

BRITISH COLUMBIA DEPARTMENT OF MINES

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BULLETIN No. 3, 1930

PRELIMINARY REVIEW AND SUMMARY OF MINING OPERATIONS FOR THE YEAR 1930, IN THE PROVINCE OF BRITISH COLUMBIA

COMPILED BY

JOHN D. GALLOWAY, Provincial Mineralogist.

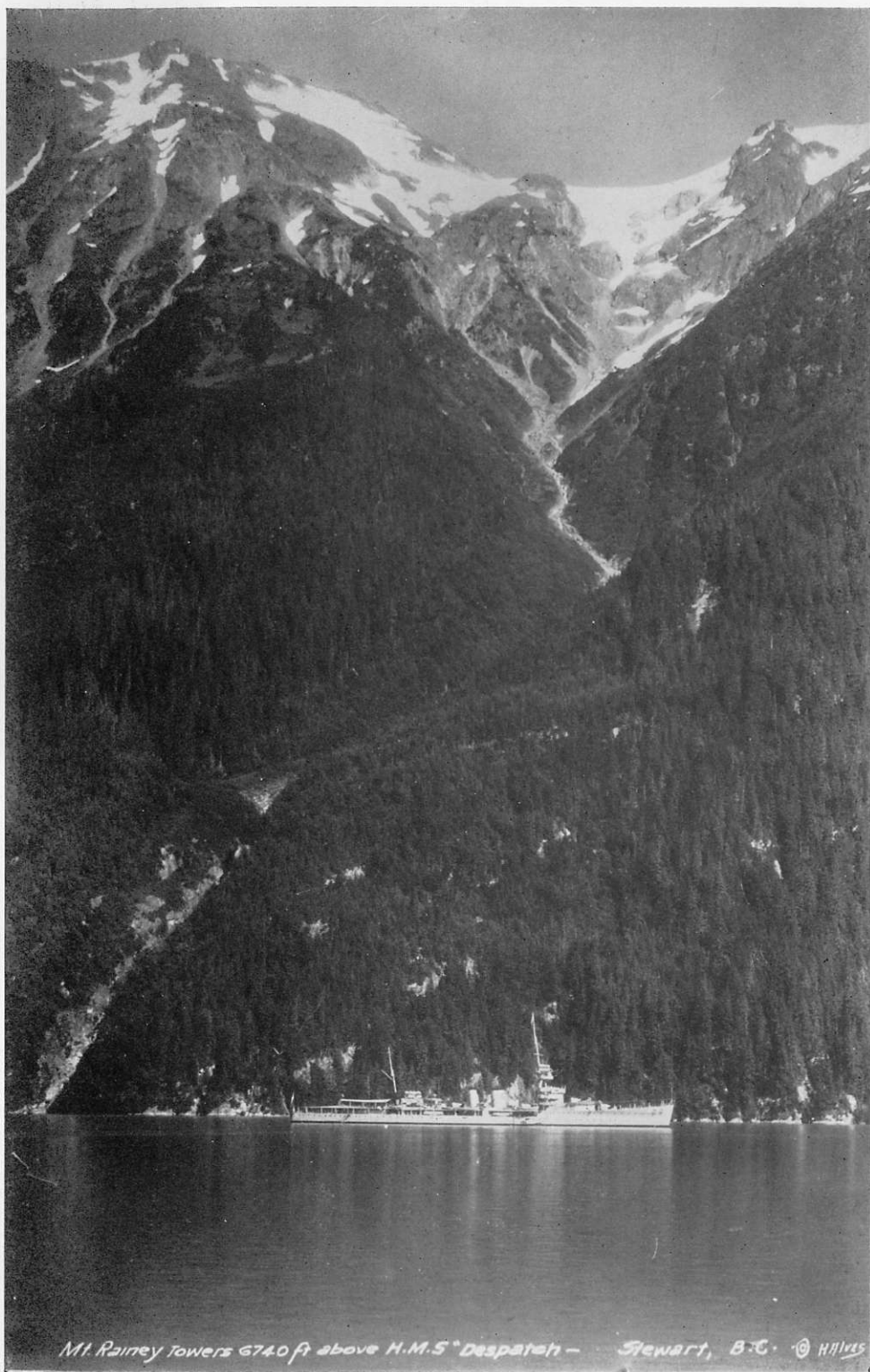


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Mt. Rainey towers 6740 ft above H.M.S. "Despatch" - Stewart, B.C. © H.H.H. 1915

Mount Rainey, East Side of Portland Canal near Stewart.

*To the Hon. W. A. McKenzie,
Minister of Mines, Victoria, B.C.*

SIR,—I beg to submit herewith a preliminary review and summary of mining operations in the Province for the year ending December 31st, 1930.

The object of this bulletin is to summarize briefly the progress of the industry and to estimate approximately the value of the mineral production for the year 1930.

Included are reports on each of the Mineral Survey Districts of the Province by the Resident Engineers and a summary regarding coal-mining by the Chief Inspector.

I have the honour to be,

Sir,

Your obedient servant,

JOHN D. GALLOWAY,
Provincial Mineralogist.

*Bureau of Mines,
Victoria, B.C., December 15th, 1930.*

PRELIMINARY REVIEW AND SUMMARY OF MINING OPERATIONS, 1930.

GENERAL SUMMARY.

BY JOHN D. GALLOWAY, PROVINCIAL MINERALOGIST.

The gross value of the mineral production of the Province for 1930 is estimated at \$55,164,515, a decline from the output in 1929 of \$13,080,928, or 19.15 per cent.

The following table shows the estimated production for 1930 and comparative figures for 1929:—

ESTIMATED MINERAL PRODUCTION FOR 1930.

(1929 FINAL FIGURES SHOWN FOR COMPARISON.)

Description.	PRODUCTION, 1929.		ESTIMATED PRODUCTION, 1930.			
	Quantity.	Value.	Quantity.	Value.	Increase.	Decrease.
Gold, placer, oz.....	6,983	\$118,711	9,100	\$154,700	\$35,989	.....
Gold, lode, oz.....	145,339	3,004,419	154,000	3,183,457	179,038	.....
Silver, oz.....	9,918,800	5,256,270	11,800,000	4,334,268	.....	\$722,002
Copper, lb.....	101,483,857	18,375,682	92,000,000	11,928,720	.....	6,446,962
Lead, lb.....	302,346,268	15,269,696	320,000,000	12,605,120	.....	2,664,576
Zinc, lb.....	172,096,841	9,268,792	250,000,000	9,043,250	.....	225,542
Coal, tons (2,240 lb.).....	2,251,252	11,256,260	1,878,000	9,390,000	.....	1,866,260
Structural materials.....	.....	3,921,768	.....	3,400,000	.....	521,768
Miscellaneous minerals and metals.....	.....	1,773,845	.....	925,000	.....	848,845
Totals.....	.....	\$68,245,443	.....	\$55,164,515	.....	\$13,080,928

The value of the metallic production—gold, silver, copper, lead, and zinc—amounts to \$4,449,515, the coal production to \$9,390,000, and the output of structural materials and miscellaneous products is valued at \$4,325,000.

Increased quantity outputs are shown for gold, silver, lead, and zinc, with decreases in coal and copper and a lowered valuation for structural materials and miscellaneous products. The big drop in the gross value is mainly accounted for by much lower metal prices and a decreased coal-output.

It is remarkable, however, to note that, notwithstanding very much lower metal prices, record outputs of silver, lead, and zinc will have been made this year. Valued at 1929 prices, the estimated mineral production for 1930 would approximate nearly \$70,000,000, which shows that quantity production of metals and minerals during the year has, in the aggregate, been at the greatest rate in the history of mining in the Province.

The tonnage of ore mined and treated in the Province in 1930 is estimated at 6,600,000 tons, as compared with 6,977,681 tons in 1929. The closing of a number of mines at different times during the year accounts for the decreased tonnage.

The average gross value of the ore mined during the year is estimated at \$6.25 a ton, as compared with \$7.35 a ton in 1929. This drop of 15 per cent. in the value of the ore mined reflects the effect in the aggregate of the lowered metal prices prevailing during 1930.

Profits of the industry will be considerably less this year than in recent years. The official index of profits is dividends, but these usually lag a bit behind in indicating current profits. Dividends for 1930 will not be as much lower than for 1929 as the lessened profits for this year would indicate. This year a bigger percentage of profits has been paid as dividends and in some cases surpluses have been dipped into. It is estimated that a total of \$11,000,000 or more will be paid out in dividends for 1930. While the dividend record this year will be satisfactory, the outlook is for lower dividends in the next few years than in recent years. However, dividends are not so important to the life of the Province as steady pay-rolls and the money circulated for supplies, transportation, etc.

The year 1930, now approaching its end, has been an unfortunate one for the mineral industries of the world. The mining of minerals and the production of metals is a business peculiarly dependent on world progress, and during the past twelve months normal business has been severely interrupted. The two important factors in denoting hard times for the miner of base metals are extremely low prices for metals and the difficulty of marketing these metals even at the prevailing low prices. Similarly, industrial depression has caused declines in all the varied branches of the industry—at least in dollar values. However, in spite of an unusually bad year for the world in general, mining in British Columbia has held up remarkably well in 1930. The main mines of the Province have continued production and in some instances have increased their outputs; and some new mines have commenced production. Although numerous small properties have closed down and many pessimistic statements are made, if viewed in a broad way the conclusion must be that British Columbia's mining industry has weathered the storm of depression in a better way than might have been expected.

The bulk of the metallic mineral production of the Province for the last five years has been made by five mines, and the record of the past year shows that many small mines closing down affects but little the total production. During the last three years, development had indicated that a number of properties were likely to become producers in the near future. Five of these were brought into production since December, 1929, but abnormally low metal prices and the uncertain future outlook for improvement have stopped certain of these enterprises and have caused capital to look more for high-grade properties than before. It cannot be expected, therefore, that the industry will do much more than hold its own, so far as metal production is concerned, until prices improve materially. It is decidedly encouraging, however, that during a period of world depression in mining (except gold) British Columbia should have made such a splendid record. With improvement in world conditions, which is bound to come sooner or later, the mineral industry of British Columbia will continue to expand in future years as it has in the past.

PRODUCTION OF VARIOUS MINERALS BRIEFLY REVIEWED.

Placer Gold.—The production of placer gold is estimated at \$154,700, as compared with \$118,711 in 1929. The principal placer-mining camps are in Atlin, Cariboo, and Quesnel, while less important areas, such as Liard, Omineca, Clinton, Similkameen, and Fort Steele, add to the production in proportion. The production from Atlin during the last two years has been much less than normal, as the three larger companies have confined their attention to development-work. Indications are that the increase shown by this camp this year over 1929 will continue in the future.

Cariboo Division made about the same production as in 1929, but many plans now under way may result in a larger output in future years.

Quesnel Division made a substantially larger output in 1930 than in the previous year and future prospects are encouraging.

The interest now being taken in gold-mining is stimulating an increased interest in placer-mining, and this branch of the industry may be expected to return gradually to something approaching its former importance.

Lode Gold.—The production of lode gold for the year is estimated at \$3,183,457, an increase of \$179,038, or 6 per cent., as compared with 1929. The largest part of the gold-output comes from the *Premier* mine, which made a lower output in 1930 than in the preceding year.

The next most important gold-mine is the *Pioneer*, which gives every indication of becoming of increasing importance in the future. The *Reno* and *Union* mines are new producers this year, the former being a straight gold-mine and the latter a gold-silver property.

The *Nickel Plate* mine is still producing gold, but not as much as in former years. A few small gold properties and by-product production from copper-mining account for the remainder of the gold-output of the Province.

It is quite apparent that there is an active interest in searching for gold properties in British Columbia. A number of small properties in the Nelson Division are being developed and many old properties are being carefully examined.

Silver.—The production of silver is estimated at 11,800,000 oz., as compared with 9,918,800 oz. in 1929, an increase of 1,881,200 oz., or 19 per cent. This will be a new high record for silver-output in the Province. The increase is mainly due to an output of approximately 1,500,000 oz.

from the *Prosperity* mine at Stewart, a new producer this year. In addition, the *Premier* made a larger production than in 1929. A heavy decline was registered from the Slocan district, where several former shippers were closed down on account of low metal prices.

The value of the silver-output is estimated at \$4,534,268, a decline from the 1929 value of \$722,002, or 13.7 per cent. Thus, notwithstanding a record output, the value, owing to the big drop in silver prices, is less than any of the last six years.

The largest producer in the Province is the *Sullivan* mine, followed by the *Premier*, with the *Prosperity* in third place.

The average price of silver for the year is estimated at 38.426 cents an ounce, as compared with 52.993 cents in 1929, a decline of 27.5 per cent.

Copper.—The output of copper in 1930 is estimated at 92,000,000 lb., valued at \$11,928,720. This is a decline in output of 9,483,857 lb. and in value of \$6,446,362.

The decline in production is accounted for by the closing-down in November of the *Copper Mountain* mine and curtailment by the *Hidden Creek* mine, both owned by the Granby Consolidated Mining and Smelting Company. This decrease was in part offset by increased production from the *Britannia* mine, which will in 1930 make a record output.

The tremendous drop in copper price during the year from an average of 18.107 cents a pound in 1929 to 12.966 cents in 1930 is largely responsible for the big decline in the value of the copper-output, and has resulted in greatly decreased profits for the two main copper companies of the Province.

Lead.—The production of lead in 1930 is estimated at 320,000,000 lb., which is a new high record output, being nearly 18,000,000 lb. greater than the 1929 figure. The main producer is the *Sullivan* mine of the Consolidated Mining and Smelting Company, which made a slightly higher output this year, thereby offsetting a decline from the Slocan district. A substantial output was also made by the *Monarch* mine of the Base Metals Mining Corporation.

The lead produced this year is valued at \$12,605,120, a decrease of \$2,664,576 as compared with the 1929 figure. The average London price of lead in 1930 is estimated at 3.94 cents a pound, as compared with 5.0504 cents in 1929, a decline of 22 per cent. The outlook for the future is that the present rate of output of lead will be easily maintained.

Zinc.—The output of zinc for the year is estimated at 250,000,000 lb., a most substantial increase over that of 1929 and also 1928, the previous record year. The increase amounts to nearly 78,000,000 lb. as compared with 1929.

Notwithstanding the largely increased output, the value is slightly lower than the figure for 1929, being \$9,043,250 as compared with \$9,268,792.

The principal producer of zinc is the *Sullivan* mine of the Consolidated Mining and Smelting Company, which this year made a greater output than in 1929, and in addition a considerable contribution was made by the *Monarch* mine.

A large part of the increased production this year was, however, due to the commencement of operations by the new slag-fuming plant of the Consolidated Company at Trail. This plant recovers zinc formerly lost in the slag from the lead-furnaces. In addition to the current slag production, there is a large quantity of slag from former operations stored at the Trail plant awaiting re-treatment. This plant is now turning out zinc oxide, equivalent to 50 tons of metallic zinc a day.

The average price of zinc for the year is estimated at 3.62 cents a pound, as compared with 5.3858 cents in 1929, a decline of 32.8 per cent.

Coal.—The production of coal in 1930 is estimated at 1,878,000 long tons, a decrease of 373,252 from the 1929 output, or 16.6 per cent. The decrease was general throughout all the fields of the Province, and is largely due to the displacement of coal by fuel-oil, together with decreased fuel requirements occasioned by business depression. For details of the production see the Chief Inspector of Mines' report at the end of this bulletin.

Structural Materials.—The output of structural materials for the year is valued at \$3,400,000, as compared with \$3,921,768 in 1929, a decrease of \$521,768, or 13.3 per cent.

The decline is due to lessened construction-work and probably less maintenance, both a natural result of the business depression.

This branch of the mineral industry derives its market locally within the Province and the bulk of the production is sold in the Coast cities. It is to be expected, therefore, yearly fluctuations in output will occur, according to the state of business in general. There is, however, a

plentiful supply of the various raw materials in the Province, so that as the Province grows in population and industry, expansion of output of structural materials will occur.

Miscellaneous Metals and Minerals.—The value of miscellaneous metals and minerals produced is estimated at \$925,000, which is substantially below the figure of \$1,773,845 recorded in 1929 and only slightly above the 1928 output.

No fluorspar or bismuth was produced in 1930 and only about half as much cadmium. The *Rock Candy* mine of the Consolidated Company produces the fluorspar and it is only operated a short time every two or three years to supply the acid-making requirements of the Consolidated plant. The world market for bismuth and cadmium is limited and apparently the Consolidated Company producing these metals did not force production in 1930.

An increased output of gypsum is estimated for the year, but most of the other products will probably show declines.

There are numerous deposits of non-metallic minerals in the Province, some of which are being investigated and developed, so that this branch of the industry may be expected to expand when normal business follows the present depression.

METALLURGICAL FEATURES OF THE YEAR.

The era of mill-construction which prevailed in British Columbia during 1927, 1928, and 1929 has passed and much less construction of new concentrators was carried on in 1930. Undoubtedly, some of these plants were prematurely constructed as an adjunct to misguided stock promotions, which were a feature of the recent mining boom. A number of mills, the construction of which was justified at the time, are now idle, as it is impossible to operate profitably the properties at present metal prices. In the future some of these will return to the active shipping-list.

The Consolidated Mining and Smelting Company, however, continued its steady expansion and in 1930 a larger programme of construction was under way than in recent years. During the year the new slag-fuming plant, constructed at a cost of \$2,000,000, was completed and operations commenced in August. The interesting feature of this plant is that it recovers zinc formerly wasted in the lead blast-furnace slags. Eventually this plant is expected to produce 100 tons of zinc a day in the form of oxide, which is turned into the metal in a special unit of the zinc-refinery.

In the treatment process in this plant the volatilized zinc oxide and associated gases are evolved at very high temperatures and this heat is used to generate steam in two 1,750-horse-power waste-heat boilers; this central heating plant will supply heat and process steam for the whole metallurgical works at Trail, including the new chemical-fertilizer plant.

The major construction-work of the year by the Consolidated Company has been the new fertilizer plant at Warfield Flat, 2 miles from Trail. This plant will cost approximately \$10,000,000 and it is expected that the production of phosphate fertilizer will commence in the spring of 1931. Later, other units of the plant will be completed and other synthetic fertilizers produced.

This construction has done much to alleviate unemployment, which was severe this year in the Kootenay district owing to the closing-down of many small mines.

Another Consolidated operation that may mean much to the Stewart camp is the construction of a 100-ton pilot-mill at the *Big Missouri*. This plant is expected to be in operation about the end of the year and a thorough appraisal of the possibilities of the extensive but irregular mineralization on this property will probably be obtained in 1931.

New mills constructed at the *Monarch* mine at Field and at the *Union* mine near Grand Forks were completed and tuning-up commenced about the end of 1929, but the adjustment of these to regular working conditions was made this year.

At the *Reno* mine, in the Nelson Division, a 30-ton gold-cyanide plant was constructed in 1929 and brought into steady production in 1930. Although a small-tonnage operation, this has been quite successful, with an output of gold for the year of approximately \$150,000.

The *Pioneer* mine completed further construction of power plant and incidental equipment to permit of larger tonnages being handled. A very successful year was experienced with a production of gold estimated at \$250,000. This mine is entering the best period of its career, with increased output confidently expected in the future.

In a time of depressed conditions and low metal prices, when operating profits are necessarily reduced, it is always noticeable that extraordinary efforts are put forth not only to lower mining and milling costs, but also to improve metallurgical efficiencies. Results obtained this year along these lines by several of the larger companies have been impressive; and one benefit to the industry is that when metal prices improve in the future, lower-grade ore reserves may be profitably treated.

METAL PRICES.

The tremendous declines in metal prices in 1930 have played havoc with the mining industry all over the world. It is unnecessary to discuss this matter at length, except to say that the prices of silver, copper, lead, and zinc have, in the aggregate, declined more this year, as compared with prices in 1929, than in any previous year in history. This condition has resulted in the closing-down of a number of mines in the Province, where it was impossible to continue production without making an operating loss. The first mines to feel the effect were small silver-lead-zinc producers, particularly in the Slocan district. Towards the end of the year the *Copper Mountain* mine of the Granby Company—an important copper-producer—was forced to close. Operations were also suspended by the Base Metals Mining Company at the *Monarch* in November, mainly because of the desirability of conserving ore reserves.

The following table shows the average metal prices for 1930 (December estimated) and for comparison the 1929 prices:—

Metal.	1929.	1930, December estimated.	Increase.	Decrease.
	Cents.	Cents.	Per Cent.	Per Cent.
Silver (New York), per oz.....	52.993	38.426	.....	27.5
Copper (New York), per lb.....	18.107	12.966	.....	28.4
Lead (London), per lb.....	5.0504	3.9391	.....	22.0
Zinc (London), per lb.....	5.3858	3.6173	.....	32.8

The important question now is, when will metal prices return to a level whereby various mines may be able to profitably resume production? In order to appraise the situation it is necessary to inquire into the causes of the decline.

In a word, it is evident that consumption of metals has failed to keep pace with the tremendous world increase in output in recent years. There seems little doubt that the present world capacity to produce silver, copper, lead, and zinc is greater than the probable world consumption for some time to come. Lacking intelligent and co-operative curtailment of production, the result has been a huge increase in metal stocks, with inevitable price-cutting.

So far as British Columbia is concerned, there is practically no local market for the output of silver, copper, lead, and zinc, and the Canadian market will not absorb at the most more than 25 per cent. of the production of these metals; world market prices therefore rule for British Columbia. It is evident that any improvement in metal prices must come by the concerted action of all important world producers. Such definite action has been taken by both the zinc-producers and the copper-producers, and it may be expected that within six months excess stocks of these metals will be reduced and a healthier tone imparted to the market.

Lead is in a sounder position statistically than the other metals, with supply and demand better balanced. It may be expected, therefore, that during 1931 lead prices should gradually improve.

Silver is in a most unfortunate position, as it has lost to a large extent its former demand for currency uses. With a declining demand and a flush production the outlook is not encouraging. So much silver is produced as a by-product of other mining operations that direct curtailment of silver-output is impracticable.

In discussing curtailment of production as a remedy for uneconomic metal prices it should be realized that this in no way involves price-fixing, which procedure the world at large is not likely to tolerate again in any widely produced world commodities. The procedure, however, of balancing supply to demand is practised in many industries in order to ensure that price fluctuations will be within reasonable economic limits. This would seem to be an intelligent

policy for the mining industry, as even low-cost producers can hardly afford to waste unreplaceable assets in the shape of ore reserves without receiving a reasonable profit on the invested capital.

At this time it is most heartening to have the official opinion of the Board of Directors of the Consolidated Mining and Smelting Company, who in the past have been quite successful in predicting the trend of metal prices. Accompanying the recent regular dividend and bonus declaration for the last half of 1930, the statement was issued: "They (the Directors) do not expect a continuation of present low metal prices in 1931."

DEVELOPMENT.

Development of mineral properties in British Columbia during 1930 was at a somewhat decreased rate as compared with the last three years. In general, it may be said that the big falling-off in development has been in those properties financed by public subscription to small local stock companies. Except under special conditions, there is no great incentive at the present time to develop properties carrying values in silver, lead, and zinc; in fact, many such properties with developed ore reserves and equipped with modern-type concentrators are closed down, as it is impossible to mine and sell lead and zinc concentrates at a profit at present metal prices.

The larger mining companies have maintained development on the usual scale, not only at producing properties, but at many which are in the semi-developed stage. In particular, the Consolidated has continued its widespread development programme throughout the Province practically without curtailment. This company normally each year takes up, and drops after examination or a small amount of work, many properties, but at the present time has an average number under development.

A Consolidated operation that is of particular interest is the erection of a 100-ton pilot-mill at the *Big Missouri* mine at Stewart. The values are mainly in gold, and owing to the erratic nature of the mineralization ordinary sampling apparently was unsatisfactory; hence the decision to put in a pilot-mill which will conclusively determine average values in different sections of the property. The mill is expected to be in operation about the end of the year.

One disappointment of the year occasioned by the abnormally low silver price and uncertain outlook for the future is the indefinite suspension of work by the Britannia Mining and Smelting Company at the *Toric* and adjoining properties in the Alice Arm section. The Britannia Company, however, has acquired a property in the State of Washington, which apparently is promising, judging from the rearrangement of company officials recently announced, evidently with the idea of providing the best possible technical supervision in developing and equipping this new property.

The year has witnessed the completion of the development plans of the Premier Gold Mining Company on the *Prosperity* and *Porter-Idaho* mines on the Marmot river, near Stewart. Towards the end of 1929 the aerial tramway was completed and shipments were commenced from the *Prosperity*, which were continued steadily throughout 1930. The *Porter-Idaho* was also brought into production. The main value in the ore from these properties is silver and it is interesting that both were profitably operated, notwithstanding the low price of silver.

Useful development was done on the property of the B.C. Nickel Company during the year. This consisted of electrical prospecting, surface-stripping, and diamond-drilling. An important success was registered by electrical prospecting on this operation, whereby a new ore-body was found and the general nature of the ore occurrences was more accurately diagnosed than heretofore. This property now gives indication of being a probable nickel-producer when fully developed and equipped.

The *Pioneer* mine, in the Lillooet Division, is an old one, but as a result of capable management is now entering the best part of its career. Deep development and mill-construction in the last two years have placed this mine now in the position of one of the important gold-mines of the Province. The production this year will be greater than ever, with the prospect of a still larger output in 1931.

During the year prospecting, scouting, and exploration for mineral properties proceeded steadily, and more was carried out than would have been expected considering the depressed state of the metal markets.

An intensified search for gold properties was apparent, but it is believed that a much keener interest will be shown in potential gold-mines in 1931. There are many gold areas in British Columbia that will justify more prospecting and more development of known properties than has yet taken place. Undoubtedly, in the next few years gold-mining is going to be decidedly popular and British Columbia should share in this reawakened interest.

Some new discoveries were made during the year which promise to be of importance. One of these is a silver-lead-zinc property on the northern end of Vancouver island, optioned by the American Smelting and Refining Company, and the other a gold property north of Kamloops, optioned by the Premier Company. Descriptions of these will be found in the Resident Engineers' reports.

MINING DISTRICTS OF BRITISH COLUMBIA

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

PRELIMINARY REPORT FOR THE YEAR 1930.

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

GENERAL SUMMARY.

The North-western Mineral Survey District (No. 1) comprises Queen Charlotte, Bella Coola, Skeena, Nass River, Portland Canal, Stikine, Liard, and Atlin Mining Divisions. It includes all the Arctic drainage area of the Province north of the Peace river and its tributaries, and the Pacific drainage area of the Province from Seymour inlet to the Yukon boundary, including Queen Charlotte islands.

The district has withstood the depression and falling metal prices that prevailed during 1930 remarkably well. The effects of this condition have in fact been to a certain extent beneficial in both a psychological and practical way. The results in this respect have been a sounder conservatism and the introduction of economies and increased efficiency that will be lasting in their effects.

All the major operations and producers of the district have, without exception, continued in uninterrupted operation, albeit with some curtailment, and, in the case of the producing companies, in the face of decreased profits resulting from falling metal prices. In the successful development of the *Porter-Idaho* and *Prosperity* properties by the Premier Gold Mining Company two new producers have been added to the list.

The decision of the Consolidated Mining and Smelting Company of Canada to erect a pilot concentrating-sampling mill on the *Big Missouri* to determine the commercial possibilities of this deposit is of decided interest. The energetic development and encouraging results achieved by the Dalhousie Mining Company, Limited, on the Tidewater Mines Company's molybdenum property at Alice arm holds good promise of commercial production of molybdenite from this property.

There have been some disappointments and a combination of factors has in some cases resulted in the relinquishment of options on properties by operating companies. Outstanding in this respect is the discouraging result of development of the *Manville* group, Taku river, which in the face of severe option terms compelled the relinquishment of the option on this property by the Alaska Juneau Gold Mining Company. The temporary cessation of operations by the Torbrit Mining Company on the *Toric*, on account of the uncertain condition of the silver market, was a keen disappointment in the Alice Arm area.

Several minor exploratory and development operations were temporarily closed down or only sufficient work carried on to hold properties in good standing.

The harnessing of Falls river by the Northern B.C. Power Company and the completion of the first unit plant of 5,000 horse-power for utilization primarily in the city of Prince Rupert will have an eventual beneficial effect on the future of the mining industry. United States interests have been considering the construction of a power plant on Davis river, on the Alaskan side of Portland canal.

Prospecting has been quite active and normal in comparison with other years. There has, however, been a reduced inclination on the part of prospectors to venture too far from available arteries of transportation. This is probably a wise and constructive outcome. It would seem that a little more discretion in this respect was timely. A concentration of prospecting effort in the extensive promising and more accessible areas still available to the prospector will not only bring quick reward to the discoverer of valuable mineral and be of immediate benefit to the industry, but will probably more surely and rapidly further the development of the hinterland. Due to the deflation of base-metal prices a more intensive search for gold has naturally materialized.

Several discoveries of interest have been made. On the *Nifty* group, in the Bella Coola Division, a lead-zinc-silver discovery by the Consolidated Mining and Smelting Company was extensively explored during the season.

In the Skeena Division discoveries of gold-bearing pyrite in quartz veins in batholithic rocks have been made on the *Hunter* group, Khutze River area, and on the *Eddy Pass* group on Porcher island. On Porcher island also a discovery of promising chalcopyrite mineralization in a well-defined vein in the pendant schists overlying the batholith is being explored on the *Copper Coin* group.

In the Nass River Division recent discoveries are directing attention to the gold possibilities of the upper Kitsault River area, and also to the indication of replacement base-metal ore-bodies in some of the porous tuff-beds of the Dolly Varden series.

In the Portland Canal Division the discovery of appreciable pyrrhotite ore-bodies carrying good gold values on the *Salmon Gold* group is of exceptional interest.

The discovery of a new route into the Unuk River mineralized area by Arthur Skelhorne, representing the Mining Corporation of Canada, may be of much utility in the matter of future access to this section.

Prospecting in the Stikine River area resulted in a discovery of chalcopyrite ore on the *Drapich* group and additional discoveries on the *Jackson* and *Central* groups. Several new discoveries, but of generally low-grade tenor, have been made in the Taku River area. Little work has been carried out on these as yet. In the Rainy Hollow section extensive prospecting on the *Gold Cord* (old *Stampede*) group is reported by the owners to have resulted in the discovery of fifteen new veins.

Examining engineers representing every large local operation, besides the engineers of several Eastern and United States companies, have been scouring the district for promising prospects. It would seem that despite the slump in metal prices the search for promising prospects is as keen as ever.

Increased attention to the study of economic geological factors relative to the ore-deposits of the district is proving of much benefit to both the prospector and the operator. In this respect the inauguration by the Department of Mines of classes for prospectors has been of great constructive benefit. These classes were held at central points in the district during the late winter months and were ably conducted by George Winkler.

Substantial assistance has been rendered by the Department of Mines in the construction and reconditioning of mining and prospecting roads and trails. In this respect every section of every Division has received careful consideration where the expenditure has seemed warranted.

Important assistance has been rendered by the Geological Survey of Canada in the mapping of the Alice Arm area by George Hanson and by F. A. Kerr in the Stikine River and Taku River sections. Representatives of the Dominion Department of Mines have also visited the district.

As a natural outcome of low metal prices it is to be expected that the production value from the district for 1930 will be less than for 1929. The fact that the mining industry of the district has passed through this period of stress without closing the operation of any of its stable producers, with the bringing-in of two new producers and the advancing of several promising properties to stages appreciably closer to that possibility, is a sound tribute to the stability and future potentialities of the mining industry in the North-western District.

Placer-gold operations have been very active, with generally a greater interest displayed in this phase of the industry. There is also a tendency to more conservative and calculated preliminary exploration of placer-ground before commencing operations. The production of placer gold from the district for 1930 will probably show about a 15 per cent. increase over that of 1929.

The Resident Engineer desires to express his thanks to the prospectors and operators of the district for the many courtesies and kind assistance extended during the conduct of his work.

BELLA COOLA MINING DIVISION.

Nifty.—Interest in the Bella Coola Division has been stimulated through the discovery by prospectors for the Consolidated Mining and Smelting Company of Canada of a zinc-lead deposit with some fair silver values. The occurrence is in limestone close to intrusive andesite and is associated with a barite gangue. The property is up Tseapseahoolz (Noosgulch) river, about 24 miles by trail from the highway at Fairvale, which is about 20 miles from seaboard. Extensive stripping and trenching was carried out by the Consolidated and, it is understood, will be continued next season. The values encountered so far appear to be low grade.

QUEEN CHARLOTTE MINING DIVISION.

Hanssen Positive Separation Mining Co., Ltd.—The Queen Charlotte Syndicate, which had been conducting tests in extraction of gold from the black sands on the east coast of Graham island with the Hanssen Positive machine, was merged with this company. The tests were continued for a short period during 1930. Several improvements and alterations in mechanism have been worked out and applied. The report of the engineer conducting the experiments indicates an economic extraction of gold values. A recovery of about \$325 in gold is reported. The success of the venture on the Graham Island beach-sands is, however, dependent on the quantity of black sand available, which factor is both doubtful and variable. As was pointed out in the 1929 Annual Report, successful use of this machine on the Graham Island deposits is also dependent on the introduction of some feasible portable method of preliminary concentration.

On November 27th a petition for the winding-up of the Hanssen Positive Separation Mining Company was granted. It is understood that interested parties, with the experience gained in this venture, may undertake further operations.

