly the far-reaching beneficial effect of the growth of the mining industry. Locally, that effect is very marked. The old towns of Barkerville, Quesnel, and Stanley have undergone a transformation, and a new town, Wells, will shortly appear on the map. Employment has been found for hundreds of men.

The output of the Cariboo Gold Quartz Mining Company for 1933 is expected by the management to approximate 8,000 oz. of gold. This company, which commenced milling on January 2nd, is experiencing its first year of productive life and the production record is eminently satisfactory.

New operations were greatly retarded by an unusually late spring and by early snows in the fall. In spite of this, however, the sum total both of underground development and surface work carried out during the year in the Cariboo district is very considerable, apart altogether from the development programme of Cariboo Gold Quartz Mining Company. A striking feature is the miner-like way in which the great majority of companies are carrying on operations and the zeal which is being shown.

As to the results of development to date, apart from that at the property of the Cariboo Gold Quartz Mining Company, gratifying results have been obtained at several different points, but various problems in connection with faulting have presented themselves. There is, however, every present indication that the lode-gold possibilities of the Cariboo district will be thoroughly probed, and that the highest measure of geologic and executive skill is being focused on this objective. The known facts undoubtedly justify persistence of effort. To date underground development has been almost entirely directed to the north-west ends of the "Island Mountain-

Round Top Mountain" and "Stanley-Yanks Peak" quartz-vein belts of pre-Mississippian age. At the south-eastern portions of both these belts showings of decided promise exist—namely, in the vicinity of Round Top mountain (*Hudson* group) and on Yanks peak.

In the Omineca Mining Division small-scale development took place at several different widely separated points, and prospecting was kept in the McLeod River area.

Noteworthy efforts on the part of two separate groups of individuals were: (1) The installation of a wood producer-gas power plant and small pilot-mill on the *Gold Brick* group (formerly *Horseshoe* group) on Bob creek, near Houston, by H. C. Stratford and associates; and (2) shipment of a car of ore (about 27 tons) from the *Glacier Gulch* group (gold values are associated with telluride of bismuth and also exist free), near Smithers, by S. F. Campbell and associate owners.

In placer-mining, material expansion took place and important developments resulted at several properties, notably at that of Consolidated Gold Alluvials of B.C., Limited. Much large-scale activity was manifested in the Cariboo and Quesnel Mining Divisions and in the Manson section of the Omineca Mining Division. Access to the last mentioned is now greatly facilitated by the construction of a road from Fort St. James to a point 15 miles north of the Nation river. Small-scale activity was marked in the McLeod River area of the Omineca Mining Division, and to a lesser degree at other points of the latter, such as Lorne, Bob, and Dog creeks. Generally speaking, there is every indication that the placer-mining industry is in a flourishing condition, and it is desired to emphasize the fact that properties offering promise to capital under intelligent direction yet await development.

In coal-mining, in view of the increasing market for "Bulkley Valley Coal," F. M. Dockrill substituted mechanical haulage for horse-haulage in the main slope of his colliery at Goat creek, near Tekwa. At the Lake Kathlyn coalfield, near Smithers, Lake Kathlyn Anthracite Coal Company carried out a considerable amount of exploratory development.

Of very real service at the present time has been the assistance rendered by the Geological Survey of Canada. The presence of W. E. Cockfield and George Hanson in the Barkerville area and of F. A. Kerr in the Manson section has been especially welcome to the operators and others.

LODE-MINING.

CARIBOO MINING DIVISION.

So far as is known at present, the quartz veins of the Cariboo district are of two different geologic ages and occur in three parallel belts or zones. Those classified by Uglow as being of pre-Mississippian age occur in the two parallel belts, as the Island Mountain-Round Top Mountain belt and the Stanley-Yanks Peak belt. The widths and the exact lengths of these belts have not yet been ascertained. The veins of Jura-Cretaceous age are distributed in a belt, coincident with the path of the Central batholith, some miles in width and over 200 miles in length, extending from Boss mountain, the south-eastern extremity of the Quesnel Division, and into the Cariboo Division and beyond the confines of the latter. All these belts are approximately parallel, trending north-west and south-east. Distinction between veins of the two classes mentioned is important. It is unlikely that pre-Mississippian veins are very prevalent west of the Stanley-Yanks Peak belt, but it is likely that some may occur in this region. The prevailing strike of the formation in the pre-Mississippian vein-belts being north-west, exploratory tunnels and surface trenches are run as a rule in this direction, because the veins which show greatest commercial promise cut across the formation.

Milling operations were commenced on January 2nd and have since been carried on continuously, the present treatment rate being about 65 tons daily. **Cariboo Gold Quartz Co.** Material expansions have been effected in the plant during the year. Diesel-engine power has been increased to 533 horse-power and air-compressor capacity to 1,300 cubic feet of free air per minute. Zinc boxes formerly used in the mill have been replaced by the Merrill-Crowe precipitation process, and the capacity of the plant is now 100 tons daily. Accommodation for employees has been enlarged and is of the most modern description. The main crosscut tunnel is being continued three shifts per day; a mechanical mucker and electric underground haulage have also been installed. This crosscut tunnel, in accordance with the plans of the management, will be the main development artery, from which branches will be run following such veins as are known to lie ahead, or others that may be met within the course of development. Underground developments during the year are distinctly

satisfactory. Items of much interest are: The striking in the course of development by exploratory winze, 110 feet below the main crosscut tunnel, a width of 50 feet of commercial ore; other blocks of ground adjacent to Nos. 5 and 8 veins at the main tunnel-level have been found to constitute commercial ore over a width of upwards of 65 feet. Another vein of good width showing values distinctly above the average was recently struck in the 1,200-foot level.

Recently, Fred M. Wells, manager, has announced that the main tunnel had penetrated the downward continuation of the *Rainbow* vein system at a depth of over 600 feet below the surface, and that the vein struck showed high-grade ore, and that in other respects its appearance was satisfactory.

This corporation is interested in several properties in the Cariboo district. **Newmont Mining Corporation, Ltd.,** Operations are conducted under the name of P. Kraft, the resident manager. The sum total of work carried out at various properties is very considerable. **of New York.**

On Island mountain, on the *Aurum* group, at 85 feet above Jack of Clubs lake, a main crosscut tunnel has been run on a bearing N. 50° W. a total distance of 1,140 feet, the objective being the probing of the downward continuation of the *Johns* ledges, and general exploration. Various veins have been encountered and one interesting replacement deposit of pyrite in limestone. Appearances generally are sufficiently encouraging to warrant expansion, and, in the fall, work was commenced on increased accommodation for employees and the installation of an air-compressor of 500 cubic feet of free air per minute capacity, operated by a 100-horse-power Ruston & Hornsby Diesel engine. On Proserpine mountain, on the *Proserpine* group, a crosscut 630 feet in length has been run on a bearing N. 79° E. to probe the downward continuation of a "cross" vein, on which a shaft was originally sunk to a depth of 50 feet. The crosscut is 120 feet vertically below the collar of the shaft. Other objectives on this group under consideration are the investigation of the vein on which the Wilkinson shaft was originally sunk and the mineralization on the *Penelope*. On the *Myrtle* and *Morning Star* groups a very large amount of surface-stripping was carried out, but no underground development. On the *Hudson* group, Cunningham creek, a certain amount of preliminary prospecting was carried out.

Premier Gold Mining Co., Ltd.—This company carried out extensive surface-stripping on the properties held under option, situated on Sugar creek and on Antler mountain.

Britannia Mining and Smelting Co., Ltd.—This company, on the *Black Jack* and *Westport* groups and on the *Wintrip* real-estate claim, has carried out extensive surface-stripping, somewhat over 500 feet of underground development in the aggregate, and also some diamond-drilling.

This syndicate, directed by W. R. Wilson & Sons, with C. M. Campbell in charge of operations, has acquired options on the *Independence* group and adjoining claims on Proserpine mountain. Extensive surface-trenching has been carried out and a programme of underground development commenced, which includes continuation of the *Warspite* adit under the *Warspite* shaft, giving a depth of 80 feet at the latter point. Curiously enough, the "A" vein system on this property is reported to carry better values than the "B" veins, of which a very large number have been exposed by surface-trenching.

Situated on Cornish mountain, just east of the Willow river, this syndicate **Cariboo Coronado Mining Syndicate.** is busily engaged in making preparations to install a small Diesel-operated air-compressor and drive a crosscut tunnel north-west at the base of the mountain on the south slope to probe the downward continuation of some prominent "cross" veins exposed on the mountain about 750 feet vertically above the tunnel-site.

This company has installed a portable Sullivan air-compressor and is driving a crosscut tunnel on a bearing N. 39° W. at elevation 4,226 feet, just above the Cairn on the outskirts of Barkerville; the first chief objective being the downward extension of the *Home Rule* ledge exposed about 500 feet vertically above the tunnel on Barkerville mountain. This tunnel is situated about 1,500 feet east of the main tunnel of the Cariboo Gold Quartz Mining Company, Limited, and on October 17th had reached a distance of 627 feet.

This company is running a tunnel at elevation 5,200 feet south-easterly, to **Richfield Cariboo Gold Mines, Ltd.** be deflected southerly at 600 feet to probe the downward continuation of a group of veins exposed by surface-stripping at elevations of between 5,850 and 6,000 feet. On October 9th the tunnel had reached a distance of 421 feet.

A portable Sullivan air-compressor has been installed on this property.

Cariboo Central Gold Mines Co.—This company has erected camp buildings at the head of Stouts gulch and is making preparations to run a crosscut tunnel due west at this point at elevation 4,870 feet to explore in depth various veins exposed on the surface on the *Blue Jay* group. A small air-compressor is to be installed.

This company owns various groups of claims situated at the following points:
Cariboo Amalgamated Gold Mines, Ltd. On Moose creek, tributary of the Willow river; on Dauntless creek, near Wingdam; on Red Gulch; in Devils canyon; on Olally creek; on Pinkerton creek; on China creek; on Cunningham creek (*Hudson* group); and on Proserpine mountain. Camps were established at Moose creek, Dauntless creek, Devils canyon, and China creek, and preliminary prospecting operations commenced at such, under the direction of J. F. Tener.

The following companies are operating in the vicinity of Stanley:—

This company is developing the *Perkins* group on Burns mountain. A small Diesel-operated air-compressor has been installed, and a crosscut tunnel about
Burns Mountain Gold Quartz Mining Co., Ltd. 200 feet vertically below the crosscut tunnel formerly run has been run a distance of 1,040 feet (on October 4th) at a point south-east of the latter tunnel. The direction of the new tunnel is N. 33° W. and the objective is the penetration of the vein system exposed by the earlier workings on this group. The tunnel has reached close to a point at which the latter may be expected to be cut.

This company is operating a group of claims situated contiguous to Chisholm
Foster Ledge Gold Mines, Ltd. creek, on one of which the old *Foster* shaft was sunk many years ago. The latter is now full of water. Close to the shaft, west of the latter, three small mineralized cross-veins occur within a width of 15 feet, and about 1,200 feet east of the shaft two intersecting cross-veins are exposed, one of which shows free gold in its outcrop. A few hundred feet south from the *Foster* shaft, and 80 feet vertically below the latter, a tunnel was formerly run about 200 feet in a northerly direction. At the end of this tunnel a crosscut has been run, exposing three small "cross" veins occurring within a width of a few feet, which are being followed by a drift towards the *Foster* shaft. These veins are well mineralized and sulphides show encouraging gold values. A crosscut is to be run towards the *Foster* vein when the drift mentioned is opposite the shaft.

This company holds a number of claims on Cariboo mountain distant by pack-
Cariboo Mountain Gold Mines, Ltd. trail about 23 miles from Stanley. The chief feature is the *Dominion* ledge, a large quartz vein, probably averaging from 8 to 10 feet in width, which outcrops prominently on the summit of the mountain. Although bleached white on the surface, oxidation is apparent at a depth of a foot or so, and free gold can be detected at some points. This vein cuts across the enclosing schistose sediments, which latter are intruded by pyroxenite in the near vicinity of the vein. The company is engaged in running a crosscut tunnel which will cut the vein at a vertical depth of 160 feet below the outcrop in an estimated distance of 360 feet. A force of twenty men is employed under the direction of J. A. McLaughlin.

This company has a small force of men engaged under the direction of
Bridge Island Golds, Ltd. C. B. Hume on the *Coulter* group, situated on Coulter creek. A tunnel is being run following a wide vein striking N. 72° E. (mag.) at an elevation of 5,175 feet, after a considerable amount of surface prospecting had been carried out. A small air-compressor is to be installed shortly.

B.C. Cariboo Gold Fields, Ltd.—This company, of which V. Dolmage is vice-president, holds nineteen mineral claims on Burns mountain, at the head of Burns creek, and carried out preliminary prospecting during 1933.

Dragon Mountain Gold Quartz Group.—On this and adjoining claims situated on Timon and Jawbone creeks a large amount of painstaking prospecting has been carried out by G. W. Bruggy and associates.

Hixon Creek.

Considerable activity occurred on this creek during 1933. Quesnelle Quartz Mining Company, Limited, installed a small Diesel-operated air-compressor and pumping plant, and unwatered the old shaft and workings carried out by a company of this name fifty years or so ago, and as to which there has been much surmise. It is now disclosed that the country-rocks in the vicinity of the shaft consist of schisted interstratified greenstones and sedimentaries.

In the former are numerous quartz veins varying in width from a few inches up to several feet. The country-rocks have been subjected to intense oxidation and alteration down to a point about 100 feet below the collar of the shaft. Below this, oxidation is much less marked, and practically absent at the bottom of the shaft, the total depth of which is 198 feet. It is rendered evident that there is exemplified in the region of this shaft, and extending eastwards as far as the tunnel on *Cayenne 2*, an uneroded remnant of a zone which has undergone deep secular decay in Tertiary times, and wherein the quartz veins have been subject to a process of slight secondary enrichment. Detailed sampling of underground workings has been carried out by the management. The result of this will doubtless throw much light on the matter, but it seems possible that commercial aspects will resolve themselves into the matter of determining by further exploratory work whether a wide belt of rocks down to the bottom of the oxidized zone does or does not constitute low-grade ore if mined *en bloc*. Operations at this property are conducted under the direction of E. D. Clarke.

This company owns a large number of mineral claims adjoining Quesnelle **Brotgold Mines, Quartz Mining Company** on the east, and a small force of men under H. F. S. **Ltd.** Woolverton has been engaged during the year in detailed surface examination and preparation of a detailed topographical map, and also in continuation of the tunnel on the *Cayenne* group, on which this company has an option; the object of this preliminary work being to determine the existence of such commercial possibilities as may exist in connection with mining a large block of ground. Late in the season Placer Mining Lease No. 2118 (owned by E. Hann and J. Strbac and described in the 1931 Annual Report) was acquired, and it was decided to drive a tunnel in the left bank of the creek from the face of the pit in the hope of encountering the source of the rich residual gold disclosed by placer-mining operations. This tunnel had not been started at the time of inspection by the Resident Engineer. A. M. Richmond, Assistant Resident Engineer, was detailed to make a special examination of this area.

In the fall R. S. Eskridge obtained an option on the *Moosehorn* group, owned by H. Guthrie, situated in the Ahbau Lake section (*see* 1920 Annual Report), and at once commenced preliminary prospecting operations. Markedly encouraging results are stated to have been obtained and tunnelling is to be carried on during this winter.

QUESNEL MINING DIVISION.

The quartz veins exposed at the headwaters of the Horsefly river attracted considerable attention on the part of examining engineers, and A. M. Richmond, Assistant Resident Engineer, was detailed to make a special reconnaissance of this area.

