

BRITISH COLUMBIA DEPARTMENT OF MINES

HON. W. A. McKENZIE, Minister.

ROBT. DUNN, Deputy Minister.

J. D. GALLOWAY, Provincial Mineralogist.

J. DICKSON, Chief Inspector of Mines.

BULLETIN No. 2, 1929

PRELIMINARY REVIEW
AND
SUMMARY OF MINING OPERATIONS
FOR THE YEAR 1929, IN THE PROVINCE OF
BRITISH COLUMBIA

COMPILED BY
JOHN D. GALLOWAY, Provincial Mineralogist.



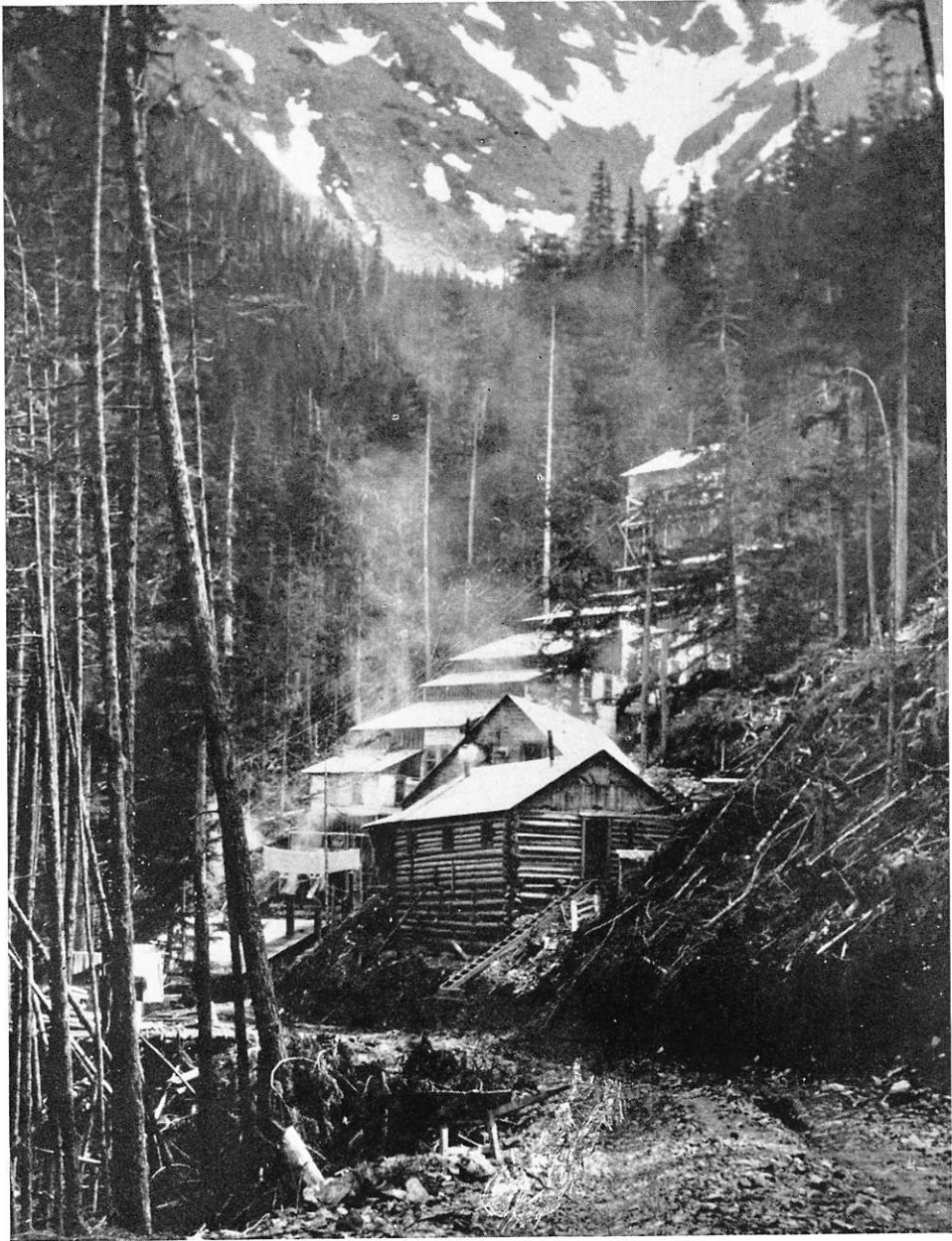
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1929.

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Silver Cup Mine—New Mill at Nine-mile Mountain, Omineca M.D.

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*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, 1929.

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 1929.

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 10th, 1929.*

PRELIMINARY REVIEW AND SUMMARY OF MINING OPERATIONS, 1929.

GENERAL SUMMARY.

BY JOHN D. GALLOWAY, PROVINCIAL MINERALOGIST.

The gross value of the mineral production of the Province for 1929 is estimated at \$70,030,976, a new high record in the history of mining in the Province. This figure is \$4,658,393 greater than the value of the output in 1928, or 7.13 per cent., and 4.2 per cent. higher than the previous record production in 1926.

The following table shows the estimated production for 1929 and comparative figures for 1928:—

ESTIMATED MINERAL PRODUCTION FOR 1929.

(1928 FINAL FIGURES SHOWN FOR COMPARISON.)

Description.	PRODUCTION, 1928.		ESTIMATED PRODUCTION, 1929.			
	Quantity.	Value.	Quantity.	Value.	Increase.	Decrease.
Gold, placer, oz.....	8,424	\$143,208	7,706	\$131,000	.....	\$12,208
Gold, lode, oz.....	188,087	3,888,097	154,000	3,183,180	.....	704,917
Silver, oz.....	10,627,167	6,182,461	10,400,000	5,519,176	.....	663,285
Copper, lb.....	97,908,316	14,265,242	103,000,000	18,650,210	\$4,384,968	.....
Lead, lb.....	305,140,792	13,961,412	309,000,000	15,632,310	1,670,898	.....
Zinc, lb.....	181,763,147	9,984,613	180,000,000	9,750,600	.....	234,013
Coal, tons (2,240 lb.).....	2,526,702	12,633,510	2,313,900	11,569,500	.....	1,064,010
Structural materials.....	.....	3,408,686	.....	3,880,000	471,314	.....
Miscellaneous minerals and metals.....	.....	905,354	.....	1,715,000	809,646	.....
Totals.....	.....	\$65,372,583	.....	\$70,030,976	\$4,658,393	.....

The metallic production—gold, silver, lead, zinc, and copper—amounts to \$52,866,476, the coal production to \$11,569,500, and the output of structural materials and miscellaneous products is valued at \$5,595,000.

Increases are shown in the metallics and structural-miscellaneous classes and a heavy decrease in coal. From a comparison of the figures with those of 1928, it is apparent that production in 1929 may be characterized as normal, as, in the aggregate, the quantities of metals and minerals produced, despite individual variations, was substantially the same as in the preceding year. The explanation of the higher valuation is largely due to the much higher price of copper metal during 1929 and also a slightly higher average price of lead. If the 1929 output were valued at 1928 prices throughout, the gross value would be approximately \$65,500,000, or just slightly higher than the 1928 value.

The quantity of copper produced, estimated at 103,000,000 lb., will be a new high record and the first time that the output has been in excess of 100,000,000 lb.; the valuation is also a new high figure. The lead production also establishes a new high record in quantity although not in value. Zinc and silver outputs are approximately the same as last year, while gold shows a considerable decline.

The coal industry, unfortunately, had a poor year, with a production value more than \$1,000,000 under that of 1928.

Structural-materials output is estimated at \$3,880,000 and this figure will probably be exceeded when final returns are received from all producers. This increase of 14 per cent. as compared with 1928 shows clearly that building and construction work was expanded somewhat during 1929.

The estimate of \$1,715,000 for miscellaneous metals and minerals shows that this branch of the industry is rapidly forging ahead. It is particularly interesting as it represents the utilization of non-metallic deposits and by-product metals formerly dormant or waste products. Com-

pared with the output valued at \$905,354 in 1928, an increase of 89 per cent. is shown. The important items included in this class are cadmium, bismuth, gypsum, and pyrite.

It is estimated that the tonnage of metalliferous ore mined in the Province during the year will amount to approximately 6,600,000 tons, as compared with 6,241,310 tons in 1928, an increase of 7.35 per cent. This increase is almost entirely due to larger tonnages mined at the *Sullivan* and *Britannia*. Slightly lower-grade ore was handled at these properties, so that the metal production from them was approximately the same as in 1928. The average gross value of the ore mined in the Province is approximately \$8 a ton.

It is expected that the dividends declared this year will constitute a new high record. A figure somewhat in excess of \$12,500,000 is expected, as compared with \$11,556,688 in 1928. The Granby Company increased payments during the year, so that now the shares are on an \$8 annual basis. The Howe Sound Company has maintained the regular \$4 rate, but has declared an extra dividend of 50 cents. The Consolidated and Premier Companies have maintained the regular rate.

PRODUCTION OF VARIOUS MINERALS BRIEFLY REVIEWED.

Placer Gold.—The production of placer gold is estimated at \$131,000, as compared with \$143,208 in 1928. 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. There was an increase in the Cariboo camp and the hydraulic properties near Barkerville made a satisfactory yield. In Quesnel, in spite of a good clean-up at Cedar creek, the production was less. The work on the tributaries of the Fraser river in Clinton Mining Division was not so extensive as in 1928. Considerable activity took place on Perry creek, in Fort Steele Mining Division. From the statistics issued by the Gold Commissioners regarding placer leases issued and renewed, it is apparent that there is no falling-off in exploratory interest in placer-ground throughout the Province. During the past two years production has declined, but from the amount of development that has taken place it seems probable that the production of placer gold will increase in the near future.

Lode Gold.—The production of lode gold is estimated at \$3,183,180, a decrease of \$704,917 as compared with 1928. The largest part of the gold production comes from the *Premier* mine and a fair amount as a by-product of copper-mining.

The output from the *Premier* will be considerably less than last year owing to lower-grade ore being treated.

Silver.—The production of silver is estimated at 10,400,000 oz., as compared with 10,627,167 oz. in 1928, a decrease of 227,167 oz. The value of this output is \$5,519,176, as compared with \$6,182,461 in 1928. British Columbia will again easily maintain its position as the leading silver-producing Province of Canada.

The bulk of the silver production comes from the *Sullivan* and *Premier* mines, but numerous mines throughout the Province contribute. The output is practically the same as last year, but it is expected that Slocan and Ainsworth Divisions will show decreases, partially offset by increases from Portland Canal and Fort Steele Divisions.

The price of silver for the year is estimated at 53.069 cents an ounce, as compared with 58.176 cents an ounce in 1928.

Most of the silver produced in the Province is associated with other minerals and is produced by the treatment of silver-lead-zinc ores and copper ores. The silver-output may be expected to grow as the mining of copper, lead, and zinc ores expands.

Copper.—The copper-output for the year is estimated at 103,000,000 lb., as compared with 97,908,316 lb. in 1928. This is the largest yearly production of copper ever made in the Province, the increase being mainly accounted for by the larger output made by the Granby Company at its *Hidden Creek* and *Copper Mountain* mines. The *Britannia* Company handled a larger tonnage, but the copper-metal production was substantially the same as in 1928.

Owing to the much higher market price of copper—18.107 cents a pound average, as compared with 14.57 cents in 1928—the copper production in 1929 established a new high record for valuation; the figure of \$18,650,210 compares with the previous record of \$17,784,494 in 1916, when the average price of copper was 27.202 cents a pound.

During recent years the two large operating companies have gradually lowered costs and increased capacities, and now that a good price is received for copper metal these companies are making satisfactory profits. The improved price for copper also makes possible the mining of lower-grade ore.

There are several copper properties in the Province which are developed to a considerable extent, but which are not yet productive. The strength in the copper-metal market should hasten production from some of these properties and also stimulate development of unproven copper properties.

The activity of the Consolidated Mining and Smelting Company and other smaller companies in acquiring and developing copper properties along the coast of the Province should result in further important copper-mining enterprises.

Lead.—The production of lead for 1929 is estimated at 309,000,000 lb., as compared with 305,140,792 lb. in 1928, or an increase of 1.3 per cent. This is another record output of lead and as in past years the greater part of it was produced by the *Sullivan* mine.

The output is valued at \$15,632,310, which is an increase of \$1,670,898 as compared with the value in 1928. The average lead price for the year is estimated at 5.059 cents a pound, as compared with 4.575 cents in 1928.

The outlook for increased lead production is excellent from the view-point of the mines, but no expansion can be expected until lead prices strengthen.

Zinc.—The output of zinc for the year is estimated at 180,000,000 lb., as compared with 181,763,147 lb. in 1928. The output is valued at \$9,750,600, which shows a slight decrease as compared with 1928.

The average zinc price for the year was practically the same as in 1928, the respective figures being 5.417 cents and 5.493 cents a pound. Towards the close of the year, however, the price declined considerably and the present price of approximately 4.4 cents a pound (London) makes the production of zinc concentrates unprofitable for many mines. No expansion of zinc mining or production in the Province can be expected until the price of the metal improves.

Coal.—The production of coal is estimated at 2,313,900 long tons, or a decrease of 212,802 tons from the 1928 output. The decrease was general throughout all the fields of the Province, with the exception of Nicola-Princeton district which shows a slight increase. For details of the production see the report of the Chief Inspector of Mines at the end of this bulletin.

Structural Materials.—It is difficult to get very definite preliminary estimates on the value of structural materials produced during the year, but it is believed that the output will approximate \$3,880,000, as compared with \$3,408,686 in 1928. The greater production is due to an increase in the output of nearly all the items in this class.

Building construction in Vancouver, where the bulk of the structural materials is marketed, is reported to have been greater than in 1928, which probably largely accounts for the increased production. This branch of the mineral industry is one that will continue to expand as the population of the Province grows. A plentiful supply of the various raw materials is found in many parts of the Province.

Miscellaneous Minerals and Metals.—The value of miscellaneous minerals and metals produced is estimated at \$1,715,000, as compared with \$905,354 in 1928. This substantial increase is due to increased outputs of cadmium, bismuth, and gypsum. This branch of the mineral industry is now assuming substantial proportions and may be expected to steadily expand in the future.

METALLURGICAL FEATURES OF THE YEAR.

As has been customary in recent years, the most important metallurgical events of the year have been those related to the continued expansion of the Consolidated Mining and Smelting Company of Canada, Limited, at the Trail plant. These included the following:—

(1.) The completion of the 100-ton increase in the zinc-plant capacity, which makes it a 400-ton plant. This is not operating yet, but will be in shape to operate very shortly.

(2.) Work has started on the fertilizer plant, which is expected to be in operation some time toward the end of 1930.

(3.) The slag-fuming plant, for which the increase in the zinc plant has been built, which probably will be in operation by the middle of 1930.

Production has been speeded up at the *Britannia* during the year, so that now the daily tonnage handled is about 6,000 tons, and some days more than this is put through the mill.

An important event of the year was the construction of a 300-ton flotation-mill at the *Monarch* at Field. This property is now well developed and equipped and should be an important producer in the future.

Construction was proceeded with during the year on the *Mammoth* mill at Silverton, and it is expected this will go into production in 1930.

The *Union* gold-silver property in the Grand Forks Division is being equipped with a 100-ton concentrator, which will go into production in 1930.

Construction of a small flotation concentrator was completed at the *Silver Cup* near Hazelton and production commenced.

A 30-ton cyanide plant was constructed and production commenced at the *Reno*, Nelson Mining Division.

The new concentrator and hydro-electric power plant at the *Cork Province*, Ainsworth Mining Division, was completed during the year and production commenced. Late in the fall this plant was closed down.

A 100-ton flotation-mill was completed at the *Planet*, Nicola Mining Division, and production commenced.

Generally speaking, the metallurgical treatment of ores in British Columbia is efficiently handled and the technical practice is the equal of any other part of the world. It is, however, evident that in some instances small companies build concentrators before the mine is sufficiently developed to justify mill-construction. In these cases funds are used on construction that would be much better employed in development.

This condition is largely caused by the affairs of such companies being in the hands of inexperienced operators. More use should be made of the qualified practising mining engineers of the Province, and the report of a thoroughly reputable engineer should always be obtained before proceeding with mill-construction. In this connection it is to be noted that the Consolidated Mining and Smelting Company does much to assist the small operator. The splendid resources of this company in research-work are, in many instances, used to solve the problems of small operators and much useful advice is given by the company's excellent engineering staff.

METAL PRICES.

Perhaps the most important feature at the present time in the mining situation is the question of metal prices. Silver, lead, and zinc prices have recently declined materially, while copper is still holding firmly at 18 cents. The decline in these metal prices is to some extent affecting the mining industry, by causing curtailment of production.

Silver commenced the year at 57 cents an ounce and held steadily until March, when a decline commenced and continued until now the metal is down to 49½ cents an ounce. For the year, with December estimated, the average price is 53.069 cents, as compared with 58.17 cents for 1928.

In January copper averaged 16.603 cents a pound, rose to an average of 21.257 cents in March, and then declined to the present fixed price of 17.775 cents a pound. This is the refinery price equivalent to the customary 18-cent delivered quotation. The average for the year (December estimated) is 18.107 cents a pound.

Productive copper-mining has been speeded up this year because of the increased price of copper. A considerably higher tonnage of copper ore has been treated, but the grade of ore has been somewhat lower, and as a result the output of copper is only slightly higher than in 1928. However, with an 18-cent price for copper, our two large copper companies have made considerably higher profits. Development of copper properties has also been accelerated this year and, owing to this, increased production may be anticipated in the future.

Expert opinion is by no means unanimous regarding the trend of copper-metal prices in the next year or two. The price has been stabilized at 18 cents by the Copper Export Association, and by balancing supply and demand this association expects to keep the price stabilized. That price may not be 18 cents, but at least it is not at all likely to return to the relatively unprofitable levels of a year ago. It can safely be predicted that the future of copper-mining is on a firm basis and that the price of copper metal will probably be maintained at a level profitable to copper-mining in British Columbia.

Lead and zinc prices may be discussed together, as this year they have moved in sympathy and the two metals are produced by the same mines. The London prices of these metals are

used in smelter settlements for ores and concentrates in British Columbia. The average price of lead for the year (December estimated) was 5.059 cents a pound for lead, as compared with 4.5754 in 1928, and for zinc 5.417 cents, as against 5.4932 in 1928. This, however, does not tell the whole story, as recently these prices have declined considerably. Present prices are about 4.66 cents a pound for lead and 4.4 cents for zinc. Lead is therefore down to the average level of 1928 and zinc a cent a pound lower, or 23 per cent.