Skidegate-Southeaster.—This group on Graham island has been optioned by the Kitsault-Eagle Mining Company. Early in the season work was started on the *Skidegate* and shaft-sinking, crosscutting, and drifting on the east wall of the shear-zone disclosed in places some fair values in gold. Towards the end of September negotiations for acquisition of the *Southeaster* and *Beaconsfield* claims were closed and pumping machinery installed for the dewatering of the old workings. The old drainage-tunnel has also been opened. The old workings will be examined and sampled by Angus W. Davis, who has been retained as consulting engineer, and a plan for further exploration outlined with a view to ascertaining the attitude and extent of indicated gold-bearing ore-shoots. The property was described in detail in the 1929 Annual Report.

In the Moresby Island section further work has been carried out on the *Swede* group near Lockeport, the *McMillin* near Harriet harbour, and on several properties in the neighbourhood of Huston inlet and Collison bay.

SKEENA MINING DIVISION.

COAST SECTION.

Pink Rose.—This group, owned by Alex. McLean, of Butedale, and associates, is situated on the north side of Klekane inlet, about 1 mile from its head. During the season five claims of the group were surveyed for Crown-granting. The remaining three claims are being prospected and may be Crown-granted later. During the season work was concentrated on the new discovery in the canyon about 300 feet below the outcrop, where 10 feet of encouraging mineralization was encountered. One shot was put in the lower lead at altitude 600 feet and tools placed there in preparation for further work next season.

Detroit Western Mining Corporation.—No further work has been done on this corporation's property since September, 1929. A watchman has been in charge.

Abruzzi.—This group, comprising eight claims owned by Cesaro Venzio and associates, of Terrace, is situated 8 miles south of the old *Drum Lummon* on the north-westerly shore of Douglas channel. The mineral occurrence is a replacement in altered schists in a schist inclusion in the batholith. A general description may be found in the 1929 Annual Report.

Extension of the two open-cuts 30 feet apart along the beach has exposed some improvement in the tenor of chalcopyrite mineralization. The best mineralization observed is in the most southerly cut, where some bunches and seams of fair-grade chalcopyrite mineralization is irregularly developed in the more basic phases of the schist. The mineralization in this cut does not, however, represent a commercial grade of ore when considered from the standpoint of a working-face. A sample across 7.7 feet of the best material exposed in the floor of this cut assayed: Gold, trace; silver, 0.30 oz. to the ton; copper, 1.4 per cent.

Sixty feet of cross-trench and an open-cut at 15 feet higher elevation, and about 40 feet north-west of the beach trenches, expose banded altered schists with no apparent copper mineralization. It would appear from the structure exposed by this work that the schists are folded and assume a north-easterly strike a few feet north of the northerly cut, in contrast to a north-westerly strike south of the most southerly cut. This would indicate that what ore is

exposed is probably confined to the folded crest of a definite schist-band, and that if it has further continuity this will be found in the northerly wing of this band, which bends down to the beach again to within about 100 feet north of the most northerly cut. Depth exploration for further continuity and improvement of the known mineralization would necessitate sinking operations close to the shore of Douglas channel and would probably be burdened with excessive water difficulties. It is possible other bands on the crest of this fold farther inshore may be mineralized (*see* generalized section, page 6, 1929 Annual Report). These should be prospected for by cross-formational stripping and open-cutting.

Dعاire.—This group is situated about 2 miles south of the *Abruzzi*, on the north side of the North fork of Koskeesh creek, at altitude 550 feet. It is owned by Cesaro Venanzio and associates, of Terrace.

The occurrence is an irregular silicification of gneissic granite contiguous to a kersantite dyke. In places several feet of quartz is developed, which grades again into granite or disperses as tightly frozen bull-quartz veinlets. Some zinc-blende, pyrite, and a little galena show in cross-fractures. The mineralization is very sparse. The occurrence is of no commercial importance.

Los Angeles-Vancouver Mines, Ltd.—Work during 1930 was chiefly confined to the driving of the raise connecting the lower and upper tunnels with a back of about 236 feet. This was completed late in the season and exposed the same bunched and erratic ore conditions that have hitherto characterized this ore occurrence in pegmatite. It is interesting to note also that in the small bunches of ore encountered in the lower tunnel there seemed to be a greater proportion of chalcopryrite with the bornite, chalcocite, and covellite than is the case in the upper tunnel workings. Assays by the Bureau of Mines of the different types of mineralization indicate that the bornite, chalcocite, and covellite are probably secondary from chalcopryrite carrying high values in gold and silver.

The work completed should offer a fair criterion of the character of the deposit to be expected generally. This indicates a general very erratic distribution of ore in small bunched shoots, from which the development of any stable shipping or milling tonnage would be both doubtful and expensive.

It is suggested, however, that an individual operator or lessee employing very close selective mining and rigidly following the ore-bunches where encountered, coupled with hand-sorting and cobbing, might possibly earn a profit from the sacking of shipping-grade ore. In this way some further exploration of the deposit would also be accomplished.

Work on the property ceased about the end of September, with the company afflicted with financial stress and the employees left stranded on the property financially embarrassed and with no word regarding further operation.

Gibson Girl.—The ore-showings on this group of four claims, situated on Gibson island, about 27 miles south of Prince Rupert, have been further improved by additional surface-stripping and open-cutting. The ore occurrence is described in detail in the 1929 Annual Report. Further exposures of good chalcopryrite, zinc-blende, and galena mineralization have been made on both the old and new mineralized belts. In some exposures good-grade widths of chalcopryrite mineralization are developed in the altered schist rocks as well as in the limestone. Continuity of the belts is now proved for a distance of about 1,100 feet, with numerous exposures of milling-grade ore over fair average widths. This is one of the best showings in the coastal area and it is recommended to examining engineers as being decidedly worthy of further exploration.

Kumealon.—This group, owned by Pete Brozet and situated around the head of Kumealon inlet, about 35 miles south of Prince Rupert, was further prospected during the season. Nothing of additional interest has, however, been discovered. The owners of these and other claims in this area are advised to continue the prospecting of the Prince Rupert series of altered sediments in the vicinity of the batholith contact. No commercial utility is as yet indicated in the sillimanite and ilmenite rock occurring in this locality. Further tests on this mineral combination may, however, be suggested to the Department of Mines at Ottawa.

Stuart Anchorage.—The magnetite-deposit occurring on the shore of Stuart anchorage was examined late in the season. It was found to be erratic in general magnetite content, with restricted development of massive magnetite lenses. The type and mode of occurrence will be elaborated on in the forthcoming Annual Report.

Hunter.—This group of twelve claims is owned by C. W. Meldrum and associates, of Vancouver. It is situated about $8\frac{1}{4}$ miles from the Detroit Western Mining Company railway-camp

terminus and about 12 miles from the head of Khutze inlet. The camp is at altitude 950 feet on the east side of a north branch of the North fork of the Khutze river. The property is reached by a trapper's trail from the railway through the rugged confines of the narrow North Fork valley. The rainfall of the area is excessive and at times the Khutze river and its branches rapidly swell to raging proportions.

The original claims of the property were staked in 1927 on the east side of the main north branch of the North fork. In 1929 and 1930 further discoveries were made on the west-side slope between elevations 1,200 to 2,750 feet. Late in the season the property was optioned to Vancouver parties, who plan a thorough exploration of the showings.

The mineral-deposit consists of lenses of pyrite carrying high gold values occurring in narrow quartz veins in a segregated phase of what appears to be a hornblende granite or quartz diorite. At the time of examination (October 16th) six veins varying in width from 1 to about 30 inches had been discovered. Practically no work had been done on these. Surface-tracing has been intermittent and mainly by natural outcrops.

The structure and lithological character of the country-rock indicates that the deposit occupies the segregated roof phase of the batholith at an horizon below the old surface close to the border of the zone of flowage and the zone of fracture. A condition of lenticulation would characterize vein-structure in this horizon and an assumption of both horizontal and vertical continuity based on intermittent surface exposure is somewhat hazardous. Preliminary surface exploration by close stripping, open-cutting, and test-pitting, followed by crosscutting or drifting at carefully selected sites to explore for continuity at depth of the most likely pyrite lenses, is advised.

A log cabin was being erected as it is intended to prosecute work during the winter.

Rowe.—Additional open-cutting on this group of three claims on the west side of Pitt island was carried out by the owner, C. O. Rowe, of Prince Rupert. The showing consists of a quartz vein 2 to 5 feet wide that seems to follow an aplitic, in part micro-pegmatitic, phase of the granodiorite. The vein has been traced about 700 feet, with seven cuts and a 6-foot-long tunnel at the north end. It strikes N. 57° E. (mag.) and dips from 15° to 30° E. Mineralization is pyrite with some chalcopyrite in places and in the majority of cuts is sparse and bunchy. In the tunnel-face, however, about 25 per cent. of the vein-width of 5 feet is composed of sulphides. A sample across 58 inches on the south side of the tunnel-face, containing about 40 per cent. of sulphides, assayed: Gold, trace; silver, 0.30 oz. to the ton; copper 0.5 per cent. A sample taken from the face by the owner later in the season assayed: Gold, 0.02 oz. to the ton; silver, 0.30 oz. to the ton; copper, 2.4 per cent. Another sample taken by the owner from the south side near to the tunnel entrance assayed: Gold, 2.04 oz. to the ton; silver, 0.8 oz. to the ton.

Surf Point.—Work has been done on this property on Porcher island, about 25 miles southeasterly of Prince Rupert, by J. B. Woodworth, with whom is associated Noah Timmins. A crew of from twenty to thirty men has been employed. During the year the No. 1 and No. 3 tunnel workings have been connected by drifting and a raise of about 20 feet from No. 1 to No. 3 tunnel level. Raises on ore-shoots have been started on both No. 1 and No. 3 levels. The year's work has resulted in the cutting of additional sulphide lenses. At the raise connection between the two levels and also at a point about 270 feet north of No. 1 portal good widths and lengths of sulphide ore-shoots are developed. Work concentrated at these two localities may be productive of a fair tonnage of good-grade ore.

Mining-work was suspended in June to concentrate on the construction of a narrow-gauge railway from the beach to the mine, a distance of about 1¼ miles and an elevation variance of about 350 feet. This construction, together with a wharf at the beach terminal, is nearing completion. Mining operations were resumed in November. At the time of examination (November 9th) a crew of thirty men was employed between the mine and railway operations.

Eddy Pass.—This group of five claims is owned by F. T. Patterson, of Prince Rupert. The property adjoins the *Surf Point* on the north. Several good showings of gold-bearing pyrite in a system of quartz veins in quartz diorite have been exposed on the property by extensive stripping through deep muskeg overburden. The veins vary from 4 inches to 3 feet in width and occupy a north-east and north-west structure in the country-rock.

In places the pyrite carries high gold values. On the main showing a fair shearing structure and a pyrite ore-shoot length of about 80 feet, with a width of from 1 to 3 feet, is indicated.

Further prospecting will undoubtedly be rewarded with additional discoveries. The property is conveniently situated at about altitude 150 feet above sea-level and within about a quarter of a mile of the shore. The property is worthy of further extensive exploration.

I.X.L.—This group of two claims and two fractions, owned by H. E. Dennison, Box 964, Prince Rupert, adjoins the *Trixie* claim of the *Surf Point* on the south. Between elevations of 500 to 600 feet a system of eleven more or less parallel east-west (mag.) quartz veins in quartz diorite are exposed by open-cuts and a 70-foot tunnel on the *I.X.L.* claim. The veins vary in width from 2 inches to 3 feet and have been traced for distances of from 30 to about 80 feet. Mineralization consists of an erratic distribution of pyrite, with encouraging gold values in places. At the southerly end of the *I.X.L.*, which is contiguous to a remnant of the Prince Rupert series of altered sediments, a tendency to chalcopryite mineralization is indicated.

Copper Coin.—This group of six claims, owned by H. Dodd and associates, of Prince Rupert, is situated about 1½ miles south of the *Surf Point* on the westerly side of Porcher island. The showings are at altitude 150 feet and about 1,500 feet from the head of a small bay.

The occurrence is a well-defined banded quartzose shear-zone 7 to 12 feet wide in chlorite-schist of the Prince Rupert series. The vein has been traced about 250 feet, striking N. 50° W. (mag.) and dipping 45° N. In the south-westerly cut a width of 7.7 feet is exposed showing about 2 feet of well-mineralized quartz vein-matter on the foot-wall. Ninety feet north-east of this a deep open-cut 20 feet long exposes a width of 12 feet composed of 2.6 feet of gouge and crushed rock on the hanging-wall, 3.2 feet sheared rock and quartz-bands with streaks of chalcopryite, 3.8 feet of banded quartz and chlorite with some chalcopryite, and on the foot-wall 2.4 feet of quartz well mineralized with disseminated chalcopryite. The shear is contiguous to a granitic dyke.

At the time of examination work was being prosecuted in a tunnel that should cut the foot-wall with a back of about 10 feet at about 11 feet from the portal. The tunnel is only 20 feet from the open-cut showing described above and with no back developed is practically superfluous. The operators are advised to prosecute further systematic tracing and surface exploration by open-cutting at reasonable intervals. Should this work indicate a sufficient surface continuity of the promising showings exposed in the present cuts, the occurrence should receive further preliminary exploration by diamond-drilling. This would not only shed some light on underground mineralization, but would also determine the most important factor of the depth of the underlying batholith.

Tuck Inlet.—Some prospecting has been done in this area and on the *Englestone* and *Drumharvey* groups some further open-cutting has been done. So far nothing of commercial importance has been uncovered. This pendant area of the Prince Rupert series has, however, sufficient indications of mineralization to warrant further and more intensive prospecting than it is receiving.

CANADIAN NATIONAL RAILWAY SECTION.

Some prospecting has been carried out in this area between Prince Rupert and Terrace. On the *Autumn* and *Teddy Bear* groups, located in a belt of the Kitsalas series 8 miles wide west of Terrace, some further exploration has been completed.

KITSUMGALLUM LAKE SECTION.

Kalum Lake Mines, Ltd.—This property is in an area of granitic rocks on the west shore of Kitsumgallum lake and about 1½ miles from the foot of the lake. It consists of two claims and one fraction, not Crown-granted. The company is capitalized at 75,000 shares of \$1 par value; most of the outstanding stock is held locally.

The mineral occurrence consists of narrow quartz veins in quartz diorite. Mineralization is with gold-bearing pyrite in erratic distribution. The veins have been explored by some open-cutting, two incline shafts, 32 and 81 feet deep respectively, about 205 feet of drifting, and three short crosscuts. There is also an adit-drift 90 feet long. Due to inadequate pumping facilities the underground workings have been flooded. A sample of selected sulphides from a small dump at the shaft-house assayed: Gold, 0.62 oz. to the ton; silver, 2.2 oz. to the ton. Some drifting in the adit-tunnel was being carried on by one man at the time of examination.

Motherlode.—This property of seven claims, owned by Oscar Olander and associates, of Terrace, is situated at altitude 5,000 to 6,000 feet on the south-west slope of Maroon mountain. A tunnel has been driven crosscutting the slate formation to explore for the existence of a

mineralized band surmised to occur on account of the presence of float carrying high silver values. This upper tunnel, at altitude 5,600 feet, has been advanced to 245 feet. The face is composed of chlorite-schist seamed with small calcite veinlets and mineralized with pyrite and some pyrrhotite. A chip sample of this assayed: Gold, trace; silver, 0.5 oz. to the ton.

Hawk.—This group of two claims is owned by Dave Wilson and William Treston, of Terrace. It lies on the north slope of Maroon mountain to Wesach (Hall) creek at altitude 4,300 to 5,000 feet. Dave Wilson has been carrying out creditable prospecting for the continuation of the *Bear* vein on the *Hawk* claim and has been open-cutting a newly discovered quartz vein 8 feet wide on the *Old Timer*. The claims are in an area known to contain gold-bearing veins carrying in places high values. Several veins have been discovered on the property, which warrants extensive prospecting.

Bear.—This group, consisting of the *Bear* and *Cub* claims, owned by Matt Allard, of Terrace, is situated on the north slope of Maroon mountain at altitude 4,500 feet. The property has been described in former Annual Reports. The feature of the ore occurrence is the predominating gold values. It would seem that former operations by Idaho interests were conducted without the necessary technical supervision and advice and that the property is worthy of further exploration. It is suggested that a consolidation of this and adjoining properties would be worthy of exploration for the possibility of a small-tonnage gold-producing operation.

Some further exploration was carried out by the owner and additional discoveries have been made on the *Cub* claim.

Gold Cap.—This claim is owned by J. Corruthers, of Terrace, and adjoins the *Bear* on the east. The occurrence is a quartz vein 2 to 3 inches wide, much oxidized on surface and showing specks of free gold in places. The country-rock is sandstone and arkose slate. The vein has been traced from the *Bear* for an appreciable distance on the *Gold Cap* by surface-trenching.

Alice.—This property of one claim and a fraction is owned by Paul Broden and associates, of Terrace. It adjoins the *Gold Cap* on the east.

Some work has been carried out on what is possibly the continuation of the *Bear* and *Gold Cap* vein on the south side of Wesach creek. The occurrence here is 3 feet of oxidized quartz stringers in slate. Where the vein crosses the creek the owners report that it assays \$7 in gold. Very little work has been done and further tracing is necessary in order to correlate the showings with those on the *Gold Cap* and *Bear*.

Hunter.—This group of four claims is situated on the south side of Egan creek, a tributary of the Cedar river, about 16 miles from Rosswood, at the head of Kitsumgallum lake. The occurrence is a brecciated quartz vein of undetermined width, striking N. 80° E. (mag.) and dipping 65° N. The vein has been traced for about 150 feet. Mineralization consists of irregular patches and specks of galena, zinc-blende, and chalcopyrite. On the foot-wall of the vein exposed in the most westerly cut a 2-foot width of fair chalcopyrite mineralization is exposed. The vein has been explored by two shallow shafts and one cut.

PLACER-MINING.

Douglas Creek.—About 2 miles up the creek Mr. and Mrs. Nightwine were mining by hand-work, shovelling gravel from the creek-bed in a narrow canyon. At the time of examination (August 30th) bed-rock had not been reached. The outfit consists of eleven sluice-boxes and twenty-eight sections of flume. A daily clean-up of about \$3 was being made. Better values will probably be encountered if bed-rock, which is about 6 feet below the present shovelling, can be reached.

About a quarter of a mile farther up the creek W. A. Stephens and W. H. Cavanagh have two placer claims. At the time of examination they were shovelling ground worked over years ago by old-timers. About 6 feet of this ground remained to be shovelled before entering virgin ground. About \$3 to \$5 was being recovered from every three days' shovelling.

About 1½ miles above the Stephens workings A. Egan is sluicing for bed-rock in deep channel ground.

LAKELSE SECTION.

In the Thornhill Mountain area Michaud Bros. have been actively prospecting their claims. On the *Sadie* of the *St. Paul* group several cuts have been put into a recently discovered fracture-zone carrying chalcopyrite mineralization. Some further work has also been done on the large carbonate-zones carrying quartz stringers with chalcopyrite and some grey-copper mineralization.

D. Mason has also been prospecting his group adjoining the *St. Paul* on the south-west. Some further open-cutting has also been carried out by P. J. Kirkpatrick on the *La Libertad*.

In the Williams Creek area J. Bell has carried out further work on the contact-metamorphic chalcopyrite and magnetite lenses occurring on the *Copper Queen* group. With assistance from the Department of Mines the trail was also cleaned out and improved during the season. On the *Surprise* group, owned by T. Turner, of Terrace, open-cutting was carried out on ore-bodies similar to those occurring on the adjoining *Copper Queen*. These deposits are isolated lenses occurring in garnetized and epidotized limestone in a shallow and very disturbed inclusion area of chiefly limestone and slate belts, severely intruded by granitic spurs and dykes.

Of interest in connection with non-metallic possibilities is the occurrence over the divide from Williams creek to the Chlore (South fork of Zymoetz) river of a fine plastic purplish-brown clay that hardens very rapidly on drying and takes a brilliant polish without burning or glazing. This material will be further tested for its ceramic possibilities. On T. Turner's ranch, about 4 miles from Terrace, there is also an occurrence of a fine, very plastic chocolate-brown clay that seems to have distinct possibilities for brick and tile manufacture. During the summer T. Turner was experimenting with this material and turning out a fair-grade brick from a crude kiln.

NASS RIVER MINING DIVISION.

OBSERVATORY INLET SECTION.

Granby Consolidated Mining, Smelting, and Power Co.—The operations of this company at Anyox were carried on continuously throughout 1930. The condition of the copper market and the falling price of that metal, however, necessitated some curtailment in production. This was met by proportionate curtailment of smelter and mine operation.

Underground exploration for continuity at depth of the *Hidden Creek* ore-bodies has been energetically carried on by diamond-drilling, shaft-sinking, and lateral work, and has met with some encouraging indications of additional ore on the lower horizons.

On the *Bonanza* the shaft on the north side of Bonanza creek has been completed and lateral exploration of the ore-body has resulted in the development of additional ore in this section of the *Bonanza* workings. Structural mapping to clarify the mode of occurrence and attendant dislocations of this ore-body has also been carried out. About the middle of November a slide caused by incessant heavy rains demolished the *Bonanza* bunk-house and unfortunately resulted in six fatalities and several being injured.

Deadwood and Quartz.—These groups adjoin the *Hidden Creek* mine-workings on the north and are owned by W. Hanna, of Anyox. The owner has carried out further exploration of the showing in the bed of the creek at altitude 750 feet, where there is a fair showing of pyrrhotite-chalcopyrite mineralization on which very little work had been done at the time of examination (August 6th).

Black Bear.—This property of one claim and two fractions is owned by S. W. Barclay, of Anyox. It adjoins the *Bonanza* on the south-east at elevation 1,000 feet. The owner has carried out some further prospecting of the lenticular masses and stringers of quartz occurring in altered hornblende-schist.

Silver Crest Mines, Ltd.—This company has been developing the *Saddle* claim. The contract for driving the tunnel at altitude 4,400 feet to an additional 400 feet was completed in the early spring. It is estimated that a further 275 feet will have to be driven to reach the objective of the downward extension of the vein showing in the shaft at altitude 4,600 feet.

Elkhorn.—Very little prospecting or exploration of the known showings on this property was carried out in 1930, the owners devoting their attention chiefly to trail-construction.

ALICE ARM SECTION.

Tidewater-Molybdenum Mines, Ltd.—This property on the west side of Alice arm is being developed by the Dalhousie Mining Company, Limited, which started active operations early in the spring and continued uninterruptedly throughout the year. Work has been concentrated on the driving of a lower crosscut tunnel about 135 feet below the old upper workings and drifting on the veins encountered. Some good-grade molybdenite ore over fair average widths and lengths has been encountered in this work. There is a known vein system about 800 feet long to be explored, in which are encouraging showings of clean molybdenite ore, and on which,

from the lower tunnel-level, an average back of about 200 feet can be developed. Lateral exploration also promises additional discoveries with a still greater back from this level. The outlook for an eventual profitable production of molybdenite from this deposit is encouraging.

With assistance from the Department of Mines the trail from the beach to the mine has been improved. It is planned to block sufficient ore to warrant the construction of a mill. To facilitate this work it is the intention of the operators to install a compressor plant. The work is being efficiently and conservatively conducted under the direction of Angus McLeod.

Cariboo.—The molybdenite-showings on this property on the east side of Alice arm have been further prospected by the owner. An option procured on this property during the summer by the Dalhousie Mining Company, Limited, has not been exercised.

Keystone.—This property is situated near the head of Roundy creek and about $3\frac{1}{2}$ miles from Silver City. The lower or main tunnel at altitude 2,190 feet was driven a further 14 feet. In this distance it has penetrated the east wall of the granite dyke and is faced in silicified argillite carrying a characteristic, and from an economic standpoint unimportant, contact mineralization of pyrrhotite. It would seem that the objective for which this tunnel is aimed lies considerably to the west of the face.

KITSAULT RIVER SECTION.

Wolf.—On this property, adjoining the *Esperanza* on the south, further underground development by J. Fiva has exposed some additional good-grade ore.

Esperanza.—One or two men have worked intermittently on this property during the year. A raise from No. 3 to No. 2 tunnel was completed, but unfortunately, through failure to survey, broke into No. 2 only about 20 feet from the portal and is consequently superfluous. Some work was also done in No. 9 tunnel and the face turned about 38° to the west to achieve a more direct alignment to its objective. Some surface prospecting was also carried out farther up the hill.

Wildcat.—Work on this property was energetically prosecuted by the owner, A. Davidson, during the winter and intermittently during the summer months. It is understood that the showings have been extended and some new mineralization discovered.

Dolly Varden and Wolf.—The options on these properties by Britannia Mining and Smelting Company, Limited, were relinquished in the early summer.

Torbrit Mining Co., Ltd.—Active exploration of the *Toric* was continued up to the middle of April, when, on account of the depressed and uncertain silver market, operations were suspended. Very encouraging results were being met in the winze and lateral work from it, which showed an increased width of the ore-body with sections of high-grade ore and a fair general average value. Should the silver market improve it is understood the Britannia Mining and Smelting Company, which owns a controlling interest in this company, will probably resume operations.

North Star.—On this property, adjoining the *Dolly Varden* on the north-east, the owners have carried on crosscutting to locate the continuation of the vein southerly of the sheared section penetrated by the drift. In the tunnel-workings at altitude 1,800 feet some good widths and grade of ore, in places carrying high silver values, are exposed.

The southerly crosscut penetrates a belt of red fragmental andesite for a distance of about 20 feet to the face. In view of the fact that the presence of zinc mineralization has not heretofore been recognized on this property, and as an indication of the possibility for the occurrence of replacement ore-bodies in the porous tuff-beds of the *Dolly Varden* series, it is of exceptional interest to note that the red fragmental andesite of this crosscut was found to be well mineralized in places with a light-coloured resinous zinc-blende. A canary-yellow oxidation product along some of the seams suggests also that the zinc-blende contains cadmium. An assay of a grab sample of the red andesite taken about 15 feet from the face, and from the face itself, assayed: Gold, trace; silver, 0.24 oz. to the ton; zinc, 7.2 per cent. It is advised that the owners channel-sample this red-andesite belt systematically to ascertain the extent and distribution of the contained mineralization.

Combination.—This claim, adjoining the *Red Point* on the north, has been restaked by Miles Donald, of Alice Arm. Good vein-widths well mineralized with chalcopyrite, pyrrhotite, pyrite, and an unidentified dark-grey mineral in a quartz gangue are exposed in one open-cut and two strippings over a distance of about 200 feet at altitude 2,200 feet. A sample of about 15 tons of ore from the dump of an old caved tunnel that could not be examined assayed: Gold, 0.22 oz.

to the ton; silver, 2.2 oz. to the ton; copper, 2.1 per cent.; arsenic, *nil*. Miles Donald intended carrying out further development during the late fall and winter. The showings are well worth further intensive exploration.

On the *Kitsault*, *Silver Crown*, *Lucky Strike*, and *Iron* groups, situated on the west side of the upper Kitsault valley, active and intelligent prospecting has been carried out by John Hauber and Billy McLean, of Alice Arm. On the *Lucky Strike* John Hauber has been driving a short crosscut tunnel to penetrate a 20-foot-wide brecciated vein at altitude 3,850 feet. The tunnel was in 4 feet at the time of examination and would have to be driven a further 5 feet to cut the vein. Good gold values are reported in this vein in a cut northerly from the tunnel. The owner is advised to concentrate on the further tracing and development of this vein.

At altitude 4,200 feet on the *Silver Crown* there is also an encouraging showing in a well-defined shear about 2 feet wide in a dioritic intrusive rock. Mineralization is massive fine-grained galena, some chalcopryite, grey copper, pyrite, and zinc-blende in $\frac{1}{2}$ - to 1-inch stringers in the shear-zone. A sample of selected galena ore from this showing assayed: Gold, 0.58 oz. to the ton; silver, 40 oz. to the ton; copper, *nil*; lead, 15.1 per cent.; zinc, 3 per cent.; antimony, *nil*. This showing should also receive further exploration.

Kitsault River Mining and Development Co.—A crosscut tunnel has been driven about 60 feet, at altitude 3,900 feet, to cut a vein striking north-east and dipping 60° W. which shows on the ridge about 20 feet above the tunnel. The vein shows a width of about 2½ feet in the face. It is a quartzose replacement with a fairly well-defined foot-wall in a dark-grey siliceous intrusive. An assay of \$24 in gold was reported by the owners to have been obtained from this vein. Some further prospecting of other showings on the property has also been carried out. The operators are advised to ascertain by careful average sampling the gold-bearing possibilities of several unexplored siliceous pyritized zones occurring on the higher altitudes of the property, both in and contiguous to what appears to be a young intrusive diorite.

On the east side of the upper Kitsault River valley some prospecting and development-work has been done on the *Moose*, *Silver Horde*, *Last Chance*, *Climax*, *Summit*, *Tyee*, and *Highland* groups. The area covered by these groups is worthy of intensive and systematic exploration.

Of interest in this area also is the hitherto unsuspected indication of the possible occurrence of replacement ore-bodies in porous tuff-beds. On the *Summit* this is indicated in the mineralization by a very light buff-coloured zinc-blende of a tuff-bed at the portal of a crosscut tunnel at altitude 3,060 feet. This mineral is reminiscent of the Santander, Spain, and the Upper Silesia zinc-blende. A sample across 5.5 feet of this bed assayed: Gold, 0.01 oz. to the ton; silver, 1.2 oz. to the ton; lead, 1.1 per cent.; zinc, 3.6 per cent. Other tuff-beds in this group carry stringers of galena and zinc-blende along cross-fractures and joint-planes.

On the *Tyee* and *Highland* there is a similar occurrence but of predominating fine-grained galena along joint-planes in the tuff. Archie McPhail has done extensive open-cutting on these showings. On the *Tyee* is an exceptionally interesting showing of massive reticulated galena stringers, 1 to 2 inches wide, filling the fracture-planes of a dark tuff-bed 12 feet wide. The bed lies conformable to the 50° westerly-dipping interbedded tuff-argillite formation and about 30 feet east of the foot-wall shear of the *Blue-Bird* vein.

ILLIANCE RIVER SECTION.

Early in the season the option held by the Kitsault-Eagle Silver Mines, Limited, on the *Sunrise* group on McGrath mountain was relinquished.

Active prospecting of the *Three Mile*, *Iron*, *Beaver Extension*, *Titrite*, and *Silver Star* groups has been carried out by the owner, John Hauber, of Alice Arm. This prospector deserves credit for having done some constructive prospecting on his ground in an attempt to find commercial values in the several veins and pyritized silicified zones discovered.

On the *Falcon* and *Monarch* groups, at the head of the North fork of the Illiance river, some further trenching and open-cutting has proved additional continuity of the known veins and uncovered some promising showings. These groups warrant further exploration. The *Falcon* and *Homebush* lack the preliminary work that the showings warrant. The general ore occurrence in this section is zinc-blende, galena, and grey copper in a quartz, calcite, siderite gangue in shear-zones and fault-veins from about 2 to 8 feet wide, in a formation of folded interbedded tuffs and sandy argillite.

No work was carried out on the *United Metals* group. The showings on this group appear to be a series of parallel shear-zones in folded tuff-beds carrying zinc-blende, galena, and some grey-copper mineralization. The ground should be prospected for additional shears which probably occur and should be explored for mill-grade ore. The property has not the potentialities of a profitable high-grade shipping proposition as is intimated by its sponsors, particularly when its remote location is considered.

PORTLAND CANAL MINING DIVISION.

GEORGIA RIVER SECTION.

North Country Mining Co., Ltd.—Further exploration of this property was carried on during the winter months. During the summer the trail up Bulldog creek and over the Georgia River divide to the property was completed. Extensive exploration of the showings on this property has been carried out, but as yet nothing of commercial importance has been uncovered. The showings are in a shallow and extremely disturbed and intruded small-inclusion area of the batholith. If exploration is continued the operators are advised to prospect for showings that have some commercial potentialities. It would seem a forlorn hope to expect this from the small scattered showings of sparse mineralization contained in the isolated inclusion patches of argillaceous rock sandwiched between granitic rocks and numerous satellitic dykes. It is possible that the granitic rocks may contain gold-bearing quartz veins that may warrant exploration.

Pedro Georgia.—During the season two men carried on further prospecting of this property at the head of Georgia river.

Georgia River Gold Mines, Ltd.—The No. 3 tunnel has been extended to the *Bullion* vein, which has been drifted on for 200 feet. A raise along the vein to connect with the *Bullion* tunnel is reported to have encountered encouraging mineralization. It is planned to crosscut from No. 3 tunnel to tap the south-west vein and explore for ore-shoots in it at this horizon. Work closed for the season about October 2nd.

MARMOT RIVER SECTION.

Outstanding in the Portland Canal area is the successful development of the *Porter-Idaho* and *Prosperity* properties into steady and profitable producers by the Premier Gold Mining Company, Limited. In the face of extremely difficult construction and mining problems, and with the extra burden of low silver prices, this achievement reflects the greatest credit on the *Premier* organization and staff. From the *Prosperity* about 1,500,000 oz. of silver was produced during 1930, and from the *Porter-Idaho* over 200,000 oz.

The *Prosperity* vein system has been explored on three levels from No. 3 tunnel and new ore-shoots have been discovered and developed.

On the *Porter-Idaho*, development and some stoping has been carried out on "D" tunnel level. A subsidiary aerial tramway connecting "D" tunnel with the main tramway terminal at No. 3 tunnel has been completed. A new compressor has been installed at "I" tunnel and a new approach to this tunnel, to avoid slides, has been completed. Some diamond-drilling has also been done.

The geology of the *Porter-Idaho* and *Prosperity* deposits is being carefully studied with a view to ascertaining the possibility for localization of ore-shoots in definite tuff-beds.