On Yanks peak the Britannia Mining and Smelting Company, Limited, has an option on the *Midas* group, owned by H. G. S. Heisterman, O. J. Pickering, and J. Glover. On this at one point occur within a comparatively small area a number of "cross" veins, which appear to offer considerable promise. Assays of one vein, of considerable size, are given in the 1930 Annual Report, and in some of the others free gold can be seen, and in one instance the mineral chiviatite was seen to be present. A force of seven men will be employed in underground work this winter.

The *Yanks Peak* group, owned by the Cariboo Yankee Belle Mining Company, Limited, adjoins this property on the south-east, and the showings thereon appear to well merit intelligent development. A crosscut tunnel, which on September 19th had advanced a distance of 145 feet, is, the management states, to be continued on contract this winter. A portable air-compressor has been installed. This crosscut is approximately 400 feet below the original No. 1 adit-tunnel. It is stated that some veins showing good gold values were penetrated by this crosscut shortly after commencement, but lagging prevented inspection.

The *Jane* group, owned by R. Reinhold, adjoins the *Midas* on the north-west, and also well merits development. A new cross-vein showing free gold was discovered by the owner during 1933.

Active prospecting took place in this Mining Division and some new discoveries were made. Among the latter may be mentioned the *Mariner* group, owned by F. Dickson and associates, situated on Spanish mountain, close to the Likely-Spanish Lake road. On this occur several veins, some of which are well mineralized, and one of which shows free gold on the surface. Considerable interest attaches to this property in view of the fact that the veins occur in an

igneous rock which closely resembles the pre-Mississippian intrusives of the Barkerville area, and the region merits detailed examination and prospecting.

On the *Treadwell* group (formerly *Wonder* group; see 1923 Annual Report), owned by J. Creagh, situated on Cedar creek, an option was obtained by the Premier Gold Mining Company, Limited. This company relinquished its option after carrying out development-work.

OMINECA MINING DIVISION.

Small-scale development has taken place at several different widely separated points. Columario Consolidated Gold Mines, Limited (formerly Columario Gold Mines, Limited), resumed operations in October at its property near Usk, employing a force of fifteen men. On Hudson Bay mountain, near Smithers, a small amount of development was undertaken at the *Jessie* group by Jessie Gold Mines, Limited; at the *Silver Lake* group by W. R. Wilson & Sons; and on Dome mountain, near Telkwa, W. R. Wilson & Sons carried on underground development at the *Free Gold* group with a small force. Results obtained are said to have been satisfactory. The scale of operations at this property and at the *Silver Lake* group is to be increased in 1934.

At the *Glacier Gulch* group (described in Bulletin No. 1, 1932) the owners, S. F. Campbell and associates, mined a car-lot (27 tons) of ore and erected a small aerial tram to convey the ore to the road—a highly commendable effort. The shipment of ore assayed 3.09 oz. gold and 0.55 oz. silver per ton. Freight charges are \$9 per ton and smelting charges \$2 per ton. Further shipments of high-grade ore are expected and it is quite possible the property may develop into a large-tonnage producer of lower-grade ore. Surrounding conditions contributing to low mining costs are favourable. Attention is directed to this property, which exhibits pronounced promise.

In the northern portion of this Mining Division at Aiken lake, at the headwaters of the Mesilinka river, Consolidated Mining and Smelting Company, Limited, has been carrying on preliminary operations on the *Polaris* group, a gold property discovered by the staff of this company last year.

At the *Gold Brick* group (formerly the *Horseshoe* group) on Bob creek, near Houston, H. C. Shatford, A. J. MacPherson, G. W. Smith, and associate owners, have installed a wood producer-gas power plant of 175 horse-power capacity and have erected a small pilot-mill for treating the "Porphyry Dyke," in which free gold is present. This type of power plant is rare in the Province and is of undoubted interest, and all the more so because it has been actually constructed by H. C. Stratford himself, whose mechanical genius is reflected in the many novel features of the milling equipment and plant generally. The commercial possibilities of this property have engaged the attention of various examining engineers for some years past, since it is evident that if values are sufficient to permit of mining the highly altered belt of volcanic rocks as a whole, extremely low mining and milling costs would obtain. An intelligent opinion as to average values can only be formed after thorough and detailed sampling. Of seven samples taken by the Resident Engineer from the south canyon-walls, four showed a trace of gold only, and the remaining three showed upon assay, respectively, 0.04, 0.20, and 0.10 oz. gold per ton. These results are quite insufficient to form an opinion of average values, but, considered in conjunction with the size of the deposit and the surrounding features contributing to remarkably low mining and milling costs, they clearly indicate the advisability of thorough sampling. It might be added that, inasmuch as intrusive rocks are known to exist south of this property, there is a possibility that gold values may increase as the intrusive is approached.

Radio Gold Mines, Limited, installed a portable compressor at its property near Babine lake and carried out some development.

PLACER-MINING.

Noteworthy expansion has marked the year in several different directions and important developments have taken place at several different properties. There are now in all five drag-line plants of different sizes and types in the district.

In the Manson section the Consolidated Mining and Smelting Company of Canada, Limited, has carried out much road-construction (in connection with the road now being gradually advanced northwards from Fort St. James and which has reached a point 15 miles north of the Nation river) and has completed the installation of a Sauerman high-line installation with a 2-cubic-yard bucket on its property on Slate creek. Operation of this plant was expected in September. At the property of Germansen Placers, Limited, hydraulic operations have been

carried on throughout the season. Omineca Placers, Limited, early in the year commenced operation of its 1-cubic-yard bucket, Sauerman high-line plant at its property below the mouth of Slate creek and continued throughout the season. Vital creek, on which deep-lead operations were carried on by Gow Sing and associates at one point, and by R. M. Shepherd at another point, appears likely to develop into an important placer-gold producer. The operations of J. J. Warren, W. Gibbon, and E. T. Gibbon at their property, situated on the buried channel of Tom creek, have shown good bed-rock values, and it seems likely that further investigation may disclose that this property can with advantage be hydraulicked. On the south side of Manson River valley, below Slate creek, S. Rosetti and A. E. Hayward have carried out meritorious prospecting on leases held by them. On Kelly creek a number of prospectors were engaged following the discovery of coarse gold on that creek last year by David Alexander, an Indian.

On McLeod and Little McLeod (McDougall) rivers much activity developed on the part of prospectors. Much preliminary testing was carried out at the property of the Little McLeod River Placers, Limited, under the direction of F. B. Chettleburgh. On the leases of W. L. Armstrong and associates on the McLeod river a considerable amount of prospecting was carried out.

In the Cariboo and Quesnel Mining Divisions activity and expansion were widespread, and important developments took place at several properties, which cannot in this report be enumerated in detail. Among the larger hydraulics, the *Bullion* mine was operated by Bullion Placers, Limited, under the management of R. F. Sharpe, and a longer operating season was had than for some years past. A noteworthy event was the commencement of deep-lead mining operations by the Consolidated Gold Alluvials of B.C., Limited, at Wingdam. Mining operations carried on in No. 2 shaft disclosed that the run of pay-gravels, encountered originally in this shaft at a depth of approximately 120 feet, on false bed-rock was quite extensive and clean-ups were made each week. Considerable remodelling of plant and construction of additional camp buildings were effected during the year, and immediate preparations put in hand to commence mining bed-rock gravels in No. 1 shaft as soon as certain necessary preliminary work, which cannot be here described in detail, has been carried out. Upwards of 100 men have been employed at this property during the year.

SOUTHERN AND CENTRAL MINERAL SURVEY DISTRICTS (Nos. 3 AND 4).

REPORT BY PHILIP B. FREELAND, RESIDENT MINING ENGINEER (HEADQUARTERS, PENTICTON).

INTRODUCTION.

Mining developments throughout the district have been very satisfactory, and many old prospects are being opened up and developed with encouraging results. Unemployed men have been placer-mining in the creeks and recovering sufficient "pay" to make a living. Much time was spent by the Resident Engineer in assisting those unfamiliar with mining and the results will, it is hoped, create more prospectors. The best area for prospecting is in and around the locality where gold has already been produced, such as the Fairview belt near Oliver, Hedley, Camp McKinney, Greenwood, Coquihalla, Stump lake, Vidette lake, and in the neighbourhood of the *Windpass* mine near Chu Chua. Most of these areas have good transportation facilities and electric power, which play a very important part in mine development, and often mean that mineral-deposits containing lower values in gold may be mined profitably, whereas those much farther afield without these facilities cannot be considered at the present time.

GRAND FORKS MINING DIVISION.

FRANKLIN CAMP.

This mine was closed early in the year as no ore was found beyond the **Union.** *Maple Leaf* fault. This fault has a comparatively flat dip to the south-west and has dropped the overlying conglomerates in that direction. Numerous diamond-drill holes failed to prove any ore and the Union Mining and Milling Company (con-

trolled by the Hecla Mining Company operating in the name of James F. McCarthy) decided to close down. The ground lying in the direction of the throw of the fault holds attractive possibilities and it seems unlikely that the ore-deposits found in the *Union* cease at this point, so that further exploration such as sinking on the fault appears to be warranted. The company is building a small cyanide unit to treat the mill tailings from former operations.

The Union Mining and Milling Company developed this claim by shaft-sinking and drifting on the ore. Mineralization occurred in cherty quartzites. The values in gold were not evenly distributed throughout the shear-zone and an average milling-grade was not obtained. Exploration ceased in October. The interesting point about this area is that similar geological and mineralogical conditions occur on the *Homestake* and *Banner* to those on the *Union* group, and although it is possible, it seems unlikely, that the ground lying in between is barren of ore. It is probable that the ore-bodies have been pushed in a southerly direction by later intrusives and the ore will be found to lie in a semi-circle between the *Union* workings and the *Homestake*.

Maple Leaf.—A considerable amount of work was done by the Union Mining and Milling Company on this group, adjoining the *Union* to the north, but no ore was found. This camp warrants a great deal more exploration-work.

PAULSON SECTION.

In this mineralized area there are many different types of ore-deposits containing gold. The *Molly Gibson*, lying to the south-west of Paulson, contains pyrite, chalcopyrite, and gold in replaced limestone. To the east of Paulson there are many quartz veins in the syenite and some very attractive gold assays have been obtained.

LIGHTNING PEAK SECTION.

Developments in this area are proving very satisfactory. On the *Waterloo*, lenses containing high-grade ruby silver varying from 8 inches to 4 feet have been found in the No. 4 tunnel. This ore is mostly primary, and individual samples will assay between 7,000 and 8,000 oz. per ton in silver. Numerous attractive-looking shear-zones from 4 to 10 feet wide have been uncovered a few hundred feet to the east of the *Waterloo* workings, and, although of comparatively low grade, these warrant exploration. A shaft has been sunk on one of the north-south shear-zones and, according to reports, good gold assays have been obtained.

On the *Morning-Dictator* group, lying about 2½ miles north of the *Waterloo* group, several parallel shear-zones have been uncovered and assays varying from 0.04 to 0.50 oz. in gold per ton have been taken. Picked samples assay 1.60 oz. in gold. These shear-zones appear to be very attractive, having a width of from 4 to 10 feet. Mineralization is with pyrite, chalcopyrite, arsenopyrite, and lesser amounts of galena in a quartz gangue.

On the old *Lightning Peak* group, owned by W. A. Calder, more high-grade silver ore has been found in the lower drift. On the *Pay Day* group a new displaced vein, containing a high percentage of galena, sphalerite, and antimony, has been discovered.

Developments in the Lightning Peak area in the past two years have been most promising, and it is considered well worthy of further development. Transportation facilities, although still rough, have been much improved and in the summer a car can be driven into camp.

PLACER-MINING.

A good deal of placer-prospecting has been carried on by individuals and some gold recovered, although no outstanding discoveries have been made in this Division.

GREENWOOD MINING DIVISION.

WALLACE MOUNTAIN SECTION.

The appreciation in the price of silver has assisted the miners in this section and many of the old Crown-granted claims have been taken up. The *Bell* and *Highland Lass* properties are as attractive as ever and appear to have many years' supply of ore. The *Wellington* is also a constant shipper. On the *Sally* group ore is being shipped from the *Peublo Fraction*. It seems likely that more silver ore will be found in these old workings. On the *Beaver* a new high-grade silver ore-shoot was found and some shipments made.

Carmi.

The Canadian American Mines, Limited, a syndicate operating the *Carmi-Butcher Boy* group close to Carmi, has carried on development from the bottom of the shaft and made some shipments of gold ore to the smelter. The ore in this locality appears to lie in certain shear-zones striking in an easterly-westerly direction. Some good values were found in the bottom of the *Butcher Boy* shaft at a point about 565 feet west of the *Carmi* shaft.

Mogul Mining Co., Ltd.

More work has been done on the *Mogul* claim by this company and small segregations of gold ore were found at and near the contact of the quartz diorite and Wallace group of rocks. This work had been closed down temporarily. A small shipment of ore was made.

GREENWOOD SECTION.

Stemwinder and Brooklyn.—These claims, now owned by R. Forshaw, of Greenwood, have been optioned by outside interests, but, according to reports, no work has been done. Some attractive assays in gold were taken from the *Stemwinder* glory-hole and on the 80-foot level of the *Brooklyn*.

Winner-Keno.

Development-work on this group, lying about 2 miles south-east of Phoenix, has uncovered two quartz veins varying from a few inches to 4 feet in width, which contain gold values from 0.10 to 2 oz. per ton. This mineralization appears to occur in certain shoots and is not generally distributed throughout the quartz veins. More exploration would be justified.

Quartz veins containing some good values in gold have been found on the *Golconda*, owned by Oli Lofstad; the *Dynamo*, owned by Jerome McDonell; the *Starve Out* and *Helen*, owned by Oli Lofstad; the *Texas*, owned by Geo. Swanlund; and other claims, most of which lie to the east of Greenwood.

JEWEL LAKE CAMP.

The Dentonia Mines, Limited, is developing the old *Jewel-Enterprise* group and, according to reliable reports, some good ore-widths and values have been found above what is known as the Water tunnel. The ore occurs in quartz in the schistose rocks. Major Angus Davis is in charge of the work.

Gold Drop-North Star.

These claims have been developed further by a syndicate of men from Greenwood and a shipment made to the smelter. The ore found in the quartz veins which parallel the *Jewel-Enterprise* vein system to the east contain segregations of pyrite, galena, tellurides, and free gold. Vein-widths vary from a few inches to 4 feet, occurring in schist. The prospects for more ore are good.

CAMP MCKINNEY SECTION.

Some development-work has been done on the *Gold Hill* group, lying to the north-west of the old *Cariboo-Amelia* mine, and small segregations of ore containing free gold have been found. It is understood that the owners of the old *Sailor-Cariboo-Amelia* group intend to work this winter on their holdings. Other claims lying to the east of the *Cariboo-Amelia* group, and held by J. Malone and Alec Broomfield, of Princeton, are also being developed.

This area has been brought to the attention of the public for some years, but practically nothing has been done other than staking and acquiring old Crown-granted claims. This is an attractive section. The quartz veins vary from 1 to 6 feet in width and can be traced for several thousand feet in an easterly and westerly direction. Values on the surface are not generally high, but good ore was mined and milled in the old *Cariboo-Amelia*; and on the *Waterloo Consolidated*, lying about 2,500 feet from it to the east, a similar type of ore-deposit was found. According to those who worked last in the mine, a strong quartz vein still exists in the bottom levels. A motor-road and a high-power electric line pass through the centre of this area and these will greatly assist future development. The quartz veins occur in schistose rocks and in some places conform to and in others cut across the bedding of the schist.

PLACER-MINING.