The bulk of the lead and zinc production of the Province comes from the *Sullivan* mine—95 per cent. of the lead and 92 per cent. of the zinc output. This mine could continue to produce lead and zinc profitably when low prices would shut down most of the other lead-zinc mines in the world. The ore from this mine is milled and smelted and the metals refined and marketed by the owning company—the Consolidated Mining and Smelting Company of Canada, Limited—so that the company gets all the available profit in producing this lead and zinc. Costs in relation to selling-price are not likely, therefore, to influence the Consolidated Company in curtailing production from the *Sullivan*. However, the Consolidated is now an important factor in the world marketing of lead and zinc and world conditions may be such in the next six months as to warrant some curtailment. Actually the company is in shape to make a considerably larger production just as soon as more hydro-electric energy is made available, plans for which are being pushed ahead as fast as possible. The zinc-refinery of the company now has a capacity of 400 tons of zinc a day.

The independent lead-zinc mines of the Province only mine and mill the ore. The concentrates made are shipped to the Consolidated smelter at Trail, or occasionally to other plants, and these mines only get a small percentage of the market price of these metals. At the present time a 50-per-cent. zinc concentrate nets the shipper to the Trail smelter about \$12 a ton for the zinc content and a 60-per-cent. lead concentrate nets the shipper about \$27 a ton. The result is that there is no profit for the independent shipper in mining straight lead-zinc ores at present. Only those that have a fair silver content in the ore can manage to keep going, and even some of these are only breaking even.

The question, then, of increased production from the existing silver-lead-zinc mines of the Province in 1930 is almost entirely dependent on the trend of the prices of these metals. The statistical position of lead is sound and, barring a serious recession in world business, the price of lead is more likely to advance than decline. Zinc is in an unfortunate position, with much overproduction. A great deal of this is really by-product output which is produced regardless of price. Zinc ore, zinc concentrates, and the metal are all being stored now in considerable quantities. There is not likely to be any improvement in the price of zinc for a long time to come, unless concerted and systematic curtailment of production is put in force by the leading world producers, along the lines of what has been done to stabilize the copper market. Interference by artificial means with the time-established law of supply and demand, however, has not had much success in handling any commodity. The apparent success with copper metal still faces the test of going through a period of business recession.

Approximately 80 per cent. of the silver production of the Province is made from mines in which copper, lead, or zinc outputs are the major item. The output of silver, therefore, will expand or decline proportionally to the production of these base metals.

Summing up, it may be said that while some curtailment of production may take place with the small mines in 1930, due to low metal prices, it is expected that the large producers will maintain normal outputs and that the quantities of silver, copper, lead, and zinc produced next year will equal or exceed those of 1929.

Since 1921 there has been practically no curtailment of production in British Columbia owing to fluctuations of metal prices, and it may be expected that the mine operators will show the same resourcefulness in meeting conditions in the future as they have in the past.

COAL.

The decline of over \$1,000,000 in the value of the output of the coal-mines of the Province warrants some comment.

Since 1910, when 2,800,000 tons of coal was mined, the coal industry has not only made no headway, but is steadily declining, and the figures show clearly that this industry has not shared in the industrial expansion of the Province. While it is recognized that it is impossible

for coal to compete in certain lines with hydro-electric energy and fuel-oil, still it is apparent that the coal industry has dwindled to a lower ebb than seems necessary.

In the past our coal operators have mainly been concerned with mining coal rather than selling it and have not kept pace with the intensive selling propaganda used on behalf of fuel-oil. Generally, the coal industry of the Province would seem to require some modern research and salesmanship applied to it; it is still marketing coal on the lines used many years ago.

The utilization of pulverized coal, particularly on Coast steamboats, and the greater use of coal on the railways would materially assist the industry.

The following discussion on pulverized coal, contributed to the annual meeting at Vancouver of the British Columbia Division of the Canadian Institute of Mining and Metallurgy, November, 1929, by the Provincial Mineralogist, is printed, as it is considered that it may be of interest:—

It is not my intention to discuss pulverized coal at any length, but I would like to take this opportunity of bringing out certain information regarding the applicability of such equipment to British Columbia conditions.

Contrary to the general belief which apparently prevails in British Columbia, the use of coal as fuel in pulverized form is not new, experimental, or in any way wrapped up in mystery. Coal has been used in this way for many years, but in the last three years its use has expanded tremendously. Hundreds of plants are in operation in the United States and Eastern Canada.

Primarily, it has been used mainly for large industrial plants generating steam for power, but now it is being used for small installations and for steam for heating purposes. It is true that there are still many old-type pulverized-coal plants which do not show any particular advantage over other methods of burning coal, but all modern pulverized-coal plants show greater efficiency than any other method of burning coal; furthermore, these plants compete successfully in net cost of raising steam with fuel-oil in places where oil is cheaper than in British Columbia.

After an extensive survey of the literature on pulverized coal I am satisfied that the following statements can be substantiated:—

(1.) Pulverized coal is the most efficient form of burning coal; in raising steam an average efficiency of 85 per cent. can be obtained under proper conditions, and still higher with the use of economizers and super-heaters.

(2.) With proper equipment no trouble is experienced with ash either in the furnace or from the smoke-stack.

(3.) One authority says:—

"Powdered coal possesses many of the properties of a combustible gas and has the great flexibility and low banking losses that are possible with gaseous fuels. Thus, in a boiler furnace in which no coal had been burned for six hours, the boiler was brought to 300 per cent. of rating in less than five minutes. This great flexibility and practically zero-stand-by loss cannot be obtained with any other type of coal-firing equipment now known. Moreover, all the powdered-coal preparation and feeding equipment is outside the furnace, and in case of a mechanical break-down it is not necessary to let the furnace cool down before making repairs. No arches, expensive to install and maintain, are necessary in powdered-coal furnaces. Close regulation of the desired rate of combustion is quickly and easily made."

(4.) The labour required in powdered-coal installations is small and fuel distribution is easy—similar to turning on and shutting off gas. The energy and therefore cost of crushing and grinding the coal is as low as that required to atomize fuel-oil in oil-burning installations.

(5.) High furnace capacities are possible and high overloads are easily handled.

(6.) The chief advantages of powdered coal lie in the great flexibility, the high efficiencies that it is possible to maintain, and the wide range of fuels which may be used successfully. Coal of all types, from the low-grade fuels, such as lignite or high-ash graphitic anthracites, to the high-rank, high-quality bituminous coals have been successfully adapted for powdered-coal firing.

(7.) The main essential for success in pulverized-coal installations is very fine grinding; 90 per cent. of the product should pass through a 200-mesh screen. This solves all problems of incomplete combustion, ash troubles, and a lagging of brickwork. I would like to emphasize this question of the required fine-grinding of the coal. I have no intention of advocating any particular type of grinding equipment, but this is the most important point to be considered in selecting such equipment. As a corollary to this, I would add that equipment should be chosen that will give a continuous uniform product of the desired degree of fineness, with a minimum repair bill.

(8.) The initial cost of pulverized-coal equipment is from two to three times that of equipment to atomize and handle oil-fuel.

(9.) Thermostatic control of pulverized-coal equipment can be applied just the same as for oil-fuel.

(10.) Pulverized coal at \$6 a long ton of 12,000 B.T.U.'s will give a 20-per-cent. saving in cost for steam-raising as compared with fuel-oil (18,000 B.T.U.'s) at \$1.50 a barrel.

The following quotation from a standard authority summarizes the case for pulverized coal:—

"In addition to increased efficiency, there are other marked advantages for pulverized coal. This system of combustion more nearly approaches the 'efficiency built into the apparatus' ideal than any thus far developed. Pulverized coal permits one man to fire more horse-power and at the same time attracts a better class of firemen. It enables the boilers to follow the load demands more closely than with stokers, whether there be peaks of 300 to 400 per cent. rating or banked periods, and lends

itself most readily to automatic control, there being no fuel-bed variations to contend with. Banking-coal consumption is low since there is no simmering away of coal in the bank as is the case with stokers.

"Smokelessness is readily obtained. Furnace maintenance is low, particularly with modern hollow-wall furnaces. All classes of fuels can be burned. One of the conditions militating most seriously against continuous high efficiency with stokers is changes in coal. With pulverized coal such changes are handled by the simple adjustment of a valve.

"Another important factor is that the bulk of maintenance cost in pulverized-coal plants is at the preparation end, and deficiencies of equipment due to neglected maintenance do not affect the efficiency of combustion, as is the case with stokers having moving parts in the furnace upon which depend the efficiency of coal-burning."

SCOPE FOR PULVERIZED COAL IN BRITISH COLUMBIA.

I have lately been making inquiries regarding the number of plants burning coal and fuel-oil for steam-raising in British Columbia. While my figures are not complete, they have enabled me to make the following estimate:—

Plants burning from 500 to 1,000 tons a year.....	10
Plants burning from 1,000 to 2,000 tons a year.....	4
Plants burning over 3,000 tons a year.....	16

Total.....	30
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Plants burning 2,000 barrels of oil or over a year.....	20
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Of these plants, four burn coal as pulverized fuel. All the others are potential users of pulverized coal.

In the first place, we are concerned with the twenty plants using fuel-oil. Each one of these could probably effect a saving by using pulverized coal. In some instances, owing to the nature of the plant, the capital cost of conversion would not justify the change, but with most of them it would.

An estimate shows that at least 1,000,000 barrels of oil a year is being used as fuel, or the equivalent of approximately 250,000 tons of coal. This is, of course, exclusive of the fuel-oil used in locomotives and ships, which amounts to a very much larger figure.

With regard to the plants now burning coal by hand-firing or mechanical stokers, in all instances a saving in operating cost could be effected by the use of pulverized coal. In some instances the change might not be warranted, but in most of them it would. One great advantage would be the elimination of the smoke nuisance. In every plant using coal with hand-firing or mechanical stoking great clouds of black smoke are emitted from time to time. Pulverized coal gives no black smoke, but it does give off a faint light-grey smoke which is not nearly so obnoxious or destructive. Provided the coal is sufficiently finely ground, the ash given off is so impalpable that it floats in the air and is disseminated and dissipated without causing an accumulation anywhere.

I would like now to refer briefly to a pulverized-coal installation at Seattle which I examined a short time ago.

This is at the James Madison High School, a new building erected within the last year. After due investigation it was decided to raise steam, which is used mainly for heating, with pulverized coal as fuel, notwithstanding that coal is dearer and oil cheaper than in British Columbia. The boiler and furnace were designed for pulverized coal and the Kennedy-Van Saun system of pulverizing and blowing in the coal-dust was selected. By this system a ball-mill is used for the grinding and the pulverized coal is drawn out of the ball-mill by an exhaust-fan and blown through a burner into the furnace. The plant consists of a 125-H.P., H.R.T. boiler with a small pulverizer 3 feet 6 inches by 6 feet.

It was estimated that 600 tons of coal a year would be used, based on data from similar schools stoker-fired, but only about 360 tons will be required, or about 1¼ tons a day while operated. This gives an idea how small a plant can be successfully operated on pulverized coal.

Coal costs \$6.91 a short ton delivered at the school, and it is stated comparative results with an oil-fired plant in a similar coal show slightly higher costs for the coal, with oil at \$1.12½ a barrel. In this case fuel-oil is the cheaper first cost, but is amply offset by elimination of the smoke nuisance.

The use of pulverized coal in steamships has received much attention in the last three years. It is quite apparent that where boilers and furnaces are designed for pulverized coal this system is more efficient, cleaner, and generally more satisfactory than stoker or hand-firing of the coal. However, some difficulty is experienced in using pulverized coal in existing boiler installations, generally owing to the fire-boxes being too short. Improved burners are now available which in most cases overcome the difficulty. I have no doubt that from now on many steamships will be converted for using this type of equipment.

I have been unable to get figures showing the amount of fuel-oil used by shipping in British Columbia waters, but undoubtedly a much larger amount is used than in steam plants on land. Practically all our Coast boats burn oil, as do many tugs and small boats. This represents the most vital competition from fuel-oil that our coal industry suffers from.

One point is worth noting, and that is that oil is largely used on passenger-boats because it is much cleaner than coal. However, it is a fact that oil-fuel in many instances produces an obnoxious smoke laden with greasy smut or carbon. In this respect pulverized coal presents a distinct advantage as giving no black smoke and the fine ash coming out of the smoke-stack will only be deposited far in the wake of the boat.

It is to be hoped that before long some Coast boat will be equipped for burning pulverized coal, so as to demonstrate the efficiencies and advantages of this system.

In conclusion, I would say that the question of using pulverized coal merits the attention of all those in the Province in charge of steam plants, for two reasons:—

(1.) It is desirable and advantageous to all in the Province to have more British Columbia coal used and mined and less fuel-oil imported.

(2.) Modern business must be on the alert for every mechanical device that will increase efficiency and lower costs. The industrial prosperity in the United States in recent years is universally credited to the utilization of new machinery wherever possible; old plants and old types have been ruthlessly scrapped and new equipment put in, regardless of capital cost, wherever increased efficiency or lessened man-power could be obtained. British Columbia industry should be just as alert to profit by all new ideas that are based on sound principles.

DEVELOPMENT AND PROSPECTING.

The year 1929 has been characterized by a steady continuation of the intensive development and exploration that has been a feature of the mining industry during the last three years. As usual, the Consolidated Company has been the most active in optioning and developing properties, but the Britannia, Granby, and Premier companies have also carried on much scouting and development. This has been largely augmented by numerous small companies and individuals.

It is believed that more prospectors were out in the hills than in 1928 and some important new discoveries have been reported. The Consolidated Company maintained numerous prospectors in the field, as did many small companies and exploration syndicates. As an aid to prospecting in the vast areas of the north, hydroplanes were used in some instances to transport prospectors and supplies.

As sufficient information is given by the Resident Engineers regarding the successes and disappointments of this development-work in the respective districts, no attempt will be made here to mention them all. Some comment is warranted, however, regarding conditions in the industry.

It must be admitted that results in the Slocan District have not come up to the expectations of a year or so ago. The ore-bodies are irregular and mining costs in many instances are high. These factors, combined with low metal prices and other unfavourable conditions, have resulted in a disappointing year. There is but little doubt, however, that there is still much mineral in the Slocan District that will yet be mined under more favourable conditions.

In the neighbouring Nelson District one small gold-mine has been brought into production this year and the results attained by excellent work at the *Reeves-McDonald* are most encouraging. This is one of the important events of the year's mining and eventually this will be an important mine, but production is some distance in the future.

The Portland Canal Division has hardly carried out the rosy promises made for its mineral properties, but it should be remembered that all promises of quick production and dividends were largely made by irresponsible parties. The record in this Division again illustrates that as a rule it takes ten to fifteen years to make a mine out of a prospect. This is particularly true in this district, where climatic and physical conditions make initial mining development slow and costly. It has been said that Portland Canal is still a one-mine camp, referring to the fact that the only important producer is the *Premier*. However, several more properties are now within striking distance of production and much remains still to be done in developing attractive showings.

One encouraging feature is the discovery of a deeper ore-body on the *Premier* than heretofore and the successful results on the adjoining properties on the north-eastern porphyry-zone of the *Premier*.

The expenditures made by the Consolidated Company in the Stewart camp and the vast mineralized area to the east and north show that this portion of the Province holds out much promise that valuable ore-deposits will be found and that some of the known ones will be productive mines of the future.

Regarding the dominating mining and metallurgical company of the Province—the Consolidated Mining and Smelting Company of Canada, Limited—it may be said that the usual energy, ability, and initiative shown in recent years by the management of this company, which have placed it in such a splendid position, have been displayed to a greater extent than ever this

year. Higher efficiencies have characterized the metallurgical operations; intensive scouting, exploration, prospecting, and development has been carried on and plans for developing more hydro-electric energy have been steadily advanced. The company has been most aggressive in attempting to secure sufficient ore reserves to warrant the erection of a smelting plant on the Coast of British Columbia, but no definite announcement regarding such a plant has yet been made.

The last three years have been characterized by extensive and widespread development of mineral properties throughout the Province and the activity in 1929 probably exceeded that of the two previous years. In addition to the development carried on by the old-established mining companies in the search for new mines, many new companies have been incorporated for the purpose of reopening abandoned properties and developing raw prospects.

It will be useful to examine briefly the real results that have been accomplished in the last three years of intensive mining development and exploration in British Columbia. During this period the large mining companies of the Province—the Consolidated, Granby, Britannia, and Premier companies—have optioned hundreds of prospects, carried out varying amounts of work on many, and have finally acquired a few of them, and a percentage of these will probably make productive and profitable mines. In this period new mining companies were incorporated as follows: 56 in 1927, 171 in 1928, and 115 in 1929 up to the end of October; a total of 342.

Of the 342 new mining companies formed in the last three years a small number have been successful in bringing mines into production, but in several instances this has not been profitable production.

Summing up the results of this three years of intensive exploration, the net result is that probably a dozen important profitable producing mines will be brought into existence and a number of others are developing fairly well. Many of the small companies have not yet had time or sufficient capital to carry their projects to success, but some of these may still materialize.

The record emphasizes what has been repeatedly said, that mining is speculative and new mining enterprises are extremely hazardous speculations. The history of mining in every country in the world shows that several hundred mineral-showings are discovered for each valuable ore-deposit that is finally brought into production. No one really in the mining industry should feel despondent because many mining developments are failures, as that always has been and always will be the history of looking for mines.

The important metal producers of the Province are the *Sullivan*, *Britannia*, *Premier*, *Hidden Creek*, and *Copper Mountain* mines, at least 90 per cent. of the metallic production being made by these five mines. This condition has existed now for several years, but looking back still farther to 1914, at that time the bulk of the metallic output was from the *Boundary* and *Rossland* mines, which now are virtually non-productive. This illustrates the gradual change that takes place in mining, with some mines becoming exhausted, small mines expanding to large ones, and new mines being brought into production.

Fifteen years ago these five mines that are producing 90 per cent. of the metallic minerals of the Province were either unknown or relatively unimportant. These five mines are quite able to carry the annual metal production at its present pace for some time to come, and the expectation of a dozen or more substantial new mines gradually coming into production is assurance that the mineral-output will continue to expand. The remaining 10 per cent. of the metallic production comes from 125 shippers. The record in the last three years is as follows: In 1927 there were 132 shipping-mines; in 1928, 110; and 1929 will probably show about the same number.

In considering the future of the mining industry, one factor that should be remembered is the possible extensive expansion in production from some of those mines that are at present only small shippers; it has happened in the past and it is to be expected in the future. In this connection the *Monarch* at Field is a good illustration. It is a very old mine and, in the past, a rather disappointing one. Now, adequately financed, developed, and equipped with a 300-ton mill, it will be an important producer.