About 100 men are employed in the *Porter-Idaho* and *Prosperity* operations, with Gus Anderson, foreman, in charge.

On the *Engineer*, situated on the south side of Marmot River South Fork glacier at about 3,000 feet altitude, George Bunn, with assistance from the Department of Mines, has improved the trail into the area. He has extended the tunnel to crosscut a quartz-zone striking N. 30° W. (mag.) and dipping 65° N., which is 7 feet wide and sparsely mineralized with chalcopyrite. This zone is exposed in an open-cut at about 75 feet higher altitude and about 250 feet southerly.

Bi-Metallic Syndicate.—Exploration on this property was carried on with a small crew continuously to late in the fall. Work was concentrated on the extension of the main drift and surface prospecting.

BEAR RIVER SECTION.

Silverado Consolidated Mines, Ltd.—Early in January operations on this property by the Premier Gold Mining Company, Limited, were suspended. About the middle of June develop-



Boulder Creek Placers, Atlin M.D.



Big Missouri Mine, Portland Canal M.D.—New Mill in Course of Construction.

ment and exploration was resumed and continued to the beginning of September, when operations were again suspended. Exploration results on this property have not been encouraging.

Molly B.—Interest has been revived in the molybdenite possibilities of this property on the east side of the Bear river, about 1 mile from Stewart.

United Empire Gold and Silver Mining Co., Ltd.—Billy Dann has advanced the tunnel 4 feet, with the face in sheared material showing impregnated galena and some ruby silver.

Argentine Syndicate.—Under the direction of Clay Porter, this syndicate has carried out active exploration of the old *Mobile-Kenneth* group on the south side of Glacier creek. Very encouraging results have been achieved. A promising ore-body carrying good-grade silver-lead mineralization has been opened up. Other veins of equal promise are also indicated. The ore occurrence consists of well-defined, banded, and brecciated shear-zones, 2 to 15 feet wide, in the Bitter Creek argillite contiguous to intrusive diorite. In places the hanging and foot walls are featured by a 12- to 18-inch pay-streak carrying appreciable native silver. The property appears to have distinct possibilities.

Ben Bolt.—The *Alice* group of this property has been prospected by G. Clark, who reports the discovery of a promising galena-showing. The showings in this area warrant extensive exploration.

Mayou Gold Copper Co., Ltd.—Active underground exploration was continued on this property up to late in the season. To determine the future policy regarding the development of this property a thorough examination was carried out by a mining engineer at the end of the season.

Ore Mountain.—Exploration of this property was actively carried on during the season.

Lucky Date.—W. Younkin and Onney McFadden continued prospecting on this group at the head of the North fork of Bitter creek. A crosscut tunnel has been started to cut the vein explored in the narrow steep ravine of the mountain-slope to the west of the North Fork glacier. At the time of examination this crosscut had advanced 15 feet and should cut the vein at about 40 feet. The showings on this property are well worth the exploration planned by the owners.

Windsor.—Tunnelling and open-cutting were carried out on this property throughout the season. It is understood that further encouraging values in gold have been encountered in this work.

On the *Palme* and *A. & T.* groups on the west side of the Bear River valley intensive prospecting by W. R. Tooth and associates has resulted in the discovery of new ore-showings that warrant further prospecting.

In the upper Bear River area, on the *Bornite* group (old *Black Bear*), adjoining the *Red Top*, Nick Gillof and partners prosecuted surface prospecting and reported the discovery of encouraging galena and chalcopryrite showings carrying good values in copper, gold, silver, and lead.

Prospecting was carried out on the *George Enterprise* with a crew of seven men. Tunnels "A" and 15 were extended and several open-cuts put in. The work is reported to have resulted in several new discoveries.

On the *Southern Cross* further prospecting was carried out by Ted Morris on the series of veinlets carrying grey copper in a complex of tuffs and breccias. Four parallel veins from 10 to 12 feet wide, carrying hæmatite, magnetite, and pyrite, with some galena, were also prospected.

George Gold Copper Mining Co., Ltd.—No development or exploration has been carried out on this property during 1930.

AMERICAN CREEK SECTION.

On the *Keystone* and *Morning-Jubilee* groups, situated near the mouth of American creek, Sam Deschamps has done further open-cutting and tunnelling. On the *Galena Farm* claim tunnelling is planned to crosscut a quartz vein 20 inches wide, carrying fair mineralization of chalcopryrite, galena, and zinc-blende, occurring about 250 feet north-west of the portal and at about 125 feet higher altitude. A sample at the face of the *Morning-Jubilee* tunnel, 60 feet from the portal, over a width of 12 inches of the best mineralization showing pyrite and patches of zinc-blende in a quartz-calcite gangue assayed: Gold, trace; silver, 1.3 oz. to the ton.

On the *Mountain Boy* the plan of open-cutting, stripping, and structure-mapping inaugurated and supervised by J. R. McDonald to unravel the structural complications of this ore occurrence before proceeding further with underground exploration is a sound and efficient plan of preliminary exploration fitting the character of this occurrence. It will result in the saving of

what might otherwise be much abortive expenditure. Underground work was suspended late in January. On the resumption of operations in the early summer the structural elucidation was concentrated on and completed at the end of the season. The further policy of exploration will be based on the engineer's report relative to these structural problems. This is a creditable example of efficient and befitting preliminary exploration.

About 2 miles north of the *Mountain Boy* the American Creek Mining Company, Limited, has prospected a block of about sixty claims. Joseph Morin is in charge of the work, with Joe Miller assisting. Several showings warranting further prospecting have been discovered. Three of these show fair structure and chalcopryite mineralization. It is planned to explore these thoroughly during the 1931 season.

In the upper American Creek area north of the glacier the Excelsior Prospecting Syndicate has been prospecting on the *B.L.K.*, *Bryant*, *Dundee*, and *Virginia* groups. The area is somewhat remote and as yet not much work has been done. However, the silver-lead mineralization uncovered, together with the general geology of the area, indicate that the showings so far discovered and the area in general warrant further prospecting.

About 3 miles north of the *Dundee*, and about 15 miles from the end of the Bear River road, the Northwestern Aerial Prospectors, Limited, has been prospecting a group of fifteen claims on the west side of American creek. On the *Moonlight* claim a carbonate-tuff zone about 14 feet wide, with a pay-streak of massive galena 4 to 10 inches wide on the hanging and foot walls and stringers through the zone along cross-fractures, has been traced about 60 feet. This showing warrants thorough prospecting.

On the east bank of the creek, opposite the *Excelsior* camp, Kinney McLeod is prospecting a group of claims. Several other groups have also been staked in the area and slightly prospected.

Consolidated Mining and Smelting Company of Canada engineers have examined the holdings of the Northwestern Aerial Prospectors, Limited, in the Treaty Creek-Bell-Irving River section of the Nass River slope. It is understood the values in the mineral occurrence may be too low grade in relation to the remote location of the claims.

SALMON RIVER SECTION.

Premier Gold Mining Co., Ltd.—This company has operated continuously. Earnings are naturally adversely affected by the low price of silver. New ore is being picked up from time to time in small shoots lateral to the main zone between Nos. 2 and 3 levels. Development of the sixth level ore-shoot has been steadily carried on. This shoot is characterized by irregular silicification and erratic values. Improvements in the mill that promise increased efficiency have been worked out. Intensive search for new lateral ore-bodies has been carried on with three diamond-drills on the higher-altitude ground east of the main ore-zone.

B.C. Silver Mines, Ltd.—Work has been concentrated on the further exploration of the No. 6 level ore-body, north-east of No. 2 shaft, with encouraging results. Interesting and still more encouraging results are to be expected in raising and sub-level exploration in this area.

Work on the *Sebakwe* No. 6 level towards *B.C. Silver* ground was discontinued in January on account of excessive water.

Premier Border Mining Co., Ltd.—Operations were suspended on this property in June. The tunnel had been advanced to about 1,800 feet and some diamond-drilling carried out.

Woodbine Gold Mining Co., Ltd.—The diamond-drilling started on this property in November, 1929, was completed in February, 1930. Following this drilling, underground exploration by means of a winze off 209 drift was commenced about the middle of August. It is hoped this will determine whether the indications encountered in the drilling have sufficient continuity to constitute a commercial ore-body. About sixteen men were employed. Due to inadequate pumping facilities work ceased in October.

Big Missouri.—Extensive diamond-drilling of the silicified zone has been continued with a view to delineating its dimensions and obtaining some criterion of the distribution of values in it. About midsummer the erection of a 100-ton concentrator was decided on. The primary purpose of this mill is to ascertain by careful run-of-mine sampling through the mill whether the erratic distribution of values indicated in the silicified zone by the diamond-drilling may constitute a large-tonnage, low-grade, commercial ore-body. Construction of the mill and new camps has been rushed and it is expected they will be in operation before the end of the year. About

ninety men are employed. A creditable adjunct to this rapid construction is the efficient hauling of construction material and machinery by the Crawford Transfer Company, of Stewart, in the face of many difficulties. To facilitate the progress of the work the Department of Mines and the Department of Public Works co-operated in every way possible in the matter of road conditioning and repair.

Should the *Big Missouri* operation materialize into a profitable undertaking, it will reflect great credit on the efficiency and persistence of the Consolidated Mining and Smelting Company's engineering staff and be of the utmost importance to the progress of the mining industry of the Portland Canal area.

The Consolidated Company is to be commended for rectifying, through the medium of the public press, misleading statements that have been published concerning this property.

Unicorn Mining Co., Ltd.—On this property, adjoining the *Big Missouri*, John Hovland has continued the crosscut tunnel towards its objective of "A" vein. Encouraging results have been encountered. At the time of examination (October 6th) the tunnel had advanced 340 feet. Four feet from the face a quartz vein 2 feet wide carrying some free gold was encountered. "A" vein should be tapped at about 700 feet from the tunnel portal.

On the *Bank* group on the east side of the Salmon glacier Ed. Winkler has been doing assessment-work.

On the *Salmon Gold* group of twenty-six claims on the west side of Summit lake Ted Morris has made an exceptionally promising discovery of gold-bearing pyrrhotite ore in three replacement zones of appreciable width occurring in augite porphyry. Consistent values of from \$4 to over \$40 have been obtained by sampling. On No. 1 zone an average sample taken by the Resident Engineer across a width of 5 feet assayed: Gold, 0.24 oz. to the ton; silver, 0.4 oz. to the ton; copper, *nil*. A sample across 6 feet of No. 3 zone assayed: Gold, 0.32 oz. to the ton; silver, 0.7 oz. to the ton; copper, trace. This property is recommended to examining engineers.

On the *Troy* group the pyritized, silicified, feldspar-porphyry zone has been prospected by open-cutting and some additional showings have been uncovered.

F. R. Jancowski and associates have prospected the *Silverton* group on the west side of Tide lake and report the discovery of an 8- to 12-inch vein well mineralized with galena carrying high silver values.

Gordon Cook has also intensively prospected his ground on the southerly slope of Berendon mountain.

On the *Pioneer* group on the west side of Tide lake sufficiently encouraging results to warrant the continuance of diamond-drilling by Consolidated Mining and Smelting Company were not encountered. Operations were suspended in the late summer. It is understood the Consolidated option on this property has been relinquished.

UNUK RIVER SECTION.

Several prospecting-parties penetrated this area during the season, but no discoveries have yet been reported. Of importance in the matter of future access to the mineralized section of this area is the discovery and traversing of a more accessible route than up the Unuk river proper by Arthur Skelhorne, prospecting for the Mining Corporation of Canada. This route follows Lake Creek valley across the Alaskan panhandle and crosses a comparatively low divide to the headwaters of Gracey creek on the British Columbia side. Gracey Creek valley is followed to the South fork of the Unuk river and Sulphur creek.

STIKINE AND LIARD MINING DIVISIONS.

On Devils Elbow mountain Pete Hamel has been prospecting the *Central* group energetically. Open-cutting has extended the continuity of the vein to about 300 feet and uncovered some promising mineralization. A sample from one of the cuts over a width of 4½ feet assayed: Gold, 0.01 oz. to the ton; silver, 6 oz. to the ton; copper, 1.6 per cent.; lead, 1.8 per cent.; zinc, 10 per cent.

Early in the summer a discovery of chalcopryite mineralization was made on the *Drapich* group on the west bank of the Stikine river opposite Jackson's Landing. The ore occurrence is a deposit of chalcopryite along bedding-planes of folded and altered limestone contiguous to a granite spur. Three such showings were uncovered. The best development of ore seen was 14 inches of massive chalcopryite uncovered for a length of about 4 feet. Some disseminated

chalcopyrite occurs along cross joint-planes for a length of about 40 feet. Seven men were put to work by Sid Barrington to explore the showing.

Development-work on the *Limpoke* group on Limpoke creek by two men employed by Sid Barrington proved disappointing and operations were suspended.

Results of the exploration of the *Glenora* and other groups on the north slope of Glenora mountain were discouraging to the Mining Corporation of Canada. The work was suspended about midsummer.

Frank Jackson has carried out some further exploration of the *Jackson* group on the south side of the Chutine river, but had devoted most of the season to trail-construction.

Some exploration was carried out on claims up the Iskut river and some prospectors entered this area. Prospectors representing the Coniagas Mining Company, Limited, of Cobalt, carried out general prospecting in the Stikine River area during the season.

PLACER-MINING.

During the season the Barrington Transportation Company employed a crew of five men drilling the Stikine River bars at the mouth of Glacier creek.

Vickery & Moody and two men worked their ground on Goldpan creek for a short time on a co-operative plan. Disagreement between the workers caused a shut-down.

Ben Cambron is preparing to work his ground on Goldpan and will remain on the creek during the winter whip-sawing lumber.

Dease Creek Mines Corporation was engaged all season in drilling its ground on Dease creek. On this creek also the Cassiar Hydraulic Mines, Limited, recovered about 68 oz. of gold from about three weeks' hydraulicking. Shortage of water caused a cessation of hydraulicking and necessitated extra ditching-work.

On Mosquito creek the Gibson Hydraulic Association is extending the bed-rock flume. About 100 oz. of gold has been recovered by picking from bed-rock during the course of this work.

D. L. Wing has been up McDame creek, but came out early in the season.

It is estimated that about 378 oz. of placer gold valued at about \$6,193 has been recovered in the Stikine Mining Division during 1930.

ATLIN MINING DIVISION.

TAKU RIVER SECTION.

Depression in the metal and stock markets were contributing factors in a curtailment of expected exploration in this section. Much staking had been carried out during the late winter months, and when the snow disappeared legitimate prospectors found extensive areas of the most accessible ground blanketed with stakes. This is a deplorable condition for which some remedy should be found. During the season about 100 prospectors were active in the section. Many examining engineers representing various mining companies visited the section during 1930.

Improved river transportation was inaugurated by Alaska Juneau Gold Mining Company interests. Several dwellings, a store, bunk-house, and restaurant were constructed. A post-office was opened and a Customs official, Deputy Mining Recorder, and Provincial Constable appointed.

On the *Manville*, *Hill*, *Sparling*, *Moose*, *Walker*, and *River* groups the Alaska Juneau Gold Mining Company, Limited, carried out extensive exploration and prospecting. On the *Manville* the encouragement of initial exploration was not sustained in the later underground drifting and crosscutting. The lenticulation and dispersal of mineralization intimated in Bulletin No. 1, 1930, as being indicated in the mode of occurrence of this deposit, was unfortunately found to be present. It was also found that the apparent spectacular surface showings were not a general characteristic of the deposit. Later in the season the Alaska Juneau Gold Mining Company suspended operations and relinquished its option.

Due to the general financial depression the contemplated extensive further development this season of the *Tulsequah Chief* group by the United Eastern Mining Company did not materialize. No work was carried out on this property in 1930. It is understood, however, that the United Eastern Mining Company has kept up its cash payments in accordance with the option agreement.

On the *Whitewater* group the owners have developed further continuity and width of the antimoniferous shear-zones by further open-cutting and are obtaining encouraging gold values from the extended showings.

At the mouth of the South fork Joe Hill has uncovered two well-defined antimoniferous shear-zones, 9 and 11 feet wide, on the *Council* and *Surveyor* groups. It is interesting to note that mariposite is a characteristic accompanying mineral in these deposits, but unfortunately careful sampling and assaying does not disclose gold values of any importance.

Some open-cutting and stripping has been carried out on several groups up the South fork, including the *Beverly*, *North Star*, *Daisy*, *Silver Doll*, and *Finn* groups. On the *South Fork* group, situated about 6 miles up the South fork, T. E. Arnold has done some stripping on an oxidized, pyritized shear-zone. He reports an indication of an ore-shoot in one place carrying galena and zinc-blende, from which a selected sample of a 3½-foot width assayed: Gold, 0.04 oz. to the ton; silver, 87.9 oz. to the ton; lead, 74.2 per cent.

Several groups of claims have also been staked and prospected in the vicinity of Niagara creek, on the south side of the Taku river and north of the South fork. Neil Forbes, an Alice Arm prospector, reports a discovery in this area of an extensive silicified, pyritized zone, from which indiscriminate sampling has returned consistently interesting, though low-grade, gold values.

To facilitate prospecting in the Taku River section the Department of Mines has constructed prospecting-trails up the east bank of the Tulsequah river and up the east bank of the South fork.

RAINY HOLLOW SECTION.

Gold Cord.—This is a restaking of the old *Stampede* group and further prospecting has been carried on by W. Bunting, J. O. Stenbraten, and associates. On the *Yellow Jacket*, a new claim staked in 1930, the owners report the discovery of fifteen new veins carrying variable values in gold.

ATLIN LAKE SECTION.

Engineer.—Further exploration of this property was resumed early in the season with a small crew. Development was being concentrated on the extension of the main drift with a view to exploring the commercial possibilities of the large replacement shear from which the small high-grade veins radiate. This work was carried on efficiently and continuously throughout the summer season and late into the fall. These operations were sponsored by C. V. Bob, of New York. It is understood that further exploration of this property may possibly be undertaken by other interests.

Happy Sullivan.—This property, owned by Clarence Sands and associates, of Atlin, is situated about 3 miles north of the *Engineer*. The ore occurrence is a large pyritized shear-zone containing gold values in quartz stringers. Surface-trenching and a limited amount of tunnelling carried out under a former option are not conclusive regarding the potentialities of this property. The deposit warrants further exploration. A sample of bluish quartz with some mariposite and a little pyrite chipped from several stringers and quartzose sections at different places in the zone assayed: Gold, 0.26 oz. to the ton; silver, 1.10 oz. to the ton.

Atlin Ruffner Mines, Ltd.—Development was resumed early in the season under the sponsorship of C. V. Bob, of New York. Work was concentrated on drifting and raising on No. 2 vein from 2 D level at altitude 4,350 feet. A main crosscut tunnel was also started at altitude 4,140 feet to tap Nos. 1, 2, and 3 veins. Late in the year a readjustment of the affairs of the operation was effected and the operations will be continued in association with Buffalo interests.

Jack Jensen has carried out exploration of his claims, adjoining the *Atlin-Ruffner* on the higher altitude of Vaughan mountain, throughout the summer season.

PLACER-MINING.

Pine Creek.—Discovery Mining and Power Company has been stripping at the north end of the old pit. It was expected to get into a presumed old channel about 1,000 feet north of the present preparatory stripping. It is planned to drill the ground next season. The affairs of this operation, which was sponsored by C. V. Bob, of New York, have been adjusted and operation will be continued in 1931 by the Golden Centre Mines, which has taken over the holdings and arranged finances for future development.

On Boulder creek Consolidated Mining and Smelting Company has been stripping to get into "pay" about 500 feet ahead of present working. The encountering of hard-pan and a shortage of water has handicapped rapid progress.

On Ruby creek a severe cloudburst and attendant flood early in July destroyed the Watson & Schultz plant about a week before a clean-up was planned. The boxes have since been recovered and repairs completed. It is planned to mine under the lava-bed during the winter. Emil Tornquist's operation under the lava-bed was not much hurt by the Ruby Creek flood. His workings continue in good "pay." Morrison McKay and Johnson, mining under the lava, have squared up the flood damage and are just entering pay-dirt. A recovery of about 600 oz. is estimated from Ruby creek.

On Wright creek J. E. Moran and L. T. Hodges are hydraulicking into bed-rock below the workings of old-timers. John Hyland is working a bench lease higher up the creek. He has taken out several good slugs of gold during the season, including one valued at about \$400. It is estimated about 60 oz. of gold will be recovered from this bench operation.

On Otter creek Compagnie Francaise de Mines d'or du Canada has been stripping with a good supply of water. Some excellent "pay" was encountered early in the season. A recovery of about 650 oz. of gold is estimated from this operation.

On Union creek Vic Kronquist has been working a lease on the creek-bed.

On Spruce creek Marco Viola and Marco Pini, mining on a lay, are recovering from \$1.50 to \$2.50 to the car (about 7 cubic feet). Koppacher, Morse & Company has completed the drainage-work and is mining in good ground. A recovery of from \$1 to \$2.50 to the car has been made. I. Mathews has two men working. John Nedved has started to sink a new shaft and expects to reach bed-rock within 55 feet. Several other individuals are operating on this creek. A recovery of about 1,300 oz. is estimated from Spruce creek.

On O'Donnel river N. Murphy has been making a fair recovery and will continue work during the winter. Tom Prpich, working just above Murphy, has also made a fair recovery.

On McKee creek the Delta Gold Mining Company, Limited, with Geo. Adams, manager, has been prospecting for an old channel, but as yet without success.

Several leases have been taken out on Lincoln creek by Atlin men and optioned to R. W. Foster, of New York. No work has been done on these so far.

The placer-gold output of the Atlin section for 1930 is estimated at about 2,800 oz., valued at \$47,600. This represents a substantial increase over 1929 and very nearly equals the total output from the entire No. 1 District for that year. The outlook for a continued increase is bright.

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

PRELIMINARY REPORT FOR THE YEAR 1930.

By DOUGLAS LAY, RESIDENT MINING ENGINEER (HEADQUARTERS, HAZELTON).

GENERAL SUMMARY.

The North-eastern Mineral Survey District comprises the Omineca, Cariboo, Quesnel, and Peace River Mining Divisions, and occupies a large portion of Northern British Columbia, having an area of nearly 100,000 square miles.

The master-feature of the topography is that of a great central plateau, the Nechako plateau, which merges gradually westwards in the Coast range of mountains, eastwards in the Rocky mountains, northwards in the mountains of the Cassiar system, and southwards in the Fraser plateau.

The outstanding geologic features are the two great parallel batholiths, the Coast range and the Cassiar-Omineca batholith, which cross the district in a north-westerly and south-easterly direction, about 175 miles apart. Besides these two great mineralizers, there are numerous and widespread intrusions of batholithic rock throughout the district, with which mineral occurrences are associated.

The district exhibits within its confines a wide diversification of mineral occurrence, and offers every indication of potential wealth in lode-minerals, in non-metallic minerals, and in coal, and also oil possibilities. In spite of the fact that the placer-mining field has been under extraction for the past seventy years, field-study supports the view that this field is far from exhaustion and still offers major possibilities.

As to the year's developments: In lode-mining the serious declines in the market prices of base metals, accompanied by very unsettled financial conditions generally which have characterized the year, checked the expansion of base-metal mining operations in the district. Silver-lead-zinc properties were the first to feel the effect, and in March, Duthie Mines, Limited, the most important producing property in the district, suspended operations entirely, and this property has since remained closed. For a short time prospects for copper properties remained more hopeful, but the sudden drop of 4 cents a pound in the price of copper on April 15th, followed by further declines in the price of this metal, rendered the immediate outlook for copper properties equally unfavourable.

In consequence, actual production of lode-mineral ceased early in the year and several companies suspended operations entirely. Nevertheless, a very considerable amount of development took place. In fact, the amount was greatly in excess of that which might have been expected under the prevailing conditions.

A feature of the year was the very determined attempt on the part of the prospector and small-scale operator to work out his own salvation by developing his property himself. Never before has so much work in this respect been carried out at so many points in the immense area embraced by this district, and in many cases at points hundreds of miles from the railway.

Of signal service to the district were the operations of the Consolidated Mining and Smelting Company of Canada, Limited. This company carried out a large amount of development at the *Emerald* group, in the Sibola section; at its recently acquired *Driftwood* group, west of the Driftwood river; at its property in the vicinity of the Nation river; and also at its property on Timothy mountain, in the Quesnel Mining Division. In addition, this company maintained prospecting parties in the northern portion of the Omineca Mining Division throughout the field season.

Among other companies more or less actively engaged may be mentioned: Igenika Mines, Limited, at the *Ferguson* on the Igenika river; Columario Gold Mines, Limited, at the *Valhalla* and *Kleanza* groups, Usk; American Copper Mines, Limited, at the *Diadem* group, Usk; Babine Bonanza Metals, Limited, at the *Cronin* property in the Babine mountains; and Cariboo Gold Quartz Mining Company, Limited, at its property on Lowhee creek, in the Cariboo Mining Division. In the early fall small-scale operations were carried out by Lorraine Copper Silver Mines, Limited, and also by Omineca Silver King Mining Company, Limited, at the respective properties of these companies in the Babine mountains.

The large number of railway and other survey parties at work during the year in the northern portion of the Omineca Mining Division aroused much interest. Doubtless this was the means of stimulating the extensive prospecting and initial development which took place in this region. Several new discoveries were made and much additional light thrown on the regional geology.

In spite of the depressed metal market, decided interest was evinced by the large operating companies of the Province in the examination of base-metal prospects. Interest in gold properties was naturally very marked.

Among important features of development may be mentioned:—

(1.) The very fine surface showings uncovered by Duthie Mines, Limited, on the *Canary* claim. At one point of particular promise, samples taken by the company's staff average: Gold, 0.11 oz. to the ton; silver, 16 oz. to the ton; lead, 11 per cent.; zinc, 9 per cent., over a width of 91 inches.

(2.) The results obtained by the owners (C. Matheson and D. Heenan, both of Topley) of the *Golden Eagle* group, Topley. High-grade silver ore is exposed in the newly-discovered vein at intervals over a length of 355 feet.

(3.) At the Babine Bonanza Company's property (*Cronin* mine) development during the year has, it is reported, been of a distinctly encouraging character. While it was not possible to visit this property this year, this information is believed to be reliable.

(4.) At the Cariboo Gold Quartz Mining Company's property on Lowhee creek, in the Cariboo Mining Division, the results obtained during the year are decidedly encouraging and justify further development.

Promising results were obtained at several other properties, to which reference will be made in the body of this report.

NEW DISCOVERIES.

(1.) *Childhood's Dream* group, a promising lead-zinc mineralization in dolomite, situated on the Osilinka river, discovered by A. O. Swiggum, of Finlay Forks.

(2.) *Wedge* group, a very large quartz vein which reaches a width of 130 feet at one point and which can be traced on the surface for several thousand feet; mineralization is with copper pyrites. Situated in the Rocky mountains, about 25 miles east of Deserter's canyon. Discovered by Mort Teare and associates, of Prince George.

(3.) *Blue Ridge* group, situated at the headwaters of Duck creek, a south-flowing tributary of the Omineca river; a batholithic intrusion mineralized with copper. Not inspected by the Resident Engineer, but described by an experienced examining engineer as a prospect of outstanding interest owing to the vast tonnage of low-grade copper material apparent. Unfortunately the copper content seems to fall below commercial grade at the present time. This discovery was made by F. Weber, of Fort Grahame.

(4.) *Weber* group, situated a few miles west of the *Childhood's Dream* group, on the opposite side of the Osilinka river; a lead-zinc dissemination in siliceous dolomite. Discovered by F. Weber, of Fort Grahame.

(5.) A rock consisting wholly of the mineral tremolite, situated about 15 miles south of Vanderhoof, discovered by natives and brought to attention by George Ogston, of Vanderhoof. The asbestiform style of the crystals has only been partially assumed in the exposures of the rock in place. Boulders of float show asbestiform mineral of commercial grade and further search for the origin of such is warranted.

Mention will be found in the body of this report of various new discoveries made on existing properties.

In placer-mining there has been considerable activity. In this branch of the mining industry also, as in lode-mining, the efforts of individual owners have been a noteworthy feature of the year. The purchase of a Keystone drill by one ownership (C. R. Carfrae and O. Sandberg) and systematic drilling of the ground exemplifies the enterprise evinced by this class of operator.

Prospecting was quite active, and new discoveries are reported on Rainbow creek, a tributary of the Nation river, by George Snell, of Vanderhoof; and also on Canyon creek, in the Cariboo Mining Division.

Important features of the year were: The success gained by B. Boe on Cedar creek; the continued operation of Lowhee Mining Company, Limited, in productive ground; and the reopening of the *Bullion* mine by the Quatsino Sound Mining Company, Limited.

Among new operations started this year may be mentioned: Those of R. N. Campbell and associates on Antoine creek, in the Horsefly section; those of Placer Engineers, Limited, on 4-Mile creek, a tributary of Keithley creek; those of J. Shaw and L. J. Auten on the North fork of the Quesnel river; those of George Kuchan and associates on tailings on the Horsefly river from the old "Hobson's Horsefly" property; and the investigation of dredging possibilities on the Fraser river between the Goat river and Loos by means of Keystone-drilling, undertaken by a syndicate under the direction of Gordon F. Dickson.

In the Omineca Mining Division much work was done by R. C. McCorkell and associates, of Vanderhoof, in the Manson section; and by George Snell and associates on tributaries of the Nation river.

Keystone-drilling was carried on at several points in the Cariboo and Quesnel Mining Divisions.

It is estimated that the production of placer gold will be about \$90,000, as compared with \$66,912 in 1929.

The coal areas of the district attracted much attention during the year. In the Quesnel Mining Division the Cariboo Coal and Clay Company carried out much exploratory work by diamond-drilling and surface prospecting in the lignite-coal area in the vicinity of Australian, where several wide seams occur. In the Omineca Mining Division, near Telkwa, F. M. Dockrill obtained a lease from the B.C. Coal and Land Company of Sections 391 and 401, adjoining the property of Telkwa Collieries, Limited, on the south, and has opened up a large seam of coal 12½ feet in width. This operation has no problem of overproduction to contend with, the local demand being very active between Prince George and Prince Rupert. The coal-output for 1930 is estimated at 1,200 long tons.

The oil possibilities of the region in the vicinity of Quesnel have attracted attention during the year. An oil-drilling rig was set up on the Yorston ranch just east of the Fraser river, about three-quarters of a mile north of Australian creek, and an oil-well spudded in on October 2nd. These operations are being carried out, it is understood, by a syndicate headed by F. A. Patrick. Drilling operations are in charge of J. F. Harrison. The outcome of this enterprise will be awaited with much interest.

A gratifying increase has taken place in the output of diatomite from the quarry of B.C. Refractories, Limited, at Quesnel.

It is germane to the subject-matter of this report to chronicle two events of concern to the mining industry:—

The visit of the Alaska Highway Caravan to the district in June, apart from its special purpose, was the means of directing attention to the mineral resources of the district.

At Quesnel on June 26th a memorial erected as a tribute to the pioneer placer-miners of the Cariboo was unveiled by His Honour the Lieutenant-Governor. This memorial, sponsored by the British Columbia Division of the Canadian Institute of Mining and Metallurgy and aided by the Department of Mines, took the form of erecting at Quesnel the first Cornish pump brought into the Cariboo and its operating water-wheel.

Inspection trips were made by the Resident Engineer during the year to certain portions of the northern Omineca Mining Division not hitherto examined. An account of these will be found in the forthcoming Annual Report for 1930.

ROADS AND TRAILS.

Substantial aid was rendered by the Department of Mines in connection with mining roads and trails at all points of the district.

Among the items of major importance undertaken this year may be mentioned the Sakumtha Pass route from the Dean channel on the Pacific coast to the chain of large lakes in the interior. The trail extends from Kimsquit on the Dean channel to Pondosy bay on Eutsuk lake, and will, it is anticipated, be completed next year. Much work was done on the trail this year and a light surface portage-tramway between Whitesail and Eutsuk lakes was almost completed. A full description of this route will be found in the Annual Report for 1926, including maps, on pages 147, 148, and 149.

OMINECA MINING DIVISION.

Although several operating companies, notably Duthie Mines, Limited, suspended operations entirely, owing to the depressed condition of the base-metal market, nevertheless development took place at more widely separated points of the district than in any previous year. Quite remarkable was the amount of initial development carried on at new properties in the northern and more remote portions of this Mining Division.

In the region contiguous to the Canadian National Railway, Usk, Smithers, Topley, and Burns Lake were the centres of greatest activity.

In the Skeena section the *Valhalla* and *Kleanza* groups were under active development by Columario Gold Mines, Limited, for the major portion of the year. The management states that hopeful results were gained, but that, owing to the generally difficult financial situation, operations were suspended in September.

The Copper River Exploration Company, Limited, had a force of six men engaged for two months in prospecting its properties situated between Kleanza creek and the Zymoetz river.

Canadian Copper Mines, Ltd.—This company was organized to take over the *Diadem* group near Usk and the *Mitts* group on the North fork of Chindemash creek. These properties were optioned originally by R. E. Doan, who is now president of the Canadian Copper Mines, Limited, which is incorporated under the laws of Delaware, with a capitalization of \$5,000,000 (all common stock), with shares of \$1 par.

It is understood that the properties of the Canadian Copper Mines, Limited, have now been transferred to the American Copper Mines, Limited, a British Columbia incorporation of \$500,000 capitalization in \$1 par shares. In return for the properties a large block of American Copper Mines, Limited, stock has been transferred to the Canadian Copper Mines, Limited.