A considerable amount of activity has been going on in the placer mines on Rock creek, Boundary creek, and the northern part of the Kettle river. On Rock creek, now called Jolly creek, some shafts are being sunk by the Puget Sound Bridge and Dredging Company on the

Rock Creek Consolidated ground. When examined in October the shaft had not reached bed-rock. On lease No. 66, below the road crossing on Jolly creek, a drag-line and suction-pump were installed by this company with the intention of cross-sectioning the creek and ascertaining the possible values in the gravels. Some good gold values were recovered, but high water this autumn necessitated closing down the operation for the year.

The bottom of Rock creek seems to offer attractive possibilities to those financially able to handle the water problem. On McKinney creek several small operations have been carried on, gold recoveries being made where the gravels are generally shallow, say from 4 to 8 feet. Such gravels offer better opportunities to those without financial backing.

Boundary Creek.

A considerable amount of work has been done on the lower reaches of this creek, and gold values in certain strata have been recovered. High water has also interfered with these operations.

Below the Edgewood-Vernon road bridge on the Kettle river, on several small workings some gravel varying from 6 to 20 feet deep containing placer gold has been discovered. The gravel on bed-rock appears to be particularly attractive.

OSOYOOS MINING DIVISION.

The old workings on the *Lakeview* have been cleaned out and sampled and some development has been done on the *Dividend* and *Little Manx* by the Northern Syndicate, Limited, of Calgary. The results of this sampling are not yet to hand, but it is understood that gold values up to $\frac{1}{2}$ oz. per ton have been obtained over mine-widths. The area has been very much disturbed, and should values be found more exploration-work will have to be done before any definite idea can be had regarding the possibilities. On the *Lakeview*, chalcopryite occurs with the ore.

FAIRVIEW CAMP.

The *Morning Star* shaft has been unwatered down to the 200-foot level and the old drifts on the 100- and 200-foot levels cleaned out and extended in a northerly direction. Up to the present, values for 230 feet north and above the 100-foot level have been found to vary, but, with sorting, several shipments of ore have been made. The original outcrop of this ore-body was rich in gold and it is surmised that this shoot rakes at a flat angle to the north, passing under the 100-foot level at a distance approximately 200 feet north of the shaft. Should the shoot extend to the 200-foot level it will probably be found some distance ahead of the present drift-face. Mineralized vein-widths vary from 3 to 10 feet. There is a strong parallel vein 200 feet east of the main vein upon which nothing has been done recently. Reports of ore formerly found in this vein are satisfactory. Full equipment for development has been installed and a camp constructed. About twenty-five men are employed.

In the *Silver Crown* workings, approximately 1,500 feet to the north-west of the *Morning Star*, an attractive ore-body was uncovered some years ago. On the *Black Diamond*, lying to the south of the *Morning Star* workings, another vein containing gold ore was developed. Both these properties are owned by the *Morning Star* group. It therefore seems possible that the ore mentioned above might be mined in conjunction with the lower-grade quartz and an average obtained that would pay to mill.

This company did a considerable amount of work in reconditioning the old workings, tunnelling, and open-cutting quartz veins varying in width from 2 to 8 feet on the *Flora* group, which adjoins the *Stemwinder* to the north-west. At the present time a contract has been let to drive 100 feet of tunnel from the lower workings to intersect the downward extension of one of the strong quartz veins found on the surface.

General.

In this area, which lies on the south end of the Fairview gold-belt, there are many persistent quartz veins varying from 2 to 20 feet in width. These veins strike in north-south and east-west directions in the granite and schistose rocks and are attractive enough to warrant development. Most of the outcrops consist of either barren quartz or contain segregations

of high-grade gold ore which are probably the tops of shoots having a definite rake. It seems likely that the ore-shoots will be found where favourable structural conditions exist, such as faulting or warping of the schistose rocks. A quartz-porphphyry or aplite-porphphyry dyke is closely associated with the ore-bodies in the *Morning Star* mine.

At the north end of this area, about 10 miles from Oliver, the *Twin Lakes* (Parvenue Mines, Limited) and the Grandora Mining and Milling Company's ground on Oro Fino mountain have been optioned by the Colonel Spencer interests. Developments in these mines (which adjoin) have proven the continuity of the ore-bodies containing some very satisfactory values in gold. In this area the quartz veins have been flattened out and considerably faulted by some igneous intrusive. Several car-loads of ore have been shipped direct to the smelter and a small tonnage of lower-grade material has been milled. At the present time a new plant is being installed on the *Twin Lakes*. The ore occurrences in these mines give a very good idea of what may happen when favourable structure exists.

Other attractive prospects on which only a small amount of work has been done lie to the south-west of Oro Fino mountain. Amongst these may be mentioned the *Torreos* group, owned by William Long and associates, of Penticton; the *Standard* group, owned by A. S. Hatfield and associates, of Penticton; and the *Horseshoe* group, owned by W. A. Roadhouse, of Penticton. On all these claims strong quartz veins containing occasional high-grade values in gold have been found. Further exploration is warranted.

HEDLEY SECTION.

Exploration-work has continued throughout the year on the Hedley Gold Mining Company's property, which has been optioned by the Mercer interests, now called the Kelowna Exploration Company. Nothing official has been issued regarding results, but it is understood more work is justified.

On the Gold Mountain Mines property, formerly the *Pollock* group on Henry creek close to Hedley, development-work in the upper workings of the *Maple Leaf* has uncovered an attractive highly oxidized quartz vein containing pyrite and arsenopyrite. Values in this vein appear to be erratic near the surface. The company intends to drive a crosscut tunnel to tap this vein at an elevation of 280 feet lower. There are two veins on this property which converge on the strike to the south and it is in this direction that more consistent values are looked for. A small portable gasoline compressor is being installed, a log camp constructed on the property, and a wagon-road built from the Great Northern Railway to the camp.

The Stenwinder Mountain Mines, embracing the *Whirlwind* group, lying on the ridge between Hedley creek and Similkameen river west of Hedley, is being developed by driving ahead what is known as the Red tunnel, in which attractive values in gold in arsenopyrite have been found. Some years ago this property was diamond-drilled and in one of the holes, about 300 feet north of the Red tunnel, about 3 feet of ore assaying 0.33 oz. in gold per ton was found. A wood-frame camp has been built about half a mile west of the tunnel and development will be carried on this winter.

On the *Boston* group, lying north of the *Nickel Plate*, some diamond-drilling is being done by Victoria interests. South of the Similkameen river prospecting has uncovered wide mineral-zones containing values in gold in arsenopyrite and more development-work is anticipated.

SIMILKAMEEN MINING DIVISION.

Sterling Gold Mines. On the Sterling Gold Mines (formerly *Patsy* group), situated on Sterling creek, two crosscuts, one from the bottom of the creek and the other higher up the hill, have intersected two separate ore-zones varying from 6 to 9 feet in width and containing bands of arsenopyrite, carrying gold. It seems likely that other zones will be found. The company has installed a Diesel engine and compressor and will drive the lowest crosscut ahead this winter. Prospects for this company appear to be quite good, providing permanent ore-shoots are found along the strike.

GENERAL.

Numerous discoveries of gold have been reported in the section embracing the watershed of Granite creek and between Otter lake and the Tulameen river. These were not examined this year. A good deal of work was done on the gravels of the Similkameen and Tulameen

rivers and a considerable amount of gold and platinum recovered by individuals. On Siwash creek the benches have been prospected by means of a small hydraulic outfit as well as shaft-sinking and open-cutting. Attractive values were found on the old high channels where some of the work was done, and should they continue it seems likely that a comparatively large operation may be justified.

VERNON MINING DIVISION.

The Pre-Cambrian Mines Company's property (*White Elephant*) has been worked by Seattle interest under the management of P. W. Holdsworth. Ore taken from the collar of the old shaft was milled with, it is said, satisfactory results. Certain additions were made to the mill to permit this test being made.

Skookum.

This group of nine claims is situated about $4\frac{1}{2}$ miles from Vernon road on the west side of Okanagan lake. An option was taken by W. J. Armstrong, Vernon. Strong quartz veins from 2 to 4 feet in width in volcanics and sediments are exposed. In highly metamorphosed zones some high-grade gold ore is found.

From Trout creek north, on the west side of Okanagan lake, a lot of prospecting has been carried on and numerous quartz veins uncovered. It is too early to say just what these discoveries may indicate, but it seems likely that some valuable deposits may be found.

On the *St. Paul* group, on a branch of Cherry creek east of Vernon, New Westminster parties have continued development. Some years ago some high-grade ore was found and mined on this property.

The old *Monashee* mines were cleaned out and sampled by Vernon interests and some good gold values found in certain sections. According to reports, exploration is being proceeded with.

One of the most interesting discoveries was made approximately 800 feet above and east of Woods lake on what appears to be an old river-channel now covered by basalt. Well-rounded pebbles are found extending for about $1\frac{1}{2}$ miles in a northerly direction and about 1 mile to the east, with an approximate depth of 200 feet. Some values in placer gold have been recovered in a tunnel driven close to bed-rock near the south end. It is too soon to estimate the value of this property, but should these values continue from bed-rock up for any considerable distance a large part of this mass might be profitably mined.

PLACER-MINING.

Most of the creeks in this Division, including Mission, have been mined by snipers and small amounts of placer gold recovered.

KAMLOOPS MINING DIVISION.

Allies. This group, on the South fork of Tranquille creek and formerly owned by O. Batchelor & Sons, of Kamloops, has been taken over by D. B. Sterret, Gordon Dickson, and associates, and some machinery installed for development-work. A great deal of oxidized material occurs over a wide area in which quartz veins have been found containing high values in gold. Exploration along the creek has proven that some of the quartz is not in place and seems to have been transported there by glacial action. The high gold values are worth developing, and this winter work will probably prove whether or not minable veins and values occur in place.

Windpass. This group was developed some years ago and a considerable amount of gold ore blocked out. During 1933 the Trites-Wilson interests commenced construction of a mill, and have put in an aerial tram from the mine to Dunn lake, where the mill is being built, and production should commence in 1934. The ore is complex, containing pyrite, chalcopyrite, sphalerite, galena, and a bismuth telluride in a gangue of quartz and calcite. When the mine was examined in September a definite flow-sheet had not been worked out for the mill, but it seems likely that flotation in connection with Wilfley tables will be used and, later, possibly the tailings will be cyanided. Two cars of high-grade ore were shipped to the smelter.

GENERAL.

A tremendous lot of prospecting has been done in the Kamloops Mining Division and some likely-looking samples of gold ore sent in from the Clearwater Lake area.

PLACER-MINING.

Practically all the streams flowing into the North Thompson river have been exploited by placer-miners, with the result that many men have been able to earn a living. Reports of placer-gold finds on Scotch creek, flowing into Shuswap lake, have been gratifying. At low water on the North Thompson and Thompson rivers the bars offer opportunities for small operations.

CLINTON MINING DIVISION.

The Big Slide Mining and Development Company has been taken over by W. L. Gilbert and associates and reorganized. A 25-ton mill was in course of construction in September and suitable machinery for power installed. Unfortunately the lower drift could not be examined on account of water, but it is understood that from the bottom level drifts were driven both ways and crosscuts put in at intervals into the foot-wall. In these crosscuts ore varying from 1 to 3 feet is said to have been found and values up to \$30 per ton in gold obtained. Pelton wheels will be used to generate power for the operation.

Adjoining the *Big Slide* group and under the same regime, the Pavilion Gold Mines, Limited, property is located. On this property a shaft has been sunk about 165 feet and levels driven at 75 feet and near the bottom. In the 75-foot level an oxidized quartz vein occurs varying from 6 inches to 3 feet in width. On the lowest level the vein in the face of the drift was 2 feet 10 inches wide and was heavily mineralized with pyrite and chalcopyrite. The management states that values are very variable and that only by taking samples from the entire face can a proper average be obtained. There are surface indications of other veins in this vicinity traceable for several hundred feet and some work is justified on the property.

ASHCROFT MINING DIVISION.

The Rufus Argenta Mines, Limited, has an option on the *Ashcroft* group, about 1.8 miles from Martel, on the Canadian National Railway. Some diamond-drilling was being done on a series of quartz veins varying from a few inches to 6 feet in width in the schistose and volcanic rocks of the lower Cache Creek series. The veins generally conform to the strike of the schist. Only low values had been found at the time of examination on September 24th. A camp has been constructed on the property.

PLACER.

A lot of small placer-mining operations were carried on along the Thompson and Fraser rivers in this Division and many small lots of gold recovered. Some of the bars on these rivers appear to be attractive if they can be economically mined.

The *Vidette* mine, situated on Vidette lake, about 45 miles north of Savona, has been refinanced this year and is being vigorously developed under the direction of Gordon F. Dickson. At the present time a new working-shaft is being sunk to the 500-foot level. Other development is being carried out on the main vein, which varies from 6 to 37 inches in width. Drifts were being run on the ore. The results of development this year have been very satisfactory, according to reports by the management. It is expected that mill-feed will average nearly 1 oz. of gold per ton. The mill has been improved and will have a capacity of 40 tons a day. It was started in December, running one shift. This mine is expected to be a fairly important gold-producer in 1934.

The whole area around Vidette lake seems to offer some promise, and although most of the veins discovered are narrow they are persistent. Other discoveries have been reported from this neighbourhood carrying between 0.50 to 0.80 oz. in gold per ton over 3-foot widths.

NICOLA MINING DIVISION.

Nicola Mines and Metals. This company was organized in 1933 to take over the Planet Mines and Reduction Company, Limited, and certain other adjoining properties, the most important of which is the *Joshua* group, worked many years ago by an English company. The new company is financed by New York interests. The group now embraces the *Joshua*, *Tubal Cain*, and *Enterprise* veins, which heretofore have been worked separately.

The old *Joshua* shaft is being sunk from the 400-foot level (previously done) to the 1,000-foot level and the *Enterprise* (old *Planet*) crosscut is being extended to intersect the *Tubal Cain* and *Joshua* veins. The approximate distance between the *Enterprise* and the *Joshua* vein is 2,000 feet, providing the dip of the vein is maintained. The veins in these three properties vary in width from 4 to 46 inches and the values from 0.20 to 1 oz. per ton in gold, with some silver. The minerals found are pyrite, galena, chalcopyrite, tetrahedrite, and free gold. The country-rock is the Nicola formation and includes various types of volcanics and greenstones. The old *Planet* mine was equipped with a 100-ton mill, from which some production was previously made. This mill is being improved and when sufficient ore is developed it is expected that production will be commenced.

Gold Reef Mines, Ltd. This company staked a group of claims adjoining the property of the Nicola Mines and Metals Company to the south-east and a small amount of prospecting has been done on the possible vein extensions. There seems to be a good opportunity to develop some ore on this company's holdings and systematic work should be undertaken with this end in view. The veins and country-rock are similar to those found on the Nicola Mines and Metals ground.

Jennie Long. This old claim, adjoining the *Gold Reef* group, was taken over by Calgary parties under the direction of E. W. Watson, and in June a camp, blacksmith's shop, and head-frame erected. The old shaft is supposedly 70 feet deep and certain sections of the quartz vein are said to contain gold values. The strike of the vein is north-west and south-east (mag.) and the dip at the shaft-collar 64° N.E. The vein has been traced for about 500 feet to the south-east by means of open-cuts and shallow shafts. A sample of quartz ore piled on the dump assayed: Gold, trace; silver, 1.20 oz. per ton. Galena and pyrite were present.

YALE MINING DIVISION.