Another guarantee of increased mineral production in future years is to be found in the results obtained so far in the opening-up of the more or less unprospected areas. British Columbia is rich in potential mineral possibilities for the prospector and results obtained by

prospecting and development of existing prospects in the last three years have brought to light these possibilities. This is well illustrated by the *Ferguson* in Ingenika, the *Emerald* in Omineca, the two spectacular properties in the Taku River area, and the Kinman property on Vancouver island.

An industry with a \$70,000,000 annual production, with 18 per cent. of this paid out in dividends and the bulk of the remainder distributed in the Province, is a tremendous asset to the 600,000 people of British Columbia. In conclusion, it may be said that production is increasing, the dividend record is excellent, mineral development in the aggregate is satisfactory, even though many individual failures continually occur, and the potential mineral-bearing areas of the Province warrant prospecting and exploitation on a more extensive scale than they have yet received.

MINING DISTRICTS OF BRITISH COLUMBIA.

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

PRELIMINARY REPORT FOR THE YEAR 1929.

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

INTRODUCTION.

During the season an arrangement was made by the Department of Mines whereby Herbert Carmichael made reports on certain properties in the Atlin and Queen Charlotte Mining Divisions. Brief notes on some properties in the Atlin section by Mr. Carmichael are included in this report and his full reports will appear in later publications by the Department.

In August F. P. Caddy was engaged by the Department of Mines as a temporary Assistant Engineer and spent several weeks in the North-western District assisting the Resident Engineer in examination-work. Information from Mr. Caddy has been incorporated in this report and his full reports on properties examined will appear in the Annual Report for 1929.

North-western Mineral Survey District (No. 1) comprises Queen Charlotte, Bella Coola, Skeena, Nass River, Portland Canal, Stikine, Liard, and Atlin Mining Divisions. It is approximately 125,000 square miles in area and embraces the northerly extension of the Coast Range eastern contact-zone; several pendant inclusions within the batholith and appreciable remnant areas of the western contact-zone.

The exploration and development activity that featured the commencement of the operating season has kept pace through 1929. At least twelve operations will be continued through the winter months.

The district is attracting the attention of sound mining capital to a greater extent than ever before in its history. During the year seven of the most stable and conservative operating companies of the continent have been conducting mining, development, and exploration work. Engineers and scouts of many outstanding companies have continuously inspected properties and discoveries, not only in new areas, but also in the older-established camps. This activity promises important and continuous additions to capital available for large-scale development and exploration.

Over seventy smaller syndicates and companies, including fifteen devoted to placer operations, have been conducting commendable, and in most instances efficient, exploration and development throughout the district.

Capital for the development of likely-looking mineral-showings has never before been within such easy reach of the prospector. It is being gradually realized that all of the seven Mining Divisions which form the District, even the older areas in them, still have vast undeveloped mineral potentialities. The promise of these activities during 1929 portends such an increase of interest during the coming year that no better and more probably lucrative field could be chosen by ambitious prospectors.

PROSPECTING.

Prospecting has been quite active during 1929 and has been very profitable to many men. The tremendous extent of the promising areas, as yet only scratched or not even touched, offers ample room for many more prospectors. Prospectors have ventured farther afield than ever before, notably into the Bell-Irving River section and the easterly drainage area of the upper Stikine river.

Outstanding amongst the season's new discoveries, the most important in the district in recent years, are those in the Taku River area, Atlin Mining Division. In the Stikine River section discoveries on the Iskut river, Clearwater river, Limpoke creek, and 4-Mile creek indicate this new area to be also one of great promise. Reports of important finds on the Canadian side of the International boundary, up the Whiting river and the Unuk river, indicate these areas to be equally as promising as the Stikine or Taku areas. In the Portland Canal Division new and important discoveries have been made on the B.C. Silver Mines, Limited, property and on that of the Premier Gold Mining Company, which augment the ore possibilities of these older operations. Late in the season an important discovery was made in the hitherto unprospected

area at the head of American creek, indicating that the Portland Canal Division still has attractive possibilities for the prospector. On Saddle mountain, Hastings arm, a spectacular discovery of free-gold ore was made late in the season, showing that the older areas retain enticing rewards for the intensive prospector.

In the Alice Arm section additional discoveries made in the upper Kitsault valley have extended the possibilities of this area to the north and west.

In the Coast area interesting discoveries on Gibson island, at the head of Grenville channel, and on Douglas channel and Gardner canal indicate that these easily accessible regions are well worth the prospector's attention.

TRANSPORTATION.

The results of aeroplane transportation for prospectors, engineers, supplies, and equipment, initiated during the season, have culminated in a definite decision for increased flying service from several strategic points during 1930. This efficient means of transportation will hasten the development of the district.

Assistance by the Department of Mines in the construction and reconditioning of trails to mining properties and promising mineral areas, and the gathering of data upon which will be based the location and route of several projected mining-trails, has been a governing factor in the progress and prosperity of the district.

DEVELOPMENT.

Several exceptional development operations have featured the year's operations. Outstanding among these is the completion of the Porter-Idaho aerial tram by the Premier Gold Mining Company, Limited, in the face of exceptionally difficult construction problems. Ore is now being hauled over this tramway to seaboard.

The development record by the United Eastern Mining Company on the *Tulsequah Chief* property in the Taku River area, under the direction of J. B. Stapler, is an outstanding example of efficient exploration.

In Alice arm the energetic exploration and development of the *Toric* property and the extension of this work to the *Dolly Varden* and *Wolf* groups augurs well for the future prosperity of this promising area.

In placer-gold mining the work and progress of Compagnie Francaise des Mines d'Or du Canada in drilling its ground on Otter creek, Atlin Division, and embarking on the construction of 9½ miles of flume and ditch to garner water from five creeks, is commendable and efficient enterprise. It is estimated by the company that the placer-ground available for this operation will take fifty years to work out. Should this work, and that of Consolidated Mining and Smelting Company of Canada on Boulder creek, Discovery Mining and Power Company on Pine creek, and Delta Gold Mining Company, Limited, on McKee creek, result in profitable output, the placer-gold mining industry of the district will have made a decided step towards the restoration of its past appreciable production.

GEOLOGICAL SURVEY.

The Geological Survey of Canada has continued with commendable pioneer work ahead of the prospector. Notable has been the completion of the mapping of the Stikine River area by Forrest A. Kerr. George Hanson has also completed the mapping of the Alice Arm section. The reports and maps of these areas are being awaited with much interest. It is hoped that the work of the Geological Survey will be extended next season into the Taku River area and that the Unuk river and Whiting river will also receive detailed attention in the near future. With this work in hand, a complete correlation of the economic geological features of the eastern contact margin of the Coast Range batholith from the Nass river to the Taku river will become available to the prospector and operator. This will embrace a stretch 250 miles in length of potential mineral area equally as promising as any on the American continent, and generally untouched as yet by the prospector's pick.

OUTLOOK.

A constructive feature of the year in all Mining Divisions of the district has been a marked tendency towards conservatism and the fundamental aspects of sound mining principles. The importance of employing competent mining engineers to assure efficient development of properties

and to safeguard the interests of investors is being realized to a greater extent than ever before. No single factor is having a more definite bearing in placing the mining industry in the North-western District on a sound footing, and in attracting capital for development, than this tendency to conservatism and the basic principles of efficient mining.

During the year all the branches of the industry, including the technical institutes and associations, have shown a decided and increased trend towards constructive co-operation for the welfare of the industry in the district.

BELLA COOLA MINING DIVISION.

This area has been comparatively inactive, both with regard to development and prospecting. Nothing of importance has consequently materialized. Several inclusion zones within the granitic rocks of the batholith on Dean and Burke channels deserve more than the superficial shore prospecting they have received. The interior region of the Bella Coola valley, along the eastern margin of the batholith-contact which cuts through the valley about 20 miles inland, offers a likely area for prospecting. Some cursory prospecting in this region carried out in the past disclosed evidence of mineralization to warrant a more intensive exploration.

SKEENA MINING DIVISION.

COAST SECTION.

Detroit Western Mining Corporation.—The stock of this corporation is held by a few Detroit and Eastern States individuals. The property being explored in this district is the old *Western Copper* group, situated up the Khutze River valley, about 5 miles from the head of Khutze inlet. During the season a small shipment of ore was made and work continued in the shaft to about the middle of September. At the beginning of November operations on the property were closed down and only a watchman left in charge. The management states that it is intended to resume operations in the early spring.

Los Angeles-Vancouver Mines, Ltd.—This company is developing the old *Drum Lummon* property on Douglas channel. At elevation 239 feet a 9 by 7 crosscut tunnel is being driven to intersect the vein at 236 feet below the upper tunnel. At the time of examination (November 9th) this crosscut had been advanced 1,235 feet, and it is calculated that an additional 370 feet should complete the intersection. In the upper tunnel 295 feet of drifting to the west, 20 feet of raising, and 10 feet of crosscutting had also been completed this season.

An incline tramway 600 feet long has also been constructed from elevation 82 feet to the portal of the lower tunnel. This incline is connected with the beach by a narrow-gauge railway 2,800 feet long. Snow-sheds are being constructed over exposed parts of the transportation system to permit of uninterrupted operation during the winter months. The property is well equipped and the operations are being efficiently and economically carried out.

When the vein is intersected by the lower tunnel, it is planned to raise through to the upper tunnel, west of an ore-shoot that shows in the upper tunnel drift. This will explore any possible westerly rake of this shoot and allow of sectional exploration for this shoot by intermediate drifting east and west.

The ore occurrence has been fully described in the Annual Report for 1922, and also in the Summary Report, 1921, Part A, Geological Survey of Canada, to which readers are referred. The present operators recognize the erratic character of the ore distribution in the occurrence. They are, however, assuming the possibility of striking a more stable ore condition or lenses of appreciable extent with development on the lower horizon.

Trixie.—This property is situated on Porcher island and has been continuously developed during the season with the backing of Eastern capital. The original claims of the group consisted of the *Trixie* and *Western Hope*. It is stated that thirty claims have been added to these by staking to protect continuity of the ore-zones.

Work is at present being carried on in No. 1 tunnel at elevation 370 feet. At the time of examination this tunnel had been advanced to 715 feet and was being driven north to connect with No. 3 tunnel, which was also being advanced in the direction of No. 1. Sixteen men are employed, working one eight-hour shift. During November the workings were being sampled to ascertain the possibilities of tonnage.

Moult Claims.—This property is situated on James island, on Griffin pass, between Mathieson channel and Sheep pass. The showings are at altitude 100 feet and about 1,000 feet east of the beach on Griffin pass. Several open-cuts distributed over a length of about 1,100 feet have explored a metamorphosed schist-limestone zone showing widths of 2 to 9 feet of copper mineralization. The zone strikes N. 60° W. and dips 60° S. On the northerly or foot-wall side it is in contact with quartz diorite. Mineralization consists of chalcopyrite, pyrite, and some bornite, disseminated and in small veinlets. The showing is well worth further exploration and offers every facility for economical operation.

Western Canada Graphite, Ltd.—This company was incorporated in August, 1929, for the purpose of operating graphite-deposits on Mussel and Kynoch inlets. The locality was visited during November, but the claim-holders were unfortunately not then on the ground. Two days were spent in searching the Bear River, Poison Cove area, the valleys of three streams that flow into the head of Lou Kent bay, Mussel inlet, and the area around the north shore and head of Kynoch inlet, for the workings. A water-power staking by L. K. Lentz, dated August 16th, was located at the head of Lou Kent bay. Unfortunately, however, no workings could be located and no blazes or trails that might lead to them were found. The deposits are mentioned in the Summary Report, 1921, Part A, Geological Survey of Canada, and are described as disseminated graphite in schist.

The holders of the claims have been advised that on account of the present condition of the graphite market, and the intricate factors that govern the situation, the outlook for profitable graphite production is not bright, and that any operation for mining, milling, and refining of that commodity should not be embarked upon without very cautious deliberation.

Klekane Inlet.—Alex. McLeod has been carrying on exploration of the old *Bolton* group on behalf of the syndicate which has taken over these claims.

Some claims up a creek south of Klekane inlet have been staked by Albert Lund, Butedale. Quartz float has been found on these claims carrying copper mineralization with a reported high gold content. The formation is a contact of schist with granite.

High Tide.—This group, *High Tide No. 1* and *No. 2*, was staked on the old location of the *Payroll* group by L. W. Patmore, of Prince Rupert. The showing is at the foot of a small bluff that rises from the south shore of Kiltuish inlet, Gardner canal, about 1½ miles from the head of the inlet.

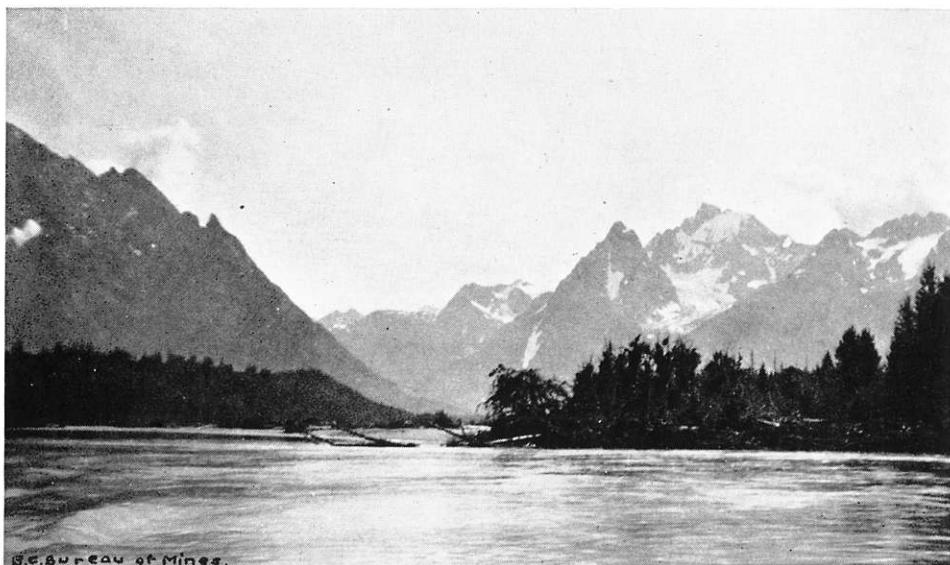
An open-cut 12 feet long has exposed a silicified zone in a pendant area of altered sedimentaries. The attitude of the zone is not clear, but it appears to be striking N. 15° W. parallel to the general trend of the formation. Mineralization across 9 feet consists of pyrrhotite, massive in places, with pyrite and some finely disseminated chalcopyrite, in a quartz gangue. Continuity to the south is obscured by heavy slide material and to the north by the sea. The showing warrants further exploration.

Kildala and Bolton No. 2.—These groups at the head of Kildala arm, Douglas channel, are owned by John Bolton and partners, of Kitimat. A good cabin and blacksmith-shed have been built. During the season some further stripping was done on the shore-line showings of the *Kildala*. The few small patches of pyrite with very sparse chalcopyrite exposed in this showing are not of importance.

On the *Bolton No. 2*, about 1¼ miles north-east of the *Kildala*, a cut 60 feet long along the east wall of a small creek has exposed veinlets and irregularly scattered bunches of pyrite with some chalcopyrite, in altered sedimentaries heavily garnetized and epidotized in places. Although this showing is apparently low grade, it warrants further work, and the area in general warrants detailed prospecting.

Big Bertha.—This group, consisting of the *Big Bertha* and *Big Diana* and owned by Cesaro Venezziò, of Terrace, is situated on Douglas channel, north of old Hartley Bay. The occurrence consists of sparse and irregular veinlets of chalcopyrite with massive development of pyrrhotite in places, in altered schists exposed by a 12 by 8 open-cut and a shallow shaft.

Kumealon Inlet.—A group of claims has been staked by Pete Brozet about a quarter of a mile east of the east shore of the head of the inlet. The showing consists of a sericitized shear-zone of undelimited width, in schists of the Prince Rupert series. A 9 by 6 by 5 open-cut into the zone has exposed banded and disseminated development of marcasite. An assay of the sulphides returned only traces of gold and silver.



Taku River, South Fork—Looking down from Mouth of Tulsequah River.



Graham Island—Black-sand Placers.

Gibson Girl.—This group, situated on Gibson island, Grenville channel, consists of four claims and is owned by George Keys and Frank Cole, of Prince Rupert. Open-cuts and strippings have been deepened by the owners, and in several cuts where the ore seemed to give place to limestone, or where only limestone was showing in some of the strippings, more ore has been exposed over encouraging widths. Further prospecting has also extended the continuity of the zone to about 1,100 feet. Mineralization is chalcopryrite, zinc-blende, and galena in reticulated structure in the fracture and bedding-planes of limestone-zones intercalated in mica-schists of the Prince Rupert series. The showing warrants intensive exploration and further prospecting.

LAKELSE SECTION.

Copper Queen.—This group is situated on Williams creek and consists of ten claims, owned by J. Bell and associates, of Terrace. The occurrence is chalcopryrite, bornite, pyrite, and pyrrhotite in a zone of banded epidotite and garnetite with some magnetite. The general rock formation of the area is altered argillite. In places the belt shows zinc-blende and galena mineralization. The zone is well mineralized and can be traced for several hundred feet over a vertical height of about 1,000 feet. Several open-cuts show an average width of about 8 feet carrying good mineralization. The showing warrants systematic exploration.

La Libertad.—This claim is situated near the top of Thornhill mountain and is owned by A. L. Fitzpatrick, of Terrace. The showing consists of a quartz vein varying from a stringer to 4 feet wide, traced for about 1,000 feet. The vein occurs on the hanging-wall of a greenstone dyke in granodiorite country-rock. The vein is sparsely mineralized with galena, grey copper, specks of chalcopryrite, and pyrite, with some calcite in the gangue.

Sadie.—This claim is situated about 800 feet east of the new Forestry Department lookout cabin on Thornhill mountain. It is owned by Michaud Bros., of Terrace. The showing is a replacement zone about 18 inches wide mineralized with chalcopryrite, pyrite, and copper carbonates.

The *St. Paul* and *Annie Laurie* claims, owned by the Michaud Bros., of Terrace, are situated at altitude 1,100 feet on the east slope of Thornhill mountain. Several open-cuts and short tunnels have traced a flat-dipping quartz vein in granodiorite several hundred feet. The vein varies from a stringer to 30 inches in width. It is mineralized with patches of scheelite, with a little galena and pyrite, and in places contains visible gold. The vein is well defined and merits systematic exploration and sampling.

On the *Annie Laurie* a 9-inch quartz vein striking S. 55° W., and dipping 78° N., mineralized with chalcopryrite, galena, and some grey copper, in a granodiorite formation, has been drifted on for 25 feet. In the tunnel-face the vein is rather shattered.