Literature issued by or on behalf of the Canadian Copper Mines, Limited, and containing quotations from alleged reports by R. E. Doan, contain much misleading information and statements not in accordance with facts regarding the *Diadem* and *Mitts* properties. These properties

are prospects which warrant intelligent development, but the showings in no way justify the sensational statements in company literature of vast tonnages of ore "almost beyond belief." There is no large tonnage of ore developed on either property.

The investing public is hereby warned that no reliance whatever should be placed in any of these over-optimistic statements regarding the mineral-showings on these properties contained in literature that has been issued by the Canadian Copper Mines, Limited, R. E. Doan, or their agents.

During 1930 work on the *Diadem* group consisted of running two crosscut tunnels at points about 4,000 feet apart, a short distance from and above the railway-track. About 1,000 feet of tunnelling was carried out, and in addition camp buildings were constructed and a 36-42-horse-power Petter semi-Diesel engine and air-compressor installed at each tunnel. Some development-work was also done on the *Mitts* group.

The *Cordillera* group was under operation with a small force of men after August by L. H. McGuire, of Usk, and associates.

A trail was constructed, with the aid of the Government, to the *Smyth Fissure* group, situated at the head of the North fork of Chindemash creek, by the owners, A. A. Macdonald, of Usk, and R. C. Smyth, of Calgary.

On the *Lucky Jim*, Kleanza creek, some work was carried out by the owner, Fred Forrest, of Usk.

On the *Diorite* group at Pitman some work was done by the owner, J. M. Dechene, of Pacific.

Promising developments are reported on the *Grotto* group, near Pitman, owned by G. Alger, of Usk.

The owners of the *Waverly* group, H. Macdonald and M. Orr, of Pacific, and Russell Smith, of Smithers, constructed a trail to their property from Dorreen, with the aid of the Department of Mines. This property is situated at the head of Oliver creek, on the western slopes of Seven Sisters mountain, and is one of the discoveries of importance made last year.

On the *Silver Sisters* group, near Cedarvale, much prospecting was carried out by the owners, F. McLean and W. Moberley, of Cedarvale.

On the *Morning Star* group further work was done by the owner, D. C. McGregor, of Woodcock.

On the *Bermaline* and *Granite* groups, situated at the headwaters of the North fork of Lorne creek, distant about 20 miles from Ritchie, a large amount of painstaking prospecting and trail-work was carried out by the owners, Andrew Martinson, A. Johnson, and associates, of Ritchie.

In the Hazelton section Hazelton Copper Mines, Limited, carried on small-scale operations at the *Rocher Déboulé* mine during the early part of the year, with the idea of shipping a hand-sorted product. Continued declines in the prices of copper and silver caused suspension of operations.

On the *Summit* and *True Blue* claims on Rocher Déboulé mountain Dan. Macdonald, of Hazelton, the owner, carried out additional work.

In the Smithers section, on Hudson Bay mountain, operations were suspended by Duthie Mines, Limited, at the *Henderson* in March owing to the depressed metal market, and were not subsequently resumed. Fine surface showings were uncovered by this company on its recently acquired *Canary* claim.

On the *Mayflower* group the owners, L. S. McGill and associates, of Smithers, achieved important results.

On the *Victory* group much additional work was carried out by the owner, D. C. Simpson, of Smithers.

On the auriferous bismuth showings on the *Glacier Gulch* group much additional work was carried out by the owners, S. F. Campbell and Grover Loveless, of Smithers, with encouraging results.

In the Babine mountains, at the *Cronin* mine, development-work was carried on for some months by Babine Bonanza Metals, Limited, with, it is stated on good authority, highly encouraging results.

On the *Silver King* small-scale operations, both underground and on the surface, have been carried on by Omineca Silver King Mining Company, Limited, with, it is stated by the management, distinctly successful results. It is the stated intention of the management to continue operations at this property during the coming winter.

On the *Victoria* group further work was done by Lorraine Copper Silver Mines, Limited, comprising, it is stated by the management, continuation of the crosscut tunnel and surface work on the west vein, with encouraging results.

On the *Four Lakes* and *Silver Saddle* groups further work was done by the owners, A. T. Harrer and B. F. Messner, of Smithers, with, it is stated, encouraging results.

On the *Rainbow* group some further work was done by J. Wright and associates, of Smithers, the owners, some new high-grade ore being discovered.

On the *Harvey* group further work was carried out by R. L. Gale, of Smithers.

In the Telkwa section O. A. Riegle, of Telkwa, was engaged in repairing the trail to his properties in the Hunter basin.

In the Houston section a considerable amount of prospecting was carried out on the *Quinn*, *Morrison*, and adjoining groups on Peacock creek by the owners, N. Morrison and J. Quinn, of Houston, and on the *Black Hawk* group by F. Madigan, of Houston.

On Morice mountain R. J. Douglas, of Houston, discovered on his *Crocus* claim a batholithic intrusion showing a somewhat sparse copper mineralization. While commercial possibilities are not apparent, this discovery throws light on the geology of this mountain.

The option on the controlling interest in the Owen Lake Mining and Development Company, Limited, was relinquished by Noah Timmins early in the year. As a result of the efforts of the late Frank H. Taylor, development was resumed at this property in March, some diamond-drilling being carried out. Operations were suspended entirely shortly after the regrettable death of Mr. Taylor on April 27th.

Further surface work was done at the *Lucky Day* group by W. H. Simpson, of Houston, and on the *Risk* and *Hope* claims by R. Hayes, of Houston.

In the Topley section, at the *Golden Eagle* group, important results were gained by the owners, C. Matheson and D. Heenan, of Topley. Additional work was done on the *Evergreen*, *Gold Top*, and *Joker* groups, owned respectively by L. Kylling, J. Mulholland, and B. Ailport, all of Topley.

A new vein showing grey copper was discovered on the *Cup* group by the owner, Matthew Sam, of Topley, who also uncovered additional surface showings on his *Jack Rabbit* group.

In the Burns Lake section the operations of Topley-Richfield Mining Company, Limited, at the *Three Star* group on Boo mountain were suspended early in March. Under normal conditions further work would probably have been carried out at this property.

On the *Golden Glory* group, owned by W. Reed and R. H. Gerow, of Burns Lake, and on the *Silver Glance*, owned by J. C. McLean, of Burns Lake, a considerable amount of work was done during the year by the respective owners.

In the Sibola section much development was carried out by the Consolidated Mining and Smelting Company of Canada, Limited, at the *Emerald* group.

In the northern portion of the Omineca Mining Division, at the *Ferguson* mine, active development was carried on by Ingenika Mines, Limited. Extensive initial development was carried out by the Consolidated Mining and Smelting Company, Limited, at its recently optioned *Driftwood* group, a discovery of last year which exhibited a promising copper mineralization and which is situated west of the Driftwood river. A copper prospect of promise, the *Rainbow* group, situated west of Takla lake, about 20 miles south of the *Driftwood* group, was discovered last year by A. Michell and Frank Martin, both of Hazelton. The owners this year constructed a trail to their property from Takla lake, with the aid of the Department of Mines.

At the *Wedge* and *Protection* groups, owned by Mort Teare and associates, of Prince George, and situated on Wedge creek, about 25 miles east of the Finlay river in the Rocky mountains, much intelligent surface development was carried out by the owners.

Some mineral-showings in the vicinity of Thutade lake at the headwaters of the Finlay river were investigated during the year by a syndicate composed, it is understood, of R. W. Alward and associates, of Prince George. It was not possible to inspect this property.

A considerable amount of prospecting was carried out by R. R. Wilson and associates, of Victoria, on some copper-showings situated on Ruby creek, a tributary of the Finlay river, situated at the most northerly point of the latter. This property was not inspected owing to lack of time.

CARIBOO MINING DIVISION.

The most important lode-mining operation in this Mining Division is that of the Cariboo Gold Quartz Mining Company, Limited, of which further particulars are given below.

C. J. Seymour Baker carried out work on his properties on Island mountain, and also on his *Proserpine* group. On the *Pani* claim of the latter group a wide quartz vein showing some galena and zinc-blende was uncovered on the left bank of Williams creek.

On the *Westport* group, the owners, F. J. Tregillus and T. Blair, uncovered a vein showing good gold values.

Much interest was shown by examining engineers during the year in the *Hudson* group (owned by I. E. Moore and associates, of Barkerville), situated on Cunningham creek; and also in the *Cayenne* group (owned by E. Hann and J. Strbac, of Hixon Creek) and neighbouring claims, owned by Cariboo Lode Mines, Limited, situated on Hixon creek.

Cariboo Gold Quartz Mining Co., Ltd.—While no large amount of underground development had been carried out at the time of inspection in October, since last year, nevertheless, distinctly favourable and encouraging results were obtained; these being the finding of a rich gold mineral showing also free gold at different points in the large cross-vein struck last year, and also in a smaller cross-vein encountered this year near the face of the crosscut tunnel directed towards the *Rainbow* group. The exact composition of this mineral is being determined by the Department of Mines, but it might be mentioned that in 1925 bismuthinite carrying high gold values and showing free gold was noted on the *Rainbow* group on the surface.

While there is no reason to infer that large amounts of this rich mineral will be a characteristic of the veins encountered in the present workings, nevertheless it is encouraging finding it at the present horizon.

There appear to be three objectives of immediate major importance which call for investigation at the horizon of the present workings, namely: (1) The further investigation of the large cross-vein encountered; (2) the probing in depth of the promising surface exposure of quartz referred to in the 1929 Annual Report; and (3) the investigation of the area immediately below the *Rainbow* showings.

The chief activities of the company during the year have focused on the construction of a power-house and camp buildings, and installation of Diesel engine and air-compressor at a point about 100 feet above Jack of Clubs lake.

At this point, which is about 375 feet vertically below the present crosscut tunnel and drifts therefrom, it is proposed to run a crosscut tunnel, the length of which is stated by the management as being about 2,500 feet, to probe the vein system at this greater depth.

A reinforced-concrete building, comprising power-house, changing-room, and blacksmith-shop, has been erected, and a 409-cubic-foot Ingersoll-Rand air-compressor and 94-horse-power Ruston & Hornsby Diesel engine have been installed, also a 10-kw. generator. Camp buildings are also to be erected at this point.

QUESNEL MINING DIVISION.

On Yanks peak further work was done on the *Midas* group by O. J. Pickering and J. Glover, of Keithley, and on the *Jane* group by R. Reinhold, of Keithley.

PLACER-MINING.

OMINECA MINING DIVISION.

In the Manson section R. C. McCorkell and associates, of Vanderhoof, have been operating a drag-line scraper on Manson creek at the mouth of Skeleton gulch, and have sunk several prospect-shafts at the head of Germansen creek, with, it is stated, promising results.

On tributaries of the Nation river George Snell and associates, of Vanderhoof, carried out much work.

On Bob creek and the Buck river, near Houston, R. R. Macdonald and associates were engaged in testing their ground.



New Power Plant—Cariboo Gold Quartz Mining Co., Ltd.



Halifax Mine, Grand Forks M.D.

PEACE RIVER MINING DIVISION.

T. Wiggin was engaged during the year in testing out various bars on the Peace river with an appliance of his own invention.

CARIBOO MINING DIVISION.

Water conditions during the year were distinctly favourable for the operation of hydraulic mines. The chief contributor to the output was the Lowhee Mining Company on Lowhee creek, which continued operations in productive ground.

Other important contributors to the output were the various Chinese operators at the *Point* and neighbouring hydraulics on Slough creek, and M. Sundberg on Donovan creek.

On Dragon creek much work was done by L. Ford and R. McDougall, of Barkerville, in installing sluice-flume and making preparations for the spring run.

The customary activity was evinced by the numerous small placer operators in this Mining Division.

On Hixon creek E. Hann and J. Strbac, who have been working on the creek for some years, continued operations on their lease, where they obtain coarse unworn gold on a false bed-rock.

Golden Reward Placers, Limited, holds seven creek leases extending below the lease of Hann & Strbac to the falls. Last winter this company installed a sawmill on its property and cut and placed on skidways about 300,000 feet B.M. of logs for the purpose of flume-construction, but nothing further had been done up to the time of inspection in October.

A new discovery was reported on Canyon creek, but time did not permit of inspecting this creek.

Keystone-drilling was carried out at the Trehouse hydraulic mine on Cunningham creek under the supervision of C. W. Moore, acting for Robert McKee, who has an option on this property.

The dredging possibilities of the Fraser river between the Goat river and Loos were investigated by means of Keystone-drilling undertaken by a syndicate under the direction of Gordon F. Dickson.

QUESNEL MINING DIVISION.

A feature of the year was the success obtained by B. Boe on Cedar creek.

The *Bullion* mine was reopened during the year by the Quatsino Sound Mining Company, G. C. Bagley being in charge of operations.

Among new operations started during the year may be mentioned: Those of R. N. Campbell and associates, of Horsefly, on Antoine creek, where there is evidence of the existence of metals of the platinum group in addition to gold values; those of Placer Engineers, Limited, on 4-Mile creek, a tributary of Keithley creek; those of George Kuchan and associates, of Horsefly, on the Hobson mine tailings, Horsefly river; and those of J. Shaw and L. J. Auten on the North fork of the Quesnel river.

On Black creek, tributary of the Horsefly river, Rountree Mines, Limited, was engaged in hydraulic operations.

A limited amount of Keystone-drilling was carried out by Aero Mineral Locators, Limited, on Drummond flats. Careful examination of this area subsequent to the drilling inclines the belief that further investigation is fully warranted.

Keystone-drilling was carried out by C. R. Carfrae and O. Sandberg at the leases of the former in Beaver valley. Individual operators were active at many points.

Attention is again drawn to the fact that there are many promising placer properties (dealt with at length in Bulletin No. 2, 1930, "Placer-mining in British Columbia," published by this Department early in 1930, and further mention of which will be made in the forthcoming Annual Report for 1930) which await investigation. The present appears to be a particularly opportune time for turning attention to such.

CENTRAL MINERAL SURVEY DISTRICT (No. 3).

PRELIMINARY REPORT FOR THE YEAR 1930.

By H. G. NICHOLS.

GENERAL SUMMARY.

The Central District, which covers the greater portion of the southern interior of British Columbia, comprises the seven Mining Divisions of Kamloops, Clinton, Lillooet, Ashcroft, Yale, Nicola, and Vernon, and includes the Chilcotin plateau; the entire valley of the Thompson river with the Shuswap Lakes area; the Nicola plateau; the Fraser Valley watershed below Williams Lake as far south as Hope with the Bridge River area; the Okanagan valley and that of the Skagit river down to the International boundary-line.

The district is identified with the first stages of the mining history of the Province, but for various causes development within its boundaries has been backward as compared with other sections of British Columbia.

In days gone by the principal items of mining activity were in connection with placer-mining on the Fraser river and its tributaries; with some lode-gold operations on a small scale in the Lillooet district; with intermittent attempts to exploit resources of non-metallic minerals, and with the operation of the *Iron Mask* mine near Kamloops, from which a considerable production of copper-silver ore was obtained some years ago.

More recently attention was directed towards the investigation of widespread occurrences of copper ores in the Kamloops, Nicola, Yale, Ashcroft, and Clinton Mining Divisions; to a number of prospects of the lead-zinc-silver type in the Shuswap Lakes area, and to a variety of interesting and attractive gold-deposits upon which a considerable amount of development-work was performed. The non-metallic industry, more particularly in connection with gypsum, was advanced to a stage of production.

In the course of the years following the early days of mining in the latter part of the last century a large number of mineral prospects were brought to notice, embracing a wide variety of types, but in no case had a stage of production been reached on any notable scale. In the year 1929 the chief interest attached to the gold-quartz veins in the Bridge River area, where the *Pioneer* mine was producing gold bullion steadily and was in course of development; to the opening-up of a silver-lead vein in the Stump Lake area of the Nicola Mining Division; to the prospecting development that was being carried out on the nickel-bearing bodies of pyrrhotite at the head of Emory creek, in the Yale Mining Division, and to the gypsum-quarries at Falkland, in the Kamloops Mining Division, where a largely increased production had been achieved by Gypsum, Lime, and Alabastine Canada, Limited, for the purposes of manufacture at its plant in New Westminster. In addition to these few instances, there was widespread activity in prospecting and a greater amount of attention was paid by operating companies and investors to the mineral resources of the southern interior than perhaps at any previous period.

Despite this general interest, it is to be borne in mind that at the commencement of the present year the mining situation in the Central District was still in a state of evolution and there was no one outstanding mine within its boundaries to offset the generally unfavourable outlook with which the year started.

In view of these conditions, the achievements during the current year are of striking significance and may be pointed to as placing this district in a position unique in its history, inasmuch as it affords some of the most encouraging features in the mining situation of the Province to-day.

Many factors have contributed to the above result; foremost among these are undoubtedly the dogged perseverance of prospectors and operators in face of the very real handicap and discouragement attaching to this time of industrial depression, and the realization of the opportunity for preparedness which is inherent to such times that has been evidenced by the exploration policy of operating companies.

The Provincial Department of Mines also has given evidence of appreciation of the necessity for stimulating activity, by making unusually large grants of money to assist in the construc-

tion of roads and trails leading to mining areas and properties, and invaluable aid has also been given by the Dominion Geological Survey in connection with the mapping of new areas and the supply of geological information. In general it may be said that, in spite of conditions under which it might reasonably have been expected that the best to be done was to mark time, this district has responded to the efforts that have been made in its development to a degree which is entirely encouraging, and a high tribute is paid to the work of all those prospectors and others who have contributed to this end.

PROSPECTING.

Considerable activity has centred around the area embracing the Adams plateau north of the Shuswap lakes and reaching north-westerly beyond the valley of the North Thompson river. Prospecting in the Adams Plateau area is likely to be benefited materially as a result of the aerial photographic work of the Topographical Survey. Work has also been carried on in the Highland Valley area, especially on Forge mountain, where G. Novak, of Rossland, has been developing the *Transvaal* group, and it is hoped that with the completion of a road which is being constructed developments in this area will follow. A certain amount of work has been done in the Coquihalla and Skagit River sections, but, on the whole, activity in this field has fallen off; however, as previous efforts in this direction were not in the main guided by a spirit of intelligent search so much as by promotion interests, it is possible that better results may be obtained by the more careful system that is being employed at present.

A limited number of prospectors have been active in the field in the Okanagan section. This is a difficult country for the individual prospector and presents geological problems that are apt to confuse him. In this connection it is fitting to observe that considerable harm may attach to statements of irresponsible operators. An instance of such pernicious influence is the unwarrantable publicity that has been given to a project of oil exploration in this area. It cannot be stated too definitely that there is no justification in the known facts for the statements that have been made in certain quarters with regard to the possibility of finding oil in the country around Kelowna.

The Taseko Valley (Whitewater) area has been quiet following suspension of operations by the Consolidated Mining and Smelting Company on the *Mohawk* and *Spokane* groups, but E. J. Taylor reports further discoveries of gold ore on the *Buzzer* group, adjoining the *Windfall* claim.

J. Russell, of Lillooet, and Grant White, of Bridge River, have done assessment-work on properties north of Bridge river between Gun creek and the Shulap range, where occurrences of ores of gold, copper, and mercury are found, but no new discoveries are reported from this section.

W. Davidson has been carrying on work on the *Alpha* group on the Bridge River road and there has been the usual amount of placer-work on Marshall creek and Hurley river.

The old *Maggie* mine on the Cariboo road was unwatered and some prospecting was carried out in the area south-west of Kamloops and in the North and South Thompson River valleys, including work by G. K. Rogers, of Knutsford, on properties near the *Ajax* group of copper claims, by W. Graham, of Cherry Creek, on the *Copper King*, and by Meadow Creek Mines, headed by C. E. Scanlan, of Kamloops, on properties near Dupont lake. Further exploitation-work has been done by Comstock of B.C., Limited, on the lead-silver and iron deposits on Iron mountain near Merritt, and J. L. Brown, acting for Primary Ore Mining Company, of Vancouver, has been continuing work on the *Mary Reynolds* group near Stump lake. H. J. Blurton, of Vernon, has opened up some more gold-bearing quartz veins near Vernon and there has been some activity in the country west of Okanagan lake and in the valley of Cherry creek, in the Vernon Mining Division.

DISCOVERIES.

An interesting discovery of gold associated with arsenopyrite has been made near Mount Olie, in the Kamloops Mining Division. This discovery is of particular significance, the values being found to be associated with arsenopyrite in a high-temperature iron-ore deposit under conditions that lend encouragement to the search for similar occurrences in the surrounding country, and a considerable amount of activity has been stimulated. The mineralization appears

to be related to the intrusive classified by W. L. Uglow as the Darlington hornblende-diorite, of which there are numerous exposures in the vicinity. The property has been optioned by the Premier Gold Mining Company, Limited, and this company is now actively interested in the district for the first time.

Discoveries of silver-lead-zinc ore have been made on Adams plateau by F. A. McLeod, of Salmon Arm. These bodies of sulphide ore, which outcrop on the level surface, lie in the same mineralized zone east of Adams lake on which diamond-drilling work was carried out previously by the Granby Consolidated Mining, Smelting, and Power Company. A similar occurrence has been opened up by Bischoff Bros., of Celista, at a few miles to the east, and hopes for this area are enhanced considerably by the growing amount of proof of the extent of the mineralization and by knowledge of geological features having a bearing upon it.

DEVELOPMENT.

The principal item of development is that of the *Pioneer* mine, in the Bridge River district, which may now be referred to as in a leading position among the primarily gold-producing mines of the Province. Development of the *Enterprise* vein on the *Planct* property, in the Nicola Mining Division, has resulted in the production of lead-silver-gold concentrate to the gross value of about \$100,000 and has demonstrated the economic value of this member of the series of veins in this area. Work on the nickel-deposits on Emory creek, in the Yale Mining Division, has yielded encouraging results, a second ore-body having been outlined by open-cutting and diamond-drilling work. This property may now be looked upon as a probable producer of nickel on an important scale. In the Clinton Mining Division the Consolidated Mining and Smelting Company, Limited, has been developing the chrome iron-ore deposits on Scottie creek, and it is understood that the results are sufficiently encouraging to warrant further work.

KAMLOOPS MINING DIVISION.

SHUSWAP LAKE SECTION.

Lucky Coon and Lucky Strike.—This property, owned by H. McGillivray, of Shuswap, and associates, is situated on Adams plateau, about 3 miles east of Adams lake, at an elevation of about 6,000 feet, and covers a zone of mineralization in schist in which three seams are identified within a width of about 600 feet, extending for about $1\frac{1}{4}$ miles. The minerals are galena, sphalerite, and pyrrhotite, and there is a medium-grade silver content. The direction of this belt is approximately north-east and south-west, but there are several deflections in the ore-bodies which appear to be related to a near-by intrusion of hornblende-diorite. A large amount of open-cutting has been done upon these claims and a certain amount of diamond-drilling was also carried out some years ago. The seams have a flat dip, and while results obtained from the surface workings did not indicate ore-bodies large enough or rich enough to encourage further development at the time, it is possible that different results would be encountered at some depth with a change in the type of mineralization.

King Tut.—Adjoining the above property towards the north-east another group of claims of this name has been located by F. A. McLeod, of Salmon Arm, and during the year a body of silver-lead ore hitherto unsuspected was uncovered in a series of open-cuts. The strike of this seam of heavy lead-zinc sulphide ore shows a distinct swing towards the east from that of the *Lucky Coon* ore-bodies, but the amount of work so far accomplished is not sufficient to show whether this indicates a permanent change of direction, possibly influenced by the intrusive rock that is approached in this direction, or whether the seam will resume its normal strike towards the north-east. In either case this discovery is of interest and justifies further development, more particularly in connection with the possibilities outlined in the preceding paragraph.

Speedwell.—This group is owned by a Salmon Arm syndicate and was located by J. Thornton. The claims are parallel to the preceding group and extend beyond them to the north-east, right up to the contact with the intrusive diorite. On this group some narrow seams of a high-grade silver-lead mineral have been found and also some extensive bodies of quartz. This property covers a tunnel-site from which deep development of this whole system of veins might be attacked in the event of exploration at depth proving the existence of workable bodies of ore.

Mosquito King.—Situated at a distance of about 4 miles due east from the above-mentioned zone of mineralization, a number of claims have been staked on a parallel zone by Bischoff Bros., of Celista. The mineral occurrence along this zone is in many respects similar to that of the zone lying to the west. The width of the mineralized seam, which is exposed in a number of workings extending for a distance of over $1\frac{1}{2}$ miles, appears to reach a maximum of about 18 feet. In places, more particularly where outcrops of the intrusive rock occur, a dislocation of the seam is noticed. The occurrence is one of considerable attraction and is considered to hold promise of ore-bodies of economic size and importance at some depth. The average of eight samples taken from various points along this seam assayed: Gold, trace; silver, 3.3 oz. to the ton; lead, 8.9 per cent.; zinc, 12.1 per cent.

Venus.—Situated on Crowfoot mountain, on the east side of Scotch creek, and at approximately the same elevation as the plateau generally, this group of claims is located on an occurrence of silver-lead-zinc ore found in beds of limestone in contact with, and highly disturbed by, intrusive rocks. Some patches of a high-grade silver-lead mineral have been found in irregular seams, but up to the present time no continuity has been proved. A sample of picked ore from one of these seams assayed: Gold, trace; silver, 50.01 oz. to the ton; lead, 41.2 per cent.; zinc, 7.8 per cent.

Bonnie Brae.—The mineral occurrence on this group of four claims, situated on the northern slope of Mount Ida, near Salmon Arm, at an elevation of approximately 1,500 feet above the valley, consists of extensive bodies of quartz with a considerable amount of pyrite and some zinc-blende and galena carrying silver values and a little gold. The quartz occurs in zones of shearing and fracturing in impure quartzite and schist traversed by dykes of feldspar porphyry. Some tunnelling and open-cut work has been done, but no consistent values have yet been proved.

NORTH THOMPSON SECTION.

Lakeview.—An important discovery of gold-bearing mineral was made late in the season by P. Johnson and F. Lawrence about 14 miles west of Mount Olie on the Canadian National Railway. These two prospectors had been working on claims known as the *Silver Lake* group in the same vicinity for some years. All these claims are situated on a rolling upland at an elevation of about 4,000 feet above sea-level, the *Lakeview* group covering a lake having an area about three-quarters of a mile by about half a mile, at a distance of about $2\frac{1}{2}$ miles south of the *Silver Lake* group. On the latter property the mineralization was represented chiefly by copper and zinc; on the *Lakeview* group extensive outcrops occurred of oxidized iron ore in limestone near a body of hornblende-diorite intrusive. Previous to this year's work the unoxidized ore identified with these outcrops was recognized as magnetite, but selecting one of the most striking of the mineralized zones, surface-stripping exposed a body of pyrrhotite with an arsenopyrite content. The width of this zone as indicated by the surface-stripping is approximately 40 feet, and a cut was made to a depth of 6 feet across the southern half of this exposure, which has an apparent east-west strike. In this cut a width of 6 feet of the sulphide was exposed coming right to surface, the remainder of the section being represented by heavily iron-stained weathered material. Samples of this body of mineral yielded assays of around $2\frac{1}{2}$ oz. gold to the ton, and a sample of a streak of solid arsenopyrite included in the 6-foot width of pyrrhotite assayed over 12 oz. gold to the ton. It is clear, therefore, that the gold values are related to the arsenopyrite.

The mineral occurrence is an ordinary type of high-temperature deposit of iron sulphide ore near to an intrusive contact.

The view held by the prospectors is that there is a series of limestone-beds with zones of mineralization lying between them. It would appear, however, more probable that the mineralization occupies zones of alteration, related to structural conditions, influenced by the intrusion, in a wide belt of limestone; and, in view of the surface evidence of width of these zones of alteration, the possibility is indicated of bodies of mineral of considerable extent.

Up to the present time, owing to the lateness of the season when this discovery was made, no work has been done on which an estimate of the extent of the mineralization might be based, but an interesting feature is the occurrence of pyrrhotite in an oxidized section of ground about 300 feet distant from the main exposure and in a direction which agrees with that assumed for the ore-body. The value of the property depends upon the association of arsenopyrite with this

body of mineral. Looking at it from the point of view of the sole exposure that has been made, this is a prospect of very considerable attraction, and it is not surprising that it should have been bonded by the Premier Gold Mining Company with a view to its development. A camp has been erected and operations which are expected to be continued throughout the winter have been initiated.

Considerable interest has been roused by this discovery of gold-bearing iron ore, which lies at no great distance from the *Windpass* mine, where gold is found in association with magnetite, and a new aspect is given to the value of prospecting in the entire area, reaching as far as the Adams plateau on the south-east in which phases of the same batholithic intrusion are indicated.

Homestake.—This property was originally located in the seventies and was reported on by Dawson in 1888. The present owners are O. Redpath, T. Bulman, and associates, of Kamloops. The property is situated at Jamieson creek, which flows into the North Thompson river 18 miles north of Kamloops, and lies at an elevation of about 2,000 feet at a distance of $2\frac{1}{2}$ miles from the river. A series of gold-bearing quartz veins are found traversing the apex of a prominent granite butte in a north-westerly direction over a width of about 300 feet. Towards the west some open-cuts on the side of a steep bluff expose a zone of shearing in the granite, in which quartz occurring for the greater part in vein-like formation occupies approximately 40 per cent. of the width of 30 feet, while three other open-cuts on the flat grassy summit of the hill extending over a distance of about 300 feet towards the north-west indicate a width of about 50 feet for this shear-zone. At a distance of approximately 250 feet to the east there is another body of quartz approximately 18 feet wide on which some sinking, drifting, and open-cutting has been done. The gold content appears to be erratic, ranging from traces in gold and silver to 0.40 oz. gold and 9 oz. silver to the ton, while Dawson quotes an assay from one specimen which yielded: Gold, 1.10 oz. to the ton; silver, 38 oz. to the ton. The property presents a good opportunity for prospecting-development work and the structural conditions mentioned above are favourable to persistence of the quartz veins.

Smuggler.—This property, owned by the Smuggler Hill Development Company, of Kamloops, is situated at Birch Island, on the Canadian National Railway. Some further prospecting has been done in the way of digging pits to determine the extent of a surface deposit of oxidized manganese ore which is found covering a fairly wide area on the lower slopes of the hill. This work has not been sufficiently extensive or systematic to enable an estimate of the extent of this deposit to be made, but it is probable that the extraction of a sufficiently pure material of workable grade would be attended with some difficulties.

Grizzley.—This group is situated in the Clearwater district, on the divide between the Azure river and Hobson creek, and is owned by A. J. Horne, of Blue River. Some further prospecting was done during the year on the lead-silver ore-body which is exposed in some open-cut work on the plateau-like area. The opening-up of this property has been retarded owing to the difficulty of transportation, but with the improvement of trails leading to it both from the east and west which has been carried out on the initiative of the Department of Mines it is hoped that this prospecting-work will be stimulated.

Hobson Creek.—Work on the placer property on this creek, about $2\frac{1}{2}$ miles above the head of the upper Clearwater lake, was continued through the year, a tunnel being driven by which the old workings in which favourable results were reported to have been obtained in previous operations were entered. It is stated that some pay-gravel has been encountered, but the conditions point to the probability of local enrichment of the mass of glacial debris rather than to the existence of an old channel.

Louis Creek.—The placer operations on this creek have been continued by Paymore Mines, Limited, an incorporation which acquired the property from the former owners in 1929. A considerable amount of ground was moved by hydraulic operations and a few hundred yards of gravel were washed, with results encouraging to small-scale operations.

SOUTH THOMPSON SECTION.

Bertha and Molly.—These properties are situated about $3\frac{1}{2}$ miles south of a point on the road from Kamloops to Mamit lake at a distance of about 35 miles from Kamloops. The properties, which cover old locations, were acquired by a Kamloops syndicate entitled Meadow Creek

Mines, and some work was done in an attempt to extract ore from the old workings for purposes of shipment. The mineral occurrence is represented by chalcopyrite, some bornite and copper-glance in a fractured diabase porphyrite. A shaft had been sunk on one of the most promising outcrops where some irregular seams of mineral are found following a more or less general east-and-west direction. The recent operations were confined to excavating around the collar of the shaft and some 120 sacks of sorted material from this work had been stacked on the dump for shipment. The shaft had been filled in with the broken rock from this work and could not therefore be inspected.

HIGHLAND VALLEY (PART OF).

A limited amount of prospecting has been carried out on the copper properties in the portion of this area which is included in Kamloops Mining Division.

CLINTON MINING DIVISION.

Maggie.—This property is situated on the Cariboo road at a distance of 24 miles north of Ashcroft. The area is occupied by fragmental volcanics and argillites of the Cache Creek series; and in the immediate neighbourhood of the *Maggie* workings there is an exposure of serpentine representing an alteration of an intrusion of peridotite, and the formation is intersected by a number of albite dykes.

Zones of fracture having a general north-south direction constitute a noticeable feature, owing to the extensive oxidation of an original pyrite content in the disintegrated and broken-down rocks. The property was originally located and developed in the nineties with the object of opening up bodies of sulphide ore occurring in a shear-zone with a north-east and south-west strike which, as exposed in the cutting on the highway, is approximately 80 feet wide. A tunnel was driven for a distance of about 600 feet from the level of the road, following the direction of the shear towards the south-west, and a shaft was sunk from the outcrop at a distance of about 100 feet from the portal of the tunnel and 100 feet vertically above it. This shaft is said to have been carried down to a depth of 200 feet below the adit-tunnel. Workings were partly unwatered and opened up during the year for the first time in a period of over twenty years by W. R. Hocking, of Seattle.