Developments in the Coquihalla area seem to point to the fact that there are important values at depth. The lower crosscut on the *Home Gold* cut the ore-body at about 465 feet from the portal and 187 feet below No. 3. The ore-body at this point covered about $15\frac{1}{2}$ feet in width, made up of $4\frac{1}{2}$ feet of heavy pyrite-arsenopyrite minerals on the hanging-wall and the remainder a web-like quartz structure containing pyrite. The hanging-wall ore assayed 0.70 oz. in gold and 0.10 oz. in silver per ton. Nine feet of the foot-wall quartz adjoining this assayed 0.25 oz. in gold and 0.06 oz. in silver per ton. The ore, faulted on the north end of the lower level, has been found beyond the break and good values over 5 feet in width obtained.

The *Dawson* mine No. 4 level has been extended, and some likely-looking mineralization over drift-widths assayed 0.40 oz. in gold and 0.10 oz. in silver per ton.

There are many other prospects in this belt, which is about 2 miles wide and extends from Coquihalla over the Summit into Siwash creek on the Fraser River slope, that justify some exploratory work. The vein systems occur both in the serpentine, greenstone, and metamorphosed slates. Transportation is by means of the Canadian Pacific Railway, which traverses the foot of the mountain along the Coquihalla river. Veins striking into the hill permit gravity operations.

EASTERN MINERAL SURVEY DISTRICT (No. 5).

REPORT BY B. T. O'GRADY, RESIDENT MINING ENGINEER (HEADQUARTERS, NELSON).

INTRODUCTION.

Briefly summarizing the year's activities, pronounced interest in lode-gold mining has been sustained throughout District No. 5, resulting in a large aggregate amount of development and exploratory work, accompanied by a substantial increase in gold production. The 1933 gold production should approximate \$1,000,000 in value. This is chiefly derived from the Nelson and Trail Creek Mining Divisions. The Nelson output, which should approximate 21,000 oz., is the best since the year 1913, and the Rossland production, which showed a marked increase since August, when the well-known gold-copper properties of the Consolidated Mining and Smelting Company were made available to lessees, should be close to 10,000 oz., the largest amount of gold recorded from this area since 1925, when large-scale production by this company languished.

While interest in the yellow metal, stimulated by its increased price, has been the means of creating a substantial amount of new employment in the aggregate, the largest factor in the general mining industry of the district is the advancing price of silver and the associated base metals due to higher sterling exchange values. This is of importance in connection with the outstanding production of silver, lead, and zinc made by the Consolidated Mining and Smelting Company, which raises wages as metal prices go higher. The Trail plant is being operated 85 per cent. of capacity in the lead department and 50 per cent. in the zinc. This is in accordance with production ratios established by the international cartel, which regulates output. This company's pay-roll amounts to \$5,000,000 at present, employing 3,800 men. The daily output from the *Sullivan* mine is 5,450 tons. The largest development feature to report is the sinking of the concreted shaft, which, at the time of writing, is down about 800 feet below the 3,900-foot level. Other undertakings of the same company included one month's operation of the Crow phosphate-deposits, about 2,000 tons having been shipped to the chemical-fertilizer plant, near Trail, for experimental purposes. Exports of ammonium-sulphate fertilizer are assuming importance, while production of phosphate brands has been restricted to the seasonal requirements of the Prairie market.

An important contribution to silver-lead-zinc production is that made from the *Monarch* mine, near Field, of the Base Metals Mining Corporation during the last five months of the year. Regular shipments of lead and zinc concentrates have been maintained to European smelters. The mine reopened in July and production started in August, when 4,137 tons of ore was milled and was stepped up to about 8,300 tons in December, with a total of 35,885 tons milled for the five months. Lead concentrates amounted to 6,076 tons, zinc concentrates 7,326 tons, with 51,619 oz. silver. The production drift in the *West Monarch* was extended slightly and production ore-pockets put in, the incline being equipped with side-dump cars, handled by the loaders, the ore-car working in balance.

In the mill the following equipment was installed: A weightometer; an automatic sampler and distributor; a 36-inch double-spiral Akins classifier with the capacity to handle a circulating load of 2,000 tons per day; six zinc and six lead cleaner flotation-cells; necessary pumps and other equipment were added to take care of increase and change in circuit. Development-work was vigorously pushed and another ore-body was found in the extreme south end of the *West Monarch* workings. As this ore-body has just been tapped no estimate as to size is available. Two new warehouses and a tank-house have been built, and numerous other surface improvements were also made on the property. F. R. Eichelberger is in charge.

In anticipation of higher prices, revived interest in silver has recently become apparent and exploration has been initiated at the *Lucky Boy* mine near Trout Lake under the direction of J. M. Robertson, of Nelson. New deals are being negotiated in several cases, from which activities should result. In the Slocan camp, including portions of the Slocan and adjoining Ainsworth Divisions, lessees at a number of properties have been accumulating ore for shipment when it can be disposed of more advantageously. At least fifty car-loads of silver-lead ore are awaiting shipment from this source, while in some cases small shipments have been made at intervals during the year.

NELSON MINING DIVISION.

The leading producer was the Reno Gold Mines, Limited, with an output approximating 1,000 oz. of gold monthly. Conditions in the mine are very healthy, with good ore developments on the No. 5 level and 600-foot sub-level, the deepest working. On the No. 5 level the easterly ore-shoot recently opened up averages about 1 oz. per ton over a width of 3 feet and a length of about 300 feet. The drift off the winze at the 600-foot sub-level at the end of November had been advanced to 207 feet in length, the average assay being 1.64 oz. in gold per ton over an average width of 3.3 feet. The new crushing plant installed in the mill is working very smoothly and the mill is handling from 65 to 70 tons per day. Development of ore reserves has been stepped up by the new managing director, I. M. Marshall, and it is planned to sink a shaft, 8 by 17 feet outside dimensions, to develop the ore-bodies below the No. 5 level for production.

Bullion and concentrates were also produced by the Relief-Arlington Mines, Limited, from the *Second Relief* mine near Erie. Control was recently acquired by the W. N. O'Neil Company, of Vancouver, and work started July 15th under W. G. Norrie-Loewenthal. To November 10th the No. 5 tunnel had been advanced 900 feet, of which some 650 feet is driven in ore (or about

68 per cent. of the vein-length developed). Average width of the ore is 24 inches, assaying 0.83 oz. in gold per ton. In October the mill averaged 30 tons a day and the mill-heads, chiefly from development ore, averaged about 0.6 oz. per ton. About 12 months' ore reserves on a 40-ton milling basis above the No. 5 level seem assured, 25 per cent. dilution being assumed, giving a grade to the mill of 0.58 oz. gold per ton. In addition to 980 lineal feet of underground work, surface exploration was done on parallel veins. Of these, the No. 5 vein, outcropping at a point 637 feet higher than the No. 5 level on the No. 1 vein (the only vein hitherto worked), gave an assay of 0.39 oz. gold per ton across 39 inches. During the preliminary development and testing period since July 15th 1,094,571 oz. were produced from 2,088 dry tons milled. Recovery was 85 per cent., of which bullion recovery was 39 per cent. and recovery in concentrates 46 per cent. Through improvements in milling practice it is anticipated that recovery will be brought up to between 90 and 95 per cent. When stoping operations are under way the mine is expected to produce 50 tons a day, of which about 25 per cent. waste will be discarded before reaching the mill. Camp buildings have been provided for the crew of forty men. An additional Fairbanks-Morse Y-type Diesel engine (60 horse-power) has been installed, which with the 80-horse-power similar engine already provided serve as auxiliary power to tide over periods when water-power is not available. The character of the ore and conditions of the vein occurrence are described in former publications of this Department.

At the *Wilcox* mine, near Ymir, Dave Norcross, J. J. Cullinane, and associates produced bullion and concentrates from operation of the 10-ton mill since the spring.

The mill at the *Queen* mine, Sheep creek, Salmo, was operated intermittently by C. E. Witter, of Moscow, Idaho, some bullion being produced. A new flume for water-power was constructed on Wolf creek and new equipment installed in the mill. Amalgamation with the adjoining *Vancouver* mine has been consummated and the Sheep Creek Gold Mines, Limited, has been incorporated to operate both properties.

The largest shipper of crude ore was the *Yankce Girl* mine at Ymir, from which over 1,000 tons a month has gone to Trail. Together with stoping operations, development has continued, mainly in the known ore-zones. The 800-foot and 935-foot levels have received most attention, with smaller amounts on the 1,035-foot and 540-foot levels, the reason for this being to concentrate the work as much as possible on one or two levels at a time. The results of stoping and development have been most encouraging and the mine at present looks better than at any time before. A small amount of work on the 540-foot level has proven the upward extensions of ore-bodies in areas which were formerly thought to be barren, and the 800-foot level operations show much better lengths of ore than were before indicated. Large tonnage of lower-grade material will become available as ore if the increased price for gold can be depended on to continue. Thirty-five men are employed by E. P. Crawford and F. R. Weekes.

The next largest shipper was the *Kootenay Belle* mine on Sheep creek, Salmo. It was operated steadily all year and averaged two cars of siliceous ore shipped each month to the Trail smelter. The gold values are exceptionally good, as, for instance, a 41-ton lot containing 2.94 oz. per ton. During the summer a new Crossley 120-horse-power Diesel and compressor plant of about 500 cubic feet capacity were installed to provide air for a more extended campaign of development. The main work has been done on the lower or No. 2 level, toward the east on No. 1 vein, where favourable quartzite formations cross the property. A new ore-shoot was found in this working of fair average grade, and the ore is primary sulphides in quartz in contrast to the oxidized ores heretofore worked in this mine. Development is proceeding in this direction on both the No. 1 and No. 2 levels, that on the upper level having been commenced only recently. Other development was in the western parts of the mine, where the former production was made. A new engine-house, mess-house, and office have been constructed and additional water-supply installed. F. R. Weekes and E. P. Crawford have been acting as consulting engineers since early in the summer.

Shippers of from small lots to a few hundred tons were the *Arlington*, *Columbia*, *California*, *Granite-Poorman*, *Humming Bird*, *Keystone*, *Perrier*, *Royal Canadian*, *Vancouver*, *Venus-Juno*, *Sanca Mines*, *Clubine-Comstock Gold Mines*, *Bunker Hill*, *Spring Creek*, *Second Chance*, and *Tamarac*.

The restricted space available prohibits detailed mention of the numerous development and exploratory operations which have not yet reached the production stage. These include the *Gold Belt* and *Golden Belle*, combined in the *Gold Belt Mines, Limited*, under the management

of Harold Lakes. On the *Gold Belt* property 2,505 lineal feet of tunnelling had been done to November 15th, with 1,560 feet of diamond-drilling from surface and underground points. Drifting on the "C" vein has been in progress from the upper adit-tunnel level 220 feet below the outcrop. Work in the lower tunnel, about 650 feet below the outcrop of "C" vein, was discontinued pending the results of exploration in the upper tunnel. Good progress was made in driving the tunnels, from 10 to 15 feet a day having been attained.

The Fawn Mining Company has recently been incorporated to operate the *Golden Fawn* group, adjoining the *Reno* mine holdings to the east. Boston capital is interested in the undertaking, which was sponsored by Reid, Henderson & Vaux, Limited, of Vancouver.

At the property of the Clubine-Comstock Gold Mines, Limited, on Boulder creek, near Salmo, L. R. Clubine has suspended shipments and is concentrating on development, for which compressor and 80-horse-power Diesel engine have been provided. New buildings constructed include new bunk-house and blacksmith-shop.

At the *Wisconsin*, on Midge creek, a syndicate of Vancouver business and mining men, called the Lucky Strike Mining Syndicate, has conducted during the summer season an extended examination with considerable surface-trenching, some shallow diamond-drilling, thorough sampling of old surface and more important underground workings, including unwatering the 60-foot winze in the No. 1 tunnel, and sampling it. Diamond-drilling totalled just over 1,000 feet in three holes, two from the hanging-wall side and one from the foot-wall side, and the results were considered not discouraging for the depths attained. Surface-trenching proved vein-continuity for about 1,200 feet and the widths are well maintained. Heavy oxidation and leaching and also a heavy mantle of overburden toward the south do not give much information concerning values in this section and deeper development will be necessary to obtain useful results. This property is still in the prospect stage and merits a more extended campaign of development than it has yet received. F. R. Weekes and E. P. Crawford acted as consulting engineers for the syndicate.

At the *Venus-Juno-Athabasca* properties of the Noble Five Mines, Limited, above Nelson, P. Lincoln in charge, an ore-shoot about 250 feet long was drifted on in the *Juno* upper workings, and recently the crew has been engaged in tracing the *Venus* and *Athabasca* veins down the hill below the former workings preparatory to driving tunnels, in each case giving an additional depth of about 300 feet on the dip of the veins. Both tunnels are being driven. New camp buildings have been erected at the new *Athabasca* tunnel and the compressor moved there. This is being operated by electric power recently connected.

At the property of the Two Star Mining Company, east of the *Yankee Girl*, Ymir, A. B. Trites is financing exploration, and the Trites Gold Mining Company, Limited, has been incorporated. A road was first built to connect with a low-level crosscut tunnel which is planned to be driven 3,000 feet to cut the vein explored in an old shaft sunk on the outcrop and other parallel veins. Camp buildings have been erected and compressor equipment installed. J. L. Parker is in charge.

At the *Goodenough*, on Wild Horse creek, Ymir, J. F. Coats is carrying on exploration for the recently formed Ymir Gold Mines, Limited, a private company. Tunnelling is in progress on the No. 3 level and diamond-drilling has been done. Shipments of ore from the No. 2 level are to commence shortly. At the *Blackcock* mine, on the same creek, diamond-drilling has been done by H. S. Price and associates, of Calgary.

Near Nelson a start has been made by B. N. Sharp at the *Euphrates*, where development-work is being done by the Spokane-Idaho Copper Company, of Spokane. The *Tamarac*, north of Ymir, is under option to the Metonic Mines, Limited, of New York, whose representatives were recently at Nelson making preparations. The *Perrier* mine, south of Nelson, is being worked by the Perrier Mines, Limited, of Nelson.

At the *Granite-Poorman* mine H. R. Smith, representing the Livingstone Mining Company, is driving a tunnel midway between the old mill-site and the *Poorman-Hardscrabble* main level, and the mill is being re-erected below the portal of this new working.

At the *Royal Canadian*, west of the *Granite-Poorman* holdings, J. G. Allan has started a crew of men on reconditioning the old workings with a view to development, followed by shipment of ore to the smelter.

Work has been resumed at the *Aspen* silver-lead property of the Salmo-Malartic Mines, Limited, on Deer creek, near Salmo, two portable gas compressors and other mining equipment having been taken in recently.

At the *Humming Bird*, Apex, development-work is temporarily restricted pending refinancing by Seattle interests.

At the *California* W. J. Turner and associates, of Nelson, have made a start shipping ore. At the *Bunker Hill*, on the Pend d'Oreille river, A. H. Crossley and associates have made test shipments of ore. Numerous minor exploratory activities have also occurred in the Nelson Division and the investigation of gold prospects has been most active during the summer and fall. Options are being secured and new activities are expected to result.

LARDEAU AND REVELSTOKE MINING DIVISIONS.