The *Eureka* group, owned by Michaud Bros., of Terrace, is situated about 1½ miles south of the *St. Paul* on Thornhill mountain. The showing consists of irregular patches of molybdenite in a fine-grained grey granite. A small open-cut has exposed the molybdenite in large patches and lumps. The occurrence is encouraging and more work should be done to prove the continuity.

NASS RIVER MINING DIVISION.

OBSERVATORY INLET SECTION.

Granby Consolidated Mining, Smelting, and Power Co.—Development of the *Bonanza* ore-body, about 3 miles south of Anyox, has continued and the daily production of about 400 tons from this source has been steadily maintained. The *Hidden Creek* ore-bodies are being intensively explored and production from this source is also being maintained. Energetic field-work has been carried on throughout the district and many properties and new areas have been examined, but with somewhat indefinite results.

Silver Crest Mines, Ltd.—Construction of the aerial tramway and the driving of the tunnel to reach the downward extension of the surface ore-showings has been continued during the season. The stringing of one cable line of the tramway from the beach to the tunnel-site at altitude 4,400 feet had been completed and put in operation in two sections. The second cable had been hauled into position and it was hoped that the donkey-engine, rented from the Granby Company for the purpose, would be available for the further short period required to complete the job.

At the time of examination (October 6th) the drift-tunnel had been advanced to 168 feet. The vein in this tunnel is 1 to 4½ feet wide, of generally banded and, in places, brecciated

structure. A 1- to 2-inch streak of galena ore shows on or near the foot-wall from the tunnel portal to about 40 feet in. From that point to the face some isolated streaks and small bunches of galena were observed. In the face at 168 feet the vein is 24 inches wide, banded, with quartz stringers and included fragments of schist, and showing a few specks of galena and some streaks of iron oxide. At no place from the tunnel portal to the face at 168 feet does mineralization extend across the vein to a greater width than a few inches.

On surface, at the collar of the old shaft at altitude of about 4,600 feet, good mineralization of galena, zinc-blende, and chalcopyrite can be seen across a width of 3 feet. In several open-cuts on surface, promising mineralization occurs across widths of from 1 to 2½ feet. It is estimated the tunnel will have to be driven about 675 feet to reach the downward extension of the vein showing in the shaft at altitude 4,600 feet.

A contract has been let for the driving of 400 feet of tunnel during the winter. Much constructive information could be gained by crosscutting at intervals to eastward, during this work, to explore the downward extension of the surface open-cut showings.

Elkhorn.—This group is owned by J. Flynn and associates, of Alice Arm. It is situated on the eastern slope of Saddle mountain, Hastings arm.

Late in the year Flynn made an interesting discovery of free gold in a silicified zone mineralized with fine-grained pyrite, pyrrhotite, some galena and zinc-blende, on this property at altitude 3,575 feet. A small open-cut shows the zone to be about 3½ feet wide, striking N. 45° W. (mag.) and dipping steeply into the abrupt mountain-slope. Spectacular finely divided gold in streaks ¼ to 1 inch wide have been found in isolated patches. Two other apparently parallel silicified zones carrying pyrite, pyrrhotite, some galena and zinc-blende have been found at 50 and 100 feet higher altitude.

These occurrences lie to the south of the *Saddle* group (Silver Crest Company). An attempt was made by the owners early in October to explore the showings, but severe weather conditions intervened after provisions and equipment had been packed up the mountain. The showing merits intensive exploration. The whole surrounding area, which is a large inclusion of schists and volcanics within the batholith, warrants detailed prospecting.

Georgia Bay.—This group, owned by Carl Eklund and William Craig, of Anyox, adjoins the *Elkhorn* on the south. Encouraging values in gold and silver are reported from two silicified zones recently discovered. These claims were staked late in the year and the showings have not been opened up.

ALICE ARM SECTION.

Negotiations are progressing that may lead to the active development of the promising molybdenum-deposits lying contiguous to the east and west shores of Alice arm. The *Cariboo* group on Lime creek, owned by J. Wells, is under option to D. S. Tait, of Victoria, who, in September, 1929, incorporated the Tidewater Molybdenum Mines, Limited, on the opposite side of the inlet, for active development. On the *Mohawk* group on Roundy creek further prospecting has extended the continuity of the vein, and a good mineralization is reported to have been discovered at considerably lower altitudes from the upper showings.

KITSAULT RIVER SECTION.

Esperanza Mines, Ltd.—Development-work is continuing on this property with a small crew. Unfortunately the financial crisis that occurred late in the fall handicapped the negotiations that were proceeding for the more active development of the property and the installation of equipment and machinery necessary for the proving of sufficient tonnage to warrant the eventual construction of a small mill.

Billy Barton.—This group of six claims on the easterly slope of Esperanza mountain to the Kitsault valley was actively explored by the owners, J. Peacock and Tony Calfa. A 90-foot tunnel and two short crosscuts showed a series of 1- to 12-inch quartz veins following the bedding and jointing of the argillite formation. The veins are irregular and pronouncedly lenticular with sparse galena, zinc-blende, and pyrite mineralization.

Utopia.—Neill Forbes, of Alice Arm, has actively explored this property, situated about 1 mile south of the *Billy Barton*. A crosscut tunnel 130 feet long intersected the mineralized felsite dyke at 90 feet in. The tunnel continues diagonally across the dyke to the face, indicating a width of 14 feet. The dyke strikes N. 60° W. (mag.) and dips 45° S. In a tunnel 20 feet long, at about 25 feet higher elevation, directly above the lower tunnel, 2 to 4 inches of

galena, pyrite, and some grey copper shows in the dyke and along the foot-wall. Although this mineralization is not developed in the lower tunnel, the showing warrants some further exploration.

Wolf.—This property, lying south of the *Esperanza* and adjacent to the Dolly Varden Railway, was further explored by the owners, J. Fiva and associates, of Alice Arm, during the season.

Alice Arm-La Rose Mining Co., Ltd.—This property has been inactive during the year. The high-grade ore-showings associated with the tuff, explored in the raise to surface, certainly warrant further active development and exploration to determine their lateral extent and possible depth continuity, relative to the attitude of the apparently ore-making tuff.

Homeguard.—A Radiore exploration was carried out on this property. Surface prospecting has now uncovered additional ore-showings. The property is under option to the Dalhousie Mining Company.

Britannia Mining and Smelting Co.—This company has energetically continued exploration and development of the *Toric* by diamond-drilling, drifting, and crosscutting. A shaft started late in October from the main tunnel-level is projected to explore the ore-body to a depth of 250 feet. Some high-grade ore has been encountered in this shaft. The work in general is giving encouraging results. It is planned also to raise from the main level. The completion of this development-work into higher and lower horizons will permit a comparatively reliable estimate of tonnage values. Operations will be carried on through the winter months.

This company has also optioned the *Dolly Varden* and *Wolf* properties. As the season was advanced when this deal was completed, it is not expected that the properties will be actively developed until the spring of 1930.

North Star.—This fractional claim, adjoining the *Dolly Varden* group on the north, has been actively explored during the season by Gus Pearson and partners, of Alice Arm.

Utility Mines No. 1, Ltd.—This company continued active exploration of the *Tiger*, adjoining the *Toric*, until the late fall, with a crew of seven men under the direction of Ed. Pickett. No. 2 tunnel, at elevation 1,900 feet, intersected the vein showing in No. 5 cut at elevation 2,175 feet, with encouraging values indicated at the point of intersection.

On the *Vanguard* group of four claims, owned by M. Peterson and partners, of Alice Arm, further exploration during the season has given encouraging results. This group lies on the west side of the Kitsault river, about 5 miles north of the Dolly Varden Railway terminus. It is situated in what is known as the Alice Arm copper-belt. Exploration has indicated two main zones of chalcopyrite and pyrite mineralization. The zones have been prospected on the surface by several open-cuts and explored underground by about 600 feet of crosscutting and drifting. Encouraging widths of copper mineralization have been encountered in this work. This season additional showings of high-grade ore have been exposed. The silver ratio of the *Vanguard* ore is high, which factor would decidedly augment tonnage value.

The *Vanguard Extension* adjoins the *Vanguard* on the south and is owned by M. Peterson, of Alice Arm. A short tunnel has opened a similar ore occurrence to that on the *Vanguard*.

Blue Bird.—This group, situated in the upper Kitsault valley, is owned by Archie McPhail, of Alice Arm. During the season the owner reported that surface-stripping and open-cutting had given very encouraging results.

Several engineers examined properties in the upper Kitsault valley during the season, but with the exception of the Britannia Mining and Smelting Company's options on the *Dolly Varden* and *Wolf* no further definite deals have culminated.

NORTH-EAST FORK OF KITSULT RIVER SECTION.

Red Bluff.—Preparations were made during the season for the development of this group. The claims are situated on the south slope of Red Bluff mountain. Under the direction of Joe McPhee, of Butedale, a good cabin was built at the foot of the bluff on which the showings are. A trail was also constructed from the East Fork bridge to the camp-site, a distance of about 2 miles. Surface prospecting is reported to have resulted in the discovery of several additional showings of veins carrying chalcopyrite mineralization. Tunnelling into the base of the bluff to explore for better-grade copper ore than that exposed in the bluff workings is contemplated for next season.

On the *Observer* group, situated on the west side of Washout creek, additional open-cutting on the disseminated chalcopyrite replacement zone has extended the continuity of the zone.

ILLIANCE RIVER SECTION.

Kitsault-Eagle Silver Mines, Ltd.—On the *Sunrise* the crosscut tunnel being driven to cut the "Banded vein" at 500 feet below the surface outcroppings had been advanced to about 1,200 feet at the time of examination (October 4th). In the course of this work two veins outcropping on the surface were cut at about 175 and 400 feet in respectively. It was estimated that the "Banded vein" should have been intersected at about 1,000 feet in. Unfortunately, surface work on the "Banded vein" exposures has in no place defined the attitude of this vein, and consequently the position it should assume at the tunnel horizon cannot be accurately calculated. Nothing had been encountered in the tunnel that conformed to the character of the "Banded vein" outcrop.

At about 1,000 feet in, however, isolated bunches of zinc-blende were encountered associated with a somewhat indefinite structure. The tunnel discloses a gradual change of the formation attitude from an easterly dip at the portal to a westerly dip at the face. Where the attitudes of exposed veins can be definitely determined they conform in dip, more or less, to the bedding of the formation. On surface, formation exposures contiguous to the "Banded vein" indicate a westerly dip of about 45°, conforming to the westerly dip of the bedding-planes towards the tunnel-face. Should the "Banded vein" conform to this 45° westerly dip it would be encountered on the tunnel horizon at approximately about 1,500 feet in.

It is possible that the ore encountered at the 1,000-foot point may be the depth extension of a surface showing at the head of the creek at altitude 3,650 feet. At the 1,000-foot point in the tunnel the structure has been drifted on to the north for 80 feet, with bunches of zinc-blende in quartz-calcite stringers showing at intervals. At 950 feet a crosscut has been started into the north side of the tunnel, where it is estimated this structure will be cut at 40 feet in. During the winter the first vein encountered in the tunnel will be drifted on to north and the second will be explored by drifting to the south. As the best mineralization encountered on surface seems to lie to the south of the tunnel, it would seem logical to confine initial drifting to that direction where possible. Before advancing the crosscut tunnel any farther it is planned to determine the attitude of the "Banded vein" by additional surface work in the spring. This is a sound campaign of development. This exploration will shed much light on the McGrath Mountain zinc-deposits. Ten men are steadily employed on the property and the work is being economically and efficiently carried out under the supervision of A. McGuire.

On the *Billy Mack*, situated at 1,925 feet elevation on the southerly slope of McGrath mountain, the assessment for the year was carried out by the owners, James Peacock and associates, of Alice Arm. The McGrath Mountain trail has been reconditioned and in places relocated with the assistance of the Department of Mines.

PORTLAND CANAL MINING DIVISION.

GEORGIA RIVER SECTION.

North Country Mining Co., Ltd.—Work has been concentrated on driving two crosscuts in an easterly direction through a hard metamorphosed argillite. Surface and underground work has so far disclosed only irregular patches of zinc-blende, chalcopryrite, galena, and pyrite mineralization. No ore of commercial value has been found so far, but the favourable formation on the *Glory Extension* group and the indication of encouraging gold values reported by the owners and in the 1928 Annual Report warrant some further prospecting for possible continuous shoots of commercial grade and width.

Georgia River Gold Mines, Ltd.—Active and efficient development was continued on this property during the year and will proceed throughout the winter months. Compressors and other equipment were installed, bunk-house and residence erected, and assay office, warehouse, and office put under construction. With the contemplated installation of an electric-lighting system the property will be one of the best equipped in the district.

Work is being concentrated on the driving of No. 3 tunnel to intersect the southerly end of the south-west vein. This tunnel starts as a crosscut in a westerly direction for 190 feet, where it is turned northward for about 250 feet and then easterly, in which direction it had advanced about 80 feet without encountering the vein. In the surface open-cuts above this tunnel the easterly dip of the vein and the indication of displacement by a northerly-striking shear-zone may have thrown the vein farther to eastward than the position of the tunnel-face at the time of examination.

When the downward extension of the south-west vein is located it is planned to drift north-east to explore for the depth continuity of the ore-shoot indicated in the surface cuts. The vein will then be drifted on to explore for ore-shoots towards No. 2 tunnel. The progress of this work will also involve crosscutting for the depth continuity of the *Bullion* vein and the intersection of that vein with the main vein.

The veins can be traced on surface for appreciable distances, with altitude variation of from 3,180 feet at No. 3 tunnel to 3,600 feet at No. 1 tunnel. Beyond this the main vein was traced to about altitude 4,600 feet, but snow on the higher elevations obscured its further possible tracing. The main vein, which is apparently a silicified zone averaging about 14 feet wide, does not carry encouraging mineralization.

In No. 1 tunnel widths of from 4 to 30 inches have been drifted on for about 140 feet, with reported values of from 60 cents to \$170.24 in gold and silver. At the time of examination (middle of October) the face of No. 2 tunnel showed a sheared zone with quartz stringers, sparsely mineralized with iron pyrites.

The *Bullion* tunnel has been described in the 1922 Annual Report. The occurrence is in an inclusion pendant of andesitic rocks of undetermined depth underlain by diorite.

MARMOT RIVER SECTION.

Porter-Idaho.—The Premier Gold Mining Company has actively continued operations on this property. During the year work has been largely confined to the construction of the aerial tramway from the beach to the *Prosperity* tunnel terminus. Construction was completed in September, tests and adjustments carried out, and early in October the tramway was in regular operation hauling ore to the beach terminal. The successful completion of this tramway in the face of exceptionally difficult obstacles reflects great credit on the skill and resourcefulness of those engaged in its construction.

Prosperity.—Energetic exploration and development of this property by the Premier Gold Mining Company, Limited, has continued throughout the year from No. 3 tunnel. At the time of examination (October) work was proceeding in the stope off 305 drift north. The face showed about 5 feet of good-grade ore in a shoot about 30 feet long. Drifting was proceeding in No. 1 tunnel. It is planned to raise from 305 drift south to "A" tunnel, and also from 301 crosscut to No. 1 tunnel, with a sub-level drift north and south.

Melvin Mining Co., Ltd.—The claim operated by this company adjoins the *Prosperity* and *Porter-Idaho*. A narrow stringer mineralized with galena, zinc-blende, pyrite, chalcopyrite, and native silver in places, has been drifted on for 162 feet. At 20 feet in from the tunnel portal a winze was started on the high-grade ore-showing at that point. At the time of examination the winze had reached 7 feet, with 26 inches of well-mineralized vein-matter in the bottom and indications of additional width in the hanging-wall. At 15 feet depth the vein is reported to have widened to 30 inches and retained its mineral tenor. It was intended to continue operations during the winter, but a cave-in of the tunnel necessitated the cessation of operations. About 6 tons of high-grade ore was sorted from the first ore-shoot encountered near the portal and sacked for shipment.

Bi-Metallic Syndicate.—This syndicate was formed to develop a group of eleven claims on the north side of Marmot river, opposite the mouth of the North fork. Four veins, 2 inches to 4 feet wide, which appear to be shear-zones in granite, are being developed. Mineralization consists of pyrite, zinc-blende, galena, and chalcopyrite in a quartz gangue. Free gold occurs in the quartzose gossan. Considerable open-cutting and drifting on these was completed during the season. The intersection of the *Panhandle* and *Gold Pan* veins should be explored for a concentration of values.

BEAR RIVER SECTION.

Silver Bell Mining Co., Ltd.—This company owns seventeen claims adjoining the *Silverado* on the south. The showings consist of a series of shear-zones in volcanics containing small lenses of galena, with some zinc-blende and pyrite. The zones have been prospected by a few open-cuts and trenches. The property warrants systematic prospecting.

Silverado Consolidated Mines, Ltd.—This property, situated on the east side of the head of Portland canal at an elevation of about 3,500 feet, overlooking the town of Stewart, has been continuously developed by the Premier Gold Mining Company, Limited, during 1929. The downward extension of the veins has been explored by crosscutting. A raise and sub-level drift

exploring the higher horizon of these veins have given more encouraging values and lengths of ore-shoots than were encountered in the crosscut.

Bayview Mining Co., Ltd.—The eastern area of the *Lucille No. 1* was further prospected and additional discoveries are reported. No extensive development was carried out.

United Empire Gold and Silver Mining Co., Ltd.—Drifting on the vein at elevation 3,350 feet was continued during the season to intersect a high-grade ore-shoot indicated on the surface at about 150 feet higher altitude. When this vein is definitely established at the tunnel horizon, constructive exploration that will give appreciable backs on ore-shoots that may be encountered can be carried out. On the surface several cuts were deepened and additional stripping carried out in order to definitely establish the attitude and correlation of the different exposures.

Dunwell Mines, Ltd.—An electrical survey was carried out on this property during the late summer. The indications from this work were followed up with diamond-drilling, results from which are reported to be not definitely encouraging. Weather conditions necessitated the cessation of drilling. It is intended to continue with further drilling in the early spring.

Black Hill Mining Co.—Active and efficient development and exploration is being carried out on this property. A winter camp has been established and it is intended to continue through the winter months.

Work is being concentrated in the driving of No. 1 tunnel at altitude 4,475 feet to the point of intersection at altitude 4,600 feet of No. 1 vein and "No. 1 galena feeder." At the time of examination (October 13th) No. 1 tunnel had advanced 78 feet. An ore-shoot 41 feet long, averaging 12 inches in width, and heavily mineralized with zinc-blende, jamesonite, galena, and grey copper, in a calcite-barite gangue, was exposed on the west wall of the tunnel to within 9 feet of the face. In the face the vein had become shattered and sheared with only sparse mineralization. From this work two shipments of selected ore totalling about 20 tons has been made to the smelter. It is reported that the shattered condition of the vein continued for about 22 feet, when a second ore-shoot came in which is now being drifted on. At about 160 feet horizontal distance from No. 1 tunnel portal, heavy mineralization similar to that showing in the tunnel is exposed in an open-cut at altitude 4,550 feet, over a width of from 9 inches to 2 feet.