Sulphide mineral is found in narrow seams throughout the first 300 feet of the tunnel and in a crosscut a body of low-grade ore is exposed, having a width of about 6 feet and including a seam of about 2 feet wide of almost solid mineral, which is mostly iron sulphide with some chalcopyrite. Iron and copper sulphides are disseminated through the decomposed rock of the shear over greater widths. On a level 100 feet below the adit-tunnel a seam of solid mineral having a maximum width of about 3 feet was drifted on for a distance of approximately 100 feet. This seam contains bornite, tetrahedrite, and chalcopyrite associated with pyrite in a massive quartz gangue, and a sample assayed: Silver, 2.4 oz. to the ton; copper, 2.4 per cent.; lead, 0.6 per cent.; zinc, 3.4 per cent.

The appearance of this seam presents some encouragement to further development and the continuation of the drift towards the south-west to intersect one of the north-south fracture-zones has been recommended.

Flint.—This chrome-iron property has been under option to the Consolidated Mining and Smelting Company. A programme of development has been carried out during the year and a total amount of about 500 feet of tunnelling-work has been done. The property is situated on Scottie creek, at a distance of about 4 miles from the Cariboo highway, and is approached by a narrow auto-road.

The original attraction of the property was represented by the occurrence of kidney-shaped bodies of a high-grade chrome ore in association with larger occurrences of a lower-grade material in which the chrome is found disseminated throughout the altered rock. The result of the work that has been completed up to the present time has been to demonstrate the fact that the economic importance of the property is in connection with the last-named type of occurrence. Several bodies of chrome-bearing rock have been opened up, but they are irregularly scattered and do not appear to conform to any general direction. The principal problem is in connection with the grade and the ratio of iron-chrome content. This ratio, so far as has yet been determined, borders on the line of economic treatment possibilities. It is understood that the work of development will be carried on throughout the winter.

Chrome Creek.—Some prospecting-work was done by the Consolidated Mining and Smelting Company of Canada, Limited, on the chrome-ore deposits on this creek in the Bonaparte valley, but the operations have been temporarily suspended.

LILLOOET MINING DIVISION.

Pioneer Gold Mines of B.C., Ltd.—Development of this property has been carried out to a depth of 1,000 feet below the surface and a total amount of about 4,500 feet of drifting-work has been done on the vein on four levels, below the 500-foot level, at intervals of 125 feet. The vein appears to be fully as strong and, if anything, better mineralized in depth, and with the exception of two headings on the 600-foot level all the tunnel-faces are in ore. The whole amount of the material derived from this development-work was passed through the mill without sorting, with the production of bullion valued at around a quarter of a million dollars. In previous years development has been handicapped by the necessity of keeping the mill supplied with ore, and continuous operations, in the face of the large amount of dead-work that had to be done in the way of shaft-sinking and general equipment, was made possible by utilizing a large accumulation of tailing from previous operations.

By adherence to the policy of the management to put back returns into development, this condition has now been overcome, and the *Pioneer* is in a position of having large ore reserves ahead, while development both lateral and in depth has wide limits for expansion. The vein, which in places reaches a width of 8 to 9 feet and maintains an average stopping-width of about 3½ feet, shows a beautiful ribbon-structure, and values of from \$50 to \$100 a ton are obtained in some sections, an average value of about \$17 a ton being represented by the figures, as stated above, for the whole width of 5.5 feet excavated in the development-tunnels. A sample taken across 30 inches of a section of ribbon-quartz on the 800-foot level assayed: Gold, 5.06 oz. to the ton; silver, 1.5 oz. to the ton. Local faulting is a characteristic feature, but very little displacement takes place and the vein has been picked up again in almost every instance within a few feet; the principal disadvantage of this faulting lies in the fact that it is difficult to break the ore clean in the stopes in the faulted sections. Power for all the operations has been derived from Cadwallader creek, but during the year a new hydro-electric installation has been constructed on Hurley river, capable of developing up to 750 horse-power under a 260-foot head.

Paymaster.—This group was located by F. Kirkwood and associates on a creek tributary to Cadwallader creek at a distance of approximately 3 miles above the *Pioneer*. Some quartz veins occur in this neighbourhood and it was supposed that they were of the same order as those of the augite-diorite stock in which the *Pioneer*, *Lorne*, and other veins occur. It is found, however, that there is only a narrow tongue of this augite-diorite intrusive in this upper section of Cadwallader creek and the quartz veins lie in either the Bridge River or Cadwallader series of rocks, and up to the present time no values of economic importance have been found in them.

Alpha.—This property, owned by W. Davidson, of Bridge River, is situated on the auto-road up the valley of Bridge river at a distance of about a mile below Gun creek. The property was bonded last year by the Consolidated Mining and Smelting Company, and work carried out by the owner has been financed by the company during the past eighteen months. A mineralized seam in which gold and silver values are associated with pyrrhotite, lead, zinc, and antimony occurs in a shear in the Bridge River series, identified with a porphyry dyke and bodies of serpentine. A tunnel has been driven on this shear for a distance of about 400 feet and varying values have been found over the whole distance. In certain places widths of about 1 foot have yielded around ½ oz. gold to the ton, but these values are spotty, and it would appear that the average content over a width ranging from 2 to 4 feet is low—namely, from traces to \$2 in gold and a few ounces in silver to the ton. A sample of a 6-inch seam in these workings assayed: Gold, 0.52 oz. to the ton; silver, 4.7 oz. to the ton; lead, 1.2 per cent.; zinc, 5.8 per cent. The same occurrence is found on the other side of the river, where zinc and antimony predominate. Antimony is also found in the tunnel-workings, especially in seams bordering the dyke. A sample of one of these seams assayed: Gold, 0.26 oz. to the ton; silver, 13.5 oz. to the ton; copper, 0.2 per cent.; lead, 7 per cent.; zinc, 10.8 per cent.; antimony, 1.6 per cent.

A second seam and probably a second individual shear-zone is found at a distance of about 200 feet to the west, the direction of both occurrences being approximately north and south. Outcrops towards the north indicate continuation over a considerable distance. This property is in the prospect stage, but the persistent indication of gold values is held to justify the thorough prospecting that is being done upon it.

Griswold.—The Consolidated Mining and Smelting Company continued prospecting-work on this property, situated high up the valley of the Bridge river at a distance of about 40 miles beyond the auto-road. Until the month of September, when operations were suspended for the winter, bodies of a high-grade copper ore with practically no associated values in gold and silver were under development with a view to estimating the extent of the resources.

Copper Mount.—This property, owned by John Jacks, of Pemberton, is situated at the head of Wolverine creek, which flows from the Tenquille basin into the Lillooet river. There are here some extensive bodies of magnetite and pyrrhotite in which a copper content is found. The property was bonded by interests associated with E. W. Hamber, of Vancouver, and some new stripping and open-cut work has been done. While indicating a greater extent of mineralization than was hitherto exposed, no particular bodies of economic importance have been proved.

Gold King.—Some further work was done on this property, owned by Charles Barbour, of Pemberton. The shaft has been continued to a depth of about 25 feet below the surface, and further evidence of lead-zinc mineralization coming in below the surface iron-capping is found, with the suggestion of gold values being associated with the zinc. There is a strong body of mineral which has been exposed at the surface over a distance of about 500 feet, and appears to extend along a well-defined shear-zone for a considerably greater distance.

In the neighbourhood of the small shaft-workings the width of this body is about 14 feet. The property lies in a draw at an elevation of about 6,300 feet and offers an exceptional opportunity for development by diamond-drilling at a moderate expense. A sample taken from the bottom of the shaft assayed: Gold, 0.56 oz. to the ton; silver, 9 oz. to the ton; lead, 0.8 per cent.; zinc, 6.8 per cent.

ASHCROFT MINING DIVISION.

Highland Valley (Part of).—The *Transval* group of claims, owned by George Novak, of Rossland, is situated on Forge mountain in this part of the Highland Valley area. It is one of the best known of the many low-grade copper properties of this area.

Some good work has been carried out in the way of tunnelling and crosscutting to explore at a depth of about 125 feet bodies of ore exposed at the surface. Some good results were obtained, but the workings are located near the margin of the body of granite rock which covers the greater part of the Highland Valley field, and the ground in the vicinity appears to be greatly shattered. There is, on that account, some doubt as to whether any persistent bodies of ore will be developed in this particular area.

Placer-mining.—Work by individual prospectors and small syndicates has been continued on the bars of the Thompson river.

YALE MINING DIVISION.

B.C. Nickel Mines, Ltd.—Work has been continued steadily on the properties of this company, situated at the head of Emory creek, and a considerable amount of interesting information has been added to the sum of knowledge regarding this ore occurrence which is unique so far as this Province is concerned.

In many respects the deposit is analogous to that of the Sudbury nickel-mines. Extensive bodies of nickel-bearing pyrrhotite occur in a dyke-like body, having a width of about 1,000 feet in the section where the chief workings are, of a basic rock, intrusive into granite. It is generally conceded that these bodies of sulphide mineral are the result of magmatic segregation in the intrusive. Prior to the work which has been performed during the present year, the chief attraction of the prospect was centred around a massive exposure of the sulphide, which was exposed in an open-cut about 75 feet long at the base of a prominent bluff. Samples across this cut yielded average assays showing a nickel content of between 2 and 3 per cent., while diamond-drilling had yielded cores from which nickel contents up to 5 and 6 per cent. had been obtained.

In the early part of the year a limited amount of electrical prospecting-work was carried out with a view to determining the extent of the sulphide occurrence, and a further body of the mineral was indicated lower down the hill at a distance of approximately 1,000 feet from the big open-cut. Surface-stripping in this section showed up a width of about 40 feet of sulphide ore with a variable nickel content. This work was followed up by further diamond-drilling below the exposure which has indicated a width of from 70 to 80 feet of the sulphide, carrying from 1 to 1½ per cent. nickel, with occasional higher content. The exact relationship of this occurrence to the body higher up the hill is not yet fully determined, but it is shown that there

are extensive bodies of this segregation of nickel-bearing pyrrhotite, and that the nickel content varies with the degree of sulphide concentration.

Encouraging prospects have also been exposed at a distance of from one-half to three-quarters of a mile towards the east, and on the other side of the divide between the head of Emory creek and the Fraser valley. As a result of the work which has been performed this year, this property may be said to have emerged from the stage at which it was to be regarded as an interesting prospect to one presenting the distinct possibility of production of nickel on a large scale. The property calls for a large amount of development-work and existing financial conditions have tended to retard progress. The prosecution of the work is fully justified and steps are being taken by the Department of Mines for the construction of a road to facilitate taking in the machinery required for the purpose.

Aurum Mines, Ltd..—Prospecting-work conducted previously on the lower levels of this mine has been abandoned, and, following a change of management and under the direction of W. G. Norrie as consulting engineer, efforts have been devoted to tracing up the occurrence of high-grade gold ore from where it was encountered in the upper levels and to a systematic prospecting of the surface, particularly in regard to the bodies of gold-bearing quartz which occur at other points on the property. A car-load of ore taken from above the upper level was shipped, and in the course of this excavation a narrow seam of very high-grade ore was encountered in which the gold appears to be associated with arsenopyrite.

Pierre River Syndicate.—This company, with headquarters in Vancouver, acquired some placer properties on Pierre creek, which flows into the Coquihalla river from the east at a point just below Jessica, on the Kettle Valley Railway. These properties were originally owned by J. Fulbrook, of Jessica. The area, which is situated at a distance of about 6 miles up from the mouth of the creek, is identified with the eastern and western contacts of the serpentine zone of the Coquihalla area. The gold content in the gravels appears to be related to these contacts. The valley of the creek is approximately 600 feet wide for a distance of about a mile and is flanked by a series of flats and benches. The sinking of a shaft was commenced close to the bed of the creek and was carried down to a depth of 60 feet without encountering bed-rock. In previous years some good results were obtained from ground-slucing, but, so far as it is known, there is no evidence available in regard to the existence of pay-gravel on bed-rock. The proposition can only be looked upon as affording an opportunity for individual prospectors working on a small scale or as involving a heavy expenditure in the hydraulicking of a very large amount of overburden on a problematic quest. At the moment this course is not to be thought of.

Silent Friend.—Prospecting-work on this property, situated in the Skagit valley close to the International boundary-line, has been continued by Alex. Robinson. A crosscut tunnel has been driven for a distance of approximately 300 feet to intersect the continuation of the attractive natural exposure of primarily copper-silver ore on the side of a gulch about 150 feet above. Up to the present time the results of the work have been negative, but it is understood that operations will be continued next year. A good trail has been constructed to the property.

NICOLA MINING DIVISION.

Planet Mines and Reduction Co. of Nicola, Ltd..—The property of this company is situated at Stump lake, midway between Kamloops and Merritt. It comprises a group of claims covering certain veins in the diabase-porphyrity that belong to a system to which attention was called by Dawson many years ago as providing promise of the establishment of a mining camp. This system of veins covers a wide area on the hill, named by the before-mentioned authority as "Mineral hill," and several years ago a considerable amount of development-work was done on members of this system lying to the east of the vein to which the operations of this company have been devoted.

The *Enterprise* vein, which has been developed by the company, outcrops on the western slope of the hill at an elevation of approximately 400 feet above the level of the lake. The vein dips into the hill at an angle of about 45°. Development has been carried out from a crosscut tunnel which reaches the vein at a depth of 320 feet on its dip below the surface. The vein has been drifted on both north and south and stoping operations have been carried over a distance of approximately 600 feet. The vein pinches and swells and the average stoping-width is not much over 2 feet. The mineral content is represented by galena, sphalerite, and pyrite with associated gold and silver values.

During the year approximately 17,000 tons was extracted from this vein and treated in the flotation plant, which has a daily capacity of from 60 to 100 tons. A good ratio of concentration was effected in the mill, and concentrate with an average value of around \$175 a ton was shipped to Trail, having a total gross value for the year of about \$100,000.

Conditions at this property since the erection of the mill have been, as might be anticipated, subject to the disadvantage attaching to a mine which is being operated for the purpose of keeping a mill running before it has been fully developed, and at no time has there been more than a four months' reserve of ore. The inevitable result was reached late in the year when it was found impracticable to continue stoping operations in the upper levels and the mill was closed down temporarily, with the available ore reserve exhausted. A shaft has been sunk below the 320-foot level to a depth of 160 feet on the vein, and a new level is being driven at a depth of 115 feet with the intention of restarting milling operations at the earliest possible opportunity. It does not seem probable that continuous operations can be assured profitably in this way. On the other hand, the work which has been done and the results that have been obtained are distinctly encouraging to a policy of intensive development, by which the entire system of veins on this hill would be made available for ore-supply. As has been mentioned above, a considerable amount of development was done upon one of these veins many years ago. This work was carried out from a shaft sunk to a depth of about 400 feet and the workings have been under water for several years. These workings might be approached by means of continuing the crosscut tunnel beyond the *Enterprise* vein, and such development is warranted. Viewed in this light, the property may be considered as representing one of the best prospects for the district.

Thelma.—Operations upon this property, situated at a distance of 9 miles north of Nicola, were carried on for a short time during the early part of the season, but have since been abandoned owing to financial difficulties and failure to develop ore-bodies of any importance. The crosscut from the bottom of the *Thelma* shaft was driven into the hanging-wall for 90 feet, a short drift was carried from the bottom of the shaft for a distance of about 80 feet, and a small amount of crosscutting was done from it. The ore-body that was found in the upper level was not encountered in these workings. Some work was then done in the *Bernice* shaft, where a small seam of high-grade ore was encountered. It is clear that more systematic development would be required on this property; up to the present time no more than occasional shoots of silver-lead ore in the belt of limestone have been found.

Comstock of B.C., Ltd..—This company owns the *Leadville* group, situated around the summit of Iron mountain near Merritt. The workings are approached by a good auto-road. As described in previous reports, the lead-zinc-silver ore-body occurring in a barite gangue was followed down to a depth of 100 feet with a shaft in which a width of 5 feet of a good-grade lead mineral was exposed. At this depth some faulting had occurred and further sinking was abandoned; following which, operations were suspended until arrangements could be made for less expensive development-work. A portable compressor for power-drills has been taken in, and it is understood that a crosscut tunnel is to be driven to intersect the vein below the shaft-workings, from which lateral development-work will be carried out.

Primary Ore Mining Co..—This company, with headquarters in Vancouver, acquired the *Mary Reynolds* group, east of Stump lake, and for the past two years intermittent attempts have been made to develop the property. Some high-grade silver ore was found in quartzose veins in a zone of alteration in the prevailing greenstone, from which small shipments were made some years ago. Recently a drift to the north from a shaft that had been sunk on this occurrence was continued for a distance of about 35 feet, and indications of the continuation of the high-grade seam, which was supposed to have cut out in this direction, were encountered. A sample from the face of this drift across a width of 2 feet assayed: Gold, 0.10 oz. to the ton; silver, 26.6 oz. to the ton. Some diamond-drilling was also done to explore the possible continuation of this zone towards the south and some prospecting was also carried out in open-cut work on other exposures on the property.

VERNON MINING DIVISION.

Jumbo.—Further prospecting-work has been carried out on this claim, situated near the auto-road at a distance of 2 miles north of Vernon, by H. J. Blurton. In the course of this work some rich specimens of gold quartz have been obtained from a vein which follows a more or less erratic course in a much-disturbed argillite formation. Attention has been called to this property on several previous occasions by the parties interested, and intermittent attempts have been

made to open it up, but no further evidence of continuity, which is hardly to be expected, has been brought out.

Payroll.—Assessment-work on this group of claims, situated on Deep creek, was carried out by H. J. Blurton and associates.

Saint Paul.—Work was continued on this property on Monashee mountain by the Saint Paul Mining Company, with headquarters in New Westminster. Some high-grade silver-lead ore has been obtained from this property, on which the ore occurrence presents some geological problems that have not yet been worked out fully. The mine was visited during the year by C. E. Cairnes, of the Geological Survey of Canada. It appears that the deposit is in the nature of a stockwork, related to a marginal phase of an intrusive rock in which there is a high development of hornblende. At a distance of a few hundred feet from the occurrence of this sulphide ore, from which some fine specimens of jamesonite were obtained, there is a quartz vein carrying considerable pyrite with low gold values in spots. Further development is required on this property.

NON-METALLICS.

Middlesboro Collieries, Ltd.—This company, with its property in the Merritt field, continues to operate with a low average production. Some prospecting-work is being carried on at a coal-deposit near Fintry, on Okanagan Lake. The Gypsum, Lime, and Alabastine Canada, Limited, is operating the gypsum-quarries at Falkland, in the Kamloops Mining Division.

SOUTHERN MINERAL SURVEY DISTRICT (No. 4).

PRELIMINARY REPORT FOR THE YEAR 1930.

BY PHILIP B. FREELAND, RESIDENT MINING ENGINEER (HEADQUARTERS, GRAND FORKS).

GENERAL SUMMARY.

The depression in the mineral industry caused by low metal prices has been felt to some extent in No. 4 District, but not nearly so badly as in other parts of the country. This is due chiefly to the diversification of minerals found in the district. For instance, there are certain belts that are gold-bearing; others that contain high-grade silver; others, silver-lead-zinc; others, copper; and in some of the river-beds, gold and platinum placer. In addition to this, the district is served by a high-power electric line traversing, practically speaking, its whole length, as well as railways and a splendid network of roads and trails. Production is not large, except in copper, but it offers opportunities in most of the stable mineral products used to-day.

In the older mining areas, such as at Greenwood and Grand Forks, there are still opportunities. In these localities, where deep workings are unknown and where 75 per cent. of the country is covered either by soil or recent lavas, and where commercial mineralization is known to have occurred, and where power and transportation facilities exist, intensive geological examination, followed, if satisfactory, by diamond-drilling, may be recommended. There has been a sufficiently extensive mineralization to warrant extensive mining operations, and geologists state the ore-deposits were formed in the Jurassic period, followed later by Tertiary lava-flows which covered large areas of the country. The area referred to stretches from Midway to the Granby river (North fork of the Kettle river) and from the old Copper camp to the International boundary-line; also the gold-belt from Camp McKinney to Hedley.

GRAND FORKS MINING DIVISION.

Union.—The chief operation in this Division is the *Union* mine, which is registered in J. F. McCarthy's name and financed by interests associated with the Hecla Mining Company, of Wallace, Idaho. The mine has been in continuous operation during 1930, except for minor troubles such as plant breakages. Development has been carried on in Nos. 1, 2, and 3 tunnels, and stoping operations above those levels. Nothing has been done in No. 4, except to use it for haulage to the mill of ore mined. No. 4 tunnel has been disappointing so far and only

fragmentary patches of ore have been found. As far as development has gone, the ore has been proven to exist in place for about 40 feet below No. 3 tunnel. Crosscuts to the north failed to find ore. It is possible that some knowledge of the direction of the ore-body may be found when mining the ore below No. 3. The original value of the ore, which assayed from \$9 to \$10 in gold and silver to the ton (chiefly silver), has been enhanced by larger quantities of gold.

Some of the gold-pockets have been spectacular and have assayed up to \$200 a ton in that metal. The average mine-run is much below this figure, but it is doubtful if the operation could have survived the low price of silver if it had not been for the finding of higher gold values. It is not definitely known yet, but the gold appears to occur on and near the contact of a narrow dacite-porphry dyke. Possibly this dyke may have been responsible for the gold-deposition. The ore that contains the gold does not appear to be different to the other mineralization in the mine—namely, pyrite, small quantities of galena, and sphalerite, with hæmatite in the fractures, in a gangue of quartz.

The widths of ore mined vary from 5 to 25 feet and there are no commercial walls, which necessitates taking and assaying about 100 samples a day. Two assayers are employed at this work.

The flow-sheet of the mill, which is crushing about 160 tons a day, on ore that gives a ratio of about 30 tons of rock to 1 of concentrates, is as follows: One jaw-crusher, rolls, one fifteen-sixteenths size rotary screen, two ball-mills, two classifiers, oil-flotation, settling-tank, and one Butler filter-press. The concentrates are sacked and hauled to Lynch Creek Railway-station by two trucks, a distance of about 39 miles, and are shipped to the Trail smelter. About seventy men are employed.

Fife Quarries.—This property is owned by the Consolidated Mining and Smelting Company, and the operation consists of quarrying limestone, which is shipped to the Trail smelter for use as flux in the lead-furnaces.

Rock Candy.—This mine is owned by the Consolidated Mining and Smelting Company. No work was carried on at this property this year, or fluorspar shipped.

PAULSON SECTION.

Halifax.—This group has been optioned to Joe Grafton, Rossland, and a considerable amount of work done which uncovered continued copper, lead-zinc mineralization in the limestone. This area is an interesting one and warrants further exploration.

LIGHTNING PEAK SECTION.

Waterloo Consolidated Mines, Ltd.—This company, with headquarters in Penticton and managed by R. L. Clothier, Edgewood, was the chief operator in this section. The company's property is located on the headwaters of the East fork of the Kettle river. Several shipments of ore were made, over the snow in the early part of the year, containing high silver values and small percentages of lead and zinc. The mineralized part of the vein in the *Waterloo* has been variable in width and continuity. This is due apparently to faulting and to foreign intrusives in the limestones. The high-grade zone appears to rake under the present No. 2 tunnel-workings and it may be looked for when No. 3 tunnel is extended below.

A good deal of work has been done on one of several north and south veins. These range from a few inches to 4 feet in width. A shaft sunk about 20 feet deep uncovered a quartz vein about 10 inches wide consisting of pyrite, galena, sphalerite, and assaying \$7.20 in gold and \$6.40 in silver to the ton. Later samples taken by the owners have assayed as high as \$36 in gold.

This is a decidedly interesting development in the camp, which up to the present has been looked upon as a silver-lead-zinc area. Future developments can be looked forward to. The whole area in the vicinity, which embraces Lightning peak and includes the *Killarney*, *Lightning Peak* group, *Pay Day* group, and others, is an intensely interesting one for prospecting. Owing to a heavy mantle of soil this presents some difficulty, but float can generally be found and the contacts of the diorite, limestone, and schist followed.

The tractor-road has been extended, widened, and surfaced to a great extent up to a point about 9 miles from the junction of the Vernon-Edgewood highway, so that in dry weather it is possible to drive this distance. A geological survey was made of the area this year.

GREENWOOD MINING DIVISION.

WALLACE MOUNTAIN.

Wallace mountain at Beavertown has been well known for many years as a high-grade silver camp. The low price of the metal recently has, of course, decreased production to some extent, but in spite of this the *Bell*, *Highland Lass*, *Sally*, and, part of the time, the *Wellington* mines have been able to operate. The *Wellington* resumed operations recently and more ore has been discovered than at any time previously. The *Bell* and *Highland Lass* are now being operated under one management, and about 1,700 tons will probably be shipped from the *Bell* this year. This will be a record output for the mine.

The *Highland Lass* is experiencing some trouble just at present, due to the block-faulting of the Wallace formation into the quartz-diorite. The Wallace does not contain pay-ore and completely cuts off the shear-zone.

The last two shipments of ore from the lowest workings of the *Wellington* carried more gold than is usually found in the area. It seems possible that as depth is attained more gold will be found, a condition which exists in the Carmi area and which is geologically supposed to be similar to the lower horizon of Wallace mountain. This will assist the silver-producers.

Butcher Boy.—This old mine, owned by P. B. S. Stanhope and R. Kerr, of Midway, is situated beside the *Carmi* mine at Carmi, and has been reopened by J. Carlson, of Carmi, under lease from the owners. The old shaft, 84 feet deep, has been cleaned out and retimbered. A new drift is being driven from the 80-foot level towards the *Carmi* shaft, 600 feet distant. There is also an old drift about 12 feet long on the 40-foot level on an 8-inch vein containing pyrite and galena in a gangue of quartz. Similar ore has been discovered on the 80-foot level, in which there are two veins 6 inches and 8 inches wide respectively. Assays of \$80 in gold to the ton on this ore are reported by the lessee.

CAMP MCKINNEY.

This camp is receiving more attention of late, due to the fact that a comparatively large amount of gold was produced in the *Cariboo* mine thirty years ago. Since that time very little has been done. There are several healthy quartz veins outcropping which in places contain minerals containing gold, but these have not been prospected to any great extent. The ore was found in the *Cariboo* on or near the faults, of which there were many. This condition apparently was not brought into consideration when prospecting the vein extension or other veins, and it may be well to keep it in mind. The rocks that outcrop are schists which have been faulted and folded to a great extent, and which should form an excellent dam for mineralizing solutions.

Pacific Copper Mines, Ltd.—This company, with headquarters at 104 Motor Transport Building, Vancouver, is exploring a group of seventeen claims in the vicinity of the *Old England* and *Victoria* claims, about 2½ miles in a westerly direction from the old main camp. Quartz-vein systems occur in the schist and tuffs and some free gold has been found. It is the intention of the management to explore some of these veins at depth by tunnelling.

ROCK CREEK PLACERS.

A good deal of placer gold has been mined from time to time from the benches on Rock creek. Bed-rock in the present stream has never been worked to any extent. This was due to water, chiefly, and insufficiently powerful pumps in the old days to handle it. It seems likely that much gold may have been concentrated in favourable places from the gradual breaking-down of the benches and glacial material. Prospecting this area with sufficient capital is warranted.

OSOYOOS MINING DIVISION.

The Osoyoos Mining Division has received more attention this season than for many years on account of the large areas of gold-bearing rocks.

The Hedley Gold Mining Company operated the *Nickel Plate* mine at Hedley for the greater part of the year. According to the management, very little profit was made, but through diligent mining a sufficient amount was accumulated to carry on development-work in hopes that larger payable ore-bodies may be found.

Golden Zone.—A syndicate of miners (including S. M. Nechiefman, Princeton) and others have bonded this old group, which lies about 6 miles by road north of the summit on the *Nickel Plate* road.

The old company operating many years ago is said to have sunk the main shaft 100 feet deep and to have driven drifts from the shaft. Another shaft of unknown depth and numerous open-cuts have been excavated on a quartz vein containing pyrite and arsenopyrite. This vein, where seen, averages about 4 feet in width and is sparingly mineralized. Near the main shaft the vein widens and contains a heavier mineralization of arsenopyrite.

A sample from the dump around this shaft assayed: Gold, \$15.20 to the ton; silver, \$1.50 to the ton. Other samples from the vein assayed between \$2 and \$3. The shaft is being unwatered at the present time to find out how much ore is left there. If this looks promising, a tunnel will probably be driven on the vein at a depth of about 100 feet.

Oro Fino.—The old *Oro Fino* and *Independence* claims, situated about 4 miles east of Olalla, have been bonded by E. A. Somerville, of Penticton. New work consists of driving a tunnel about 30 feet long from an open-cut 25 feet long below the old workings on the *Independence*. Very spectacular, narrow, oxidized quartz veins from about 1 to 3 inches wide have been struck near the mouth of the tunnel. At the time of examination, October 25th, 1930, the face of this tunnel was barren. Later advice from Mr. Somerville states that more gold has been struck. The gold is mostly free in the oxidized quartz and is contained in the iron when in sulphide form.

This area has been well known for many years and spectacular samples of gold found, but up to the present no material tonnage has been mined or shipped. The veins are persistent and vary from a few inches to 6 feet in width. The country-rocks are mostly schist. Further development is warranted with the hope of finding tonnage.

B.E. Mining Co.—This company (with headquarters at Leavenworth, Wash.) operated in a small way the adjoining claims to the *Oro Fino* for a short period during the early part of 1930. Development results in the tunnel below the shaft proved unsatisfactory and, owing to a lack of capital, operations ceased temporarily. This is the same type of mineralization as that found in the *Oro Fino*.

Tiger Gold Syndicate.—This property, managed by A. T. Miller, Keremeos, with headquarters at 306 Bower Building, Vancouver, and situated near Similkameen Station on the Great Northern Railway, was not examined this year. Work, it is understood, has been carried on with a small crew on the quartz veins in the schistose area which was developed last year. This is a similar type of deposit to the *Oro Fino*.

Golconda.—The *Golconda*, owned by Dan McEachern, of Keremeos, and located at Olalla, has been developed this year by extending the lower tunnel and putting in upraises on the ore. The ore-zone varies from 1 to 6 feet in width and has been developed for about 155 feet in length. Upraises to the height of 12, 25, and 30 feet above the tunnel have generally improved the width and mineral content of the ore. Sorted ore assayed from 7 to 18 per cent. copper and sorted molybdenite assayed 17 per cent. MoS₂. This is very interesting copper prospect, close to railway transportation, with a narrow road leading to the property.

Whirlwind Peggy.—This group is situated on 20-Mile creek, Hedley, and owned by Dan McKinnon, Ed. Baxter, *et al.*, of Hedley. This year, on what is known as the "Red Tunnel" on the *Whirlwind* claim, a continuation of the bed of oxidized ore was found extending to the westward. It has been discovered that, without crushing, a 50-per-cent. extraction in gold can be made by leaching with cyanide. The owners intend to erect a very small plant, consisting of either wooden or metal tanks, and to pipe water about 6,000 feet. This operation, it is hoped, will supply them with sufficient funds to continue development. There are several open-cuts and short tunnels that have uncovered gold and copper ore. The arsenical iron is generally gold-bearing, so that the proposition for a small amount of capital appears to be attractive. There is 2,000 tons, roughly estimated, of oxidized ore which assays about \$8 a ton in gold.

SIMILKAMEEN MINING DIVISION.

The Granby Mining and Smelting Company's operation on Copper mountain, near Princeton, has been severely hampered by the low price of copper. During part of the year, operations were carried on for only a few days a week, so that the total output of copper from this mine will probably be considerably less than for 1930 than in 1929. The mine closed on November

15th until such time as the price of copper strengthens. The mill when operating averaged 3,000 tons a day or better.

Copper Reef.—This group, lying to the north of and adjoining the Granby Company's holdings on Copper mountain, is being developed by the Consolidated Mining and Smelting Company. Numerous open-cuts have exposed some mineralization containing copper and a diamond-drilling campaign is under way.

SUMMIT CAMP.

The Silver King Mining Company's mine and plant on Treasure mountain, Tulameen, is being operated by Wm. B. Dornberg, of Tulameen. A small mill has been built, consisting of one 10-inch jaw-crusher, two sets of rolls, 12 by 30 and 14 by 30 inches, jigs, and two Wilfley tables. A 50-horse-power Fairbanks-Morse engine operates the plant. After the usual troubles attending the starting of a plant, a car-load of concentrates was shipped, which, it is understood, assayed about 40 per cent. lead and 80 oz. in silver to the ton. This result is very satisfactory. More concentrates have been shipped since.

The idea of the plant is to concentrate the galena ore which carries the silver values and eliminate the zinc product. The ore was mined from stopes in No. 2 tunnel and, although narrow in places, will probably average about 8 inches of galena and sphalerite. The concentrates are hauled 21 miles by truck to Tulameen, from whence it is shipped to Trail.

The success of this operation will mean much to Summit camp, where there are several likely-looking veins of a similar type, owned by Andy Jensen and associates, of Tulameen; and the *Sunbeam* claim, owned by J. Thynne and others, of Tulameen. If the zinc can be successfully eliminated, it is possible, when metal prices are higher, to mine a considerable tonnage in this area.

Lion.—Prospecting for copper on the *Lion* claim on Railroad creek by Dan Vuich, Tulameen, has uncovered interesting mineralization.

On Rabbit mountain copper has also been uncovered in the schists.

The whole area lying between Otter lake and Bear creek is an interesting one. The older rocks, or Tulameen series, are flanked by intrusions of the granite and granodiorite batholith. Along the contacts there are strong indications of copper. Taken as a whole this section is worth examining.

PLACERS.