In the Lardeau Division thirty men are engaged on exploratory work on the *Criterion* (formerly *Oyster-Criterion* property) and *Eva* properties of the Meridian Mining Company. To the end of September about 2,300 feet of tunnelling had been done. In the *Criterion* No. 1 tunnel a crosscut was driven to the "A" wall of the *Eva* shear-zone, cutting 28 feet of quartz and graphitic schist containing light pyrite mineralization, but apparently no commercial values. Work has been in progress on the No. 2 level raising towards the quartz exposure above. In the *Eva* No. 7 or lowest tunnel, drifting is proceeding to explore the ground below the old *Highland Mary* shaft-workings. To October 2nd this tunnel had been extended for about 270 feet along interbanded quartz and schist, 2 to 2½ feet wide, in which mineralization with iron, lead, and zinc sulphides occurs in streaks. Specimens shown the writer contained visible gold. This *Eva* development is quite encouraging, but no assay-plans have yet been seen from which the average grade could be computed. Since the property was visited by the writer about an additional 800 lineal feet of development-work is reported to have been done to December 1st, this consisting of advancing the *Eva* No. 7 tunnel to a point beyond the ground below the old *Highland Mary* shaft; completion of the 150-foot raise between the *Criterion* No. 2 level and the *Rosslund* tunnel and driving along this tunnel towards the previously mentioned quartz-schist exposure on the *Criterion* No. 1 level. When the *Rosslund* tunnel reaches its objective below this "showing" it will be by recent survey about 17 feet below the *Criterion* No. 1 level. Statements issued by or on behalf of this company that large ore-bodies of commercial grade have been definitely indicated or opened up, and that the property is ready for a mill of 300 tons capacity or larger, cannot be substantiated. Although having certain favourable possibilities, as on the *Eva* ground, the property requires further development, and systematic sampling and assaying for the preparation of adequate assay-plans—all of which should be under competent engineering direction—before it will be known if mill-construction is justified.

Near the *Meridian*, H. Beeching, representing Vancouver interests, has acquired the *Gillman* group and adjoining claims (Poole Mountain Gold Mines, Limited). B. W. W. McDougall is consulting engineer.

Farther up Incomappleux Creek valley the *Goldfinch* has been acquired by the Dalhousie Gold Mines, Limited, of Victoria. Camp buildings have been erected, trail connections built, and other preparations made. R. H. Smith is in charge.

At the *Waverley-Tangier*, near Albert canyon, east of Revelstoke, a small crew has been engaged in preliminary work under the direction of B. W. W. McDougall.

At the *Mastodon* silver-lead-zinc property on La Forme creek, north of Revelstoke, preparations have been under way in anticipation of activity by the recently incorporated Fawn Mining Company, which also includes the *Golden Fawn* gold prospect in the Nelson Division. Work done included surface-trenching along the outcrop of the vein system and construction of a trail to afford an outlet via Carnes creek. D. H. Loughheed is in charge.

TRAIL CREEK MINING DIVISION.

Rosslund gold production was largely from the numerous leasing operations on the properties of the Consolidated Mining and Smelting Company, including the *War Eagle*, *Centre Star*, and *Le Roi*. These activities started during the last few months, and in August the Consolidated lessees produced 1,066 oz.; in September, 1,740 oz.; and in October, 1,651 oz. Similar production is being maintained. Over 100 men are employed, shipping at times as much as from 100 to 125 tons a day. The leading undertaking is that by Roy Stevens, employing over thirty men at standard wages, on the old *War Eagle*. While the leasing undertakings on properties of the Consolidated Mining and Smelting Company might be regarded as large-scale salvaging of ore left in outcrop and superficial workings, it is evident that the Rosslund camp can still contribute

substantial amounts of gold, especially if the present high price of this metal is sustained. It is quite possible that the work of the lessees will encounter extensive areas of low-grade mineralization which might be of interest to the company for possible large-scale low-cost mining and milling operation. From the independently owned O.K. Mountain properties lessees and owners ship rich to high-grade gold ore in comparatively small lots. Chief of these were the I.X.L. Lessees, Limited, which shipped several hundred tons, the *Midnight*, the *O.K.*, and the *Golden Drip*. The *I.X.L.* makes an occasional shipment of ore rich in coarse gold, such as 1 ton containing 94 oz. Smaller lots from the *I.X.L.* and *O.K.* are quite spectacular in their gold content. The indicated 1933 Rosslund output is the best since 1925, when the Consolidated Mining and Smelting Company discontinued large-scale production from its gold-copper mines. Rosslund shippers, exclusive of the leasing operations on Consolidated properties, were the *Golden Drip*, *I.X.L.*, *Midnight*, *O.K.*, *Evening Star*, *Victoria*, *Daryl*, *Georgia*, and *Velvet*.

AINSWORTH, SLOCAN, SLOCAN CITY, AND ARROW LAKE MINING DIVISIONS.

In addition to the leasing and minor activities on silver-lead-zinc properties in the Slocan camp, there has been prospecting and investigation of gold ore occurrences at widely separated localities in the area covered by the above four Divisions, such as on Lyle creek, west of Kaslo; on Vevey creek, south of Silverton, where the *L.H.*, *Little Daisy*, and *Rockland* are situated; on Bostock creek, near Burton, where silver-gold ores occur; and on the forks of Lemon creek in an area of gold and silver veins in granite.

EAST KOOTENAY.

A new activity is that at the *Midway* property of the B.C. Cariboo Gold Fields near Aldridge Siding, Moyie district. This was formerly known as the *Finley-Leask* prospect, owned by John Leask, of Cranbrook. The new undertaking is of outstanding interest, the gold vein occurring in the Aldridge quartzites, the lowest member of the Purcell series of pre-Cambrian age, which in this part of British Columbia, and in the Coeur d'Alenes district in Idaho, contains several of the greatest mineral-deposits in the world. In the Fort Steele Mining Division there are the *Sullivan* and the formerly operated *St. Eugene*, and in Idaho the *Bunker Hill*, *Sullivan*, and *Morning* mines and others.

Five claims were optioned by the B.C. Cariboo Gold Fields and some sixty-five others were staked, extending across the wide flat bottom of the Moyie valley and up to the summits of the mountains on either side. The tunnel being advanced on the vein is within a few hundred feet of the Southern Trans-Provincial highway and of the C.P.R. tracks. The new mine-camp buildings have been built on the roadside just below the tunnel. Compressor equipment is housed at the tunnel-mouth. The writer is indebted to V. Dolmage, consulting geologist for the company, for details concerning the vein occurrence, character of the ore, and geology.

The deposit consists of a quartz vein heavily mineralized with pyrite and small amounts of lead, zinc, and copper sulphides. It strikes north-westerly into the mountain and dips 45° to 55° to the north-east. In width the ore varies from 5 to 8 feet, and near the face, when last seen by the writer in October, a width of 8 feet was exposed, but the hanging-wall had not been reached, so that at that point the width is somewhat greater than 8 feet. The vein has now been followed for about 250 feet by the tunnel and has been traced on the surface for over 500 feet.

Throughout its exposed length the vein was heavily mineralized, the sulphides constituting probably 30 per cent. of the total volume. The gangue consists entirely of quartz with minute amounts of siderite. In places the quartz has been intensely brecciated and cemented. The sulphide content is mainly pyrite, with only minute amounts of zinc-blende, galena, tetrahedrite, and chalcopyrite. Arsenopyrite has recently been identified. An analysis of the ore showed, besides iron, copper, lead, and zinc, small but definite amounts of tin. The principal value is in gold, but silver is invariably present and in places in important amounts. Assays of selected ore have run from 1 to 1.86 oz. of gold and up to 10 oz. of silver per ton. All general samples taken to date range from \$3.30 to \$18, calculated on a gold price of \$20 per ounce. Owing to the character of the ore it is difficult to strike an average value, but for this purpose a car-load of 40 tons was shipped to the Trail smelter. This assayed: Gold, 0.33 oz. per ton; silver, 2.4 oz. per ton. An analysis gave approximately 60 per cent. silica, and 1 per cent. arsenic was present.

The continuity of the mineralization exposed throughout the limits of the work done, the size, character of the ore, and gold and silver values so far obtained, warrant a large amount of development-work. The ideal transportation facilities and exceptionally favourable geological conditions combine to make this prospect of unusual interest. The tunnel being driven gains a foot of backs for each foot of advance. C. S. Lord is in charge. Two diamond-drilling outfits recently started work to test the deposit at depth. C. P. Riel is managing director.

* On the *Quartz Mountain* group, situated at the headwaters of Sawmill creek, a short tributary of Perry creek, near Cranbrook, an interesting discovery of quartz, mineralized with gold-bearing iron and copper sulphides, was made late in 1932 by Elmer Rice and associates, of Kimberley. There are at least two massive quartz-outcrops on the property. The westerly showing lies up the hill from the camp at 6,400 feet elevation and averages 50 to 75 feet in width. Its continuity has been fairly well established for a length of several hundred feet by two series of trenches and numerous outcrops. Sampling of this showing indicates the quartz to be auriferous but of too low grade to be commercial. About 600 feet to the east downhill from this massive showing, and separated from it by a stock, or dyke, of diorite, is the second and most important of the showings. Here the owners have completed a 150-foot trench in the shape of a T, and while insufficient work has been done to positively determine the attitude of the quartz-outcrop disclosed, it would appear that the top bar of this T-shaped trench (105 feet long) has been made along the dip of the vein, which here apparently lies almost conformably with the mountain-side slope, and dipping into it slightly. Careful channel sampling along the length of this trench has established a value of slightly over 0.25 oz. gold per ton for the 105-foot length. One section of 20-foot length in this 105-foot length, where surface oxidation is most pronounced, and from which free-gold specimens were obtained, assayed over 1 oz. gold per ton. The short 45-foot trench to the east of the centre of the main trench shows the vein to be cut off by a diorite stock. There is no evidence of constriction to the west for several hundred feet, and further prospecting will be required to indicate the dip length and the thickness of the quartz. The surface showings might be one of several parallel quartz veins such as was indicated in the western showing, and this could best be tested by crosscutting into the hill, either by tunnelling or with a diamond-drill. The occurrence is interesting and worthy of serious prospecting and preliminary development at least. During 1933 several scouting engineers examined the ground, but up to a recent date the owners had not concluded a satisfactory deal with any of the interested parties.

There were also numerous minor activities in connection with lode-gold prospects in various parts of District No. 5 and examining engineers and scouts were busy during the latter part of the season. The investigations being conducted of the widespread gold occurrences, together with development-work being conducted, justify the expectation that District No. 5 production can be materially increased under the ideal conditions now prevailing for gold-mining.

PLACER-MINING.

Since publication of Bulletin No. 2, covering the six months ended June 30th, 1933, placer-mining has continued to be active in certain areas, including the Cranbrook-Fort Steele section, the Big Bend district north of Revelstoke, on Forty-nine creek near Nelson, and on the Lardeau river above Trout Lake. Many otherwise unemployed have maintained themselves and kept off relief. A recent activity is that by J. H. Norman and associates, of Calgary, on Wild Horse creek near Fort Steele, where from twenty to twenty-five men have been employed on the construction of a dam and V-shaped flume to divert the water from the ground to be worked. No new details are available at this time concerning activities previously mentioned.

* Report by A. M. Richmond, Assistant Resident Mining Engineer, Victoria, B.C.

14 days.

May 25, 26, 27, 28, 29, 30, 31 June 1, 2, 3, 4, 5, 6, 7

WESTERN MINERAL SURVEY DISTRICT (No. 6).

16 days in B.R.

REPORT BY GEORGE A. CLOTHIER, RESIDENT MINING ENGINEER (HEADQUARTERS, WORKMEN'S COMPENSATION BUILDING, VANCOUVER).

INTRODUCTION.

It is recognized throughout the Province that lode-gold mining has this year been the outstanding factor in at least the partial restoration of business. The fact that approximately fifty companies have been operating this year in this district alone, for which over \$1,000,000 were raised for development purposes, employing over 1,000 men in actual mining, gives some idea of the importance of the industry. In addition to this, some 4,000 mineral claims were recorded, giving employment to several hundred prospectors and claim-stakers. Further evidence of the far-reaching effects of mining is shown in the operations of the Pacific Great Eastern Railway extending from Squamish on the Coast to Quesnel in the Cariboo, which had an operating profit of some \$50,000 up to the end of October, against a deficit of \$70,000 up to the end of the same period last year.

PROSPECTING.

This phase of mining has been featured this year. Old mineralized sections have been more thoroughly investigated and many new areas have been found and promising samples brought out. There are more prospects than ever before in this district and very few that have merit are idle. New portions of the west coast of Vancouver island; Loughborough inlet on the main west coast; the Fire Mountain section up from Harrison lake; up the Brandywine river on the Pacific Great Eastern Railway; the Tenquille Creek and Birkenhead Lake section west of D'Arcy on the Pacific Great Eastern; up Whitecap creek from Seton Station; the Duffey Lake area east from Mile 86; the head of Hurley river (South fork of Bridge river); and the Gun Creek section north of Gun lake, including the Eldorado basin; and the Taylor and Bonanza basins up Tyaughton creek, are the newer areas of promise. Many miles of trails have been built this year to give reasonable access to remote properties and favourable prospecting areas. These cheaply built prospecting-trails throughout the country are of the utmost importance.

VANCOUVER ISLAND.

In this portion of the district, and particularly on the west coast, mining has very noticeably picked up this year. Placer-mining has been carried on in the Leech river, but detailed information is not available at present. On Wolfe creek, a tributary of Sooke river, this season's work has demonstrated that there is pay-gold in the benches, with good prospects of making a profitable hydraulicking operation. On Wreck bay, operations consist of the work of one old-time placer-miner who has been making a fair living wage for the past three years. This gold is fine and requires expert handling to recover.

The W.W.W. property, 12 miles up Franklin creek from Alberni canal, was operated a portion of the season by Vancouver interests under the supervision of Alex. Robinson. It has been closed down for two months. There is a fair trail to the property from the logging company's road.

Vancouver Island Gold Mines, Limited, has acquired the four old Crown-granted claims, the Warspite, Victoria, Chicago, and Alberni, with a number of recently staked claims, at the head of China creek, about 10 miles up the logging-road from Port Alberni. This is the old Consolidated Alberni property, owned by Jas. Dunsmuir about forty years ago, and was at that time connected with Port Alberni by a wagon-road. Old workings, consisting of a shaft 50 feet deep and a 200-foot tunnel on the vein, produced some high-grade gold ore. Feed to a 3-stamp mill is said to have assayed \$50 per ton. The vein varies up to 4 feet in width and occurs in the Vancouver volcanics. The present company proposes cleaning out the old road from the logging-road up to the showings, installing a compressor plant, and driving a 400-foot tunnel to tap the vein at 250 feet depth.

The Leora group, on Kennedy river, about a mile up from the head of Kennedy lake, is being developed by W. W. Gibson, of San Francisco, who operated the property twenty years ago. A shaft has been sunk 150 feet and a crosscut to the vein, which he states is 2 feet wide at this point of shipping-ore.

The *Big Boy* group is situated at the head of Herbert arm and owned by a Vancouver syndicate. The showing, which extends from tide-water, is a quartz vein in a shearing of the Vancouver volcanics. The vein varies in width up to 4 feet. A tunnel has been driven 45 feet, the last 15 feet of which shows the quartz to be pinched down to a small seam. The ore-shoot starts at tide-water and extends to the mouth of the tunnel, a distance of about 40 feet, and a further distance of 35 feet in the tunnel. I am informed that about 30 tons of ore was shipped, giving returns of about \$35 per ton. Further ore could be mined by sinking in the ore-shoot at the collar of the tunnel. The showing is pronounced and the shearing is worth further drifting in the expectation of the recurrence of such ore-shoots as exposed at the beach.

This group of twelve claims is situated about a mile east of the head of **Mary Mquilton.** Herbert arm and is now under option to the Waverley Tangier Mining Company. There are two veins exposed on the property, the upper one at 2,000 feet elevation and another at 1,500 feet elevation. The upper showing consists of a shearing in the volcanic country-rock about 7 feet in width, in which are several quartz veins paralleling the shear. These veins separately contain high gold values in places and the whole is said to average a fair milling-grade ore. The mineralization is iron sulphides with galena and zinc-blende, the latter two apparently being the gold carriers. Free gold is also found. The lower showing, about 3 to 4 feet wide, is similar to the upper. A trail has been built from the beach, camps erected, and preparations made for working through the winter. These showings are worthy of considerable exploration and might easily develop an important tonnage of milling-ore. Should they prove such, the west coast will stand a lot of investigation.