In No. 2 tunnel good-grade ore from 8 to 10 inches in width is developed. There are several other veins and intersections that will be explored as development progresses. Satisfactory arrangements for the shipment of ore by pack-horses to seaboard have been made. The operations are being directed by Stewart, Batten, and associates, consulting engineers.

Kenneth.—This group formerly known as the *Mobile* is owned by H. P. Gibson and Louis Legg, of Stewart. It is situated on the south side of Glacier creek, at an elevation of 4,000 feet. Late in the season the group was optioned by Clay Porter, of Stewart, who intends to start active developments in the spring. The main showing consists of a well-defined vein, in a shear-zone in argillite, striking north-south and dipping steeply to west, and varying in width from 18 inches to 4 feet. The vein is traced for an appreciable distance by open-cuts, tunnelling, and natural exposure, over a vertical difference of about 400 feet. Mineralization consists chiefly of zinc-blende, pyrite, and some galena.

About a quarter of a mile west, a quartz vein with similar characteristics as the first mentioned has been exposed in a creek-bed by an open-cut. This zone shows a width of 20 feet and is well mineralized over from 2 to 5 feet with zinc-blende, galena, and pyrite.

Mayou Gold Copper Co., Ltd.—This property, comprising thirty claims, is situated on the north side of Bitter creek. During the summer work has been concentrated on driving three tunnels. The main showings consist of a series of narrow shear-zones mineralized with galena, zinc-blende, and pyrite. These zones are associated with intrusive dykes in argillite. They probably represent the filling of shearing-planes along the contacts of the dykes and argillite. The veins are small but appear to be well mineralized and high grade in places. The showings warrant further exploration.

Radio-Stewart Mines, Ltd.—This property is situated on the north side of Bitter creek, adjoining the *Mayou*. Somewhat wider shear-zones than those occurring on the *Mayou*, but with similar mineralization, are exposed on this property and were further prospected during the season.

Bitter Creek Mines, Ltd.—The holdings of this company in Hartley gulch, near the head of Bitter creek, were further developed and explored during the season. Prospecting has resulted in additional discoveries. The tunnel on the fault-vein, in which nodules of high-grade galena ore occur in a grey gouge, was continued, but with indefinite results.

The upper tunnel, at altitude 3,500 feet, was continued through the silicified zone in the greenstones. This work is reported to have crosscut a width of 18 feet of promising mineralization. Unfortunately, the work was halted for the season before any drifting on the lower tunnel, to explore the promising width of mineralization exposed, could be carried out. These showings warrant more intensive exploration than they have received.

Dalhousie Mining Co., Ltd.—This company's holdings in the Portland Canal area are situated about 9 miles from Stewart, on the west side of the Bear river and adjoining the A. & T. group. At the time of examination no work was being carried out on them.

A. & T.—The Consolidated Mining and Smelting Company of Canada prosecuted active exploration on the property throughout the season. Discouraging results were obtained from the diamond-drilling, and at the conclusion of the operations the company dropped the option.

Independence Gold Mining Co., Ltd.—This company's holdings are situated on the north side of Goose creek, about 12 miles from Stewart. The showings consist of a series of mineralized zones in greenstone-bands of variable widths, bordered by granitic dykes which strike through the surrounding area in a north-westerly direction. The mineralization consists chiefly of zinc-blende with some silver values. The property is being operated by the Revenue Mining Company, Limited.

During the season work has been concentrated on the two tunnels on No. 1 vein. At the time of examination (August) No. 1 tunnel, at an elevation of 2,950 feet, had been advanced to 700 feet. A crosscut to the north-east exposed 18 feet of mineralized material. No. 2 tunnel, at 2,760 feet, had also advanced to about 700 feet. The mineralized zone which parallels the tunnel to the south-west had been penetrated by several crosscuts which show the zone to average about 12 feet in width. The zone where penetrated by the east crosscut from No. 2 tunnel was drifted on, but appears to be cut off by a dyke. It is extremely difficult to determine what has actually happened without a survey being made. Unfortunately no plan of the workings was available.

The property is equipped with an Ingersoll portable compressor, rock-drill, and a blower driven by a small gasoline-motor. Operations have been closed down for the winter.

Rufus Argenta Mines, Ltd.—The holdings of this company are situated on the north side of Bear River valley, about 20 miles from Stewart. During the early part of the season the continuation of the tunnel to cut the downward extension of the Erickson vein was carried out by the J. F. Duthie interests of Seattle. These operations ceased in the early fall and J. F. Duthie was reported to have relinquished his option. The tunnel had been driven about 800 feet and nothing of importance had been developed.

Red Top Mining Co., Ltd.—The holdings of this company are situated on the north side of the upper Bear River valley. During the summer season work was conducted from a tent camp at elevation 3,800 feet. A crosscut tunnel at elevation 3,865 feet had been driven 370 feet through greenstones to explore for the extension at depth of the surface showings exposed at 4,080 feet elevation. This showing had been traced on surface for about 1,000 feet by several open-cuts, exposing iron-stained brecciated quartz, carrying galena and chalcopyrite, with some calcite and barite. At about 370 feet in the crosscut tunnel, drifting was started to the west, but at the time of examination (end of August) the vein had not been found, though several small mineralized seams were cut in the greenstones.

At about 125 feet below the disseminated chalcopyrite surface outcrop at 3,000 feet elevation, a 330-foot crosscut penetrated the vein, showing it to be about 8 feet wide, but carrying sparse mineralization.

Docta.—This claim is owned by McNeil Bros. and adjoins the *Red Top* on the east. The staking is a new discovery of almost solid galena, carrying a little pyrite and chalcopyrite, 12 to 14 inches wide. The strike is east-west and the dip south. The vein has been exposed by two small open-cuts about 50 feet apart vertically.

Atlas Gold Copper Mining Co., Ltd.—These claims are situated on the south side of the upper Bear River valley and west of the George Copper Company's claims. During the season a diamond-drilling campaign was carried out at elevation 2,380 feet. These holes were pointed from the *Bear Valley* claim to cut the extension of the *George* group lower zone occurring at about 500 feet higher elevation on the *Elgin*. These holes failed to find anything of importance and drilling was suspended.

Operations were then begun on the old workings on the line between the *London* and *Chicago* claims, where there occurs a flat-lying zone carrying pyrrhotite, pyrite, and some chalcopyrite. These operations showed discouraging indications and work ceased for the season.

George Enterprise Mining Co., Ltd.—A very energetic and efficient campaign of exploration and development was carried out by this company on the *Enterprise* group on the north side of the upper Bear River valley, and also on the *Heather* group on the south side of the valley.

On the *Heather* group exploration disclosed only isolated small patches of chalcopyrite mineralization and no defined structure.

On the *Enterprise* group extensive open-cutting and underground work developed showings of chalcopyrite mineralization associated with well-defined structure, and indications of silver-lead values in a fault-vein associated with a silicified zone of undetermined width. This work has considerably augmented the possibilities of the property, which warrants intensive exploration and development.

George Gold Copper Mining Co., Ltd.—Diamond-drilling at elevation 2,900 feet by the Consolidated Mining and Smelting Company of Canada was continued throughout the summer season on this property. The objective of this work was to explore the lower zone for the mineralization indicated in the tunnel in the zone at about 400 feet higher elevation. Nothing definite regarding the development of tonnage from possible mineralization of the zone has been determined by the drilling campaign so far.

No development of the veins occurring at the higher altitudes was carried out during the season. With the coming of the snow, operations ceased for the season.

Montreal.—This property, comprising eight claims, is situated on the Bear River-Nass divide. A detailed description of the showings is contained in the Annual Report for 1928. During the season J. Douville and partners, the owners, carried out additional stripping and open-cutting and more discoveries were made.

Southern Cross.—This group of sixteen claims, owned by E. C. Morris and C. Lake, of Stewart, is situated on the east side of the Bear River glacier, at altitude 2,500 feet. Open-cutting and stripping during the season has exposed a showing of quartz veinlets over a width of about 20 feet in a formation complex of andesite and argillite. Mineralization consists of chalcopyrite, grey copper, and some zinc-blende. The owners report having identified native silver in the occurrence. The showings are among the season's new discoveries and indicate good prospecting possibilities towards the Meziadin Lake area.

Mountain Boy Mining Co., Ltd.—Operations have been concentrated on the exploration of the Mann vein in the Mann tunnel at altitude 2,440 feet; and of the Highgrade vein by a crosscut to the vein and drift along it at about 3,000 feet altitude, in the hope of intersecting the extension at depth of the ore-showings above.

The Mann tunnel, advanced to about 200 feet along the foot-wall of the vein, with two crosscuts at intervals to the hanging-wall, has exposed fair, though patchy, mineralization of chiefly zinc-blende for a width of about 5 feet along the foot-wall from the portal to about 40 feet in. From there to the face, although the vein shows widths of over 20 feet, mineralization is very irregular and generally sparse.

After drifting along the Highgrade vein for about 30 feet from the intersection by the crosscut the vein is assumed to be faulted. Crosscutting to east and west had failed to pick up the extension up to the time of examination (October 10th). The character of the vein exposed in this work is similar to that of the Mann vein, with sparse mineralization.

During the season a small shipment of selected high-grade ore was made from the surface showings of the Highgrade vein above the tunnel. In this showing a mineralization of galena, zinc-blende, argentite, and a mineral thought to be stromeyerite, is very irregularly distributed through the jasper-barite gangue in small kidneys, and in $\frac{1}{4}$ - to $\frac{1}{2}$ -inch veinlets along some of the cross-fractures. This character of mineralization favours generally 8 to 18 inches of the vicinity of the foot-wall and can be picked up at irregular intervals over a distance of about 100 feet. To recover appreciable quantities of high-grade ore for shipment from this surface-showing very close selective mining and sorting would be necessary.

Winter operations will be carried out from a crosscut tunnel starting a short distance north of the bunk-house at about altitude 2,400 feet. At the intersection of this tunnel with the Mann vein a raise will be started to connect with the Mann tunnel. The blacksmith equip-

ment has been moved underground and the space between the winter crosscut portal and the drier-room will be covered in to shelter from severe snow conditions.

The property is equipped with an Ingersoll-Rand 310-cubic-foot gasoline-driven, portable compressor, installed at about 1,700 feet altitude.

Lucky Jim.—This group of nine claims, owned by W. Bozance and partners, of Stewart, is situated on the west side of American creek, adjacent to the *Mountain Boy*. The showings consist of quartz-jasper-barite vein 7 feet wide carrying mineralization of galena, some chalcopryite and bornite, and a little grey copper, in an andesite formation. Four hundred feet west and at about 1,000 feet higher altitude a silicified replacement zone about 13 feet wide, showing mineralization of chalcopryite and bornite, has been stripped and open-cutted in places. Three other showings mineralized with pyrite and galena, but on which no work has been done, are reported to occur on the property.

Morning Canyon and Keystone.—These groups are situated towards the mouth of American creek and are owned by Sam Deschamps, of Stewart. The *Morning Canyon* showings have been explored by open-cuts, stripping, and a 60-foot long tunnel driven diagonally across a mineralized zone. Where the tunnel crosses the zone at 20 feet, the owner reports 7 feet of mineralization with pyrite, some galena and zinc-blende, and a little chalcopryite. From 20 feet to the face intermittent mineralization is reported, with 18 inches of fair mineralization showing in the face. During the season tunnelling was continued and a cabin built.

On the *Keystone* a quartz vein 4 feet wide mineralized with zinc-blende, chalcopryite, and some galena, in an andesite formation, has been opened up by a 50-foot tunnel, a 12-foot shaft, some stripping and open-cutting.

Heywood Mining and Development Co.—This property, consisting of fourteen claims on the east bank of American creek, was further explored during the summer by open-cutting and stripping.

Shuniah Mines, Ltd.—Options have been procured by this company on the *Ruby*, *Blue Jay*, *Maybee*, *Louise*, and *M. and M.* group, comprising thirteen claims and one fraction, situated on the west side of American creek, east and north of the *Mountain Boy* and *Lucky Jim*. The project is being financed by the Osisko Rouyn Exploration Company, of Montreal.

Late in October camp was established and operations started under the direction of W. J. Trethewey, of Montreal, with a view to preparing the showings for a thorough sampling. Exceptionally heavy rains greatly hampered the progress of the work, most of which was devoted to trail-construction to the showings on the *Ruby* claim.

Of the three veins reported to occur on the *Ruby*, only the lower vein, at about altitude 1,900 feet, has been opened up. On this there are two open-cuts about 500 feet apart. This vein was examined where it crosses a creek at about altitude 1,800 feet elevation. Here there was exposed a quartz-jasper-barite zone of appreciable but undetermined width and attitude and somewhat brecciated structure.

Mineralization at this exposure was very sparse, but an occasional small patch of what might possibly be silver sulphides associated with galena, chalcopryite, and bornite can be seen. Time did not allow other showings reported to occur on the property to be examined.

B.L.K., Bryant, Dundee, and Virginia K.—These groups, comprising twenty-four claims owned by C. M. Bryant, Mathew Little, and D. D. Kimball, of Stewart, are situated on the east and west side of the head of American creek. The claims were staked during the middle of September on discoveries made by D. D. Kimball. The owners report exposures of galena ore 3 to 4 feet wide, occurring at intervals along a considerable distance, below the edge of the glacier. Very encouraging values are reported in the assay returns from samples taken by the owners. The area has only recently been prospected and it would seem that the discoveries warrant systematic exploration.

Several other groups have been staked in the locality, including one group by the Northern Prospectors Syndicate, of Stewart, on which showings of chalcopryite are reported.

SALMON RIVER SECTION.

Premier Gold Mining Co., Ltd.—Normal production and energetic development have been carried on throughout the year. Several new ore-bodies have been developed in both the upper and lower horizons of the mine. Of particular interest is the exploration of a new ore-body indicated on the fifth level, and the intersection by diamond-drilling of encouraging values

below the sixth level. Although results from these new developments are as yet not conclusive, they indicate the possibility of commercial ore occurrences in a lower horizon than the former estimated limits. The sixth level is being vigorously pushed into the area of this new promising ground. Several improvements in the metallurgical practice are being worked out and put into operation in the mill.

Premier Border Mining Co., Ltd.—This company has absorbed the old Northern Light Mining Company, the shareholders of the latter receiving an equality of shares in the Premier Border Company. The tunnel crosscutting the formation towards the Premier line had been advanced to about 1,400 feet by the end of November. Three porphyry-zones showing encouraging values have been intersected by this work, with the face of the tunnel at 1,400 feet in porphyry. These zones will later be intensively explored for commercial ore-bodies. About 600 feet of territory between the face of the tunnel and the Premier line still remains to be prospected.

B.C. Silver Mines, Ltd.—Active exploration and development has been continuously carried on, with results that have decidedly improved the prospects for this operation. The new ore-shoot opened up on the sixth level during the summer has been delimited on that level and shows good values over a width of about 7 feet and a length of about 180 feet. This shoot is being explored for at a lower horizon. With the gradual working-out of the attitude and alignment of the ore-shoots, more rapid progress in the development of this property can be expected.

Woodbine Gold Mining Co., Ltd.—In order to adjust the affairs of this company and place it on a sounder operating basis, mining-work was suspended early in the summer and a reorganization of directorate effected. Following the advice of the Department of Mines and verification of that advice by an independent engineer, a conservative campaign of diamond-drilling to prospect for commercial ore-bodies on a lower horizon has been put into operation and is reported to be giving encouraging results.

Premier Extension Gold Mining Co., Ltd.—Efficient exploration by extensive stripping and open-cutting was carried out on this company's property, adjoining the Woodbine on the north. This work exposed a wide, north-south striking porphyry-zone of undetermined attitude and width. At altitude 1,140 feet No. 1 crosscut tunnel had been advanced 36 feet into the zone. The porphyry is generally pyritized and in a few isolated places is mineralized with zinc-blende and galena, the best development of these minerals being in a streak of about 9 feet width on the south side of the tunnel portal.

Big Missouri.—Active exploration of this property has been carried on by the Consolidated Company and will be continued through the winter. Prospecting of a siliceous area encountered has been conducted from 302, 306, and 307 drifts. Diamond-drilling has also been vigorously pushed. Results of this work are reported by the company to be inconclusive.

Unicorn Mining Co., Ltd.—Extensive and efficient exploration of the several mineralized zones occurring on this property was carried out during the season. Although generally low values in gold and silver have been met with, an occasional encouraging assay from mineralized cross-fractures warrants further systematic exploration for commercial ore-bodies.

Outland Silver Bar Mines, Ltd.—This property of fourteen Crown-granted claims is situated 6 miles up and on the west side of the Salmon River glacier. Extensive exploration of the several ore occurrences on these claims was carried out in a number of tunnels and met with encouraging results. The showings occur in an altered argillite cut by a series of east-west striking quartz-porphyry dykes. At the south end of the dyke-belt the vein system consists of north-south striking veins of from 1 to 4½ feet width, generally well mineralized with zinc-blende, galena, pyrite, pyrrhotite, and chalcopyrite. At the north end of the dyke system there is also a large, irregularly shaped mass carrying the same mineralization.

The equipment includes a 212-cubic-foot Ingersoll-Rand compressor and a drill-sharpener. There is also a well-equipped assay office, with a crusher and grinder run by a small gasoline-motor. The property merits thorough exploration and is being developed in an efficient and systematic manner.

Silver Basin.—These claims, owned by Fitzgerald Bros., of Hyder, are located on the east side of the Salmon River glacier. The showing occurs on the north wall of a small canyon. It consists of a mineralized zone of shattered argillite, containing stringers of quartz and calcite with galena, zinc-blende, and pyrite mineralization. Very little work has been done on the showing and it is certainly worthy of further exploration.

STIKINE-LIARD MINING DIVISION.

In the Iskut River area a number of claims have been staked on Johnnie mountain by A. Vreath and partner, prospecting for the Consolidated Company. This staking was not completed until late in the season and the showings have not yet been explored. In the same area the Bronson claims, staked a number of years ago, have received the attention of examining engineers.

Towards the close of the season a group of claims, about 7 miles from the mouth of the Iskut river, was staked by Barrington Bros. on a showing of galena ore from which some nice-looking specimens had been brought out.

Devils Elbow Mountain.—On the *Silver Cap* group of two claims, owned by Pete Hamel and Dan McShane, several small disconnected showings of chiefly zinc-blende, with occasionally some galena, have been prospected by stripping and several open-cuts. Lenticular showings of pyrrhotite and magnetite carrying a little chalcopyrite have also been open-cutted.