Numerous failures have been registered again this year in placer operations, due chiefly to insufficient prospecting before mining operations are commenced. The necessity of churn-drilling the bench-gravels and those that are under water has been stressed in Annual Reports for many years past, but without result. It has been pointed out that it is possible to obtain values in gold and platinum on and near the surface in many areas on the Tulameen river, but that the concentrated values, if any, generally lie in the older channels. These are naturally winding and, unless they are traced first, a dredge or drag-line scraper can easily miss the channel. There is a chance to make money from placer-mining on the Tulameen, but due to the way operations have been carried on in past years the river has received a bad name.

On Slate creek the Slate Creek Consolidated Placers, Limited (headquarters, 709 Dominion Bank Building, Vancouver), has driven a tunnel a long distance under the creek. It is announced unofficially that some stream-gravels have been struck and "pay" panned.

The John Guest leases below Coalmont were not operated this year. Between Slate creek and Tulameen, on the river, several bench leases were taken up by J. Guest (headquarters, Prudential Trust Company, Vancouver) and a bridge built over the river. Scaffolding was erected to hold the grizzly and sluice-boxes and foundations were dug for necessary machinery. The operation did not materialize on account of the money promised by French capitalists not being forthcoming. These benches are likely ground for finding gold and platinum, but, like the rest of the river, they should be tested by drilling before the plant is installed and operations commenced. Further financing is under way.

COAL.

Coal-mining at Princeton has been carried on throughout the year, with some of the production going to the domestic market in Vancouver. The outlook for this coal area, of course, depends upon the demand. The possible coal reserves are still very large, and many years' operation may be looked forward to, providing the market demands it.

EASTERN MINERAL SURVEY DISTRICT (No. 5).

PRELIMINARY REPORT FOR THE YEAR 1930.

By B. T. O'GRADY, RESIDENT MINING ENGINEER, AND A. M. RICHMOND, ASSISTANT RESIDENT ENGINEER (HEADQUARTERS, NELSON).

(Reports marked * are by A. M. Richmond.)

GENERAL SUMMARY.

The Eastern Mineral Survey District (No. 5) comprises the following twelve Mining Divisions: Revelstoke, Lardeau, Trout Lake, Slocan, Slocan City, Ainsworth, Nelson, Trail Creek, Arrow Lake, Golden, Windermere, and Fort Steele.

The effect of the abnormally low metal prices has been very severely felt in District No. 5, from which metal production is now mainly silver, lead, and zinc. The Slocan and Ainsworth Divisions, which for many years have contributed substantial amounts of ores and concentrates, have been especially hard hit, and during 1930 production from this area has been confined to occasional small shipments by leasers. Throughout the district independent shippers are marking time and many development operations have been suspended pending an improvement in conditions. The suspension of activity at many small properties has had little effect, however, on the production of the district, which is largely derived from the *Sullivan*. Production was well maintained by this great mine, which had an increased output for the first nine months of 1930. Recently, however, the scope of operations has been slightly reduced. Another factor which contributed to increase production for the nine-month period was the substantial output of concentrates from the *Monarch*, where, unfortunately, the mill was recently shut down, due to the slump in metal prices.

In spite of the depressed condition of industry generally, development, exploration, and prospecting have been continued at a fair rate. Activity in varying degree occurred at some sixty-eight properties, which represents a decrease in the number of operations of, roughly, 50 per cent. as compared with the year 1929. The sustained demand for and investigation of promising prospects by old-established mining companies indicates their confidence in the ultimate recovery of the metal market. Especially this seems to be the case in regard to lead.

Several interesting new discoveries have been made, indicating potentialities for increased production of silver, lead, and zinc under more normal conditions. In this connection the more important factors are the success attained in development at the *Monarch* mine near Field and the extensive showings opened up by the Consolidated Mining and Smelting Company on the *Comfort* and *Kootenay Chief* claims adjoining the *Bluebell* mine on Kootenay lake. Of considerable interest are the recent discovery of good-grade silver-lead-zinc ore on Salmo river north of the *Reeves-MacDonald* and the accidental discovery of large surface showings of zinc-lead ore on the *Albion* group near Vermilion Crossing in Kootenay National Park.

Recent discoveries tend to show that, as pointed out before, systematic and scientific exploration of certain promising mineral-belts and favourable formations within them offers decided possibilities for the discovery of new mines.

There has been a marked revival of interest in gold properties. The *Reno* mine has been in production throughout the period under review and small-scale activities have occurred at the following gold prospects: *Second Relief*, *Queen*, *Ymir-Wilcox*, *Goodenough*, *Bayonne*, *Euphrates*, *Humming Bird*, *California*, *I.X.L.*, *O.K.*, *Midnight*, *Snowdrop*, *Golden Drip*, *Camden*, *Homestake*, and *Running Wolf*. Some production was made by the *Second Relief* (gold bullion and concentrates), *Ymir-Wilcox* (gold bullion), and *Goodenough* (gold-silver-lead ore). Hydraulic placer-mining operations by the French Creek Development Company at its property north of Revelstoke is beginning to show results and about \$2,700 in coarse gold was recovered towards the end of the season.

The tremendous activity by the Consolidated Mining and Smelting Company in connection with the construction of the chemical-fertilizer plant at Trail has provided much employment at a critical time and will eventually be an important addition to the industrial activity of the Province. In connection with this undertaking, two phosphate-deposits are being explored in the East Kootenay, one near Crowsnest and the other at McGillivray.

At the Trail smelter the great new slag-fuming plant, which cost over \$2,000,000, has been brought into operation and notable improvements made in current practice.

HYDRO-ELECTRIC DEVELOPMENT.

Largely in connection with the fertilizer undertaking, additional power facilities are being provided by the West Kootenay Power and Light Company, the subsidiary company of the Consolidated Mining and Smelting Company. A large force of men is at work in connection with construction of a fourth plant on the Kootenay river at Corra Linn falls to develop at least 30,000 horse-power. This new plant will bring this company's capacity on the Kootenay river to about 197,000 horse-power. The same company proposes to construct a huge dam on the Pend d'Oreille river which ultimately will result in the additional development of over 200,000 horse-power. This will constitute the largest power-development in the Province. The site of the big dam is on the Pend d'Oreille river, about 1 mile above its confluence with the Columbia river. Borings recently completed have demonstrated that a suitable footing can be obtained for the dam, which will be some 365 feet or more in height above the bed of the river.

GEOLOGICAL SURVEY WORK.

Much information of economic and scientific interest is contained in the recently published Memoir 161, Geological Survey of Canada, entitled "Lardeau Map-area, with General Geology by J. F. Walker and M. F. Bancroft and Mineral Deposits by H. C. Gunning."

During the past field season B. R. MacKay made a study of the Corbin coal area in the East Kootenay. This lies about 12 miles south of Crowsnest pass and within 2 miles of the British Columbia-Alberta boundary.

GOLDEN MINING DIVISION.

Monarch.—At this mine, near Field, the results of development of the west *Monarch* ore-body continue to be very satisfactory. When the property was visited in October this deposit had been proved to extend for a length of about 1,350 feet, substantially increasing known ore reserves. Metallurgical results attained by F. R. Eichelberger, in charge of operations for Base Metals Mining Corporation, Limited, established a high standard in extraction and in the grade of lead and zinc concentrates produced. From 300 to 325 tons a day were treated in the mill. Mining and concentrating costs were exceptionally low for an operation of this scale. Milling was discontinued on October 15th, as it was considered advisable to conserve ore reserves for a better market and concentrate on mine-development. The East and West ore-bodies will be further explored and a production incline-working is being driven to facilitate ore-extraction.

Giant.—At this property, situated near Spillimacheen, south of Golden, exploration by diamond-drilling was carried on throughout the summer and fall. This work, financed by A. B. Trites, was done under the direction of J. L. Parker, mining engineer of Vancouver.

Ruth-Vermont.—This silver-lead-zinc property, situated on Vermont creek, was examined by the writer in connection with an application for assistance towards improving transportation. No activity, other than assessment-work, occurred during the period under review. A description of the deposits will be published in the forthcoming Annual Report for 1930.

*Witwatersrand Syndicate, Ltd.**—During 1930 the Witwatersrand Syndicate, Limited, of which G. W. Edwards, of Parsons, is manager, has employed a crew of fourteen to sixteen men at its McMurdo Creek property. The claims are located at the headwaters of the North fork of McMurdo creek, 40 miles by rough caterpillar-tractor trail from the Columbia river at Parsons. Late in 1929 a portable compressor, necessary power-drills, etc., were installed by the company, and during 1930 several hundred feet of underground work has been driven under the "A" showing, a low-grade replacement of lead-zinc mineralization in banded limestone and chlorite-schist. At the time of the writer's visit in August this new development had a considerable distance to go before entering the supposed downward extension of the mineralization. Recent reports from the property have not indicated the results of this further drifting.

United Copper.—At this group of ten claims on Bugaboo creek surface prospecting was done under the direction of George Weltman, who had bonded the property from H. W. Conover and R. McKeeman, of Castledale.

*Albion Group.**—During the construction of a trail in Kootenay National Park, one of the workmen, F. W. Jowett by name, picked into a large boulder of lead-zinc float. Hiding his

discovery and returning on completion of the trail with his partner, Ed. Morigeau, of Athalmer, mineralization in place was discovered; six claims were staked and recorded at Wilmer, subject to the approval of the Federal Parks Board. The claims were located $1\frac{1}{2}$ miles up Hawk creek, a short tributary of the Vermilion river, from the Banff-Windermere highway, and are reached by motor-road from either Castle mountain or Radium Hot Springs. An excellent trail connects the road and claims.

When visited in August, 1930, a limited amount of surface-trenching had exposed a width of 12 to 14 feet of zinc-lead replacement mineralization in grey limestone. Two open-cuts, for convenience called upper and lower respectively, had disclosed ore across a combined width of 14 feet, with neither wall disclosed. Subsequent trenching at this point has shown a width of 25 feet of zinc ore averaging 30 per cent. metal. A channel sample across 6 feet in the upper open-cut assayed: Gold, 0.05 oz. to the ton; silver, 1.6 oz. to the ton; lead, 4.3 per cent.; zinc, 30.6 per cent. A check sample over a width of 8 feet taken by an independent engineer gave: Lead, 9.2 per cent.; zinc, 28.9 per cent. Another channel sample on an adjacent and parallel band of mineralization in the lower open-cut across a width of 6 feet assayed: Lead, 0.5 per cent.; zinc, 36 per cent.

This prospect showing is encouraging and is worth the expenditure of a considerable amount of money in its development if the necessary permission from the Parks Board can be obtained.

*Quartz Creek.**—A small amount of surface-trenching and open-cut work was accomplished at this property, located 16 to 17 miles south of Beaver mouth on Quartz creek. The showings, which are somewhat indefinite in character, are low-grade copper, one channel sample across 100 inches assaying 0.57 per cent. copper. Selected ore from the upper open-cut of three gave 1.41 per cent. copper on assay. T. Edwards, S. Indebrigsten, *et al.*, of Revelstoke, are the owners of this group of four claims.

* Minor prospecting activities have been reported from the *White Cat* group on Slade creek, owned by J. C. Pitts, of Invermere; from the *Bald Eagle* group on Slade creek, owned by J. Burman; and the *Silver Spray* group, owned by M. McLeod.

*Zinc Mountain.**—This group of claims, situated near the head of Moose creek at the southern edge of Yoho National Park, was actively developed during the summer months by the Zinc Mountain Mining Company; F. Henderson, of Calgary, president. The results were not encouraging and it has been reported that development-work has been suspended for the present.

WINDERMERE MINING DIVISION.

Mineral King.—At this property, situated on Toby creek, a small crew of men was employed during part of the season in driving a crosscut tunnel to test the westerly extension of the vein at depth. This work was being financed by interests represented by F. R. Eichelberger, of Field.

FORT STEELE MINING DIVISION.

Sullivan.—This mine at Kimberley is the source of the bulk of District No. 5 production of silver, lead, and zinc. Owing to the immense size of the deposit and the huge quantity of ore passing through the mill daily, working-costs have been achieved which will compare favourably with any lead-zinc mine in the world. As the Consolidated Mining and Smelting Company conducts all operations, from extracting the ore to producing the refined metals, and makes most of its own machinery, it benefits by all profits from its operation and is able to work the *Sullivan* under the best possible conditions. The increased production recorded for the first nine months of 1930 has to some extent offset the low prices of lead and zinc, but recently the scope of operations was somewhat restricted in mine and mill.

In the mine new sections of the ore-body have been opened up and measurable ore reserves have been substantially increased. Recent work indicates that the north and south ore-zones belong in reality to one huge ore-body, no physical boundary being apparent between the two deposits, which are separated by areas of low-grade lead-zinc mineralization workable under favourable conditions. Diamond-drilling exploration is reported to have proved the ore to extend to at least 2,000 feet, measured on the dip of the deposit, below the 3,900-foot or lower level, and a winze is being sunk on the ore-body from this level to open up the diamond-drilled areas at deep horizons.

*Kootenay King.**—No activity has been reported from this property, situated on the north slope of Wild Horse creek, 11 miles north-east of Fort Steele, since the Britannia Mining and Smelting Company dropped its option and withdrew from the claims on December 1st, 1929.

Boy Scout.—On this property, comprising nine claims on Hellroaring creek, exploration has been continued in the lower tunnel-workings. The ore, consisting of argentiferous galena, sphalerite, and pyrite, occurs in a wide zone of shearing in quartzite and argillaceous rocks. The work is financed by the principal owner, A. H. Mayland, of Calgary.

Homestake.—Situated on Perry creek, this gold property is owned by the Cranbrook Gold Mining Company. Work done during 1930 includes retimbering of the old tunnel and about 40 feet of drifting in the Scorgie tunnel. Only a brief inspection was made as snow prevented an examination of the surface showings when the property was visited at the end of October. Numerous references to the *Homestake* are contained in past Annual Reports, perhaps the most comprehensive description of the Perry Creek quartz veins being contained in the Annual Report for 1898 by the late W. Fleet Robertson.

Running Wolf.—Some activity recently developed in connection with this property on French creek, a tributary of Perry creek. Malcolm Horie and associates, of Cranbrook, have been reconditioning the old tunnels and sampling the gold-quartz veins, which are similar to the *Homestake* deposits.

Bird Prospect.—Bird Bros. have been prospecting their gold-quartz property on Perry creek. The workings are located along the extension of the *Homestake* vein system.

B. and V.—Some further exploratory work has been done on this prospect, situated southwest of Cranbrook, by B. Frisia and associates, of Cranbrook, including about 84 feet of tunnel driven last winter. The ore is chiefly galena containing low silver values. Several references to the property are contained in earlier Annual Reports.

Empire and Strathcona.—At this copper prospect, near Galloway, minor activity occurred during the early part of the year. The property, owned by the Sir Sam Steele Estate, is under lease and bond to the Park City Mining Company, of Lethbridge, Alberta. Disseminations and stringers of chalcopyrite occur in a wide vein in which the gangue is largely composed of calcite with some quartz.

PHOSPHATE.

Two deposits of phosphate are being developed by the Consolidated Mining and Smelting Company, one near Crowsnest and the other at McGillivray. Work has been discontinued at the Lizard Creek property which was being explored in 1929. The Crowsnest deposit, apparently the most important so far explored, is situated about three-quarters of a mile from the railway at a point some 2 miles north-west of Crowsnest Station. The work in progress, mainly to determine the grade and width of the phosphate-beds below the weathered and disturbed areas close to the outcrops, and to get accurate information as to production costs and quantities available of a grade suitable for the manufacture of superphosphate, consists of crosscut tunnels to the beds and drifts along them, with raises and crosscuts at intervals for cross-sections of the formation. As far as exploration has proceeded the important beds of oolitic phosphate have in general proved to be narrow, but persistent, with a fairly regular content of phosphoric acid. In the case of the Crowsnest deposit, however, greater widths have been found where there has been folding and overlapping of beds in certain sections. At 4,600 feet elevation a crosscut 250 feet in length has been driven to cut the beds at the contact of the Fernie and Upper Banff shales. From the crosscut some 2,700 feet of drifting to the north had been done to the end of October. A raise had been put up about 650 feet to explore a thick section of phosphate which has a length of about 400 feet along the drift. Similar thick sections are developed in other portions of the drift.

Similar exploration, less advanced, is in progress at the McGillivray property. Leo Telfer is in charge of the phosphate properties, some seventy-five men being employed.

GYP SUM.

No gypsum was mined by the Canada Cement Company on its property near Mayook, 15 miles easterly from Cranbrook. Several thousand tons were mined in 1929 and shipped to the cement-works at Exshaw, in Alberta.

PETROLEUM.

An interesting summary of drilling operations carried out in the Flathead Valley oil-field by G. H. Kirkpatrick, of Vancouver, is contained in the June and July issues of the *British Columbia Miner*, published in Vancouver. The article also contains considerable information regarding the

geological work done in the area. Owing to various circumstances drilling operations have been handicapped, but evidently exploration is to be pushed to full conclusions.

Near Dorr, south of Elko, a new undertaking was recently initiated when drilling operations were begun. Full information regarding this proposition is not yet available. In the same vicinity a large number of oil leases is reported to have been acquired by J. W. Mulholland, of Nelson, and a company is reported to have been formed to undertake exploration of the area.

SLOCAN MINING DIVISION.*

The drastic decrease in the price of lead, zinc, and silver in the early months of 1930, together with the failure and curtailment of mine-development expenses by interested brokerage-houses, has been responsible for the very quiet conditions which now prevail in Slocan mining centres. The brief summary which follows, when compared with the Annual Report for 1929, will indicate this very noticeable decrease in mine operation. To offset this falling-off in production there has been an increased amount of prospecting by men formerly engaged in operating jobs around the mines.

No increased activity from the Slocan camp, which includes those portions of the Ainsworth and Slocan Mining Divisions served by the Kaslo-Nakusp Railway, can be expected until silver, lead, and zinc prices show an appreciable advance over their present level. When such an advance will take place is impossible to predict with any accuracy, the consensus of authoritative opinion being that lead prices should improve first, with zinc and silver prices being left to the righting stability of supply and demand.

ZINCTON.

*Lucky Jim.**—Development-work at this property, situated at Zincton, on the Kaslo-Nakusp Railway, was suspended at the end of January, 1930, and the property has been in charge of a watchman since that date.

SANDON CAMP.

*Ruth-Hope.**—Mining and milling operations conducted by the Ruth Hope Mining Company at its property at Sandon were stopped on February 18th, 1930. During the past summer two leasers working in the old *Ruth* upper workings shipped a car of sorted ore. Recently a crew of four men, under the supervision of H. A. Rose, has been employed in timbering, pumping, and reconditioning the lower workings of the *Ruth-Hope* mine to guard against possible damage from caving ground in the stoping areas.

*Noble Five.**—Since curtailing mining and milling operations in March, 1930, there has been no appreciable amount of development-work done at this property, situated 1½ miles east of Sandon.

*Silversmith.**—This property, situated at Sandon and owned by the Silversmith Mines, Limited (John B. White, president), has been idle for the greater part of 1930. Late in the fall A. Olsen, former mine superintendent at the *Silversmith*, obtained a working lease on a 25-per-cent. royalty basis and employed a crew of fourteen to sixteen men in reconditioning the aerial tramway, the mine stopes above the *Silversmith* No. 10 level, and the jig and table portions of the *Silversmith* mill. After mining approximately 850 tons of ore containing 5 per cent. lead and 10 oz. silver to the ton, and shipping one car of clean ore and one car of jig and table lead concentrates, it was found impossible to operate on a paying basis and the mill was closed down. It is the intention of Mr. Olsen to employ six or seven men during the winter months in underground mining and to ship a sorted product to the smelter.

*Canadian Brandon.**—This property, adjoining the *Ivanhoe* group, is situated on Silver ridge, west of Sandon. During 1930 extensive repairs were made to the trail serving this property and a few men have been employed on contract drifting in the No. 2 level under the direction of H. A. Rose, superintendent of the *Ruth-Hope* Mining Company, which company holds an option on a four-fifths interest in the *Canadian Brandon* group.

*Carnation.**—This property, owned by A. R. Mann and associates, is situated west of Sandon, on Silver ridge, and is served by a good caterpillar-tractor road. Following an enforced shut-down in the early spring months due to water-shortage at the camp, further underground development-work on the No. 3 level tunnel was undertaken during the summer months. The property is now shut down pending a decision of the owners as to future plans.

*Wonderful.**—This property, situated a short distance north of Sandon, on the west side of Carpenter creek, was prospected during the first half of 1930 by the Standard Silver-Lead

Mining Company under the direction of W. H. North. Results were disappointing to this company and the option was dropped. Recently Clarence Cunningham, of the Cunningham Mines, Limited, has employed two men on contract drifting at the *Wonderful* property in further prospecting.

*Black Colt and Queen Bess.**—These two properties, situated on the ridge north and west of Sandon, have been actively developed the major part of 1930 by the Paulsen-Porter interests of Spokane. At the present time a crew of ten men at each property is engaged in development and exploratory tunnelling. At the *Black Colt* a drift is being driven from the lower level towards *Queen Bess* ground, and it is estimated 800 feet of drifting will reach a point 350 feet vertically below the No. 10 level of the latter property, when suitable raise connections will be made. Two crews are engaged in driving a sub-level above the *Black Colt* No. 3 and a new adit-tunnel to meet the sub-level above the No. 1 level of the *Black Colt*.

At the *Queen Bess* property the crew of ten men is driving a crosscut from No. 5 level to meet the "B" vein at a point opposite the once famous *Queen Bess* stoep. Approximately 300 feet out of a total of 350 feet has been driven to date. It is planned to continue development-work throughout the winter months. Both operations are under the direction of Clarence Cunningham.

*Mountain Con.**—This property, situated 9 miles south-east of Sandon, at the head of Carpenter creek, has been further developed during 1930 by one of the original stakers, R. McLeod, of Edmonton. A crew of three to four men on contract-work extended the No. 4 tunnel (lower) north-easterly along the vein system for 100 feet, and drove a raise from near the face up along the vein for 110 feet in an endeavour to pick up lenses of high-grade silver ore, for which this small property was best known. The results at the time of examination, late in the fall, were not encouraging and it is understood that work for the present season has been discontinued.

*Bluebird.**—This property, owned by the Bluebird Mines, Limited (W. H. Burgess, managing director), is situated on the divide between the *Noble Five* and Jackson basin. Work in the Stranger tunnel on the Jackson Basin side of the ridge was discontinued early in 1930 after unsuccessful attempts to locate the vein had been made. Upon suspension of work in the Stranger tunnel a contract was let to D. McLellan *et al.* for the extension of the *Idaho* No. 2 tunnel on the Carpenter Creek side of the ridge. A portable compressor and machine-drills were purchased and good progress is being made in this work. Recent reports from the property have not indicated what results are being obtained.

*Altoona.**—A small crew under the direction of A. J. Murphy, of Sandon, has been employed at this group, situated on the Sandon-Three Forks road, 1½ miles north of Sandon. During the summer a large outcrop of zinc mineralization was uncovered by stripping to the north-east of the No. 1 level portal. Two separate occurrences, approximately 10½ and 11½ feet in width on either side of a 4-foot quartz-porphry dyke, were channel-sampled with disappointing results. The average assay of two samples over the 10½-foot width was: Gold, 0.025 oz. to the ton; silver, 2.1 oz. to the ton; lead, *nil*; zinc, 4 per cent. The average assay of two samples over the 11½-foot width was: Gold, 0.02 oz. to the ton; silver, 1.9 oz. to the ton; lead, 0.05 per cent.; zinc, 2.75 per cent. A short crosscut was being driven from the No. 1 level to get under this showing and at the time of examination in the fall had 20 to 30 feet still to go.

*Mary Ryan.**—A small amount of underground work was done at this property, situated in McGuigan basin, early in 1930 by the Mary Ryan Mines, Limited, under the direction of R. Wolthausen. A geological survey of the property was made during the summer by E. C. Annes, of Vancouver.

Minor activities that have been reported during 1930 are: Further prospecting at the *Monitor* and *Western*, near Three Forks, by George Gormley; small mining operation at the *Victor*, in the same vicinity, owned by George Petty; and at the *Helenita* or *Rio*, in Jackson basin, where a small amount of mining under lease has been done by S. Marzoli and associates.

*Galena Farm.**—The Galena Farm Consolidated Mines, Limited, property, situated 1½ miles south of Silverton, has been closed down since early February, 1930, with the exception of one or two months in the spring, when the *Galena Farm* unit was worked under a development lease by eight Silverton miners. The ore recovered in development-work by the lessees was milled and the concentrates shipped to Trail, the resulting returns being sufficient to give the lessees day wages. Decreases in the prices of lead and zinc forced a shut-down and the property is now idle.

Van Roi.*—This property, owned by the Van Roi Mines, Limited, and situated adjacent to and east of the *Hewitt* unit of the Galena Farm Consolidated holdings, has been forced to curtail its development programme for financial reasons. During the first months of the year exploratory drifting and development raising on the upper levels of the South vein met with encouraging results. The crew has since been reduced to two men, who have spent the summer as watchmen and in reconditioning the camp and reconstructing the flume.

Mammoth.*—This property, owned by the Western Exploration Company (R. A. Grimes, manager), situated on Silverton creek, has been fully equipped for production on the basis of 100 tons a day. The construction and equipment programme was completed by March 1st, 1930, since which time the plant has been idle, due to low metal prices. Development-work at the mine consisted of driving a 400-foot crosscut from the No. 4 level of the *Mammoth* into the hill to locate water and prospect new ground. Development-work at the mine has now been curtailed and reopening will of necessity depend on improved metal markets.

NEW DENVER.*

Lessees have been active at the *Bosun*, situated on the shores of Slocan lake, near New Denver, and several cars of lead-jig concentrates from the old dumps have been obtained and shipped to Trail smelter. Lessees have also shipped sorted ore from parts of the old *Standard* workings.

SLOCAN CITY MINING DIVISION.*

There has been little mining activity in this Division during the past season. The operation of the Stobie-Forlong interests in the *Enterprise* property on Enterprise creek has been closed and no plans for the near future are known. There has, however, been considerable prospecting in the area surrounding Slocan. George Stoll, of Nelson, discovered a narrow gold-quartz vein below the old *King Jack* property on Chapleau creek, from which he has obtained good gold assays over narrow widths, one sample returning him \$140 in gold to the ton. Further prospecting and development was also reported from the *Coronation* group on Memphis (12-Mile) creek, where James White has been working, and from R. D. Kennedy's claims adjacent to the *Hope* No. 2 property of the Piedmont Mines, Limited.

AINSWORTH MINING DIVISION.

PROPERTIES TRIBUTARY TO THE KASLO-NAKUSP RAILWAY.

Whitewater.*—This property, situated at Retallack, has been idle since February 1st, 1930, when all development-work was stopped and conditions are as last reported in the 1929 Annual Report.

Wellington.*—This property, owned by the Wellington Mines, Limited, is situated to the west of the *Whitewater* on the Kaslo-Nakusp Railway. After an extensive development and exploration campaign, which met with disappointing results, the company has curtailed operations and at the present time the property is idle.

KEEN CREEK AREA.

Cork-Province.*—Conditions at this property, owned by the Cork-Province Mines, Limited (W. H. Burgess, manager), and situated on the south side of Keen creek, 4 miles from Zwicky, are as last reported in the 1929 Annual Report, there having been no change during the past season.

Revenue.*—Following shipments of sorted ore from this property, situated on Sturgis creek (a tributary of Keen creek), by the Sturgis Creek Mines, Limited (F. T. Harbour, manager), operations were curtailed, and during the past season only a limited amount of development and prospecting has been done.

* Minor operations are reported from the *Silver Bear* on Keen creek, where F. Helme has continued small mining operations; and at the *Flint* on Dago creek, where J. A. Carter and son have continued development-work.

KOOTENAY LAKE AND AINSWORTH.

Comfort and Kootenay Chief.—The leading operation in this area was that by the Consolidated Mining and Smelting Company on the *Comfort* and *Kootenay Chief*, which adjoin the *Blue Bell* mine to the north and south respectively. Substantial showings of silver-lead-zinc ore

were opened up in the new workings on both claims, more especially on the lowest level of the *Comfort*, where the lead content of the ore predominates over the zinc. Work was discontinued on October 1st, presumably in line with the general policy of curtailment of this company's outside activities during the prevailing depressed conditions of the metal market. Exploration on the *Comfort* had reached the stage where further equipment was necessary to reduce development and pumping costs.

Mineral Dyke.—Exploration of this property, south-east of Walker Landing on Kootenay lake, has been discontinued by the Consolidated Mining and Smelting Company and its option dropped.

R.F.G..—Exploration was carried out during the past season by the Princess Creek Mining Company on its *R.F.G.* group, adjoining the *Kootenay-Florence*. Crosscutting was done by hand, the work being done under the direction of E. J. Edwards, of Spokane.

Banker.—At this property, close to Ainsworth, exceptionally good showings of silver-lead-zinc ore were opened up during leasing operations by Andy Garrett, Ray Hughes, and associates, of Kaslo. The mine and adjacent property, which takes in part of the Ainsworth townsite, was recently acquired by H. S. Fry, representing Portland capitalists. It is not expected, however, that any extensive work will be undertaken until there is an improvement in metal prices, particularly in regard to lead.

HOWSER LAKE AND DUNCAN RIVER.

Riverside.—Situated on the eastern side of the Duncan river, south of McGuire creek, exploration was resumed in April and continued until the fall by the Omo Mines Corporation, of Spokane. A. Sorenson was in charge of a small crew engaged in driving a crosscut tunnel to test the vein at depth. The property is at present handicapped by difficult transportation conditions in winter.

President.—Work was resumed at this property, situated on the western side of Howser lake, towards the end of April and exploratory work was continued in the lowest (or No. 4) tunnel. R. S. Gallop has directed the work for President Mines, Limited, of Victoria.

Minor prospecting activities in the Duncan River area are reported by owners of claims on Hall creek (Cyrus K. Brown) and Gertrude creek (D. D. McPhail). On Hamill creek, south-easterly from Howser, J. Brochier has been prospecting on the *St. Patrick*.

POPLAR CAMP.

Minor exploratory activities occurred at the *White Eagle* and *Comstock* on Cascade creek. Joe Gallo had a few men working on the *Green* property on the divide between Cascade and Poplar creeks.

Lardeau River Placers.—In Bulletin No. 1, 1929, attention was drawn to promotional literature issued by R. W. Elsom and Company, of Spokane, in regard to a proposed placer-dredging proposition on the Lardeau river from Gold Hill south-easterly. The first activity developed on June 1st of the present year, when a drilling-rig was set up at Gold Hill. The outfit consists of a No. 3 size Keystone traction-type, churn-drill complete with tools and some casing. The site for the first hole is located on a bench about 40 feet above the river-level and a few hundred feet easterly from the tracks of the Lardeau-Gerrard branch of the Canadian Pacific Railway. One test-hole was put down to a depth of from 25 to 30 feet. The drilling outfit was left on the ground and no activity has since been reported. More confidence would be felt in this proposition if the services of a reliable engineer were secured to direct systematic testing of the area. Past attempts to win gold from the Lardeau river are briefly summarized by H. C. Gunning in Memoir 161, "Lardeau Map-area," pages 110 and 111, Geological Survey of Canada, as follows:—

"Placer-mining has received but little attention in the Lardeau. In 1890 some shafts were sunk in the bench on the side of Lardeau river a short distance below 10-Mile, and some gold was found. Since that time a few attempts have been made to discover profitable ground in the vicinity. Peter Culkeen did considerable trenching, sluicing, and hydraulicking just above the falls in Lardeau river below 10-Mile. He is reported to have found gold in small amounts, but no profitable extraction is recorded. Small amounts of gold have been found in the bars of the river, near Trout lake, and at one time a dam and flume were constructed by an American company. The operations, unsuccessful, were discontinued after one season.

"A determined attempt was made in 1903 and again in 1914 to win placer gold from the gravels of Lardeau river between Poplar and Cascade creek. The operations have been unsuc-

cessful and the old dredge employed in the latter year may still be seen above the railroad-bridge near Gold Hill. The work done has shown that there are some good values in the gravels, but large boulders, which are abundant, have prevented profitable working with the machinery employed.

"Mr. Board, of Howser, reports that about 25 oz. of gold have been taken from Lardeau river between Howser Station and Poplar, and that the gold was in fine flakes of $\frac{1}{8}$ inch diameter or less. He has thoroughly prospected the bars between these places and does not think that there is much profit to be made therefrom. It is also reported that considerable gold was taken from Cascade creek by Chinamen in 1915, but there is no means of ascertaining how much. The low pass between Howser and Howser Station has been prospected by shafts, but no values have been found.

"The source of the gold in the placers is undoubtedly the numerous gold-quartz veins and the gold-bearing sulphide deposits of the district. On the whole, there seems to be little reason to believe that placer-mining will ever become important in the Lardeau. The district has been heavily glaciated and it is unlikely that any pre-glacial placers will be found. The difficulties of water in the gravels and large boulders have so far discouraged operations after brief intervals of activity."

REVELSTOKE MINING DIVISION.

BIG BEND SECTION.

Placer-mining.

Hydraulic mining operations carried on by the French Creek Development Company on its placer leases are beginning to show results, and towards the end of the season \$2,700 in coarse gold was recovered from 900 cubic yards of gravel, according to the report of W. G. Watson, president and managing director, of Vancouver. N. Remillard, of Revelstoke, is in charge of the property.

Lode-mining.

A. and E.—Prospecting was continued by A. Kitson, of Revelstoke, on this group of claims, situated on Kelly creek. This prospect is referred to in the Annual Report for 1929.