The *Mary Lou* and three other groups adjoining the *Mary Mquilton* are under option to Vancouver interests, who are having the ground thoroughly prospected.

This company owns the *Tagore* group of twelve claims situated about 2½ miles up from the head of Zeballos arm, and the *Jack of Spades* group of eight claims about 2 miles farther up the valley. Considerable work has been done by way of a camp at the beach, trail-building up the river, and camps at **Zeballos River Mining Co.** *Tagore* and *Jack of Spades*. The showing on the *Tagore* is a small quartz vein mineralized with iron sulphides, galena, and zinc-blende, carrying in places bonanza values in gold. The vein is exposed at the edge of the river, where it is impossible to develop it, and a tunnel is therefore being driven from the river-bank to intersect the vein, from which point depth will be obtained by drifting. Work is being done on similar showings across the river, but which I was unable to see because of the high water having taken out the bridge. On the *Jack of Spades* there is a wide belt, up to 200 feet, of garnetite and some epidote near the contact of a wide limestone-belt with granodiorite. Within a width of 30 to 40 feet, masses of good-grade chalcopyrite have been exposed and quartz patches carrying fair gold values. The indications altogether are promising. It is proposed to gain some depth by a crosscut tunnel and drift into the hill on the mineralized belt.

This company is developing the old *Marks* ground, about 8 miles up the **King Midas Mining Co.** Zeballos river from the beach. Last year's work, consisting of crosscutting to a series of small parallel quartz veins and drifting on them both ways, gave encouraging results. This season another crosscut tunnel is being driven about 200 feet south of the other to cut one or more veins exposed on the surface, from which excellent gold values were obtained, and which is probably the southerly extension of the series cut above. The lower tunnel is now in about 90 feet and has recently encountered small stringers of quartz. It is estimated that another 10 to 50 feet should reach the objective. In the meantime some work is being done in the "glory-hole" farther up the river on the contact of the limestone and volcanics, where good gold values have been uncovered in the altered limestone.

MAINLAND COAST AND ISLANDS.

The Hayden Bay Gold Mines, Limited, is developing some quartz-showings at Hayden bay, in Loughborough inlet. Good camps were erected on the beach and a small compressor plant installed. Work was started at the water-edge on a 2-foot quartz vein mineralized with iron sulphides carrying gold values up to \$25 per ton, depending on the sulphide percentage. This vein pinched out in a short distance as it approached a tongue of granodiorite, but I am informed that further work picked it up again and a fair tonnage of shipping-grade ore is being produced. The veins are contained in a belt of altered sedimentaries and volcanics included in the granodiorite batholith.

Recent prospecting discovered some open-cuts and an old tunnel in the uphill extension of the vein. The tunnel is in 45 feet and a shaft is sunk at the face to a depth of 50 feet. At about 40 feet down the shaft a drift has been run into the hill on the vein. The shaft is being made accessible for examination and sampling. In the tunnel there is a well-defined vein 4 feet wide consisting of about a foot of banded quartz mineralized with pyrite, on either side of which is about 18 inches of grey watery quartz showing little mineralization.

Two or three short ore-shoots have been encountered in the beach workings, but the ground is badly dislocated by intruding dykes and granodiorite tongues. Work higher up the hill will no doubt be in an unbroken formation and consequently better chances for more important ore-shoots.

**Enid-Julie
Mines, Ltd.**

This company's property is situated on the west side of Phillips arm, between the *Alexandria* and *Doratha Morton* properties. The general rock formation is argillite with interbedded basic dykes. The mineral-showings are quartz veins mineralized with pyrite, pyrrhotite, and arsenopyrite, carrying bonanza gold values in places. Float-ore has given assays of \$400 in gold per ton. The vein was discovered at an elevation of about 2,900 feet and traced down the hill for a vertical distance of 800 feet, in places showing a width of 25 feet of quartz.

This vein lies east of a basic dyke 10 to 12 feet in width. A tunnel was started about 30 feet east of the dyke at 2,100 feet elevation and has now been driven about 100 feet by hand-work. This is in ore all the way without any walls, the values varying from \$2 to \$8 per ton, except where cross-fracturing causes enrichments. It is planned to continue a straight drive to 200 feet and then crosscut both ways. The crosscut will be continued through the dyke to prove favourable surface ore indications on the west side of it. The vein has every appearance of developing an immense tonnage, but only development-work can prove it and the average values. Two smaller veins have been discovered east of this and some work is also being done on them. Good camps have been put up and good mining is being done under the supervision of R. Crowe-Swords. It is an outstanding prospect.

It is reported that operations are to be resumed soon on the *Alexandria Gold Mines* property. I understand that options have been taken on the *White Pine*, *Thurlow*, and *Douglas Pine* groups, situated on Thurlow island.

The Gem Gold Mines, Limited (formerly the B.C. Gold Mines, Limited), is a Vancouver syndicate formed to investigate the old *Nutcracker* property on Texada island. Under the supervision of Ralph Logan, one of the owners, the mine has been dewatered, sampled, and some underground exploratory work is now being carried out with encouraging results.

PACIFIC GREAT EASTERN RAILWAY SECTION.

Interesting reports come from the Brandywine River area west of McGuire, where there is a wide belt of sedimentaries and volcanics contained in the Coast Range batholith.

Further work has been done this year by Geo. Moffatt on the *Li-Li-Kel* group on Tranquille creek. The property is reached by trail up the Birkenhead river from Mile 76. Several new areas along the railway have been widely staked this season. Promising gold samples have been brought out of the Birkenhead Lake country west of D'Arcy, and samples of grey copper, carrying high silver values, have been obtained from the Duffey Lake section, at the head of Cayoosh creek and reached by trail from Mile 86 on the railway. J. Walker, of the Geological Survey of Canada, covered this area this season and expresses himself favourably as to its mineral possibilities.

On McGillivray creek, which empties into the lower end of Anderson lake, there are several properties on which work has been done this year. The National Gold Mines, Limited (formerly the Anderson Lake Mining and Milling Company, Limited), has been steadily developing its property about 3 miles by good horse-trail from the railway at McGillivray Falls Lodge.

The quartz vein on this property is up to 20 feet in width, averaging probably 7 feet, and is bedded with the containing sedimentary formation. The quartz is mineralized with pyrite carrying average low-grade gold values, but there are shoots of high-grade gold ore from which some of the finest gold specimens have been taken. Some years ago a 10-stamp mill was operated mainly from the higher-grade ore-shoots and is said to have produced \$25,000 to \$30,000 in gold.

The vein has been opened up on three levels by adit-tunnels totalling several thousand feet of work. This year the lower or No. 3 tunnel, which was in about 150 feet, has been continued through to the fault to a total distance of over 400 feet. Over 1,000 feet of underground work has been done under the supervision of Tom Brett, one of the original owners. Several hundred feet of this work was in exploration of branches from the main vein. Exploration-work is being carried out on the other side of the fault. The vein so far as exposed in the three tunnels shows low-grade ore, but it is stated by the management that the higher-grade ore-bodies found in places will bring the whole to a milling-grade. The indicated tonnage will warrant a fairly large concentrator.

About 3 miles up from the National Company's ground the *Gold Hill* group has had considerable work done on it by a Vancouver syndicate under the supervision of Howard Sutherland. The showings are quartz veins carrying low-grade gold values on the surface and contained in a sedimentary formation. One of these shows a width of 30 feet on the surface. It has been traced down the hill and a tunnel is now being driven on it.

The *Diorite* group, across the creek from the *Gold Hill*, covers a diorite-mass containing a quartz vein about 14 feet wide. Samples from the surface show low gold values, but the vein is worth developing. The *Star* group, at the summit of McGillivray creek, is being developed by Noel Humphreys and associates.

Farther up the Pacific Great Eastern Railway, about 8 miles up Whitecap creek, the Richstrike Gold Mines, Limited, is developing a number of parallel quartz veins in a diorite stock. I did not examine this property, but a reliable report states that the veins vary from 1 to 4½ feet in width and are mineralized with pyrite, arsenopyrite, and stibnite, carrying up to \$5 in gold per ton on the surface.

The Cache-Bonanza Gold Mines, Limited, has acquired the old *Golden Cache* and *Bonanza* properties, about 8 miles up Cayoosh creek from the head of Seton lake. The old road has been repaired and the bridge at the upper end rebuilt, so that trucks can be taken through to the camp. I understand that exploratory work has been started on both properties under the direction of Arthur Noel, who was interested in the *Golden Cache* thirty years ago, when there was a stamp-mill on it and an appreciable amount of gold taken out.

Considerable prospecting and some development has been done up the Lower Bridge river and its North fork, the Yalakom river.

BRIDGE RIVER SECTION.

This area is reached from Bridge River and Shalalth, stations on the Pacific Great Eastern Railway on Seton lake, by a very serviceable road terminating at the *Pioneer* mine, a distance of 54 miles. The Pacific Great Eastern Railway has put on a gas-car service for the transportation of autos and trucks from Craig Lodge to Bridge River Station, enabling autos to drive from Vancouver to the *Pioneer* mine. In addition to the auto traffic, it is estimated that 10,000 tons of freight has been taken over this road this year.

The Bridge River section is one of the most important mining areas in the Province and was the centre of intense activity this year. Over thirty companies were operating, of which the majority may be divided into those on and those off the diorite-belt. The favoured formation is the augite diorite in which the *Pioneer*, *Bralorne*, *Wayside*, and others are being developed, but considerable encouragement has been found in several properties off the belt, such as the *National*, *Standard*, *Reward*, and *Minto*.

Diorite-outcrops are now known to extend from the *Red Hawk* on the south to the *Gold Bond* on the north, a distance of about 24 miles. The *Pioneer* and *Bralorne* occupy the central 4 miles of the belt, which is the largest exposed outcropping of the diorite.

On the diorite-belt, starting at the south end, the *Red Hawk* and *Dan Tucker* are driving crosscut tunnels from the north toward the diorite to get depth on a shear-zone within the diorite near its north border, in which encouraging surface gold values have been found.

Further surface work on the *Pioneer Extension* has not proven definitely encouraging.

The *Pioneer* has had a most successful operating year. The mill has been steadily handling 300 tons or more per day, producing around \$200,000 gross per month. Underground development has been eminently satisfactory. The new mine on the eastern end of the property opened up last year on the seventh level has been further explored on the fifth and tenth levels. The latter level is now over 3,000 feet long

and has demonstrated the continuation of the eastern ore-body for several hundred feet beyond the seventh level above, with several thousand feet of unexplored ground ahead. Crosscuts from the main shaft to the main vein and drifts thereon have proven it consistent in width and values with the upper levels. Recent drifts on the twelfth and fourteenth levels west have opened up bonanza ore-shoots comparable with those in the same area on the upper levels found last year.

The *Bralorne* is in a rather different position than a year ago, when mill-feed was somewhat of a problem. In one year this property has been developed from an uncertainty to one with four to five years of ore reserves, at its present milling capacity of 200 tons per day; and with further outstanding possibilities. The country west of the fault is being developed on three levels with extraordinary results. Mill-feed has consisted in part of development rock and heads have been lower as a result. Production for 1933 will approximate 26,000 oz. of gold from 54,000 tons of ore milled.

The property of the Taylor (Bridge River) Mines, Limited, adjoining the *Bralorne* ground on the north, compares favourably geologically with the *Bralorne*. The ground is heavily overburdened and, lacking water for ground-sluicing purposes, stripping and trenching by hand-work has been the only means of exploring the surface. Several quartz veins have been exposed, and, though the surface values are low, they have undoubted possibilities in this formation. The property will be explored at depth very economically by the extension of a crosscut from the eighth or main level of the *Bralorne* mine. This work is now under way and will consist of a 700-foot crosscut through *Bralorne* ground to the south line of the *Taylor* ground, obtaining at that point a depth of 1,000 feet.

North of and adjoining the Taylor holdings and partially on the diorite-belt, the Grull-Wihksne Gold Mines, Limited, has done a lot of preliminary work under the supervision of E. J. Conway. This has consisted of the construction of very substantial camps and a programme of diamond-drilling with the objective of locating the underlying diorite. I am informed that this has been successful and that a shaft will be sunk to the diorite, from which further diamond-drilling will be done across that formation.

The B.R.X. Gold Mines, Limited, adjoining the *Grull-Wihksne* on the north, has carried out extensive underground work in the lower tunnel. This consists of a 500-foot crosscut to the *California* vein, extensive drifting on the vein, and drifting on other quartz veins encountered. The management states that there has been an encouraging increase in gold values in the *California* vein over those found in the upper tunnel, 200 feet vertically higher. More favourable mineralizing conditions are indicated in the finding of other quartz veins at this depth. Substantial improvements have been made this year in camp buildings and plant. The work at the mine is under the direction of E. Shepherd.

The Bridge River Consolidated Company's property, adjoining the B.R.X. on the west, was taken over on option this summer by the Consolidated Mining and Smelting Company. With C. A. Seaton in charge, several diamond-drill holes have been put down on the *Forty Thieves* claim and underground work carried on in the workings of the *Why Not* claim. The diamond-drilling has demonstrated the diorite formation at depth and has cut several almost perpendicular quartz veins which it is expected will later be explored by a tunnel from the river-level.

On the north side of Bridge river the *Wayside* has been under steady development all season, with Geo. Bancroft in charge at the mine. A lot of work has been accomplished both in surface construction and plant and underground development. New camps and mine buildings have been constructed, a new compressor and an hydro-electric plant of 460 horse-power installed, and a main working-tunnel is well under way.

When the mine was reopened this spring, drifting was continued on the main vein in No. 2 and No. 3 tunnels. A split in the vein in the No. 2 tunnel carried the drift to the east, where it encountered the shear-zone that had been drifted on for over 1,000 feet in 4-E tunnel at the foot of the hill, here showing lenses of quartz carrying fair gold values in places. A crosscut in No. 2 cut about 2 feet of quartz on the foot-wall of the shear, and about 12 feet of sheared material in which are small stringers and lenses of quartz, carrying low gold values. Further crosscutting in No. 2 was encouraging, resulting in crosscuts being driven from No. 3 and later from No. 1-B, the top tunnel, opening up the shear on three levels. This work has exposed widths up to 40 feet of milling-grade ore, giving the property all the earmarks of becoming an important producer when adequate milling facilities are provided.

There is a favourable prospecting area showing outcrops of diorite from the main road west of the *Wayside* to the South fork, north to Gun lake.

On the north side of Gun lake the Cariboo-Bridge River Gold Properties, Limited, is developing some quartz-showings contained in a wide belt of diorite. The company has put in good camps, installed a water-power plant and a compressor, and is drifting on one of the quartz veins exposed by ground-sluicing. There are three or four small veins in a comparatively small width carrying encouraging gold values on the surface. It is proposed to drive a couple of hundred feet or more in the present tunnel and crosscut from it to pick up the known veins and also further explore across the diorite. I consider that these veins in the diorite warrant considerable development. Further stripping of the diorite east of the present showings could be cheaply done by ground-sluicing. The work is being efficiently carried out by E. J. Marshall.

The *Veritas* group, on a branch of the diorite at Little Gun lake, is being developed by the owner, Matt Foster. Present work consists of driving the lower tunnel, now in about 350 feet. The face shows a small pyritized quartz vein on either side in diorite, carrying low gold values. The right or hanging wall is somewhat broken, suggesting further mineralization in that direction.