These mineral occurrences are very irregular and lenticular in form. They are associated with a complex of highly metamorphosed argillite and limestone, in places altered completely to garnetite and intersected in all directions by spurs from the underlying granite. The occurrence represents very shallow and shattered pendant remnants and does not offer much commercial promise.

On the *Stikine* group, owned by Jack Bodet and C. A. Tervo, of Telegraph Creek and Victoria, the usual assessment has been carried on. Similar small lenticular showings of zinc-blende in garnetite are affected by the same adverse geological conditions as the *Silver Cap* showings and do not offer much commercial promise.

On the *Peelock* claims, owned by Sandy McNab, of Telegraph Creek, five extensive open-cuts covering 150 feet along a bluff-face have been driven in solid garnetite, in which some very sparse zinc-blende and galena mineralization is revealed after careful search. The showing is not of commercial importance and is acutely affected by the generally adverse geological condition of Devils Elbow southerly slope.

On the *Apex* group, owned by Pete Hamel and Dan McShane, of Telegraph Creek, exploration was carried out during the season. This group was not examined. It is situated at about 5,500 feet altitude in a pendant complex of argillite and limestone that can be seen to be less disturbed than the area already described, and to be of about 3,000 feet thickness above the underlying granite. The *Central* group, owned by Pete Hamel, is situated on the lower altitudes of Devils Elbow southerly slope. Time was not available for the group to be examined, but an engineer who had seen the showing reported it to be the most promising showing on the mountain. It has been explored by open-cuts which have exposed good chalcopyrite mineralization in a replacement zone.

The northerly and south-easterly slopes of Devils Elbow mountain, which are farther away from the granite-contact, would offer a more promising region for prospecting than the slope to the Stikine river.

Jackson.—This group of twelve claims is owned by Frank Jackson, of Jackson's Landing. It is situated at altitude 3,500 feet on the south side of and $1\frac{1}{2}$ miles from the Clearwater river, 4 miles from its mouth. Three well-defined shear-zones occur in a light-coloured pyritized volcanic intrusive into gabbro. Two of the zones, 3 to 4 feet in width and several hundred feet apart, strike north-westerly and dip steeply south. What appears to be the main zone, in which undelimited widths up to 10 feet are exposed, strikes approximately north-east along the crest of the ridge for a distance of about 700 feet. The outcrops are intensely oxidized, but in the solid places show encouraging mineralization of zinc-blende, some galena, chalcopyrite, malachite, and azurite, with a little grey copper. The showing warrants systematic exploration and the area, particularly the lower elevations, should be further prospected.

Near the head of Limpoke creek a group of claims owned by Barrington Bros., of Wrangell, has been staked on an extensive low-grade showing of chalcopyrite occurring in what appears to be a pegmatite. Supplies and equipment were taken in late in the season for the exploration of the occurrence during the winter.

On 4-Mile creek a new discovery on an old location was made by F. Skelthorne's prospectors, employed by the Mining Corporation of Canada. The ore is disseminated chalcopyrite in massive pyrrhotite, reported to occur over good widths and traced for about 1,500 feet. This showing will be opened up during the coming season.

In the Klappan River area an aeroplane expedition early in the season, headed by W. George, of Stewart, resulted in the staking of several claims on Tsetogamus creek, a tributary to Klappan river near its mouth, on which interesting chalcopryite-showings are reported.

Several miles south-west of this discovery a similar showing on the north-west shore of Ealueh lake was staked late in the season by Joe Williams, of Telegraph Creek.

PLACER-MINING.

Barrington Co., Ltd.—Leases held by this company on Barrington river, a fork of the Chutine river, in the Clearwater River area, were not operated during the season. Extensive drilling operations had disclosed discouraging values in several leases that were consequently dropped. Only the discovery claim and leases 256 and 257 are retained by the company. The restricted yardage of pay-gravel that has been indicated does not appear to warrant dredging operations. As the character of the occurrence is essentially a dredging proposition, the company is faced with the problem of working out a suitable and economical method of operation.

DEASE LAKE SECTION.

Thibert Creek.—Vancouver interests headed by H. D. Wright and J. R. Walton have been conducting drilling operations on dredging lease No. 145 at the mouth of Thibert creek. The drilling operations are being directed by Barney J. O'Reilley. At the time of examination eleven holes had been drilled and it was expected to drill two or three more.

The Mosquito Creek Hydraulic Association has conducted efficient and extensive preparatory work to reach the "pay" that occurs north of a northerly-sloping reef-rim in the canyon. This has necessitated extensive solid rockwork to shoot away the reef. This work was about completed at the season's close.

Gold Pan Creek.—In this area the individual operations on the *Vickery*, *Cameron*, and *Drapich* leases have been active during the season, with an estimated recovery of slightly over 200 oz. of gold.

Dease Creek.—Unfortunate results attended the operations of the Dease Creek Mines, Limited (head office, Seattle), which ceased operations on August 27th after two very disappointing clean-ups. The crew of about twelve men were put to hardship and inconvenience through arrears of wages and at the time of inspection of the area were planning to take action against the company.

The failure of this operation is an example of the results that attend the hazardous policy of embarking on extensive production-work without first thoroughly testing the ground for values and yardage.

The Cassiar Hydraulic Mines, Limited, with office at 609 Nova Scotia Building, Vancouver, conducted extensive preparatory work on two hydraulic leases. This company is a reorganization of the Joy Mines, Limited. Excellent camps have been erected and telephone installed from the lake to the camp. At the time of examination (October 19th) 14,005 feet of 7 by 2 ditching and 1,080 feet of flume had been completed, and 14,500 feet of ditch and 2,000 feet of flume from Lyon gulch to Buck gulch was under construction. With the exception of some panning, no drilling or test-pitting has been carried out to ascertain the value of the ground to be worked.

ATLIN MINING DIVISION.

TAKU RIVER SECTION.

As the importance of the recent discoveries and developments in the Taku River area warrant detailed elaboration, and as the prospective possibilities of the region are exceptionally attractive, a special report on this region is being prepared and will be issued by the Department of Mines at an early date. Only brief mention will consequently be made here of developments in the area.

Tulsequah Chief.—The United Eastern Mining Company, Limited, of Los Angeles, which has this property under option, has carried out exceptionally efficient development and exploration during the season under the supervision of J. B. Stapler.

Complete power equipment was installed in the early summer. In about two and a half months' actual mining-work to September 1st (the time of examination) 1,124 feet of underground exploration on two levels and over 2,000 feet of diamond-drilling in four holes had been

completed. Conservatively estimated, over 120,000 tons of commercial ore had been indicated between the two tunnels and surface, exclusive of ore cut in the holes.

Two ore-bodies averaging 10 to 15 feet wide, mineralized with zinc-blende, chalcopyrite, pyrite, and some galena, occur in what is probably an altered rhyolite dyke or sill in andesitic volcanics intruded by dacite and lamprophyre. The metal contents of the ore-bodies where developed would average: Gold, 0.10 oz. to the ton; silver, 3 oz. to the ton; copper, 1.75 per cent.; lead, 0.5 per cent.; zinc, 7 per cent.

On account of the difficulties of transportation on the Tulsequah river, operations have ceased for the winter. They will be resumed in the early spring.

Manville.—This group, staked on a discovery made in May near the confluence of the Taku river with the Tulsequah river, was bonded in July by the Alaska Juneau Gold Mining Company in association with the Treadwell Yukon Mining Company.

Camps have been erected, complete power equipment installed, diamond-drill equipment placed, and an energetic campaign of exploration is in progress and will be continued through the winter.

The ore-body is similar in character and occurrence to that on the *Tulsequah Chief*. On surface the showing has been traced for about 1,000 feet, with widths from 12 to 27 feet of ore assaying: Gold, 0.12 oz. to the ton; silver, 6 oz. to the ton; copper, 2 per cent.; lead, 1 per cent.; zinc, 15 per cent.

Potlatch.—This group, situated about 6 miles south of the *Tulsequah Chief* and adjoining the *Manville* on the west, has also been bonded by the Alaska Juneau Gold Mining Company. The main ore occurrence is a mineralized shear-zone 30 feet wide in what is probably altered rhyolite in contact with andesite. Mineralization of zinc-blende, galena, and pyrite is generally sparse, but is best developed in several narrow, quartz-filled fractures in the zone.

Banker.—This group adjoins the *Potlatch* on the south-west. It has recently been bonded by the Alaska Juneau Gold Mining Company. The showing is a silicified shear-zone in altered rhyolite containing narrow veins and stringers somewhat erratically mineralized with zinc-blende, arsenopyrite, pyrite, some galena, stibnite, and probably grey copper. A sample of selected ore from the dump assayed: Gold, 0.16 oz. to the ton; silver, 147 oz. to the ton; lead, 8.8 per cent.; zinc, 13.6 per cent.

Whitewater.—This group, owned by Art Headman, Ray Walker, and Ray Rice, of Juneau, Alaska, is situated on the west bank of the Tulsequah river, about 4 miles south of the *Tulsequah Chief*. The showing consists of four well-defined, parallel shear-zones, 3 to 8 feet wide and about 25 feet apart, well mineralized with stibnite, pyrite, and some galena in a quartz gangue. The formation appears to be a diabase, intruded by felsite dykes. The ore-outcrops are heavily oxidized. A sample across 6 feet of unoxidized material assayed: Gold, 0.8 oz. to the ton; silver, 0.2 oz. to the ton; copper, trace; lead, trace; arsenic, nil; antimony, 6 per cent. Several other groups of claims have been staked in the area.

RAINY HOLLOW SECTION.

Stampede.—Situated on the Klehini river near Pleasant camp and owned by J. O. Stenbraten, this group has been optioned by the Alaska Juneau Gold Mining Company, which has carried on exploration and development during the season.

PLACER GOLD.

On Boulder Creek the Consolidated Mining and Smelting Company of Canada has carried on energetic preparatory work to get at "pay" expected to be found in unworked ground on bed-rock.

On Otter creek the Compagnie des Mines d'Or du Canada of Paris, France, is constructing 9½ miles of flume and ditch to garner sufficient water to operate on ground it estimates will take fifty years to work out. The ground is stated to have been prospected by drilling.

On Pine and McKee creeks the Discovery Mining and Power Company and the Delta Gold Mining Company are prospecting for old river-channels.

On Wright and Spruce creeks and on O'Donnel river several individual outfits are operating.

Although the larger operations are not yet in production, the activity gives promise of producers of some size. If successful these operations will undoubtedly revive interest in the placer-gold potentialities of the north, and help to restore this branch of the industry to a position comparable to its glorious past.

ATLIN SECTION.

REPORT BY HERBERT CARMICHAEL.

In lode-mining very little work has been done since the properties have been last reported on, and the following notes bring the position of properties up to date:—

Engineer.—At this mine, situated on Taku arm, there is a crew of twenty men doing development-work.

Clarence Lands and R. Pelton have three quartz claims near the *Engineer*, on which they are doing development-work.

Kirkland.—This group, situated south of the *Engineer*, is owned by Thos. Kirkland *et al.*; the group consists of seven or eight quartz claims, on which they are doing development-work.

Atlin-Ruffner Mines, Ltd.—This property, situated at the head of Fourth of July creek, has been fully described in former reports and work has been suspended owing to the death of J. M. Ruffner. The property is owned by the estate of J. M. Ruffner, and it is said that Consolidated Mining and Smelting Company, Limited, is looking over the ground.

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

PRELIMINARY REPORT FOR THE YEAR 1929.

BY DOUGLAS LAY, RESIDENT MINING ENGINEER, AND F. P. CADDY, ASSISTANT
(HEADQUARTERS, HAZELTON).

(Reports marked * are by F. P. Caddy.)

GENERAL SUMMARY.

The North-eastern Mineral Survey District comprises the Omineca, Cariboo, Quesnel, and Peace River Mining Divisions—an area of upwards of 100,000 square miles.

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

The district offers every indication of potential wealth in lode-minerals, in non-metallic minerals, and in coal, and field-study confirms the view that attractive possibilities still remain in placer gold, although this metal has been under extraction for seventy years.

By reason of the agricultural development in the Peace River Mining Division, it is no exaggeration to say that there is no portion of the Province which is more in the eye and mind of the public at the present time.

Great activity has been maintained in the district throughout the year and keen interest has been evinced in the search for and acquisition of prospects of promise, more especially on the part of the larger operating companies. Never before has the search extended over such a wide area, and for the first time in the history of the district the aeroplane has been freely used for purposes of prospecting and reconnaissance in the more inaccessible portions of the district north of the Canadian National Railway. Prospecting has been carried on by private individuals and by parties organized by companies.

Of decided interest was the acquisition of the controlling interest in the Owen Lake Mining and Development Company, Limited, by Noah A. Timmins, president of Hollinger Consolidated Mines. This took place at the end of June and involved a substantial cash payment.

The acquisition of the Canadian North-eastern Railway by the Consolidated Mining and Smelting Company of Canada, Limited, and the great publicity given to the need of a western outlet for the Peace River district, aroused profound interest by reason of the bearing these matters have on the development of the mineral resources of the northern portion of the Omineca Mining Division. By reason of such, prospecting and reconnaissance in the region affected was greatly stimulated.

Inseparable from extensive mining development is the element of disappointment, and major among the elements of disappointment experienced during the year was the cessation of operations at the *Richfield* group by the Topley-Richfield Mining Company. Offsetting this, new discoveries of promise have been made during the year.

Turning to actual production, estimates indicate that as to lode-minerals the production this year will be rather lower in silver, distinctly higher in lead, and lower in zinc than was the case last year. It is to be remembered, however, that practically the entire production was made during the last half of the year. The production of placer gold will probably be somewhat less than last year. The production of coal, all from Telkwa Collieries, Limited, will probably be slightly less than that of last year. The production of diatomite by B.C. Refractories, Limited, from its quarry at Quesnel will be much the same as last year.

Among important features of general mining development may be mentioned:—

Completion of the *Silver Cup* mill (Nine-mile mountain, Hazelton) and commencement of milling operations in May.

Resumption of milling operations at the *Henderson* by Duthie Mines, Limited, on June 1st.

New ore strikes made at the Cronin property by the Babine Bonanza Mining and Milling Company, Limited.

The active development which has taken place on gold-quartz properties in the Cariboo and Quesnel Mining Divisions, and the hopeful results which have been achieved by the Cariboo Gold Quartz Mining Company, Limited, on Lowhee creek, and also by I. E. Moore on the *Hudson* group on Cunningham creek. On Yanks peak, near Keithley, in the Cariboo Mining Division, there has been much activity. High but spotty gold values in surface exposures at the *Midas* group and at the *Yanks Peak* group justify intelligent development, but no step beyond development is justified at present.

A large amount of development has been carried on by the Consolidated Mining and Smelting Company of Canada, Limited, at various optioned properties throughout the district, notably at the *Emerald*, in the Sibola section, where operations will be carried on this winter. Options held on several properties have been relinquished.

F. H. Taylor has done a considerable amount of prospecting on his *Grubstake* group, north-west of Owen lake, and is also operating under option the *Three Star* group on Boo mountain, near Palling, some 10 miles west of Burns Lake.

Western Canada Airways, Limited, established an air base at Prince George during the year and aeroplanes were on charter during the year at this point.

On July 1st C. W. Moore was appointed temporarily Assistant Resident Engineer for the purpose of making a special study of the placer-mining sections of the district. F. P. Caddy, also appointed temporarily, divided his time after August 1st between the North-western and North-eastern Mineral Survey Districts.

A reconnaissance trip was made during the year through the region between Morice lake and the South fork of the Zymoetz river—a region geologically promising but hitherto not examined.

The mineral resources of the Pacific Great Eastern Railway lands were investigated by R. W. Brock and staff, in connection with the survey of resources undertaken during the year by C. R. Crysdale, chief engineer, and staff, for the Government.

The geology of the Owen Lake area was studied by George Hanson and A. H. Lang, of the Geological Survey.

V. L. Eardley-Wilmot, of the Dominion Department of Mines, was engaged in a study of the silver ores of the district.

Summing up the results of the year, it may be said that, in spite of some disappointments, the mining industry throughout the district is in a healthy condition and there seems every reason to contemplate the future with assurance.

NEW DISCOVERIES.

Many new discoveries have been reported this year, the majority of which have been examined. Among those examined may be mentioned the following:—

(1.) *Toulon* group, a new discovery on an old property by employees working under direction of John Willman; a copper mineralization in volcanics associated with an aplite dyke. Situated a few miles from Usk.

* (2.) *Mitts* group, a discovery by E. Mitts and Ole Berg on the North fork of Chindemash creek near Usk. A copper mineralization with subordinate amounts of lead. Exposures are insufficient to form an opinion as to width and extent, but, generally speaking, this merits investigation.

* (3.) *Waverley* group, a discovery by M. Orr and H. Macdonald of galena and zinc-blende of obvious commercial significance. Situated on Seven Sisters mountain, between the headwaters of Flint and Oliver creeks. Incidentally a discovery of particular interest to this Department, inasmuch as in the 1927 Annual Report prospectors were advised to search this region.

(4.) *Glacier Gulch* group, near Smithers, a discovery of bismuth sulphide and telluride by S. F. Campbell and Grover Loveless. A very fair exposure, but further work is required before an opinion can be formed as to commercial possibilities.

(5.) *Grandview* group on Milk creek, at the head of the Telkwa river, by T. Riley and associates; in part, apparently a relocation of the *Surprise* group (refer to 1920 Annual Report). Several well-mineralized quartz veins, varying in width up to 5 feet, occur at a high elevation. Minerals present are galena, arsenopyrite, and copper carbonates. Silver values per unit of base metal are encouraging.

* (6.) *Golden Eagle* group, Topley, a discovery of another vein on this property carrying rich silver minerals, made by the owners, C. Matheson and D. Heenan, after the option on the property had been relinquished by Topley Silver, Limited, following excavational development and diamond-drilling focused on the original vein. This would seem to be a discovery of obvious commercial significance.

(7.) *Three Star* group on Boo mountain, near Palling and 10 miles west of Burns Lake, a discovery of copper pyrites by V. Schjelderup, P. Sandnes, and K. Nysven. This property was taken under option by F. H. Taylor, who later turned his option to the Topley-Richfield Mining Company.

(8.) *Grubstake* group, situated just north of Nadina mountain, a discovery made by P. Pouport prospecting for F. H. Taylor. Exposures show two different types of copper mineralization, accompanied by high-temperature minerals. This prospect merits investigation.

ROADS AND TRAILS.

Substantial aid has been rendered by the Department of Mines not only in connection with mining roads and trails, which affect individual properties, but also in connection with those which affect mineral areas, and which consequently are of great general utility. Funds for the latter were provided at the last session of the Legislature under the "Loan Act."