Stimulated by the construction of the Big Bend road, now well advanced, some activity developed among prospectors owning claims in the tributary area.

SECTION EAST OF REVELSTOKE.

*Snowflake.**—This property, owned by the Snowflake Mining Company, is situated on Woolsey creek, 8 miles from the main line of the Canadian Pacific Railway. During the early part of 1930 a small crew was employed in lateral development-work from the main connecting raise from No. 4 level east drift. This development-work was curtailed and the east drift was extended into the Regal Silver Company's ground for approximately 300 feet on the No. 4 level for the latter company. All work was stopped at the end of August and when the district was visited in October the camp was closed. Recent reports are that new financing is to be arranged, but future plans for this company are at present unknown.

*Regal Silver Mines, Ltd.**—This property, owned by the Regal Silver Mines, Limited, adjoins the *Snowflake* to the south-east. A crew varying from twenty-four to ten men has been employed throughout 1930 in the development of the quartz vein opened up on the No. 10 level (lowest level) of the property. Many hundreds of feet of raising and development drifting on the No. 9 and No. 8 levels have added considerably to the knowledge of the vein. New surveys and assay plans for the property have been prepared and a study of the same would indicate little mineralization of commercial importance. The lower (or No. 4) tunnel of the *Snowflake* was extended into Regal Silver ground for about 300 feet and some stannite mineralization over a comparatively short length and narrow widths was found. Over a total length of 60 feet and across widths varying from $1\frac{1}{2}$ to 3 feet assays varying as follows were obtained: Silver, trace to 2.5 oz. to the ton; lead, *nil* to 4.5 per cent.; zinc, trace to 3.5 per cent.; tin, *nil* to 3.2 per cent.; copper, *nil* to 2.9 per cent.; with the greater number of the assays being nearer the lower limits given. Work at the present time is being proceeded with on two faces in the No. 8 level tunnel of the property with a crew of ten men.

*Klondyke.**—Recent reports from Albert Canyon indicate that a small crew has been employed by the Alco Syndicate, under C. Arnold, in prospecting and surface-trenching claims 9 miles up Tangier creek.

*Woolsey Mines, Ltd.**—Further development-work at this property, situated 3 miles by trail from Flat Creek Siding on the Canadian Pacific Railway, has been reported during 1930. Eastern interests who have been supplying capital, however, curtailed expenses at the beginning of October, since which time little has been done.

SECTION SOUTH OF REVELSTOKE.

*Wigwam.**—This group, owned by the Wigwam Mining Company, of Tacoma, Wash. (W. T. Dumbleton, manager), is situated 6 miles by road up the Akolkolex river from Wigwam, on the Revelstoke-Arrowhead branch of the Canadian Pacific Railway. Eighteen men have been employed through the summer months, gravelling the road and in surface and underground prospecting at the property, which has been described in some detail in Memoir No. 161, pages 101-103, by H. C. Gunning, of the Geological Survey of Canada, issued during 1930.

New equipment added during the summer consisted of a tractor-engine-driven compressor, machine-drills, and necessary auxiliary equipment. It is planned to employ eight to ten men in underground development during the winter months.

LARDEAU MINING DIVISION.

Lead Star.—At this group of six claims, situated on the Stephney branch of Sable creek, 5 miles by trail from the road north of Camborne, development has been continued by Duncan McIntosh, of Cranbrook, with three miners. A description of the geology of the property is contained in the recently issued Memoir 161, "Lardeau Map-area," Geological Survey of Canada. Since the property was examined by H. C. Gunning, author of "Mineral Deposits" in this publication, a substantial amount of work has been done. A tunnel is being driven to develop the downward continuation of a shoot of galena opened up in a 50-foot winze sunk from the upper tunnel and from which 15 tons of sorted galena was shipped last winter.

*Multiplex.**—Active development-work at this property, situated on Pool creek, has been discontinued by Eastern Canadian interests represented by A. Rennick. It is understood that, should market conditions and financing permit, the lower tunnel below No. 6 level will be extended another 20 to 30 feet to intersect the possible downward continuation of ore shown on the map on page 341 of the 1929 Annual Report. The property is owned by the Multiplex Mining, Milling, and Power Company, Limited, and O. T. Bibb is manager.

ARROW LAKE MINING DIVISION.*

There has been an increased prospecting activity in this Mining Division in 1930 around the Burton City area, and minor operations have been reported at the *Chieftain* on Caribou creek, where Vancouver interests mined and sacked several tons of ore for shipment; at the *Poorman* on Blue Grouse creek, near Mineral City, where S. Bradley *et al.* have been engaged in tunnelling and trenching on newly staked ground; at the *Ora Grande*, where J. C. Anderson has continued prospecting; at the *Silver Queen* on Snow creek, where J. Gayford has continued prospecting; at the *Caribou Ace* on Caribou creek, where D. J. Cleveland, of Vancouver, has employed a few men prospecting during the summer months; and at the *Paradise* and *Renown* on the Vernon-Edgewood road, where R. Sheill has continued prospecting and developing gold-bearing quartz veins near the *Meadow View No. 2*.

*Hailstorm.**—Development-work at this group, at the head of Canyon creek, was resumed by the Consolidated Mining and Smelting Company early in the spring and was continued until recently, when the crew and equipment were withdrawn. Underground work, drifting, cross-cutting, and raising from the crosscut tunnel described in the 1929 Annual Report failed to find the downward continuation of the promising surface silver mineralization and accordingly the property has been abandoned.

*Meadowview.**—This property, controlled by the Cotton Belt Mines, Limited, under the direction of B. F. Lundy, is situated 30 miles north-west of Edgewood on the Vernon-Edgewood road. Underground development-work conducted through the early months of the year was stopped in March because of the low-grade values obtained in the drifts driven from the low-level crosscut tunnel. Since the property was visited in June it is reported that a small amount

of exploratory work was done by the company, with disappointing results, and they have closed down the camp for the present.

TROUT LAKE MINING DIVISION.

Spyglass.—On this group of claims, situated on Poplar creek, exploratory work on a small scale was carried on during part of the season under the technical direction of E. Foley Bennett, of Penticton. An active programme of development is planned for next year.

FERGUSON CAMP.

True Fissure.—At this property, near Ferguson, a 100-ton flotation-mill has been erected on the level of "C" tunnel adit, 259 feet above the level of the Morgan crosscut or lowest tunnel, and a hydro-electric plant has been installed on Ferguson creek below the townsite. Both plants were erected under contract by the Nelson Iron Works, the mill flow-sheet having been designed by W. L. Sheeler, of Silverton.

Considerable surprise has been caused by this large expenditure on mill and power plant under existing adverse conditions of the metal market and so much in advance of ore-development in the mine. In the Annual Report for 1929 attention was directed to the advisability of proving sufficient ore reserves before mill-construction was undertaken. It was also pointed out that the mill, when warranted by future work, should preferably be located either on Ferguson creek at the foot of the mountain, where there is ample water for a mill, or at Trout Lake, where barge connection could be established with the railway at Gerrard. These views are endorsed by reliable engineers familiar with the conditions. The reason for this premature mill-construction is understood to be that the late G. F. Park, of Cincinnati, who had personally financed work in the mine for many years, was anxious to bring the mine into production. He died during the construction of the mill, but made provision in his will for completion of the work. The Latonia Milling Company was formed to finance installation of the mill and operate it under an agreement with the True Fissure Mining and Milling Company, Limited. The following mining equipment was recently purchased from the Canadian Ingersoll-Rand Company: 500-cubic-foot (actual) capacity compressor, drifter, stoper, and jack-hammer rock-drilling machines, oil-furnace, steel-sharpener, steel, etc. It is understood that the mill will not be operated before next spring or summer.

The *True Fissure* property is described at some length by H. C. Gunning in the recently issued Memoir 161, "Lardeau Map-area," Geological Survey of Canada. The following extract is from page 74 of this publication:—

"The property is one of considerable promise. The *True Fissure* lead is the most important and deserves more development. There is just a suggestion that the ore in the upper workings may rake to the south-east in the vein and that the end of the ore had not been reached in 'C' adit. It is possible that the south drift from Morgan's crosscut has not yet reached the ore, but raising would be less risky than continuing the drift. The exceedingly fine grain of much of the ore will necessitate very fine grinding if a good separation of galena and sphalerite is to be obtained. The intergrowth of these sulphides is frequently so fine that increased magnification merely reveals, under the microscope, more and more minute areas of galena in the sphalerite. In such cases, and indeed, generally, the grey copper, which is argentiferous, is related to the galena.

"A remarkable thing is that the *St. Elmo* lead, which has produced the highest-grade ore on the property, has remained essentially unprospected along its strike on the surface. This would be cheap work and another body such as that of the old workings would readily repay the owners for their expenditure.

"The *Bluebell*, where work is being done at the time of examination, seems to merit less attention than either of the other leads.

"One thing is certain, before any definite plan of production or extensive development is made, careful milling tests should be run on small shipments of the ore to ascertain just what extraction can be made."

This constructive, reliable, and impartial report is of considerable value in any consideration of proper development of the property.

Great Northern.—Since this property, consisting of ten claims adjoining the *True Fissure*, was described in the Annual Report for 1929, A. M. Richmond, Assistant Resident Engineer,

reports that the lower tunnel has been extended 32 feet and at the face an 18-foot crosscut, driven to the north-west, has developed galena-pyrite mineralization over minable widths. The face of the drift, according to H. McPherson, of Trout Lake, owner of the *Great Northern*, is now about 560 feet from the *True Fissure* boundary-line. He also states that the shipment made in 1896, and mentioned at the foot of page 337 of the Annual Report for 1929, was 47 tons.

NELSON MINING DIVISION.

There has been a marked revival of interest in gold-mines and prospects in this Division, work having been resumed at several properties. In other cases where actual mining has not yet developed there is good reason to believe that several new activities will be initiated during the coming year.

NEAR NELSON.

Euphrates.—This gold property, situated on the north-eastern side of the Great Northern Railway, about 9 miles south of Nelson, was described at some length in the Annual Report for 1929. The principal activity during the period under review has consisted in clearing right-of-way and cutting lumber in connection with the proposed erection of an aerial tram. According to published statements, it is the intention of the management to mine and ship ore.

Humming Bird.—At this gold prospect, situated on Roaring creek and owned by R. Qua, of Nelson, exploratory work was carried on during the summer months by E. B. Rowley, of Vancouver, representing Coast interests.

California.—Work was resumed in August at this gold property on Giveout creek, near Nelson. The Hillside Mining Company, Limited, sponsored by F. T. Harbour, of Calgary, has been formed to finance development. Camp buildings have been erected and No. 2 tunnel drift on the *California* vein is being advanced. From this tunnel a car-load of ore has been extracted for shipment. The *Deadwood* "vein" is being investigated as to its possibilities for large tonnage of low-grade gold ore. This deposit, explored by an old 100-foot drift-tunnel, consists of a shear-zone about 300 feet wide. Within these limits the rock, a calcareous member of the Rossland Volcanic group, is highly impregnated with iron pyrites and contains numerous little veins and stringers of quartz. Several engineers have sampled accessible areas of the zone, with interesting results. The assay value of the material appears to vary considerably and information is not yet available as to what might be considered a fair average. The few samples taken by the writer averaged \$3.90 in gold, but as the showings sampled are in some cases widely separated, this figure cannot be taken to represent any definite block of ground. The results of this sampling and that done by other engineers would seem to justify careful investigation to determine if the values are confined to streaks in the zone or if there are sufficient values over large widths. Some more definite information could be obtained by cross-cutting the full width of the deposit from the inner end of the old tunnel and trenching on the steep side-hill above the tunnel, followed by systematic sampling. As the deposit could be very cheaply worked, a comparatively small average yield in gold would be sufficient to justify work on a large scale.

YMIR SECTION.

Goodenough.—This gold-mine, situated on Wild Horse creek, has been under development by the owners, H. Jackson, A. McDonald, and associates, of Ymir. The No. 3 crosscut tunnel was continued by hand to cut the shear-zone and develop the downward extension of the ore-bodies mined in the two upper levels. From May to October, twenty-four lots of ore were shipped, amounting in the aggregate to about 1,141 dry tons. The average gold content of the shipments was between \$16 and \$17 to the ton, with appreciable values in silver, lead, and zinc. This ore was derived from Nos. 1 and 2 tunnel workings, where extensions of previously mined ore-shoots were opened up and stoped.

Ymir-Wilcox.—On Wild Horse creek work was resumed on the long-dormant *Ymir-Wilcox* gold property by F. A. Hebbard, of Vallejo, California. The mill and aerial tramway connecting it with the mine-workings were in a very dilapidated condition, but the mine had been put in shape for stoping by previous operators.

Work on rehabilitating the mill was started in July; new concrete foundations were made, the ten stamps previously used were put in shape, and two Wilfey concentrating-tables were added. Water-power for milling purposes was formerly obtained from Rapid creek; a new flume and penstock have been built to carry the water across the hill to the pipe-line. As the

volume of water was found insufficient to provide for full power requirements, it was found necessary to install auxiliary power and a new 75-horse-power, 3-cylinder Crossley Diesel engine has been connected to the same shaft as driven by the main Pelton water-wheel. The aerial tram was also put into working condition, five new towers were erected, and an ore-bin was built at the mine. Milling was commenced on October 4th and from 10 to 30 tons were put through daily until recently, when work was discontinued. Some gold bullion was shipped, but the concentrates have not yet been marketed. It is understood that work will be resumed in the spring.

Howard.—Exploratory operations at this property, situated on the South fork of Porcupine creek, have been suspended pending an improvement in metal-market conditions. Although the gold values predominate in the ore, the silver, lead, and zinc are important factors in considering profitable production. The mine is owned by the Howard Mines, Limited, largely controlled by J. F. Duthie, of Seattle.

SHEEP CREEK AND SOUTH OF SALMO.

Reno Gold Mines, Ltd.—At the property of this company, situated on Fawn creek, production has been steadily maintained since milling was started in August, 1929. Production for the year will be approximately \$150,000. The tonnage treated includes low-grade ore milled during the "tuning-up" period as well as that derived from development.

The workings consist of four adit-tunnels driven for the most part on the vein or veins, crosscuts and raises, total development footage now amounting to 3,233 feet, exclusive of raises carried up with stopes. No. 4 tunnel is connected with No. 3, 160 feet above, by raise now used as an ore-pass and also by a manway through 401 stope. No. 3 tunnel is connected with No. 1, 275 feet above, by a raise and manway. Stopping, which was started in 1929, has been done between No. 4 and No. 3 tunnels and above No. 3 tunnel. All stopping has been by shrinkage, stope-widths varying from 2 to 5 feet, with occasional small sections of greater width. The ore mined and milled to date has been, for the most part, heavily oxidized. Recent development, however, in the inner extremities of Nos. 3 and 4 levels has been in sulphide ore, carrying good gold values, which is apparently primary in origin. It contains sulphides of lead, zinc, and iron, but so far has presented no difficulty in its treatment by the cyanide process. The presence of good values in these sulphide ores, somewhat patchy in occurrence as yet, opens up possibilities for continuation of profitable production below the zone of oxidation.

All ore is trammed in cars through No. 4 tunnel to the tram terminal near the portal. From here a 2-bucket gravity-tram, 750 feet in length, conveys the ore to the mill. The milling equipment consists of jaw-crusher, ball-mill, Dorr classifier, blanket tables, four Dorr thickeners, two Dorr repulpers, three Dorr agitators, one Dorr solution classifier, zinc boxes, and the necessary storage-tanks, pumps, etc., for operation by counter-current continuous decantation. The ore is ground in cyanide solution of a maximum strength of about 1 lb. NaCN to a ton. The average cyanide-consumption per ton of ore treated, including loss in tailings, is about 1 lb. Lime-consumption is about 14 lb. a ton of ore. The company has started burning its own supply of lime for milling purposes and will shortly have a sufficient supply to carry on until next summer.

Apart from coarse gold collecting in ball-mill, classifier, and on the blankets, which is amalgamated in a clean-up barrel, all values are recovered by cyanidation, zinc shavings being used to precipitate the gold from the solutions. Approximately 20 per cent. of the total production is obtained by amalgamating the blanket concentrates, this innovation having been introduced by R. V. Neily, superintendent. Tonnage milled at the present time averages around 33 tons a day of twenty-four hours, with recoveries between 95 and 97 per cent. Production for October, the last month for which figures are available, was 899.87 oz. fine gold and 294.62 oz. fine silver, of a total value of \$18,703.44, from 913.6 tons milled.

Power for the mill, for lighting and operating the mill, water-supply pump, etc., is furnished by a Crossley Bros. 100-horse-power Diesel engine. Another Crossley engine, 138 horse-power, direct-connected to a 500-cubic-foot delivered air, Alley-McLellan compressor, furnishes air for the mine. The company recently purchased a rotary snow-plough, "Snow King," which will be operated by the "Thirty" tractor provided last winter. Forty-five men are employed in mine and mill. The writer is indebted to the management for production figures and data relating to mill operation.

Queen.—Work was recently resumed at this gold-mine, situated on Sheep creek, by the Queen Mines, Limited, a company recently formed in Wisconsin by W. A. Lavigne, of Riplinger, Wis., and associates. A small crew of men is engaged in preparatory work, including reconditioning of the flume to drive the compressor. Ample funds are understood to have been raised to finance considerable development with a view to again placing the property on a producing basis.

Reeves-MacDonald.—At this zinc-mine, situated on the Pend d'Oreille river, all activity has been suspended pending consideration of future plans. Harold Lakes, of Nelson, is in charge at the property.

Red Rock.—This group, owned by M. Meredith, of Trail, and associates, is situated on the Salmo river, about 1 mile northerly from the *Reeves-MacDonald* mine-workings. Accidental discovery of silver-lead-zinc float-ore led to further investigation and some ore in place was discovered. The property was then bonded by J. W. Falls, of Waneta, and J. S. Ramage, of Spokane. Work done under the direction of the former disclosed a large surface showing of silver-lead-zinc ore of good milling grade. Rough sampling of the sulphide ore assayed: Silver, from 7 to 10 oz. to the ton; zinc, 12 to 15 per cent.; lead, 12 to 15 per cent. Subsequently the bond was taken over by the joint Eastern Canadian and American interests associated in the Base Metals Mining Corporation of Field, and a small crew of men was put to work to continue surface exploration under the direction of C. F. Cockshutt, of Toronto. The results of this work were indefinite and work was suspended towards the end of November pending consideration of future plans.

ERIE CREEK (NORTH FORK OF SALMO RIVER).

Second Relief.—At this property, situated on Erie creek, work was started in April, both mining and milling, when the spring thaw had set in to furnish sufficient water for power. After the installation of two Wilfley concentrating-tables a break-down of the tube-mill in May necessitated shutting down the mill. A Marcy ball-mill, Model No. 54, and a second 8-foot Senn amalgamator were then installed, and milling was resumed under water-power early in July for a short test of mechanical and metallurgical features until the summer dry season exhausted the water-supply. In September, after some revisions in the flow-sheet and the installation of an 80-horse-power Fairbanks-Morse Diesel engine for mill-power, mill operations were resumed on broken ore in the stopes. A dry fall did not supply sufficient water for power to drive the air-compressor, and after the exhaustion of the broken ore in the stope operations were discontinued awaiting the spring break-up. Through an extensive series of tests carried on throughout the summer it has been found that by the addition of a flotation unit the recovery can be increased to more than 90 per cent. with a satisfactory ratio of concentration, and this improvement is contemplated as soon as warranted by development.

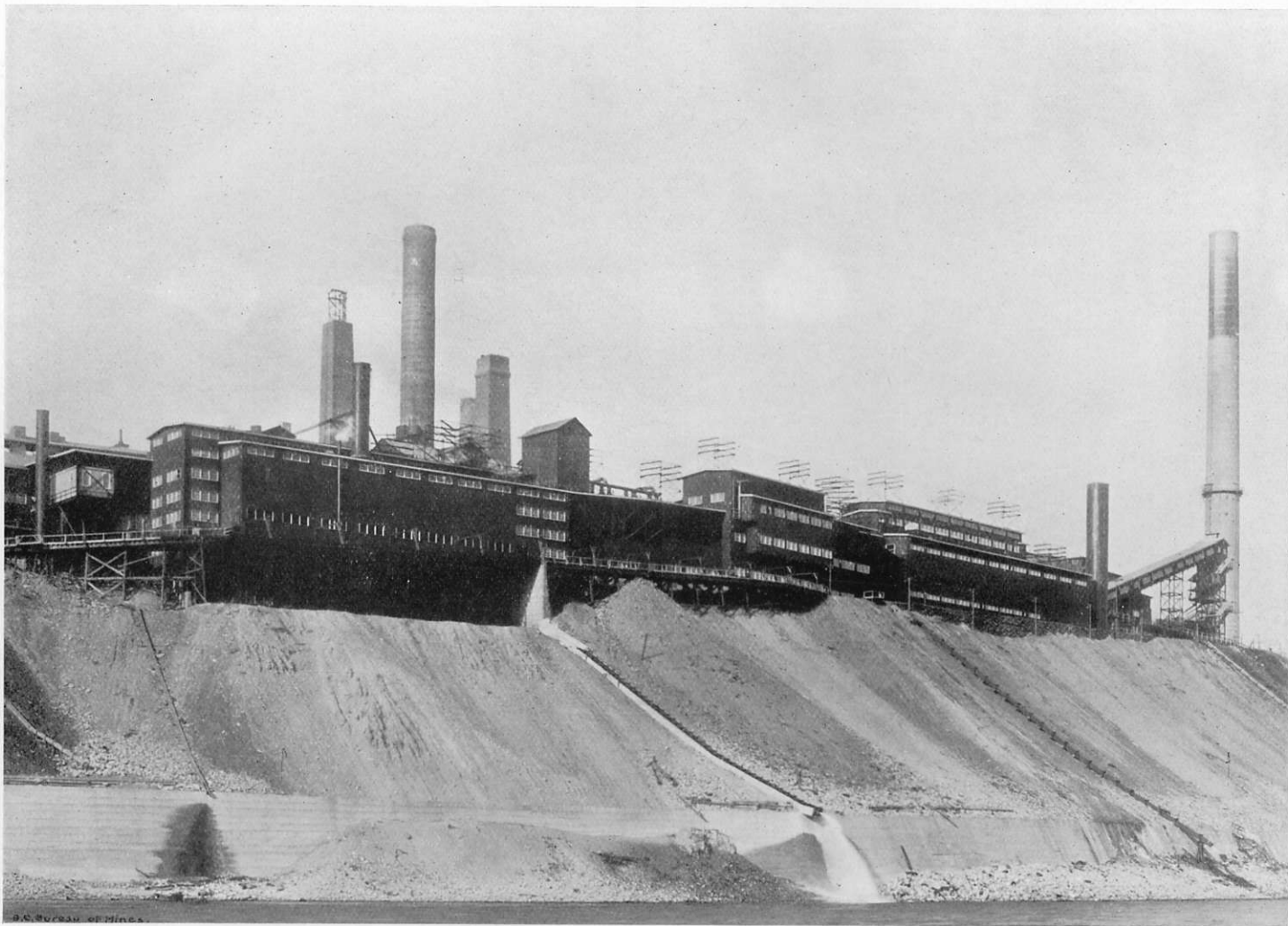
On No. 4 level of the mine 8 feet of crosscutting and 75 feet of raising were done. The new No. 5 level tunnel was started at a point just above the mill-site and has been driven 296 feet of the 600 feet necessary to tap the downward extension of the *Second Relief* vein mined on No. 4 level. The total ore extracted from stoping and raising was 1,479 tons. According to R. O. Oscarson, secretary-treasurer of the company, approximately \$23,000 in gold bullion and concentrates was produced during 1930, and this has paid for development, mining, and new equipment in the mill. Some additional surface work has been done to trace the continuity of the parallel veins, but no underground work has been done to develop them, as the policy of the management is to develop these veins from No. 5 level when it reaches the ore-zone. At the *Arlington*, also controlled by the Relief-Arlington Mines, Limited, a small crew was at work during July and August, reconditioning the old tunnels to make the mine accessible for inspection. The writer is indebted to P. E. Oscarson, until recently managing director of the company, for the data regarding mill operation.

*Second Chance.**—Minor development operations were carried out at this property, situated on the *Arlington* road, near Erie, by F. G. Reeve and interested parties of Seattle.

PROPERTIES TRIBUTARY TO KOOTENAY LAKE.

Iva Fern.—Development operations at this property, situated on Cultus creek, have been discontinued by the Consolidated Mining and Smelting Company.

Bayonne.—Since progress at this gold-mine, situated at the head of Summit creek, was reported in the Annual Report for 1929, development has continued under the direction of



New Slag-fuming Plant producing Zinc Oxide—Consolidated Mining and Smelting Co. of Canada, Ltd., Trail.

B. N. Sharp, of Spokane. In No. 2 tunnel level 280 feet of drifting and 16 feet of crosscutting have been done and a raise 240 feet long has been put up to the surface; a shaft 50 feet deep has been sunk on the north vein; and 50 feet of caved ground at the portal of No. 3 tunnel was retimbered. The mine has been resampled at 5-foot intervals. A new trail, 4 feet wide and 5 miles in length, has been constructed on a good grade to connect with the Cultus-Next Creek trunk trail (Next creek was formerly Canyon creek). The latter has been widened to a width suitable for caterpillar-tractor haulage to a point some 10 miles up from Kootenay lake. This now makes the distance by trail about 12 miles from the end of the road to the *Bayonne*. The camp at the mine has been improved by the addition of a new bunk-house, 24 by 18 feet; and new blacksmith-shop and timber-sheds have been constructed at the portal of No. 3 tunnel. J. B. Gerrard, of New York, is financing the operation.

Molly Gibson.—At this silver-lead mine, on Kokanee creek, development was resumed in the spring by the Consolidated Mining and Smelting Company. Except for leasing operations the mine has been inactive since 1918. Camp buildings were erected and a new flume was built to provide power for the compressor equipment. A new crosscut tunnel, 700 feet in at the end of October, is being driven which will gain 1,000 feet of depth below the upper workings. A large development programme, spread over a period of several years, is contemplated. The low-level crosscut tunnel will be driven a total distance of 1,800 feet to the expected intersection with the vein; extensive drifting will then be done and a raise put up to connect with the upper workings. Dan Matheson is foreman and L. W. Oughtred, of Nelson, is directing operations.

TRAIL CREEK MINING DIVISION.

ROSSLAND AREA.

*O.K. Mountain.**—During 1930 there has been considerable activity amongst the small gold properties on O.K. mountain and in one or two cases very encouraging results have been obtained. Martin Dally and partners have mined and shipped a small tonnage of high-grade ore from stopes in the *Midnight* property. John Hawkins, Jim Cullinane, George Brown, *et al.*, have installed a portable compressor plant and machine-drill equipment at the *I.X.L.*, and have continued underground prospecting and development on the No. 3 level and on a new level close to the *Midnight-I.X.L.* boundary-line. On the *Golden Drip*, which adjoins the *I.X.L.* to the south, J. C. Penny and associates, of Rossland, found some high-grade gold ore near the surface and after making a small shipment to the smelter continued underground development-work on the lower level of the claim. John Hendrickson, Tom Minsick, *et al.*, of the *O.K.* property, have continued exploratory drifting on the claim to reach the ground on the inside of the caved portion of the mine. Ole Osing and F. McIntyre and partners have continued development stoping and raising from the lower level of the *Snowdrop* workings; and John Lindberg did further surface prospecting at the *Camden*, located to the west of the *Snowdrop*.

Further activities in the vicinity of Rossland include surface prospecting, and the construction of a road by J. Tomich, of Rossland, to his *Caribou* group, located half a mile north of the Cascade highway on Little Sheep creek; the continuation of underground development by Alex. Constantine and son at their *Pearl* group, located on the first summit west of Rossland to the north of the Cascade highway.

TRAIL SMELTER.

The great new slag-fuming plant, which cost over \$2,000,000 to build, came into operation towards the end of August. This recovery of the zinc in lead-blast furnace slags is one of the greatest achievements in zinc metallurgy of the last decade, representing the successful culmination of years of experimentation by the Consolidated Mining and Smelting Company. The problem was to effect a chemical separation of the zinc oxide and lead oxide from the silica, iron, and lime in the slag. The operation is briefly summarized in the following notes kindly supplied by G. E. Murray, assistant smelter superintendent, under date of October 8th:—

"The operation consists of taking molten slag from the lead-blast furnaces which carries 16 to 18 per cent. zinc in the form of zinc oxide, combined with other slag-forming materials, and, after it is poured into a water-cooled vessel with a hearth area of 20 by 10 feet, powdered coal is blown through the slag bath and a reducing atmosphere maintained which causes the zinc oxide to be reduced to metallic zinc, which then vaporizes and ultimately burns to zinc oxide.

"The problem then is to cool the oxide-laden gases so as to allow the solids to be caught in woollen bags. This was the problem that gave us the most cause for worry, as there were no

data available on cooling gases in this condition and our installation, as far as we know, is the first of its kind to be constructed. The gases, on rising from the surface, pass by way of a flue to either one of two 1,750 B.H.P. Babcock & Wilcox waste-heat boilers. These, as far as we know, are the largest waste-heat boilers in existence. The gases enter at a temperature of 2,000° F. and leave the boiler at 600° F. These then pass by means of a flue to a large installation of Greene Economizer units, where they are cooled to approximately 200° F. and are now ready for treatment in the Draccon automatic bag-house, where the final oxide is caught ready for shipment to the zinc plant for treatment.

"The plant is designed to treat 800 tons of molten slag per day, but as yet only one unit has been completed. It is working at a higher capacity than it was designed for and has produced as much as 70 tons of zinc per day in fume.

"The rated capacity of the plant at present is between 50 and 60 tons of zinc in fume.

"The plant uses 125 tons of Corbin slack coal per day, and though it has operated successfully now for nearly two months, there are many ways in which we feel the process can be improved. We have to determine yet the optimum conditions of charge, rate of coal feed and blowing-time, all of which will take time. Incidentally, the waste heat generated by this installation will be used to supply the heat required for the fertilizer operations at Warfield."

Fertilizer Plant.

Construction of the numerous units, constituting the fertilizer plant on Warfield flats, is progressing rapidly. Work has been rushed during the past year. Mining properties have been acquired in British Columbia and in the adjoining States of Washington and Idaho, from which the necessary phosphate-rock will be procured which will be used in the new processes, together with waste materials from the older units of the Trail industry of the Consolidated Mining and Smelting Company. It was recently announced to the press by S. G. Blaylock, vice-president and general manager, that the first unit of the big plant will be operating in time for the spring planting of next year, and that 5,000 tons of the fertilizer will be shipped for Prairie planting early in 1931. The following is a brief description of the various units and their approximate production capacity (in these statistics tonnages are referred to in short tons of 2,000 lb.) :—

General Information.—The plant will cover 60 acres, will employ about 400 men, and require 34,000 horse-power electrical energy. Steel and brick construction throughout. Daily capacity, 300 to 400 tons finished products, depending on proportion of ammonium sulphate, mono-ammonium phosphate, and triple superphosphate manufactured.

Sulphuric-acid Plant.—Contact process, 370 tons per day. Produced from waste sulphur-dioxide gas from roasting of zinc concentrates.

Electrolytic Hydrogen Plant.—Knowles, Fauser, Pechkranz & Stuart electrolytic 10,000-ampere cells. Capacity, 3,148,000 cubic feet hydrogen and 1,574,000 cubic feet oxygen per day.

Nitrogen Plant.—Claude liquid-air process; capacity, 2,395,000 cubic feet nitrogen per day.

Ammonia Synthesis Plant.—Fauser process, 47 tons anhydrous ammonium per day.

Ammonium Sulphate Plant.—Parrish process, 150 tons per day.

Phosphoric Acid, Triple-superphosphate, and Mono-ammonium Phosphate Plant.—Dorr strong acid filtration process. Capacity, 450 tons phosphate rock leached per day; 175 to 285 tons finished product, depending on proportions of triple superphosphate and mono-ammonium phosphate manufactured.

Storage Plant.—Capacity, 50,000 tons finished product, handled by 7-ton overhead electric travelling grab-bucket crane.

Shops.—Machine-shop; floor-space, 5,950 square feet. Carpenter-shop; floor-space, 2,250 square feet.

Warehouse.—Fire-proof; floor-space, 5,800 square feet.

Two Laboratories.—Floor-space, each 2,600 square feet. Research laboratory on manufacturing problems and new development. Soil-research laboratory.

Inauguration of this new chemical branch at Trail is one of the outstanding events of recent years in Canadian industry. Agricultural experts from all parts of the world have visited Trail during the past year and have given of their advice to the management in the work being carried on. Experiments in the use of certain of the soil-builders to be manufactured have been successful.

Students of agriculture have expressed various opinions concerning the creation of a cheap supply of plant-foods at Trail. Some of the following objectives are considered likely of achievement through continued development of synthetic fertilizers:—

- (1.) Will reduce labour costs on the farm by causing 1 acre to do the work of several.
- (2.) May assist in a trek from the cities to the country by making the small holding a prolific and economically managed property.
- (3.) While animal fertilizers are useful, the addition of cheap synthetic soil-foods such as Trail will manufacture will cut out much waste effort in feeding and stabling unprofitable live stock.
- (4.) Will be a boon to all gardeners and horticulturists.
- (5.) In event of the merging of farms in the wheat belt and the further mechanization of farms, cheap mineral fertilizers will make possible continuous maintenance of soil-fertility.
- (6.) Its contribution to the solution of the unemployment problem will be shown chiefly in helping to make it easier for a working-man on a small piece of land to produce much of the foods needed by himself and family.
- (7.) As the Trail plant gets under way there will be a demand for fertilizers from foreign countries, more particularly Japan, China, and the Pacific littoral, and surplus quantities will find ready market in regions where immense populations live upon the products of intensively tilled land.