Prospecting north from Gun lake for 4 or 5 miles along the diorite-belt is showing a very likely country on the *Gold Pass*, *Gold Bond*, and other groups extending across Gun creek south of Eldorado creek. Good-grade gold ore was discovered this season by McLellan and Stuart west of Gun creek, above the *Gold Bond*, and their property was bonded by the Bralorne Company. This promising section is accessible by a first-class horse-trail up Gun creek from the main Bridge River road.

Much work has been done this year on properties not directly on the diorite-belt, though some may contain spurs or tongues from the main mass.

The Standard Gold Mines, Limited, is situated at the head of Cadwallader creek, 10 miles south of the *Pioneer*. Work was started by W. Sloan on this property early in the spring under difficult snow conditions. A cabin was built on the Cadwallader Creek trail, and a trail built to the camp-site, a distance of about 1½ miles. Good camps were put up, work started on the showings about half a mile farther up the creek, and the widening of the trail from the camp to the *Pioneer* to a width suitable for tractor-haulage was undertaken. The road-work, with some assistance from the Butte I.X.L. Company, was completed in September and a compressor plant taken in and installed.

In the meantime a crew of men was engaged in stripping and open-cutting in and along the bed of the creek about half a mile above the camp. This work has disclosed a width of 30 to 40 feet at the junction of three or more feldspar-porphry dykes or veins, and west of the creek an open-cut has opened up another similar body in the greenstone. These may be termed vein-dykes, as they are intrusive, cut the formation on its dip, and are siliceous and mineralized. They consist of feldspar showing plenty of mariposite, mineralized with pyrite, carrying, in general, low values. However, within the vein-dyke are small veins and masses of mineralized quartz carrying fair gold values and in places showing free gold. Commercial values will therefore depend largely on the extent and mineralization of the quartz veins.

At the time of my examination a crosscut tunnel was being driven from a point about 400 feet down the creek from the exposures in the creek-bed. I understand that this tunnel has cut an extensive width of vein-dykes, as was expected from surface indications, and the company reports very satisfactory results so far as ore indications are concerned.

The Butte I.X.L. Gold Mines, Limited, property lies north of the *Standard*, the *Royal* group intervening, on which no work has been done this year. The Butte I.X.L. showings consists of two quartz veins, the lower one in argillite and the upper one, 300 to 400 feet up the hill, in the greenstone, all in the Bridge River formation. Both veins carry low-grade surface gold values, but no appreciable amount of work has been done on either. The season's work has consisted of camp-construction, road-building both on the main Cadwallader Creek road and a branch from it to the mine, installation of water-power, sawmill, and a compressor. Mining has recently been started and will consist of sinking on the lower vein for 400 feet, drifting on it and crosscutting to the upper vein. A. McGuire, the original staker, is in charge of the work at the mine.

The *Bramoose* group, on the north side of Cadwallader creek below Piebiter creek, has had a couple of men working on it all summer. The work shows a bedded belt about 3 feet

wide in argillite, in which are small parallel veins of calcite and quartz slightly mineralized with pyrrhotite, with low gold values. South of this, open-cutting has exposed a belt of limestone highly altered to garnetite along its contact with a tongue of granodiorite. The garnetite carries considerable chalcopyrite so far as exposed.

The Holland Gold Mines, Limited, has two groups, the *Holland* and *Nomad*, north of and adjoining the *Pioneer* ground. The showings consist of quartz veins slightly mineralized, bedded in the siliceous argillites of the Bridge River formation. Considerable work on two of these veins this season did not find anything very encouraging by way of values.

The Reward Mining Company's property, lying east of and adjoining the Taylor (Bridge River) Company's ground and north of and adjoining the *Bralorne* holdings, has been systematically prospected and developed this year under the supervision of Fred Bradley. A cropping just off the Taylor east line was being opened up by a shaft at the time of my examination late in September. It consisted of two small veins about 2 feet apart, with a limy filling between, in a belt of the Bridge River greenstone, but running into the sedimentaries a short distance east. Encouraging values were found on the surface. The company gave a contract for extensive stripping toward the *Bralorne* ground.

North of this is the Motherlode Gold Mines, Limited, property, on which little or nothing has been done.

The Goldside Mines, Limited, controlling the *Simons* group, has been taken over by Eastern interests, who propose carrying out certain development-work this winter.

The Reliance Gold Mines, Limited, a Washington incorporation, acquired the *Reliance* ground and other claims on the south side of Bridge river below McDonald creek. I did not examine this property this year, but the management states that extensive surface prospecting was done and a tunnel is being driven this winter. A well-defined vein carrying milling values is reported.

The Minto Gold Mines, Limited, has acquired the *Alpha* group, on the north side of Bridge river, on the main highway. A first-class camp has been built and a compressor plant installed. Two tunnels above the camp were driven by hand up to the latter part of November, when the power plant was completed. At that time the lower tunnel was in about 175 feet from the portal, representing 75 feet of crosscut to the shear and 100 feet of drifting on the shear-zone in the greenstone of the Bridge River formation. The first 60 feet of drifting on the shear showed only a small vein of quartz a few inches in width, but it is reported by the engineer in charge, G. A. Crane, that at 204 feet from the portal the shear, 5 feet in width, has filled with quartz averaging at this point \$80 per ton (gold at \$30 an ounce). The upper tunnel, 100 feet vertically higher, is now in 86 feet and averages about \$9 per ton across 5 feet, which checks with my sampling at 35 feet from the portal.

North of the *Minto*, on the east side of Gun creek, a number of properties have been staked this year, the *Bunting-Ferguson* group containing promising quartz veins; the Region Mining Company's property, on which surface work this summer is said to have been encouraging; the *Golden* group, just above the main road east of Gun creek, and others. A start was made on a road up Gun creek by building a branch from the Tyaughton Creek road to Cinnabar creek to the Region Mines camp.

The basins at the heads of Eldorado, which flows into Gun creek, and Taylor and Bonanza creeks, which empty into Tyaughton creek, show promising quartz veins mineralized with arsenopyrite, carrying good gold values. Fine free gold can be found on the surface in many places as the result of the erosion of the arsenopyrite veins.

The *Eldorado Basin*, owned by Grant White, of Bridge River, is described in Bulletin No. 1, 1932, page 73, under the heading of *Lucky Jem*. The *Taylor Basin* ground is held by Herb. Taylor, who has done a lot of surface work. This has been bonded to Eastern interests. The *Bonanza Basin* area is owned by Cooper Drabble, Vancouver. An extensive amount of ground-slucicing, stripping, and open-cutting has been done on a wide belt of granite or feldspar porphyry. The work has exposed at different places, and especially on the north end of the belt, promising arsenopyrite quartz veins. A sample across a 10-inch vein assayed \$48 in gold per ton (\$20.67 gold) and 17 oz. silver, indicating favourable possibilities of producing shipping-ore. These basins are all worth extensive exploration and are at present accessible by good horse-trail from Tyaughton lake or the Gun Creek trail.

On the south side of the diorite the Native Son Mines, Limited, holdings adjoin the *Bralorne* ground. The company put up a good camp, built a road, and installed a compressor plant. A crosscut tunnel was started in the argillites with the object of driving to and crossing a greenstone-belt showing some quartz-croppings south of and in contact with the argillite-belt. To date the tunnel has been driven about 600 feet.

The Bridge River Ogden Mines, Limited, owns the *Short O' Bacon* group, the *Chesterfield* group, and the Crown-granted *Ogden* claim, lying south-west of and adjoining the *Native Son* and *Bralorne*.

Two quartz veins have been found, one on the contact between argillite and greenstone and another farther west in the greenstone. The former is about 3 feet wide and is opened by a surface cut to a depth of 15 feet, showing a well-defined vein but low values. The other vein is about 4 feet wide and has had only surface work done so far, giving low gold values. Joe Marron is in charge of the work.

The Golden Mitt Mining Company has three groups—the *Taff*, *Big Bonanza*, and *Star*—of thirty claims and twelve fractions, situated west of the Hurley river and adjoining the Bridge River Ogden Company's holdings. The showing on this property is a quartz vein up to 2 feet wide filling a fissure in an intrusive mass of granodiorite. The vein has been traced by shallow open-cuts for 1,000 feet or more, showing only average low-grade gold values on the surface. A camp has been put in and provisions made for working through the winter.

PLACER-MINING.

This branch of mining has been confined this year to lower Bridge river and the Fraser river. The Lower Bridge River Placers, Limited, started operations this spring with everything in shape and a well-organized programme for the season's work under the supervision of Major Hartley. It was proposed to take off the top gravel first, then carry the sluice-line back on grade, by trenching, to bed-rock. This condition would then allow piping in the sides and cleaning up on bed-rock ahead. The first delay was in cleaning out the ditch-line, which had caved in places during the winter. This completed, piping was commenced and over 200,000 yards of top gravel sluiced into the river, which gave a pit about 50 feet high in the face and considerably deeper on the sides. The work of taking out a trench for the sluice-line was carried to a point over 300 feet back from the river, expecting to encounter bed-rock at any point. At this point the head of the sluice was about 30 feet above the river. It was then decided to sink, and a depth of about 60 feet has been reached, giving a depth of 248 feet from the top of the bank in the pit, and without encountering bed-rock. At this stage work had to be closed down for the winter. It is now proposed to definitely define bed-rock ahead either by sinking a shaft or drilling.

The *Baird* lease on the Fraser river, opposite the town of Lillooet, was taken over by Vancouver interests and operated this season under the supervision of Mr. Hilton. Pits put down over the flat show from 2 to 4 feet of top soil, then varying depths of Fraser River sand and gravel, underneath which are found old channels of Bridge River gravels, apparently deposited by a meandering stream when the Fraser river was 300 to 500 feet higher than at present. The Fraser River gravels carry from 3 to 10 cents per yard and the Bridge River gravels from 20 to 60 cents per yard. The latter are readily distinguished from the Fraser River gravels by the characteristic white clayey coating giving a milky white wash when hydraulicked, while the Fraser River gravels give a dark muddy wash.

It is stated that test-pits across the bench here for a width of 500 feet or more in places gave an average of 30 cents per yard for a depth of 15 feet. The face of the pit showed a depth of about 30 feet of gravel underlain by a bed of hard sand which, it was expected, would make a good false bed-rock to wash to. About 3,000 gallons of water per minute was being used and obtained by pumping from the river. A 400-horse-power gasoline-engine was being used for pumping, utilizing about 25 per cent. of the power. One 3-inch stream was used for breaking down the gravel and two others for by-wash into the sluice. The sluice-box is 20 inches wide on a 10-per-cent. grade. The top boxes are rifled lengthwise with steel rails and the next ten to twelve boxes are fitted with cross steel-rail riffles.

Under each of the cross-rifled boxes is an undercurrent with a test-box in every second undercurrent. The plant handles about 1,000 yards in twelve hours, but because of the small size of the sluice much time is used in removing boulders. A 40-inch box with about

10,000 gallons of water per minute would handle everything. Present operations would require 10 to 12 cents per yard gravel to break even. Mr. Hilton has designed a cast aluminium-topped table on the principle of a Wilfley for treating the undercurrent product from the sluice-boxes. The table is fitted with an amalgamator at the head, which recovers the fine gold, and the table makes a clean black-sand product possibly carrying some fine gold. I understand that the plant was moved to the Lillooet side of the river for the winter, but I have no information at the moment as to the results of the summer's work.

Calgary interests are putting in a flume to take water from Texas creek, on the west side of the Fraser river below Lillooet, to hydraulic some low bench-ground below.

There were a number of individual placer-miners on the river during the low water, averaging about a living wage.

What promises to develop into a major placer operation is being worked out on extensive holdings on the lower Fraser river. The scheme calls for a high-capacity dredge of the suction type capable of handling up to 5,000 to 6,000 cubic yards in twelve hours. This type has been used very successfully in the East by sand and gravel producers for big production.

This company has been operating all season on Tyaughton creek, with Chris. **Tyaughton Creek Gold Placers, Ltd.** Beaton, an old-time hydraulic operator of Atlin, in charge. The plant as described in the 1932 Annual Report was put into commission early in the summer and two pits aggregating from 15,000 to 20,000 yards of gravel were sluiced. The upper pit contained a considerable percentage of slide-rock and the second pit was found to have been drift-mined in earlier days. The returns from these two pits therefore did not meet expectations. Operations at this upper end of the bench were very seriously handicapped by lack of dump-room. It was therefore decided to move the plant and operation down-stream half a mile to the lower end of the lease. This necessitated the laying of about 1,600 feet of pipe-line, which was accomplished too late in the season to do any piping. A small yardage shovelled into the sluices gave very encouraging returns. There is ample dumping-ground at this pit-site and a few improvements to the main ditch-line would greatly increase the supply of water and consequently the yardage handled. The company will be away to a good start in the spring and, everything considered, should make substantial profits.

SUMMARY REPORT FOR THE YEAR 1933.

REPORT BY A. M. RICHMOND, ASSISTANT MINING ENGINEER (HEADQUARTERS, VICTORIA).

INTRODUCTION.

During the field season the writer made reconnaissance trips into areas at the head of the North fork of the Bridge river (Yalakom river), the headwaters of the Horsefly river, to gold prospects in various sections of the Atlin area, to the new gold discoveries on Sawmill creek in the Cranbrook area, and to miscellaneous gold prospects in the Slocan City and Kamloops Mining Divisions. The notes which follow are about interesting areas which are not otherwise reported on in this bulletin and are preliminary to the complete reports to be issued on the undeveloped areas that were visited.

Following a short trip to the Bridge River camp, the writer went into the headwaters of the Yalakom river by way of Clinton, Big Bar ferry, and the North fork of French Bar Creek trail to inspect the reported discoveries of rich placer-gold diggings made late in the fall of 1932 by Indian sheep-herders. The discoveries were made at the headwaters of Poison Mountain creek.

POISON MOUNTAIN CREEK AREA.

Poison Mountain creek is a small tributary of Churn creek. There are three trails into the creek; the first, by way of the North fork of French Bar creek, is 37 miles long; the second trail, by way of the South fork of French Bar creek, is not in as good condition as the north trail and is slightly longer; the third trail is from Moha, a post-office at the end of the road up the Yalakom river from Lillooet, and while it is 10 miles longer than either of the French

Bar Creek trails, the grades are better and the trail is in the best shape for outsiders entering the area. The entire length of the creek, $3\frac{1}{2}$ miles, was staked as placer claims during 1932, and strangers going into this area would have to confine their prospecting and mining to other short creeks near the head of the Yalakom and Churn creeks.

Poison Mountain creek drops from an elevation of 6,900 feet at its source to 5,440 feet at its outlet into Churn creek; the average gradient for the upper $2\frac{1}{2}$ miles is 8 per cent. and on the lower section 3 per cent. The valley is narrow, characteristically V-shaped, devoid of mining-timber above 6,000 feet elevation, and after the first heavy snow-water run-off in June and July the water-supply is comparatively small. Water sufficient for 12- by 12-inch sluice-boxes is available throughout the placer season, which starts about the middle of June and ends late in September each year.

The placer gold is found at and in the bed-rock cracks of the narrow stream-bed. The bed-rock on the upper half of the creek is composed of thick-bedded boulder conglomerates interbedded with argillites and limestone. On the lower end of the creek the bed-rock is a "bird's-eye" feldspar porphyry. Several narrow pyritized quartz veins have been uncovered by the placer operations.

Approximately 17 oz. of rough, bronze-coloured gold, varying from the size of a pin-head to as large as a grain of wheat, had been recovered in short sluice-boxes at the time of the writer's visit. There were six bed-rock cuts on the creek and the gold was found to be irregularly distributed on bed-rock and not in any well-defined pay-streak. Shovelling-in methods were being used in all the operations, but due to the early date in the season only a few of the many claim-owners had actually started recovering gold, the majority of them being engaged in fixing their camps, cutting lumber, and otherwise preparing for gold-recovery.