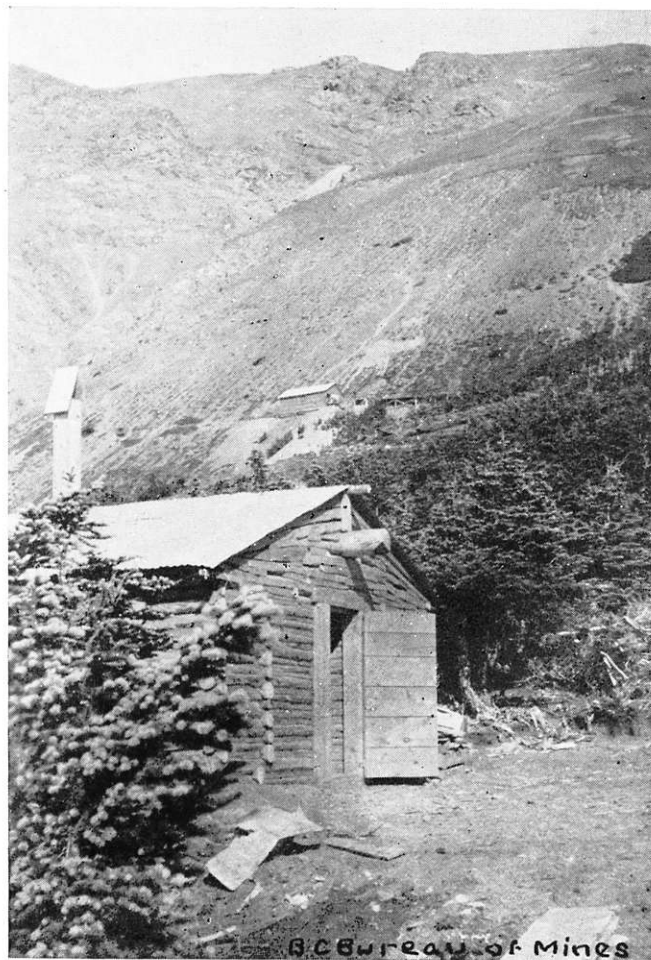
Among the more important may be mentioned the following:—

(1.) The road northwards from Fort St. James to Finlay Forks via Manson creek, the purpose of which is to give transportation to the northern portion of the Omineca Mining Division and ultimately the Peace River Mining Division. In this connection it may be stated that the Dominion Government is clearing the Finlay and Parle Pas rapids to permit of the plying of large water-craft on the Peace river above the Rocky Mountain canyon to Finlay Forks and above this point. When this work is completed, likewise the road, a summer route will be thrown open between British Columbia and Alberta.

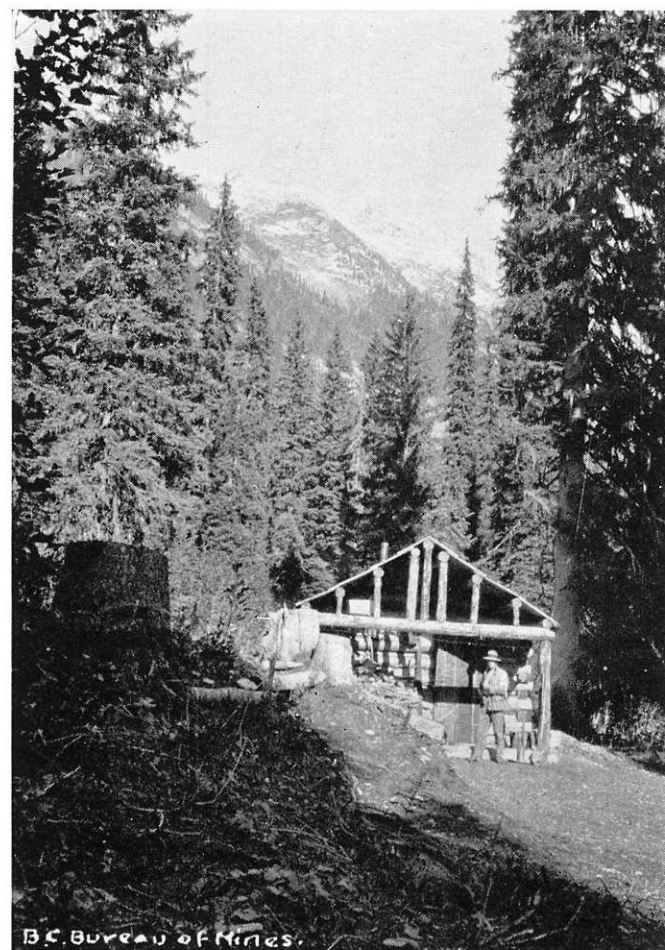
(2.) The pack-trail from Kimsquit, on the Dean channel, via the Sakumtha pass to Eutsuk lake. This trail was completed during the year to Tesla lake. A further 8 miles remain to be constructed to Eutsuk lake in order to give communication between Canadian National Railway points (Burns Lake and Houston) via this route to the Pacific Coast.

(3.) A road from Houston to Owen lake via the Morice river to afford transportation to the Owen Lake Mining and Development Company, Limited. A dirt road has been nearly completed between these points, and it was possible to get a car over the road in frosty weather in the fall, although much remains to be done before the road can be used for motor-trucking except in winter. This road is also one of the links in the route from Kimsquit via the Sakumtha pass to Canadian National Railway points.

The Resident Engineer desires to express his thanks to prospectors and mining operators generally for courtesies extended.



Emerald Group, Omineca M.D.



Paymaster Mines, Ltd., Lardeau M.D.

PRODUCTION.

Lode-mineral.—The following is a list of shipping properties and their estimated outputs:—

Name.	Ore milled.	Crude Ore shipped Direct.	Lead Concentrates.	Zinc Concentrates.
	Tons.	Tons.	Tons.	Tons.
Henderson.....	11,000	.....	437	560
Silver Cup.....	6,400	.....	640	46
Rocher Deboile.....	.....	76	.....	.....
Cronin's mine (Babine Bonanza).....	.....	90	.....	.....
Mohawk.....	.....	30	.....	.....
Totals.....	17,400	196	1,077	606

NOTE.—The foregoing properties are all situated in the Omineca Mining Division.

Placer Gold.—The estimated production of placer gold is \$64,000.

Coal.—The estimated production of coal is 1,425 long tons, all from Telkwa Collieries, Limited.

Diatomite.—The estimated production of diatomite is 180 tons, and was shipped by B.C. Refractories, Limited, from its quarry near Quesnel.

OMINECA MINING DIVISION.

SKEENA SECTION.

Usk.

Much activity has taken place during the year at properties in the vicinity of Usk.

*Valhalla and Kleanza.**—These groups are under development by Columario Gold Mines, Limited, John Willman being in charge of operations. A fairly full account will be found in Bulletin No. 1, 1929, published by the Department of Mines, which it is unnecessary to repeat herein. Since that account was written a tunnel at the same elevation as the lower tunnel on the No. 4 vein has been run on No. 5 vein, striking S. 30° E. (true) and dipping 50° N.E., for a distance of 75 feet. A sample taken over 12 inches of quartz and pyrite on the hanging-wall, 6 feet from the face, assayed: Gold, trace; silver, 0.3 oz. to the ton.

*Shenandoah.**—This property is situated on the mountain range between the North fork of Chindemash creek and St. Croix creek and is owned by R. W. Seelye and associates, Sheldon L. Glover being superintendent in charge of operations. The most important showing on the property appears to be a shear-zone replacement in andesitic volcanics, which has been traced for 1,800 feet or more by open-cuts. It is from 4 to 5 feet wide and well mineralized with chalcopyrite and copper-stains almost throughout. A small hydro-electric plant is being erected and vigorous development is planned for 1930.

*Mitts.**—This property, a new discovery of the year, is situated on the south side of the North fork of Chindemash creek, opposite the *Shenandoah*, and is reached by following the Chindemash Creek trail past the Shenandoah trail, crossing the creek and continuing up the hill by a new trail which was being constructed by the owners at the time of inspection. The group consists of twelve claims and is owned by Ole Berg and Ed. Mitts, and is under option to R. E. Doan, of St. Gabriel, California.

The main showing (elevation 4,000 feet), on which practically no work has been done, consists of a siliceous mineralized zone which appears to be lying parallel with the face of the mountain. It has been exposed by natural agencies from the head of a rockslide for a distance of approximately 500 feet up the hill. To the east it appears to underlie a dyke at the foot of a vertical bluff of andesitic volcanics. There are copper-stains in many places and scattered mineralization consisting of chalcopyrite and a little galena.

Nothing can be said about its width as I was unable to find a place where it had been broken through. The general trend is about east and west. The dip is to the north at about 40°. A selected sample containing galena assayed: Gold, trace; silver, 0.8 oz. to the ton; copper, trace; lead, 7 per cent. Another sample containing chalcopyrite assayed: Gold, 0.10 oz. to the ton; silver, 3.4 oz. to the ton; copper, 6.5 per cent.

Toulon.—This group is situated on the left bank of Chindemash creek, distant about 4 miles from Usk, and is owned by Major McConnell. Small-scale operations were carried on during the year under the direction of John Willman and a new discovery was made. This consists of a copper mineralization in andesitic flow-rocks following an aplite dyke. The showings occur in the immediate vicinity of 2-Mile creek, a northerly flowing tributary of Chindemash creek. On the steep hillside, the slope of which varies from 35° to 45°, an aplite dyke striking about N. 20° E. (mag.) has been exposed between elevations 2,050 feet and 2,630 feet at several different points. The western boundary of the aplite has been well defined, and the andesitic, and in places porphyritic, volcanics intruded are mineralized with bornite and chalcopyrite for varying distances up to a maximum of 30 feet from the dyke. At the time of examination no cuts had been made on the eastern side of the aplite, the work of open-cutting being more laborious on that side owing to heavier cover. The total length over which open-cuts extend on the west side of the aplite is about 900 feet. The copper mineralization in places follows the jointing-planes and cracks in the volcanics, in places occurs as a dissemination, and in places in the form of amygdulæ.

A sample taken at one point where the mineralization is widest, representing a width of 30 feet from the dyke westwards, assayed: Gold, trace; silver, 0.6 oz. to the ton; copper, 1.6 per cent. This property warrants further investigation.

On the *Emma* small-scale operations were carried on by A. J. Lowary, and on the *Four Aces* by M. Allison.

An option has been taken on the *Diadem* by R. E. Doan, and it is understood that development is contemplated in the near future.

On the *St. Elmo* work was carried on by A. A. Macdonald.

On the *Lucky Jim*, Kleanza creek, work was carried on by the Consolidated Mining and Smelting Company of Canada, Limited, but this company subsequently relinquished its option on the property.

Pitman.

Diorite.—This group is situated on Hardscrabble creek, within a very short distance of the railway-track, and is owned by J. M. Dechene. The showing consists of an aplitic dyke mineralized with chalcopyrite, specularite, and a little bornite. In addition, some scattered mineralization occurs in the porphyritic andesitic volcanics. Further prospecting is warranted.

Legate Creek.

The *M. & K.* and *M. & M.* groups have been under development by Consolidated Mining and Smelting Company of Canada, Limited, but the option on each held by this company has been relinquished.

Seven Sisters Mountain.

The *Seven Sisters* has been operated by the Consolidated Mining and Smelting Company of Canada, Limited, but with no encouraging results.

On the *Hughie* group further work was done by the owner, M. Orr.

*Waverley.**—This group, one of the discoveries made this year, is situated on the west slope of the main ridge of the Seven Sisters mountain, to the south of the *Seven Sisters* group. It is owned by M. Orr, H. Macdonald, and associates and consists of eight claims.

The main showing is situated in a shallow basin, well above timber-line, at elevation 5,200 feet, under the main ridge of the mountain. It consists of a large vein striking N. 10° W. and dipping steeply to the west. It is very well mineralized with galena, zinc-blende, and pyrrhotite.

At the date of inspection it had been partially stripped along the strike for a distance of 30 feet; only one wall was exposed and about 4 feet of vein; but it is understood on good authority that it has since been uncovered right across and is up to 15 feet wide.

A grab sample from the material which had just been blasted out at the time of inspection assayed: Gold, trace; silver, 39 oz. to the ton; copper, trace; lead, 23.2 per cent.; zinc, 9.2 per cent.

Other showings in the vicinity of this group are the *Margarite* and the *Big Oliver*, staked by Frank McLean, Fred Burk, Walter Moberley, and Ben Bright.

Woodcock.

A. S. Gray has done a considerable amount of work on his *Sunset* and *Grandview* claims, and further work has been done on the *Morning Star* by the owner of that group, D. McGregor.

Kitwanga.

On the *Two Laddie*, the owner, D. Lamont, has been working steadily and has uncovered another vein.

HAZELTON SECTION.

The important event in this section was the starting of milling operations on May 4th at the *Silver Cup* by the Silver Cup (Hazelton) Mining Company, Limited.

Rocher Déboulé Mountain.

Rocher Deboule.—Obtaining an option on this property, Aurimont Mines, Limited, continued the operations begun at the close of 1928. An effort was made to ship hand-sorted ore at a profit. After shipping a few cars of ore operations were suspended. W. S. Harris was in charge of this work.

Comeau.—Further work was done at this property by the owners, D. Comeau and G. Beirnes. This property possesses promising features and is commended to the attention of examining engineers.

Four-mile Mountain.

Mohawk.—Small-scale operations were carried on throughout the year by the Mohawk Mining Company, Limited, under the direction of H. A. Harris. While no material amount of ore has been met with, the indications, generally speaking, are promising. It is possible that the horizon of the main crosscut, which is the level at which recent exploration has been undertaken, is at the top of ore-bearing ground and there is justification for further development.

Comet.—Some work was done at this property by Bulkley Mines, Limited. This property warrants intelligent development.

Nine-mile Mountain.

Silver Cup.—Various difficulties were encountered by the Silver Cup (Hazelton) Mining Company, Limited (formerly the Duke Mining Company), in getting its milling and power plants into successful operation, in consequence of which it was not found possible to start milling before May 4th. It subsequently developed that the ore was not an easy one by any means to treat by flotation and it took some time to work out the flow-sheet.

Doubtless, owing to the exigencies of the situation which this company had to meet, development has fallen behind. The face of level 4, 257 feet south of raise to level 3, recently entered a white tuff somewhat similar to the tuffs on Four-mile mountain to the south. At this point the vein on level 4 was faulted or folded. Bringing of the survey up to date on levels 4 and 3 will doubtless be of assistance in recovering the vein, and it is not thought that there will be difficulty in doing so. Level 3 is 272 feet south of the raise from level 4 and shows no faulting. It is quite apparent that development is somewhat behind, but some nice ore has been struck in stoping the ground immediately above level 4; likewise above level 3 the stopes promise well. This company suspended mining operations on November 23rd and the mill was shut down on December 7th, owing, it is understood, to the desirability of reorganizing with a view to provide further working capital. It is understood that only a narrow margin of profit is yielded under present conditions. This property undoubtedly merits careful examination and scrutiny of the present situation. Further development seems to be justified, and such may disclose hopeful possibilities, conceivably along the lines of increasing production to the limit of the capacity of the mill.

G. L. Kvist is superintendent and E. Bertlin is mine foreman. The former has been responsible for working out the milling problem, which has offered many difficulties.

Thoen Basin.

J. A. Rutherford did much work on his *O.K.* and *True Fissure* groups (known as the "Suskwa Mines") and uncovered new showings of lead and copper.

SMITHERS SECTION.

Hudson Bay Mountain.

Henderson.—Much development has been carried out by Duthie Mines, Limited, and the general policy has been in accord with the programme announced at the close of 1928. Reference is invited to Bulletin No. 1, 1929, issued by this Department, for information concerning this property, which it is unnecessary to repeat herein. Generally speaking, development to date on the 600-foot level has disclosed narrow seams of ore in the *Henderson*, *Fault Plane*, and *Big Stranger* veins, with the exception that at the time of inspection on November 10th the drift on the *Henderson* vein was running into considerably wider ore than had hitherto been encountered on this level. In view of the ore met with on the 500-foot level, it would seem reasonable to anticipate productive stopes on both the *Henderson* and *Fault Plane* veins above the 600-foot level.

On the 500-foot level the *Ashman* vein has yielded productive stopes, but the silver grade of this ore is lower than that of the *Henderson* vein. On the McPherson level a drift is being run south-west on the *Ashman* vein, and it is stated that some commercial ore has been struck. On the Compressor level a crosscut is being run to the *Ashman* vein. It is also stated that about 200 feet east of the *Fault Plane* vein a new vein, known as the *Gill* vein, has been discovered on the surface, and a crosscut to this vein from the Compressor level is contemplated.

It is evident that every phase of this company's operations receives skilled and searching scrutiny, and while the final outcome is necessarily dependent upon future developments, everything possible is being done to put this property on a profit-earning basis.

Glacier Gulch.—The owners of this property, S. F. Campbell and G. Loveless, are taking out a shipment of ore, stoping from the shaft sunk last year by F. H. Taylor, and report that they have to date about 15 tons sacked.

On this property, on the opposite side of the cirque to that on which the lead-zinc showings are situated, the owners recently made an interesting discovery of bismuth.

The occurrence is that of sulphide and telluride of bismuth in what appears to be a small igneous tongue intruding the argillites. The maximum width of igneous tongue exposed is 6 feet and the bismuth minerals occur throughout this width, but are largely confined to a width of 26 inches. Further work is necessary before an opinion can be expressed as to commercial possibilities.

Silver Lake.—This group, owned by L. S. McGill and P. Schufer, is under option to W. R. Wilson & Sons.

Empire Group.—Further work on this property has been carried out by the owner, D. C. Simpson. Work has also been done on the *Yukon* group by Alex. Chisholm.

Babine Mountains.

The most important item of development in the Babine mountains has been the new ore strikes made at the property of the Babine Bonanza Mining and Milling Company, Limited. For complete descriptions of this property refer to the Annual Reports for 1917 and 1920 (containing map) and also to the Geological Survey of Canada Summary Report, 1924, Part A. Hand-mining operations were carried on during the year with a small force of men and important ore strikes were made.

As viewed on August 19th, the strikes were on vein No. 2. Tunnel C had been advanced a distance of 72 feet in continuous ore connecting with tunnel No. 1. The vein-width in this region approaches 7 feet and the width of ore appears to be about 5 feet. A sample across this width assayed: Gold, 0.08 oz. to the ton; silver, 32 oz. to the ton; lead, 2 per cent.; zinc, 18 per cent. Prospects below this region, between tunnel C and tunnel No. 2, a vertical distance of 225 feet, are undoubtedly highly favourable.