WESTERN MINERAL SURVEY DISTRICT (No. 6).

PRELIMINARY REPORT FOR THE YEAR 1930.

BY GEORGE A. CLOTHIER, RESIDENT MINING ENGINEER (HEADQUARTERS, VANCOUVER).

GENERAL SUMMARY.

The Western or No. 6 Mineral Survey District includes the following seven Mining Divisions of the Province: Victoria, Alberni, Clayoquot, Quatsino, Nanaimo, Vancouver, and New Westminster. The first four Divisions and a portion of Nanaimo Division cover Vancouver island; the remaining portion of Nanaimo Division and the last two cover that portion of the Mainland west of the Coast Range summit north to Seymour inlet. There are therefore two distinct geological areas—the Vancouver series of the Vancouver Island range and the granodiorite and included belts of altered sedimentaries and volcanics of the Coast range.

The general mining situation and outlook so far as this district is concerned seem to be about normal and much less affected by general conditions than one would expect. Prospecting has been carried on throughout the district and at least one outstanding discovery made, the *H.P.H.* group near Nahwitti lake, which is now undergoing development. The records show that the number of assessments done equals that of last year. As many worthy properties are under development now as a year ago, and production, represented in this district by the output of the *Britannia*, has even exceeded that of last year.

The outstanding disappointing feature of the year has been the failure of the Nimpkish Lake area to respond to exploration-work. The extent and character of the surface ore-showings were most encouraging and their successful development would undoubtedly have meant a Coast smelter and other important enterprises.

The continued work of the Geological Survey of Canada under H. C. Gunning in the Sproat, Great Central, and Buttle Lakes region, which is the heart of Vancouver island, and northward toward the Nimpkish river, is proving this interior portion of the island a very favourable area for prospecting. It is hoped that geological and other information on this area will be available at an early date.

The Department of Mines has in 1930 made over twenty grants to assist in constructing roads and trails, thus assisting the industry materially. These grants have not only been made toward assisting the prospector and operator on specific trails, but also for new trails to open up mineralized areas for prospecting and development. Amongst these, the foot-trail from the head of Kennedy lake across one of the main ranges of the island to the head of Sproat lake

was completed. This section contains gold-bearing quartz veins and should be prospected. It is the proposed route of the auto-road to the west coast and transportation for mining operations is therefore assured.

The trail through a well-mineralized country, between Cowichan lake and Alberni canal, was advanced and improved this year, encouraging prospecting in that section. Several other such trails will be undertaken as conditions justify.

The present would be a very opportune time for some enterprising company to organize a systematic prospecting of the Mainland coast. Any number of parties, of two to a party, could be placed on the innumerable belts contained in the Coast range and designated on the Vancouver sheet of the Geological Survey. A mining engineer thoroughly competent for such work would allot areas for prospecting, direct the work, distribute supplies, examine discoveries, oversee preliminary development-work, etc., and so make a very thorough and comprehensive investigation of belts similar in origin and structure to the great copper-producing *Britannia* belt.

The possibility of the development of an iron and steel industry on the Coast has been on the horizon all year. The situation has had some comprehensive preliminary investigations. Diamond-drilling in 1929 on the partially developed magnetite-showings on the west coast of Texada island has indicated ample tonnage of suitable ore, and detailed examinations into the operating end by reputable engineering firms would seem to augur well for the ultimate success of the undertaking.

The following is a brief review of the mining activities for the year in each of the Mining Divisions:—

VICTORIA MINING DIVISION.

The southern end of Vancouver island has been rather inactive this year. No work has been done on any of the old properties, such as the *Sunloch* and *Gabbro*.

There has been a little placering in Martins gulch in the Leech River area. Steinberger, on his claim about half a mile up from Leech river, had a couple of hundred tons of dirt to wash when there was enough water. I have not heard what results he obtained. The dirt pans good gold values, but the quantity of gravel seems limited for a larger operation.

The Eagle Talc and Mining Company, whose plant is about a mile from Leechtown, leased its property to Kennedy & Holland on a royalty basis. These men have reconditioned the mine and plant and shipped a considerable tonnage. They are extending their operations by mining a green shale near the Kapoor Lumber Company station, which is shipped mainly to the Sidney Roofing Company. Experiments are also being made with different-coloured shales and other products and it is expected that an important market will be developed with the roofing companies.

In the Cowichan Lake section there has been some activity. On the *Alpha-Beta* group, about 6 miles up Robertson river, which empties into the south end of the lake, further work has improved the prospects of this property. The ore-deposits are of the contact-metamorphic type. The mineralization is chalcopyrite and in places magnetite and chalcopyrite in a gangue of garnetite. Open-cuts on the surface along the bank of the river show a width up to 40 feet of ore that will average 3 per cent. copper. About 400 feet farther up the hill another ore-body has been exposed on the surface by open-cuts for a width of 50 feet. A tunnel driven from a small creek at right angles to Robertson creek shows that the vein or mineralized belt lies flatly along the face of the hill, and the widths of ore exposed on the surface would therefore not represent the real vein-width, which is probably over 20 feet. The extent of mineralization here would seem to justify considerable work in opening up the ore already exposed and further tracing the belt up the hill. The property is held by P. Pearson, Cowichan, and J. Long, Chemainus.

The *Crown* group of eight claims is situated about a mile from the *Alpha-Beta* and reached by a good foot-trail from the logging-railway of the Victoria Logging and Manufacturing Company, of Chemainus. This group was staked this spring by P. Pearson, of Cowichan, and optioned to the American Smelting and Refining Company. This company did some open-cutting and stripping, exposing in one place a width of 60 feet heavily mineralized with pyrrhotite and chalcopyrite averaging between 3 and 4 per cent. copper.

This occurs in a fine-grained greenish rock in which are masses of garnetite, epidote, and hornblende. Patches of ore have been exposed on the surface both above and below this main

showing, and it will require some further work to determine whether this altered formation extends to sufficient depth to carry important ore-bodies, or whether the surface ore-exposures are only residual masses of former ore-bodies eroded away.

On the north side of Cowichan lake some further work has been done on the *El Capitan* group, owned by a Duncan syndicate headed by E. F. Miller, of Duncan. The tunnel has been extended to about 100 feet, the face showing the vein to have split into three small ones, the centre one being up to a foot wide of oxidized material. A sample from a few tons of this ore on the dump gave assays of over \$100 in gold to the ton. The persistent high gold values in the sulphides make this property worth exploring, with the hope of getting below the horizon of oxides.

The *Paint Pot* group of two claims, *Paint Pot* and *Lakeview*, was staked this year by Martin Smith, of Duncan, adjoining the *El Capitan*. There is a 2-foot vein of chalcopyrite assaying on the surface \$2.80 in gold to the ton, 1.5 oz. in silver to the ton, and 6.1 per cent. copper.

ALBERNI MINING DIVISION.

There has been a very limited amount of mining done in this Division during 1930.

The Island Copper Company, of Port Alberni, which has a property about 12 miles down the canal from Port Alberni, closed down early in the year and has been unable to finance sufficiently to get under way again. There are some good copper-showings on this property which I think are sufficiently encouraging to call for deeper development. As this was described in the 1929 Annual Report there is no use in going into further details.

The old trail and Canadian National Railway right-of-way from Cowichan lake to Alberni canal has been further repaired this year by the Department of Mines, which has induced some prospecting with promising finds reported.

A little work is now under way on the quicksilver showings at Sechart, in Barkley sound. This property has been acquired by a Vancouver syndicate headed by Colin Campbell.

The *Morning* group, 4 miles up Taylor river from the head of Sproat lake, owned by A. Smith, of Port Alberni, and W. P. Beavan, of Courtenay, has been acquired by a syndicate of up-island men who have done some comprehensive exploratory work under the direction of R. N. Dickinson, mining engineer of Vancouver. This work has consisted altogether of surface-stripping and cuts and has been confined to the upper claims of the group at about 3,000 feet elevation. Several parallel quartz veins varying from 1 to 6 feet in width have been uncovered, occupying replaced shears in the volcanic country-rock. The mineralization is with pyrite, zinc-blende, and galena carrying small silver values and up to \$8 in gold to the ton, with the straight pyrite assaying up to \$18 in gold to the ton.

The work done so far would indicate the probability of developing a sufficient tonnage of milling-grade ore for a profitable small operation.

CLAYOQUOT MINING DIVISION.

The *Douglas* group of four claims up from the head of Tofino inlet and owned by Wm. Walton, of Tofino, and Duncan McMillan, of Vancouver, has been under option this year to E. G. Brown, of 718 Granville Street, Vancouver, and considerable work was done.

A number of chalcopyrite-croppings show along the face of the mountain in a distance of several hundred feet. The chalcopyrite occurs along the borders of vertical basic dykes which probably are the source of the mineralization. These cut the flat limestone-bed, which is from 10 to 30 feet thick. There is considerable alteration of the limestone on the dykes. The copper is in bunches and masses of chalcopyrite and some 70 tons of ore was sorted out in the work done. Exploration-work would consist of drifting along the dykes to find out the extent of the limestone-bed into the hill, and the amount of ore would be governed by the thickness of the limestone-bed and, of course, the amount of lateral replacement from the dykes.

The *Ormond* group of two Crown-granted claims, situated up Matilda creek on Flores island, is owned by J. Beck, 717 Caledonia Avenue, Victoria, and at present under option to Mr. Hodgkinson, who has done some work on it this year. A camp was constructed at the beach and a building is now under construction for the installation of a compressor plant also on the beach, from which an air-line will be run to the workings on the hill. There are some interesting chalcopyrite-showings carrying gold and silver values, occurring in shear-zones in the volcanic country-rock at about 1,000 feet elevation.

Up the Zeballos river the trail was improved to the camp of the Marks Gold and Copper Mines, Limited, on which some further surface exploration was done. Prospecting in that area resulted in a number of claims being staked.

The Department of Mines has expended some money this year in repairing the trail and bridges up Bedwell river from the head of Bedwell sound toward the old *Ptarmigan* property, which was under development before the war. This valley had considerable work done on showings several years ago and the repairing of the old trail again makes this area available for prospecting.

Also the trail was completed from the head of Kennedy lake on the west coast through a low pass of 800 feet elevation to the head of Sproat lake, opening up a very promising area of gold-bearing quartz veins. As this is the proposed route of the much-talked-of and much-needed auto-road from Alberni to the west coast, any prospects found could be sure of transportation within a few years.

Recommendation will be made for the continuation of the trail as a prospecting-trail another 10 miles up Taylor river, which is on the east side of one of the main ranges of the island.

QUATSINO MINING DIVISION.

The important property in this Division is that of the Coast Copper Company on Elk lake and reached by truck-roads and boats from Jeune Landing on the South-east arm of Quatsino sound. It has been under continuous operation with from thirty to forty-five men under the supervision of C. A. Seaton. The main development is drifting on the vein from the levels opened up from the shaft from the tunnel-level. I have not as yet examined the property this year.

The *Jeune* group on Alice lake was acquired by the Coast Copper Company last year and extensive exploratory work undertaken as described in the 1929 Annual Report. I am informed that the results of the work were not at all encouraging and consequently was discontinued.

The Quatsino Gold-Copper Mines, Limited, report satisfactory results from a programme of diamond-drilling and surface prospecting carried out this season. This property adjoins the Coast Copper Company's property on the south and contains the southerly extension of the *Old Sport* vein.

The *Alice* group, owned by W. Clancy and W. Kinsey, of Quatsino, has had the tunnel extended to about 80 feet this year, following an 18-inch vein of shipping-grade lead-zinc ore carrying gold and silver values.

North of the Coast Copper Company's property on Marble creek, which flows out of Alice lake into Quatsino sound, a discovery of copper ore about 3 miles from tide-water was made this year by the Spooner Bros., of Holberg, and the *Marble Creek* group staked.

The mineralization is chalcopyrite and bornite in a basalt country-rock. The chalcopyrite and bornite occur as small veinlets and bunches as well as disseminated in crystals throughout the mass. It is exposed along the west bank of the creek for 300 to 400 feet and in places exposed for a width of 25 feet. Open-cuts from the edge of the water will be put in to determine the dimensions of the body and facilitate sampling.

NANAIMO MINING DIVISION (VANCOUVER ISLAND).

The Caledonia Mines, Limited, property, situated about 5 miles north of the Port Hardy-Coal Harbour auto-road, was under option last year to the Consolidated Mining and Smelting Company, which did some underground work described in the 1929 Annual Report, but did not take up the option. The Caledonia Company is arranging to resume work early next spring.

The *H.P.H.* group of eight claims was staked in June of this year by three Port Hardy prospectors, S. S. Pugh, Meade Heppler, and Frank Hicklenton. These men had been prospecting in the vicinity of Nahwitti lake, about 16 miles directly west of Port Hardy. They were returning and got lost in dense fog and had to camp overnight. Next morning in cutting across country they stumbled on to outcroppings of galena and zinc-blende. Further prospecting on the face of the bluffs disclosed good ore-croppings and the ground was staked, some later work indicating extensive ore possibilities. The American Smelting and Refining Company, represented by Henry Lee, of Vancouver, procured an option and after a thorough examination recommended development.



Pinder Mountain, South of Nimpkish Lake, Vancouver Island.

The property is reached by an old trail from Port Hardy to Kains lake, 12 miles, then 3 miles up Kains lake to its head, then 6 miles to the property. Supplies were man-packed to Kains lake and camp established at the head of the lake. A trail was built from there to the property and two camp buildings erected at the showings. Early in October 5 tons of supplies were taken in from Port Hardy to Kains Lake camp by hydroplane and a little later another 3 tons were delivered, the plane making the round trip from Port Hardy to the camp with 1,600 to 1,800 lb. of supplies in twenty-five minutes. The hydroplane transportation has enabled sufficient supplies and equipment to be taken in for a winter crew of twelve to fifteen men, which would have been impossible by man-packing, and horses could not be taken over the trail.

The ore-showings occur in quartz-filled fissures or shears, in a limestone-belt about a mile wide, between granodiorite on the south and a 30-foot vein of magnetite on the immediate north contact, and probably volcanics north of that. The fissuring strikes S. 40° E. diagonally away from the magnetite or volcanic rock side and occurs in a series of parallel veins. So far thirteen of these zones have been found occurring across a length of three full claims or 4,500 feet. They vary in width from 30 to 140 feet, each containing a number of parallel veins showing from 1 foot to 18 inches of solid galena or zinc-blende to 14 feet of mixed ore of mill-feed grade. The veins are well defined and there is no metamorphism or alteration of the limestone walls, the only altered limestone seen being inclusions within the veins themselves. Between the zones is unbroken limestone.

In zone A, which is the discovery, a few shots and some stripping show one vein to be at least 15 feet wide of mill-feed, with about 4 feet of altered limestone in the centre. The parallel veins in this zone occupy a width of 140 feet. The ore assays from 20 to 80 cents in gold to the ton, from 7 to 55 per cent. lead, and 7 to 28 per cent. zinc, the silver content averaging about $\frac{3}{4}$ oz. to the unit of lead. A sample of clean galena assayed 40 cents gold to the ton, 108 oz. silver to the ton, 68 per cent. lead, and 8 per cent. zinc. A sample of zinc from a cropping about a mile west of the known zones assayed \$8 to the ton gold, 1 oz. silver to the ton, and 33 per cent. zinc.

I would consider any one of these zones a good prospect, but a dozen of them certainly gives it the earmarks of a very interesting property. From twelve to fifteen men are now employed on surface-stripping and open-cutting until the snow comes, when a tunnel will be driven in on the main vein in zone A for 200 or 300 feet and crosscuts then driven both ways to completely cross this zone. Extensive work will, of course, depend on the findings of this winter.

Across the range from the Coast Copper Company's holdings the Nimpkish Lake area, in which the *Kinman* and *Smith* groups carried the important mineral-showings, was investigated by the Consolidated Mining and Smelting Company. The company bonded the *Kinman* property in the fall of 1929 and carried out intensive exploration all last winter. Results, however, did not meet the expectations of the company and the bond was thrown up in April of this year. The work consisted of a thorough prospecting of the surface along the granite-limestone contact for over a mile by means of open-cuts, stripping, and trenches; the drilling of twenty diamond-drill holes aggregating about 6,700 feet; and the driving of a tunnel along the contact for a length of 140 feet. The surface work done by Mr. Kinman and partners and the later work by the company disclosed some remarkable bodies of chalcopryite on or near the granite-limestone contact, impressing every one who examined the property with its immense possibilities.

Subsequent diamond-drilling, however, under these very impressive surface ore-exposures showed that they did not continue to any appreciable depth, and as further drilling, cutting the contact in a number of places, did not encounter any ore-bodies comparable with the croppings, work was stopped. The tunnel from the canyon driven along the contact under the immense surface showings of chalcopryite went through 18 feet of massive chalcopryite to a tongue of granite, then about 25 feet through the granite into the limestone, in which, at about 40 feet, massive pyrrhotite was struck and the tunnel continued in it for 60 feet to the face, when the pyrrhotite tailed out into limestone again. The pyrrhotite carries little or no copper or other values.

Of the twenty diamond-drill holes, five were wholly in limestone and one wholly in granodiorite. Of the remaining fourteen, which all cut the contact, four showed no mineral, seven showed mineralization and some values and three large bodies of sulphides, and three showed commercial values.

The hole under the big north showing of chalcopryite drilled through 8 feet of chalcopryite and then into limestone. Later, an open-cut across this ore-body showed a mass of clean chalcopryite lying like an inverted soup-plate on top of the limestone. There was a clean line between the chalcopryite and the limestone; that is, there was no intermingling of lime and chalcopryite at all. The results of this work with such promising surface exposures were certainly most disappointing.

The company then bonded the *Smith* group, adjoining the *Kinman*, on which conditions were somewhat different, in that the ore, chalcopryite and bornite, occurred in the volcanics at or near its contact with the granite; not a limestone-granite contact as on the *Kinman*. A sufficient amount of work was done to convince the company that the ore possibilities were not sufficiently encouraging to justify further exploration.

It may be debatable whether diamond-drilling alone, under the conditions on the *Kinman* property, would gain sufficiently conclusive evidence to condemn it. The surface showings are admittedly remarkable and there is no reason why there should not be recurrences of such ore-bodies underground.

There has been some prospecting and staking this year around the Campbell lakes and Buttle lake, as well as in the Forbidden Plateau country west of Courtenay.

The *Silver Leaf* group of three claims is owned by Thos. Service, of Duncan. It is situated at the head of Jump creek and therefore rather inaccessible. The property contains two veins of chalcopryite about 2 feet wide, assaying from \$10 to \$15 in gold to the ton, 2 oz. of silver to the ton, and from 8 to 17 per cent. copper. If transportation could be established over the divide to the Canadian Northern Railway at Cowichan lake, this would make a nice little shipping-mine.

The old *Jubilee* mine was examined this year. It is now owned by the Nanaimo Copper Company; B. Thorne, secretary, Nanaimo. It lies at the head of the Nanaimo river, about 20 miles from Nanaimo, and reached by a good foot-trail from the Nanaimo waterworks dam. About 500 feet of underground work has been done on it, including a 40-foot shaft on one of the claims. The showings are mineralized shears in the volcanics, worth considerable surface prospecting and development, but not the amount of underground work done.

The old *Maple Leaf* property, owned by R. Nichol, of Ladysmith, is situated about 20 miles from Ladysmith on the Sutton trail, which is in good repair. This is another of the old properties on which an excessive amount of underground work has been done for the indications of the surface showings. Some 600 feet of tunnelling has been done here in two tunnels to cut a belt of jasper sparsely mineralized with chalcopryite where exposed on the surface. Nothing of importance has been found at depth.

NANAIMO MINING DIVISION (MAINLAND).

The Alexandria Mining Company, Limited, whose holdings are on Phillips arm, off Cordero channel, north of Thurlow island, has been operating the greater part of the season under the supervision of T. S. Davey, mining engineer of Vancouver. The head office of the company is Credit Foncier Building, Vancouver.

The property has had considerable work done on a promising gold vein. The main tunnel at the beach is in 530 feet, of which the first 300 feet is the ore-body, averaging 5 feet wide, of \$9 gold ore. Last year a shaft at 175 feet in from the portal was sunk on the vein to 100 feet and a drift started into the hill on the vein. Work in 1930 has consisted of continuing this drift to 134 feet in ore all the way, averaging about \$12 a ton. Operations were suspended a couple of months ago pending further financial arrangements, but I am informed that work has just been resumed and that it is planned to sink the shaft deeper and open up the vein below.

The continuity of the ore-body and the values obtained, combined with the ideal location, would seem to predict a profitable future for this property.

The *Douglas Pine*, *Thurlow Gold*, and *Sonora Gold* are other gold properties in that area which are promising, but not under operation this year.

The property of the Colossus Copper Company on Estero basin, at the head of Frederick arm, was fully described in the 1929 Annual Report, and as nothing has been done since there is no use in commenting on it in this review.

The Santana Copper Syndicate, of Howe Street, Vancouver, did some more work on its property near Bold point, on Quadra island, under the supervision of J. McConville, one of the original owners. New camp buildings consisting of bunk-house, cook-house, and office were constructed and the old road from the beach to the camp was put in repair.

Exploration-work was confined to surface-stripping and open-cutting along the granodiorite-limestone contact for a length of 1,500 feet or more. This work shows in the altered limestone a mineralization of iron sulphides and chalcopyrite in places 40 feet wide, in which are small bodies of commercial ore. If the limestone-bed is deep enough there is probably an important body of milling-grade ore. The surface indications, I think, justify diamond-drilling to determine the extent of the ore-bodies.

Some assessment-work has been done on properties back of Granite bay, also around Gowlland harbour and Hyacinthe bay, all on Quadra island.

The Romana Copper Mines, Limited, holdings are situated on Goat island in Powell lake. The company's office is 615 Hastings Street West, Vancouver. The property contains a wide belt of highly altered sedimentary rocks included in the Coast Range granodiorite. Within this is a belt of garnetite and epidote, in which occurs masses and lenses of iron sulphides and chalcopyrite, which have furnished small shipments from time to time.

Considerable surface work has been done and a short tunnel driven about 90 feet below the surface. It was decided this spring to drive another tunnel which would obtain a depth of 475 feet below the surface showings. This is now in 400 feet and is estimated to be 40 to 50 feet west of the downward extension of the croppings. Operations have been suspended for a month, but it is expected work will be resumed in the near future in driving a crosscut east to the ore-zone.

On Texada island the exploration-work which has been carried on for two or three years on the old Vananda copper-gold properties, the *Copper Queen*, *Little Billie*, and *Cornell*, by the Central Copper and Gold Company, Limited, of Vancouver, was discontinued early in the year. The work so far has given very encouraging results and will be started again as soon as conditions permit. There has been little mining activity on either Texada or Lasqueti islands this year.

There is considerable interest as to the outcome of the proposed plans of the Coast Range Steel Company, which has acquired the large iron-ore deposits on the west coast of Texada island. These deposits were diamond-drilled last year and an ample tonnage of ore proven.

The property of the Lasco Development Company, Limited, the *Venus* group on Lasqueti island, has been bonded and work has been resumed by Vancouver interests.

VANCOUVER MINING DIVISION.

On Jervis inlet the only property under development is that of the Mount Diadem Mines, Limited. A small crew is exploring some galena-croppings, but I have no information as to the results so far.

On Howe sound the old reliable Britannia Mining and Smelting Company operated continuously with the employment of about 1,100 men, distributing yearly about \$2,000,000 in wages and an equal amount for supplies. The fact that there are over 75 miles of underground workings will probably convey better than anything else the magnitude of this mine. Five years ago the output was less than 3,000 tons a day, while now the mill is putting through over 6,000 tons a day, calling for a production of over 2,000,000 tons of ore a year from the mine. The copper-output so far this year has exceeded over 11,000,000 lb. a quarter, which will probably bring the total for the year over 44,000,000 lb., the greatest yet, with about \$15,000 gold and 200,000 oz. silver in addition.

The attention to every detail in connection with labour, every detail in mining methods, mining equipment, ore transportation, and the utilization of every refinement in milling machinery and practice, has marked this company as one of the most efficient operations on the Continent. (Prospectors please note that there may be other *Britannias* on the west coast of British Columbia.)

Up the Pacific Great Eastern Railway, of which Charles Camsell, when an officer of the Geological Survey of Canada, said, after a reconnaissance from Squamish to the interior: "These conditions, meaning the included belts of altered sedimentaries and volcanics, included in the Coast Range granites, are most favourable for the occurrence of metallic deposits of

copper, lead and zinc, gold and silver, and the whole interior of the Coast mountains of British Columbia therefore become an excellent field for prospecting—and not only the eastern and western borders as was formerly believed to be the case. Prospectors are therefore urged to pay more attention to the possibilities of the Coast mountains than they formerly did."

There has been some activity along the railway this year. There are quite a number of groups held between Squamish and Alta lake, the summit of the Coast range, on which the owners do all the work possible during the summer; that is, much more than the necessary assessment.

There have been some copper discoveries made this summer by American interests about 2 miles east of Squamish. A number of claims have been staked and preliminary exploration is being carried on.

On Raffuse creek, about 12 miles out of Squamish, the *McVicar*, *Manson*, and *Tocher* groups have had some further work done on them this summer by the owners, resulting in several promising copper-croppings being exposed.

The general rock formation is a belt 2,000 to 3,000 feet wide of schistose sedimentaries in the granodiorite. Within the wide belt are lesser zones of further shearing which have been replaced by quartz carrying chalcopryite, galena, and zinc-blende. One of these lenses shows a width of 12 feet of 6 per cent. copper ore and there are probably a dozen equally as promising. Some diamond-drilling has been done under one or two of these lenses without encouraging results. The number and size of these showings makes one wonder whether diamond-drilling is altogether conclusive. No depth has been obtained on any of these showings by driving in on them from the surface, and I am of the opinion that some real underground work on several of them would open up important tonnages of commercial ore. The property is certainly deserving of a very thorough investigation.

The *Golden King* group is 10 miles up Ashlu creek, which flows into the Squamish river, and is 22 miles from the town of Squamish. There is an auto-road to within 9 miles of the property.

The metallic minerals consist of gold-bearing pyrite, pyrrhotite, and traces of chalcopryite in quartz gangue. The vein averages about 3 feet wide, lies flatly (about 45°) on a contact of the granodiorite and a wide belt of diabasic rock. The gold is associated with the sulphides.

The vein has been exposed by erosion along the bank of a small creek on the north side of Ashlu creek and has been drifted on for 300 feet in a tunnel on the south side of the main creek. The tunnel follows the foot-wall side of the vein for 170 feet, gradually leaving the vein above; a short raise at this point exposes it. Just beyond the raise another vein or the same vein faulted down about 10 feet was picked up and drifted on for 75 feet where it disappears into the roof, also to be exposed by No. 2 raise. A third vein, or a second faulting, appears in the bottom of the drift and is followed to the face.

There are patches of sulphides in the quartz from which assays up to 5 oz. of gold to the ton have been obtained, but they are only patches. Some crosscutting might be done to expose the whole vein in a few places, as all the work is on the foot-wall side. The importance of the property depends on the frequency of the sulphide bunches, which can only be determined by drifting on the vein.

There are several groups west of McGuire, which is just above Brandywine falls on the Pacific Great Eastern Railway.

The *Astra* group is located about a mile west of McGuire, on the Pacific Great Eastern Railway, on a wide schist-belt in which are lenses of siliceous material carrying pyrite and chalcopryite. Only a small amount of work has been done as yet by the owners, but the showings look encouraging. The claims are owned by W. Price and B. A. Falconer, of Vancouver.

On the *Blue Jack* group, owned by A. E. Snow, of Vancouver, the formation is similar, a 24-foot belt of greenstone-schist containing lenses of galena, zinc-blende, and pyrite in a quartz gangue. Across 3 feet in one place assayed \$6.80 gold to the ton, 9.6 oz. silver to the ton, 2 per cent. lead, and 5 per cent. zinc. A tunnel is being driven by the owners to obtain some depth under the surface showings.

The *Archibald* group on Sproat mountain, west of Alta lake, contains a zone of quartz diorite, hornblende, and calcite, bordered by granodiorite. On or near the contact are masses of heavy sulphides of iron, carrying a small amount of chalcopryite. There is plenty of mineralization, but all the croppings show pretty low values. No depth has been obtained.

Some work has been done this year on the old *London* group, 6 miles from Alta lake, on Fitzsimmons creek. This property is staked on another of the included belts in the granite, the metallic minerals showing in the quartz veins contained in the schist-belt. There are widths of 10 to 15 feet of fair chalcopyrite ore on the surface which probably justify deeper exploration.

NEW WESTMINSTER MINING DIVISION.

Interest is again being taken in the Harrison Lake section. Geological surveys indicate a wide belt of mineral-bearing rocks extending on the west side of the lake and north on both sides of the Lillooet River valley. Fire mountain, on the west side of the Lillooet river, was prospected over thirty years ago to some extent. Only one property, the *Money Spinner*, was developed to the extent of providing a 50-ton mill. It apparently was not a success as the gold-bearing quartz veins proved too spotty for commercial ore. Some spectacular gold quartz has been found from time to time and the belt no doubt warrants close prospecting. There has been more or less activity in the Pitt Lake section on the *Katanga* and other prospects.

The Pitt Mining Company, Limited, has suffered from financial conditions and has not yet been brought into production. I am informed that the concentrator machinery has been purchased and is being installed as finances permit. I think it will make a small profitable undertaking. The affairs of the company are being safely and efficiently handled.

A lot of staking was done in 1929 in the Chilliwack River and Chilliwack Lake sections, but this year very little has been done.

COAL-MINING.

PRELIMINARY REPORT FOR THE YEAR 1930.

By JAMES DICKSON, CHIEF INSPECTOR.

There has been a marked decrease in coal production in all the coal-mining districts of the Province.

On Vancouver island several mines have been idle for the whole or part of the year, while all the operating mines lost many working-days due to lack of demand.

The mines in the East Kootenay District also experienced many idle days due to lack of orders; one very important market which this district has enjoyed was lost, at least temporarily, when the Great Northern Railway turned to the use of fuel-oil in several divisions in Montana, Idaho, and Washington.

The locomotives in these divisions used British Columbia coal for a number of years and until January of this year, when the change to fuel-oil was made.

The mines in the Nicola-Princeton District also experienced many idle days due to lack of orders.

The estimated production of the coal-mines on Vancouver island is 993,800 tons, a decrease of about 127,000 tons, or 11.3 per cent., as compared with 1929.

The estimated production from the mines in the Nicola-Princeton District is 204,000 tons, a decrease of 38,000 tons, or 15.7 per cent., as compared with 1929.

The estimated production of the mines in the East Kootenay District is 679,000 tons, a decrease of over 207,000 tons, or 23.5 per cent., as compared with 1929.

The estimated total production of the coal-mines in the Province is 1,878,000 tons, a decrease of 373,000 tons, or 16.8 per cent., as compared with 1929.

The following table shows the production of the individual mines and companies for the year 1929 and the estimated individual production for 1930:—

ESTIMATED COAL PRODUCTION FOR THE YEAR 1930 AS COMPARED
WITH THE YEAR 1929.

VANCOUVER ISLAND DISTRICT.

	1930. Tons.	1929. Tons.
Canadian Collieries (D.), Ltd.—		
South Wellington, No. 5 mine.....	80,600	36,816
Extension Colliery	136,000	104,211
No. 9 mine		4,327
Comox Colliery	248,500	274,264
Total	465,100	419,618
Western Fuel Corporation, Ltd.—		
No. 1 mine	329,300	307,755
Reserve mine	29,000	148,349
Wakesiah mine	1,000	60,228
Total	359,300	516,332
Other collieries—		
Granby Consolidated M.S. & P. Co.....	151,000	170,767
Lantzville mine	5,300	4,420
Fiddick mine	1,300	2,998
Little Ash mine	7,000	5,464
Richardson mine	400	766
Morden Colliery	3,000	
Biggs' mine	1,000	440
Little Jingle Pot mine.....	400	
Total	169,400	184,855
Total for Vancouver Island District.....	993,800	1,120,805

NICOLA-PRINCETON DISTRICT.

Middlesboro Collieries, Ltd.	37,500	43,373
Coalmont Collieries, Ltd.	104,000	149,750
Tulameen Valley Coal Co., Ltd.	33,000	37,435
Pleasant Valley Coal Co.	17,500	3,445
Ashington Coal Co.		22
Canadian Coal and Briquetting Co.....		200
Blue Flame Colliery	12,000	6,360
Normandale Colliery		185
Gem Domestic Coal Co.		538
Black Coal Mine		928
Total for Nicola-Princeton District	204,000	242,236

NORTHERN DISTRICT.

Telkwa Collieries, Ltd.	1,200	1,505
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EAST KOOTENAY DISTRICT.

	1930. Tons.	1929. Tons.
Coal Creek Colliery	210,000	376,304
Michel Colliery	259,000	342,143
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Corbin Colliery	469,000	718,447
	210,000	168,259
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Total for East Kootenay District	679,000	886,706
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Total for Province	1,878,000	2,251,252

SUMMARY OF PRODUCTION.

Vancouver Island District	993,800	1,120,805
Nicola-Princeton District	204,000	242,236
Northern District	1,200	1,505
East Kootenay District	679,000	886,706
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Total for Province	1,878,000	2,251,252

VICTORIA, B.C.:

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1930.