From an examination of all the evidence it was concluded that the creek discoveries were not a bonanza in any sense of the word, but it is considered very probable that the claim-owners will find sections of the creek where the bed-rock is fractured and favourable for the retention of placer gold, and by small-scale hand methods they will be able to make small wages.

QUARTZ MOUNTAIN AREA.

Quartz mountain lies about 6 miles to the south of Poison Mountain creek, and as several discoveries of lode gold had been reported the writer made a short reconnaissance trip over the area with several of the interested prospectors. Unfortunately, heavy snow-drifts covered the showings at all the points of discovery and the net result was that it was impossible to form any opinion of the prospects by sampling.

The general rocks of the area are massive hornblende diorite and serpentine. The black-green serpentine rocks are associated with magnesite and chalcedony. Beds of crumpled argillite and quartzite were also noted. However, as mentioned, the discoveries of quartz carrying gold values could not be examined, although specimens which were reported to have given high gold assay returns were shown to the writer. Prospecting to the south of Quartz mountain, on Dog mountain, was recommended to the prospectors in the area, but no information as to results obtained has been received.

FIRST NORTH FORK OF WATSON BAR CREEK.

On the trip out of the Poison Mountain Creek section the South fork of French Bar Creek trail was followed down as far as Roderick creek, from where a diversion was made, over the divide to the west, into the First North fork of Watson Bar creek. This creek has produced up to \$3,500 in placer gold yearly for the last fifteen years or more, and while the best ground has been worked out on the upper part of the short creek, the lower end of it is covered by three leases, aggregating 4,500 feet in length, owned by Messrs. Webber, Harris, and Adams. This ground is considered to be well worth serious prospecting by means of shafts to bed-rock, and in the event of favourable prospects being discovered it could be best opened and worked by drift-mining methods. Just above this ground M. Daly has made a comfortable living for several years from the bed-rock pay-streak. Here the overburden is 12 to 14 feet deep, and after this is removed in the spring by ground-sluicing the owner takes up 18 inches of bed-rock from the 18-foot wide bed-rock channel. Recoveries are stated to be about \$250 to \$300 per 12 lineal feet (one box-length) of channel. It is considered that the overburden would not be less than 30 to 40 feet deep on the ground owned by Messrs. Webber, Adams, and Harris.

At the time of the writer's visit late in June several men were working small shovelling-in operations along the creek above M. Daly's ground on remnants of low-grade rim-rock gravels left by the original miners. They were making enough to pay for supplies and occasionally better.

The *Astonisher* group, owned by W. Trimble and associates, was being further developed through the extension of the 12-foot drift off the bottom of an 80-foot winze from the long tunnel on the property. Very good samples of gold-bearing quartz have been found from time to time on this property, and it would appear that they have come from narrow quartz veins which are bedded with or cut the argillaceous country-rocks close to their contact with a coarse-grained hornblende-diorite intrusive.

The *Chisholm* group, owned by T. Chisholm, J. L. Webber, *et al.*, is situated on the divide between Watson Bar and Ward creeks. Several hundred feet of trenching had exposed several narrow oxidized and mineralized quartz veins bedded with the argillite country-rocks.

The hope at both the *Astonisher* and *Chisholm* groups would seem to lie in locating a widening in the individual quartz veins and the finding of ore-shoots in the same, or in the discovery of a series of parallel quartz veins so closely spaced that they could be combined with the country-rock to give a commercial grade of ore over minable widths.

TRIP TO THE HORSEFLY RIVER HEADWATERS.

Immediately upon returning from the Watson Bar Creek area, the writer proceeded by way of Williams Lake and Horsefly to the end of the road at Hockley's ranch near Black creek, and from there by pack-train to the headwaters of the south or main branch of the Horsefly river. From Hockley's ranch to the upper end of the Horsefly river is 50 miles by trail. An alternative route into the area is by boat from the lake near Horsefly to the mouth of Archie creek, and from there by trail over the divide into the Horsefly river at the junction of the North and South forks. The trail from this junction is 20 miles long to the head of the river. Horses have to be hired before leaving Black creek as there are none to be had up the river from this point.

During the winter of 1932-33 a large number of claims were staked by the W. R. Wilson interests, Major Hart, of Williams Lake, and others, in the area around Fraser, Slide, and Eureka creeks, and on the divide between these creeks and the McKuskey river and Crooked lake. It was to investigate this activity that the trip was made. At the time of the trip possibly a dozen men were working at scattered points along the upper end of the Horsefly river. Several of them were sniping and prospecting for placer gold and in most cases had been disappointed with their returns. Two parties were prospecting the extensive stakings of lode claims. The prospectors had not been very successful up to the time of my leaving the district.

As to the district in general, the findings of the late W. Fleet Robertson, as reported in the 1902 Annual Report, are still applicable. The writer, however, could not locate the old tunnels on Fraser creek nor as much pyrite mineralization as reported by Mr. Robertson. Several samples of quartz, partially oxidized, were taken by the writer from quartz outcrops and float, but in all cases the assays returned *nil* for both gold and silver.

In the area under survey there is a well-defined belt of old sedimentary rocks, for the most part black slates and schists, with occasionally argillaceous limestones, which strike generally N. 50° W. On the western end of the sediments, near the mouth of the McKuskey river, granite mica gneisses occur interbedded as sills in the slates. A large pyroxenite dyke was noted on the other side of the belt, near the head of Fraser creek. Throughout the slates on all three creeks examined (Fraser, Slide, and Eureka) occur numerous veins of quartz which are from a few inches to as much as 60 feet in width. The veins strike N. 60° to 75° W., or approximately with the slate bedding, and dip from 30° to 50° to the west. For the most part they are white in colour and stand out prominently from the surrounding dark-coloured country-rocks. Occasionally evidences of oxidation are to be found, the quartz being indented with small impressions formerly occupied by small pyrite crystals.

It will require extensive and systematic prospecting of the entire area with a view to finding ore-shoots in some of the many exposed veins before an opinion on the value of the area could be given. The work to date has been disappointing, but it has also been haphazard and very limited. The long distance from transportation, 50 miles from a road and 115 miles from the railway at Williams Lake, is a very real difficulty. The present trail into the section is passable, but not much more.

ATLIN MINING DIVISION.

Following the Horsefly River trip, the writer proceeded to Atlin via Prince George, Prince Rupert, and Skagway, Alaska, to investigate and examine the lode-gold possibilities of the area adjacent to this promising placer-field. A month was spent examining properties adjacent to the town of Atlin, in the Big Horn section of Tagish lake, and on the southern end of Tagish lake near the *Engineer* mine.

Much has been written about the promising possibilities that have been uncovered in placer-prospecting on the many creeks of the Atlin district, and for detailed information the reader is well and strongly advised to read the reports of the Resident Engineer for the district. Several of the placer producers were visited and examined by the writer as a preliminary to studying the lode-deposits, and it is sufficient at this time to state that he was very favourably impressed with placer possibilities for the future in this already thirty-five-year-old placer camp.

Regarding lode-gold deposits the conditions are somewhat different. The residents of Atlin and vicinity are all placer-miners. They are not particularly interested in prospecting for quartz-deposits, nor will they be until they have largely depleted the placer riches. Many quartz veins were located years ago when first the camp was found. On some of the claims much money was spent unwisely; on others development-work proved disappointing; on still others showings of fair promise were developed; and in the case of the *Engineer* mine, on Tagish lake, a producing mine operated for several years with an appreciable gold production. But in spite of this activity it is the considered opinion of the writer that a very large part of the district has not been properly prospected for gold-quartz veins.

ATLIN LAKE AREA.

Of the many old locations close to Atlin and including such properties as the *Anaconda*, *Beavis*, *Imperial*, *Lakeview*, *Pictou*, and *Yellow Jacket*, probably the best known is the *Imperial* group on Munroe mountain.

This ground, owned by J. Stokes, of Atlin, and W. Moore, of Nanaimo, is situated about $4\frac{1}{2}$ miles north-east of Atlin. A road leads from Atlin to the foot of the mountain, just below the tunnels on the property. The development-work has been confined to opening up one well-defined quartz vein in the hornblende-porphyrite country-rock. The vein strikes N. 50° to 65° W. and dips at 50° to 60° to the south-west. In width it varies from 5 inches to over 6 feet, averaging approximately $2\frac{1}{2}$ or 3 feet. The vein-filling is composed mainly of quartz and crushed country-rock, through which are disseminated particles of galena, chalcopyrite, pyrite, copper carbonates, and, occasionally, free gold.

Two crosscut tunnels, 25 and 112 feet long, have tapped the vein at elevations of 3,350 and 3,260 feet respectively, roughly 1,000 feet above the level of Atlin lake. On the upper level 169 feet of drifts have been driven on the vein. On the lower level 135 feet of drifting on the vein has been done. The writer took fourteen samples, ten channel samples and four representative samples of small dumps of ore at the tunnel portals. The assay value ranged from *nil* to 2 oz. gold per ton and *nil* to 2.5 oz. silver per ton. The samples indicate a 20-inch width of ore in the upper tunnel over a length of 35 feet at the western end of the drifting which will average 0.8 oz. in gold per ton and 1 oz. in silver per ton.

Unfortunately the work on the lower level of the property has been done on the eastern end of the vein and away from the possible downward continuation of the small ore-shoot remaining in the upper level. Work to the western end of the lower level should pick up the ore in less than 125 feet of drifting along the vein.

The small ore-shoot indicated on the upper level has been stoped through to the surface on one end. It is reported by the present owners that a recovery of \$10 per ton in gold was made from the 200 tons thus removed. There formerly was a small stamp-mill on the property, but this is now dismantled. The property is advantageously situated locally with respect to transportation, timber, water, and supplies, and its possibilities, while apparently small at the present stage of development, are by no means limited.

Prospecting in the Atlin area is recommended in the section south of Surprise lake, and more particularly in the triangular area bounded by Dixie, McLay, and Farnsworth peaks. Prospecting in the old sedimentary formations to the west of Dixie mountain and down to the headwaters of Spruce creek and O'Donnell river is also recommended as holding forth promising possibilities for the quartz prospector.

BIGHORN CREEK AREA.

The *Bighorn*, *Spokane*, and *Red Rupert* properties were examined in this section and many samples taken for assay. The most promising of the three properties examined is the *Spokane* group. This group of fourteen claims is situated on the west side of Bighorn creek, 9 miles by road from Taku arm of Tagish lake. In addition to the four original claims in this group owned by Messrs. Lawsan, Schwanekamp, and Schulz, of Atlin, and recently reported transferred to Vancouver interests headed by J. E. R. Wood and W. Scheeler, ten new locations were staked in 1933 by the Vancouver parties.

The original locations were made on a remarkably persistent, uniform fissure-vein found cutting the schisted and gneissic amphibolite and granitoid rocks of the area. The vein strikes N. 80° W., almost at right angles to the valley of Bighorn creek, and dips to the north at 70° to 85°. It has been traced along a horizontal length of 3,000 feet and through a vertical distance of over 1,500 feet. The vein-filling, which averages 2½ to 3 feet in thickness, is composed of quartz and minor amounts of crushed wall-rock. It is mineralized with small particles of pyrite, small amounts of galena, and numerous samples show it to be auriferous.

Development-work on the vein includes several shallow open pits and three short adit-drift tunnels, named in ascending order the Peter's, Blacksmith, and Incline tunnels. They are located at 3,470, 3,620, and 4,200 feet above sea-level, the upper tunnel being 1,500 feet vertically above the valley-floor of Bighorn creek. The best showing is at the upper, or Incline, tunnel, where the vein averages 30 inches wide in the 12-foot tunnel-length. Two channel samples across 30 inches at the face and 5 feet back assayed 0.04 oz. gold, 0.06 oz. silver, and 1.32 oz. gold, 0.3 oz. silver per ton respectively. This gives an average of 0.68 oz. gold and 0.18 oz. silver per ton. Another group of samples channeled across the vein at six places in the Incline tunnel over an average width of 30 inches, by a reliable engineer, assayed 0.275 oz. gold per ton. Farther up the hill from the Incline tunnel are found the ruins of an old arrastra, and a sample of the roasted quartz lying on a small dump beside the ruin assayed 0.64 oz. gold per ton.

The occurrence of gold, the persistence of the vein both horizontally and vertically, the uniformity of the mineralization, and the favourable location for economical development (with the exception of high freight tariffs) make the showings worth a reasonable amount of technically directed development. This work should be first confined to the trenching and thorough sampling of the vein on the surface above and below the Incline tunnel. Drifting on the vein at the Incline tunnel-level is also recommended.

At the *Bighorn* property, about 1½ miles up-stream from the *Spokane*, and on the same side of Bighorn creek, conditions are not so favourable for a small company operation. The mineralization occurs in a flat-lying series of narrow elongated quartz-lenses. The lenses are from 4 to 18 inches in thickness and channel samples cut by the writer varied in assay value from *nil* to 1.30 oz. gold per ton. Eight channel samples over an average width of 9¼ inches at the little tunnel averaged 0.84 oz. gold per ton. The property would respond best to an energetic lessee.

TAKU ARM SECTION.

In this section the *Engineer*, *Gleaner*, *Rupert*, *White Moose*, and *Happy Sullivan* properties were visited. At the *Engineer* activities on a company scale have been curtailed for some time, but R. Brooks, who was in charge at the mine, was mining small quantities of high-grade gold ore from small pockets. It is hoped that the financial difficulties of the company will shortly be overcome and that further development-work will be done on the low-grade shear-zone, with a view to proving up a substantial tonnage of milling-grade ore. The other properties are idle at the present.

HIXON CREEK AREA.

After leaving the Atlin district the writer proceeded to Hixon creek, north of Quesnel, to examine the area being worked and explored by the Brotgold Mines, Limited, the Quesnelle Quartz Mining Company, and others.

On the Brotgold property a crew of twelve to fifteen men, under the direction of R. Langdon and H. F. S. Wolverton, has been surveying and exploring the property of Hann and J. Strbac (under option to Brotgold) and surrounding claims staked by the company. The weathered schist country-rock contains a low-grade mineralized zone.

On the Quesnelle Quartz Mining Company's property, just below the Brotgold property on Hixon creek, a crew of men under the supervision of E. O. Clarke, has installed a Diesel-driven compressor, hoist, and pumping equipment, and at the time of examination the old shaft on the south side of the creek had been unwatered down to the 105-foot level. Since that time it is understood the shaft-workings have been completely unwatered and underground development-work started.

COAL-MINING.

REPORT BY JAMES DICKSON, CHIEF INSPECTOR OF MINES (HEADQUARTERS, VICTORIA).

The estimated production of coal in British Columbia during 1933 was 1,252,000 long tons, as compared with 1,534,975 long tons in 1932, a decrease approximately of 282,975 tons. All the major coal-producing districts shared in this decrease.

Vancouver Island produced 601,000 tons in 1933, as compared with 749,006 tons in 1932, a decrease of 148,006 tons.

The East Kootenay District produced 478,000 tons in 1933, as compared with 587,875 tons in 1932, a decrease of 109,875 tons; while the Nicola-Princeton area produced 170,000 tons in 1933, as compared with 195,312 tons in 1932, a decrease of 25,312 tons.

The Bulkley Valley mine in the northern part of the Province produced over 3,000 tons, a slight increase over 1932.

There was a greater reduction in the number of working-days than in the number of men employed, the only mine where a material decrease in the number of men employed being at the Coal Creek Colliery, where the working-force was reduced from 350 to 150; production was totally suspended at these mines during April, May, and June.

Decreased buying-power and the continued used of fuel-oil are the main factors in the reduced market for British Columbia coal.

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