Tunnel B at the time of inspection had been advanced 60 feet on No. 2 vein, of which the first 30 feet showed continuous ore between 4½ and 5 feet in width. The vein appeared to be interrupted by a rhyolitic intrusion where the ore pinched out, and for the remaining distance driven the tunnel swings to the north. Near the face, ore seemed to be coming in again and the prospects generally hopeful. In tunnel No. 1, prospects on No. 2 vein south-west of the crosscut to this vein from No. 1 vein appear favourable. Indeed, it seems not unlikely that No. 2 vein crosses tunnel No. 1 at or near the face.

It is understood that the management contemplates immediate installation of an air-compressor and the operation of this property on a larger scale than recently. Assistance has been rendered by the Department of Mines in improving the road to this property from Telkwa and making it passable for winter traffic. The management also contemplates making shipments of hand-sorted ore this winter.

In a pamphlet just issued by W. F. Irwin & Company, Vancouver, the following statement regarding this property is made: "It is estimated that the Babine Bonanza mine, milling only 100 tons of \$40 ore per day, can earn upward of \$1,000,000 per annum."

This statement is very misleading, as, although the property is a promising one, such an estimate of earning-power is entirely unwarranted. The advisability of further development prior to the erection of a mill is indicated. The average grade of the ore so far developed is considerably below \$40 a ton.

Some work was also done on the *Silver King*, *Victoria*, and *Little Joe* by the respective ownerships concerned.

The Harvey property was under option to the Consolidated Mining and Smelting Company of Canada, Limited, but after carrying on operations for a time this company relinquished its option. Further work was then undertaken by the owners.

On the *Rainbow* further work was carried out by the owner, J. Wright.

TELKWA SECTION.

Operations were carried on by the Consolidated Mining and Smelting Company of Canada, Limited, at the *Duchess* and *Contention* groups steadily throughout the year, but towards its close the options held by this company were relinquished.

HOUSTON SECTION.

Owen Lake.

Owen Lake Mining and Development Co., Ltd.—Persistent development has been carried out by this company during the year. Reference is invited to Bulletin No. 1, 1929, issued by this Department, for particulars concerning this property, which cannot be repeated herein.

On November 1st the main crosscut tunnel had been advanced a distance of 2,330 feet from the portal. At 2,200 feet from the portal this tunnel was diverted to the left on a bearing N. 4° E. in order to cut the *Wrinch* vein system nearer the ore disclosed on that property. The position on November 1st was that the crosscut might be expected to reach this vein system in from 390 to 550 feet, depending upon the dip of the vein.

To date the main crosscut has passed through eleven veins, of which Nos. 1, 3, 4, 7, 9, and 11 seem to be the most important. The first three mentioned have been followed east of the tunnel, but a somewhat complicated fault system was found but a short distance from the crosscut, which terminated fine exposures of ore in an easterly direction. Clues in this region were being followed up at the time of inspection. Vein No. 7 shows as a strong fracture, 4 to 5 feet wide and fairly well mineralized, but has not as yet been followed up. Vein No. 9 shows as a narrow but well-mineralized fracture up to 18 inches in width. It has been followed mainly east of the crosscut, but the west face also merits continuation. Vein No. 11 shows persistent mineralization up to 18 inches in width and has been followed west of the crosscut for approximately 100 feet, where it is crossed by a feldspar-porphyry dyke, which had not been penetrated at the time of inspection.

A survey of this property by the Radiore Company of Canada, Limited, was made during the year, but the results have not been announced.

Grubstake.—At this property, situated about 7 miles north-west of Owen lake, in the pass between Nadina mountain and the mountain lying north of this, a considerable amount of prospecting has been carried out by the owners, F. H. Taylor, P. Pouport, and C. Hansen. This property was discovered this year by P. Pouport, in the employ of F. H. Taylor. Limitations of space preclude a full description. It exhibits two different types of copper mineralization—a dissemination in volcanic breccia and a mineralized shear-zone. In both cases high-temperature minerals are present besides copper and in the vicinity is an intrusion of diorite. Further work is well warranted.

TOPLEY SECTION.

Richfield.—Operations were discontinued in the fall at this property by Topley-Richfield Mining Company, Limited. In Bulletin No. 1, 1929, issued by this Department, will be found a description of the condition of the property at a time when a decision had to be reached as to what course to pursue.

Further diamond-drilling was undertaken, directed to probe the ground below level 2. This, it is understood, proved disappointing and the directors decided to close the property down.

*Golden Eagle.**—This group, owned by C. Matheson and D. Heenan, has been under option to Topley Silver, Limited, which company constructed camp buildings, installed compressor and pump, and carried out the development recorded in the 1928 Annual Report. After sinking one shaft to a depth of 140 feet a diamond-drilling campaign was undertaken this year, and the company subsequently relinquished its option. Since then the owners have done a considerable amount of useful work and have discovered a more or less parallel vein which strikes N. 55° W. (true); dip indeterminate at the time of inspection, which lies about 70 feet to the south-west of the original vein, and on the opposite side to that on which the diamond-drilling was done.

This new vein has been exposed in three places by means of pits over an approximate distance of 250 feet.

Pit No. 1 is 8 feet deep and there is exposed in the bottom on the foot-wall 9 inches of well-mineralized vein-matter, consisting of zinc-blende and some galena and grey copper. A sample over this width assayed: Gold, 0.20 oz. to the ton; silver, 374 oz. to the ton; copper, 1.8 per cent.; lead, 10 per cent.; zinc, 30 per cent.

Pit No. 2 is 7 feet deep. The vein in the bottom is about 24 inches wide, with 6 inches of almost solid grey copper and galena on the foot-wall. A sample from here over 18 inches assayed: Gold, 0.14 oz. to the ton; silver, 288 oz. to the ton; copper, 1.2 per cent.; lead, 25 per cent.; antimony, 0.5 per cent.

Pit No. 3 is about 8 feet deep on decomposed vein-matter, with unaltered sulphides beginning to come in in the bottom. A sample of selected ore from the dump assayed: Gold, 0.08 oz. to the ton; silver, 212 oz. to the ton; lead, 22.2 per cent.; zinc, 9.2 per cent.

Owing to the flat nature of the ground and its deep covering of loose material a considerable amount of work has to be done to get down to solid, and there is also water to contend with, so that tracing the veins is a laborious process. Great credit is due the owners for this discovery.

Babine Lake.

On the *Richmond* group, McDonald island, diamond-drilling was carried out by the Consolidated Mining and Smelting Company of Canada, Limited, which has this property under option. Operations have been suspended for the winter, but will be resumed in the spring of 1930, it is stated by the company's engineer.

The *Venture*, formerly known as the "Boling property," has been under development by the Silver Island Mining Company under the direction of H. J. Macdonald.

BURNS LAKE SECTION.

Much local interest was aroused by the discovery during the year of copper on Boo mountain, some 10 miles west of Burns Lake, known as the *Three Star* group.

Three Star.—This group was discovered during the year by V. Schjelderup, P. Sandnes, and K. Nysven, and was optioned to F. H. Taylor, who later turned his option to the Topley-Richfield Mining Company. It is situated on Boo mountain, 2 miles south-east of Palling Station and some 10 miles west of Burns Lake.

At the time of inspection on September 22nd very little work had been done, and exposures were therefore quite insufficient to form any definite opinion, beyond the fact that the showing of chalcopyrite certainly merited further work. The country-rock is volcanic, which has been subjected to shearing, and at the time of examination it seemed likely that the zone of shearing might extend to a width of 100 feet, the zone striking about N. 80° E. (mag.). Chalcopyrite and specularite occur at several points within this zone, but it is not to be inferred that the copper mineralization is necessarily 100 feet in width. The best exposure shows a heavy mineralization of chalcopyrite and a small amount of specularite. These minerals, together with quartz, form the cementing material between the rock fragments. Exposures were insuffi-

cient to form an opinion as to width. A selected sample assayed: Gold, trace; silver, 1.5 oz. to the ton; copper, 6.6 per cent.

On the *Stella*, near Endako, further work was done by the owners.

SIBOLA SECTION.

Emerald.—Much work has been carried out at this group by the Consolidated Mining and Smelting Company of Canada, Limited, which has this property under option. Camp buildings have been erected at elevation 5,370 feet, and it is the intention to carry on operations this winter, which comprise running a crosscut tunnel at elevation 5,418 feet.

The original tunnel run on this property by J. Cronin has been advanced a distance of 220 feet, during which distance ore has been continuous. The elevation of this tunnel is 6,384 feet.

Swannell Group.—The Tahtsa Mining Company is operating this property, C. L. Copp, managing director, being in charge of operations. Much useful work has been accomplished during the year. Camp buildings have been erected on the property to accommodate a small force and an adit-tunnel has been started about 100 feet vertically below the original discovery. It is stated that a little ore has been continuous for about 60 feet, the tunnel now being in a distance of 154 feet, but only the last 70 feet are on the vein, the tunnel being started as a crosscut. The face shows a width of 6½ feet of shear-zone, slightly mineralized, and is about 40 feet from being immediately below the surface outcrop.

Small-scale operations were also carried on on the *Harloworth* group, south-west of Little Whitesail lake. This is owned by H. H. Logan, B. R. Harrison, and J. Worth, and was discovered this year by the two last mentioned. The mineral occurrence is that of quartz veins mineralized with essentially galena and zinc-blende. Assays did not disclose noteworthy precious-metal values.

MANSON SECTION.

It was not possible to examine any lode-mineral properties in this section during the year, but it has been ascertained that considerable activity has been manifested on Lost and Boulder creeks, where T. Rush and associates have been working on their claims. J. Ferguson was also prospecting in this vicinity. Wilfred F. Paquette was working on his claims on Black Jack mountain.

FORT GRAHAME SECTION.

This section was not visited during the year owing to the pressure of work at other points.

It is understood that development of the *Ferguson*, on the Ingenika river, went on steadily during the year and that satisfactory results were obtained.

CARIBOO MINING DIVISION.

HIXON CREEK.

Cariboo Lode Mines, Ltd.—This is a newly incorporated company, which has an option on the property of the Quesnelle Quartz Mining Company and on adjoining claims on Hixon creek. The Quesnelle Quartz Mining Company carried on operations, it is understood, in the early seventies, but most of its workings are now under water. It is understood to be the intention of the Cariboo Lode Mines, Limited, to pump out the old workings and ascertain what is in sight.

BARKERVILLE SECTION.

Cariboo Gold Quartz Mining Co., Ltd.—Small-scale operations have been carried on at this property which have given decidedly encouraging results. From the main crosscut, which has for its objective the penetration of the *Rainbow* vein system in depth, at approximately 270 feet from the portal, a branch crosscut has been run on a bearing S. 37° E. to intercept in depth the *Pinkerton* vein system. This crosscut had at the date of inspection on October 9th progressed a distance of approximately 250 feet. Just by the point of commencement it passed through a large cross-vein upwards of 10 feet in width and very heavily mineralized with pyrite. A sample taken across a width of 9 feet at this point assayed: Gold, 0.30 oz. to the ton; silver, 0.06 oz. to the ton. Owing to the soft caving nature of this vein the drive following it into the hill is being run on the foot-wall, and drill-holes put into the vein at frequent intervals, so that it is only at the one point mentioned that the vein is fully exposed. This vein strikes S. 18° W. (mag.) and dips north-west at a steep angle, whereas the formation strikes N. 70° W. (mag.)

and dips north-east. The face of the drift following it had reached a point approximately 60 feet from the point of original crosscutting. This vein may be the same as one encountered at 200 feet from the portal of the main crosscut, this latter having similar strike.

The branch crosscut to the *Pinkerton* vein system had on the day of inspection just reached another vein at 250 feet from the point of commencement, but had not passed through it.

Surface prospecting has disclosed a large body of quartz at a point about 1,100 feet south of the cabin on the *Rainbow*, from which other quartz veins appear to branch in different directions. The width of the main body of quartz appears to be between 40 and 50 feet. One sample taken across 7 feet assayed: Gold, 0.66 oz. to the ton; silver, 0.16 oz. to the ton. Another sample from a different place, not representing any definite width, assayed: Gold, 1.30 oz. to the ton; silver, 0.3 oz. to the ton. A third sample chipped from different points, at some of which a little galena showed, assayed: Gold, trace; silver, 4.8 oz. to the ton. While it is not to be inferred that gold values such as the two foregoing samples show will necessarily continue in depth, nevertheless such clearly warrant investigation and are encouraging.

CUNNINGHAM CREEK.

Hudson.—The owner of this group, Isaac E. Moore, has recently met with very encouraging results. Only brief mention can be made in this report. In the immediate vicinity of the intersection of two veins—one 5 feet in width, striking S. 80° E. (mag.), dipping north-easterly, and one 7 feet in width, striking S. 30° E. (mag.), dipping north-east—an adit-drift follows the larger vein from the surface for a distance of 48 feet on the foot-wall. At 27 feet from the portal a width of 4 feet on the hanging-wall is heavily mineralized with galena and some iron pyrites. A sample across 4 feet at this point assayed: Gold, 2.98 oz. to the ton; silver, 5.5 oz. to the ton; lead, 24 per cent. From this point onward the hanging-wall is not exposed. A sample taken at the face across a width of 3 feet assayed: Gold, 0.54 oz. to the ton; silver, 1.26 oz. to the ton; lead, 7.6 per cent.

Two points about this property are noteworthy. In the first place, values are in primary sulphides; in the second place, the galena is auriferous rather than argentiferous. This property is distant about 21 miles from Barkerville, of which the first 12 miles is a motor-road.

On the *Homestake* group further work has been done by the owners, J. H. Campbell and J. P. Delhanty.

QUESNEL MINING DIVISION.

KEITHLEY SECTION.

Yanks Peak.

For a general description of Yanks peak reference is invited to the 1925 Annual Report. Much activity has taken place during the year, notably at the *Yanks Peak* group. On the *Midas* group a commendable painstaking effort is being made by the owners to probe their property in depth.

Yanks Peak.—This group, owned by H. Talbot and J. Larson, is under option to a private syndicate consisting of C. R. Henderson, Douglas B. Sterrett, C. Wilkinson, C. Hatton, J. A. Dowding, J. Norquay, J. M. Smith, and associates. At the time of inspection, October 14th, ten men and a cook were employed, some of the optionees being included in the employees. On this property occur a large number of quartz veins, some of which show high but spotty gold values; others show no appreciable values.

Attention at present focuses on a zone about 100 feet or so in width, in which occur possibly five parallel oxidized quartz veins varying in width from 18 inches to 3½ feet, and of these three are more clearly defined than the rest and have been exposed by open-cuts and short tunnels. These veins outcrop on a hillside, the slope of which does not exceed 20° at a maximum, and all can be developed by adit-drift, although cover is not gained very rapidly. The strike is about N. 35° E. (mag.) and the dip is steep to the south-east. On the most westerly of these an adit-drift, which was started in 1925 (refer to Annual Report for that year), has been run a distance of 84 feet, the quartz vein being terminated apparently by a fault at 69 feet from the portal. Trenching on the surface north of this point would doubtless disclose just what has happened. A sample taken from this tunnel at 69 feet from the portal, across 1.6 feet, assayed: Gold, 4.24 oz. to the ton; silver, 0.72 oz. to the ton. A sample taken across 3½ feet, 51 feet

from the portal, assayed: Gold, *nil*; silver, *nil*. About 155 feet in a south-westerly direction and about 40 feet vertically below the tunnel a shaft is sunk on this vein to a depth of 12 feet; a sample from this shaft taken in 1925 showed good gold values. About 25 feet vertically below the shaft and 120 feet from it a small-sized tunnel is driven in a distance of 105 feet, but does not disclose anything of importance, being apparently off this vein. A sample taken across $2\frac{1}{4}$ feet from an open-cut on a well-defined vein about 30 feet east of this tunnel showed no values. On the most easterly of the veins a tunnel is run 131 feet, about 120 feet vertically below the top tunnel above mentioned, and about 375 feet distant from it, but only the last 36 feet of this tunnel is actually on the vein, the tunnel being a crosscut up to this point. A sample across the vein showing in the face of this tunnel, $1\frac{1}{2}$ feet in width, showed no gold or silver values. A sample taken from this same vein across 2 feet, where it is exposed by an open-cut somewhat below the top tunnel, assayed: Gold, 0.24 oz. to the ton; silver, 0.06 oz. to the ton. A sample taken from another open-cut just above the top tunnel on a vein east of the tunnel vein showed upon assay no gold or silver values. It is quite evident from samples taken this year and in 1925 that, as might be expected, values vary widely within a distance of a few feet, from nothing to quite good values.

It is understood to be the intention to advance the lowest tunnel to a point about 100 feet vertically below the surface and then to crosscut to the other veins. Such a general scheme of development appears sound, but it would seem advisable to pick out the best vein on which to drive this adit. While the foregoing samples are not sufficiently numerous to be conclusive, they indicate the most easterly vein as being distinctly better than the others. Further sampling to check this point might be advisable.

About 1,500 feet in a north-westerly direction from these workings are numerous exposures of other quartz veins, all somewhat oxidized. Samples taken from two of these showed in one case traces only of gold and silver, and in the other case no values.

At the time of inspection camp buildings had been erected at a point about a quarter of a mile from the lowest tunnel and about 300 feet vertically below it. A small mill building was also under erection and machinery for a 25-ton-daily-capacity mill had in part arrived at Keithley. Any question of milling at the present time is regarded as quite premature, but the property merits development.

Midas.—This group, owned by O. J. Pickering, J. Glover, H. G. S. Heisterman, and E. L. Tait, is situated about $1\frac{1}{2}$ miles north-east of the workings on the *Yanks Peak* group, on the flat-topped ridge which separates Little Snowshoe creek from French Snowshoe creek.

Present operations focus on running a crosscut tunnel to probe at a depth of 130 feet a strong quartz vein of an average width of about 4 feet, striking N. 33° W. (mag.) and dipping north-east at 60° , which is exposed by open-cut over a length of about 90 feet at elevation 5,730 feet. At the north end of the open-cut not less than a width of 7 feet of quartz is exposed, possibly due to junction of a branch vein at this point. A sample across 7 feet at this point assayed: Gold, 2.24 oz. to the ton; silver, 0.64 oz. to the ton. A sample taken from the main vein across $2\frac{1}{2}$ feet, somewhat south of the foregoing, assayed: Gold, trace; silver, trace. A sample taken 40 feet from the south end of the open-cut across 3 feet 10 inches assayed: Gold, 0.08 oz. to the ton; silver, 0.02 oz. to the ton. At the south end of the open-cut a branch vein $1\frac{1}{2}$ feet wide diverges from the main vein. A sample taken from this branch vein across $1\frac{1}{2}$ feet assayed: Gold, 3.34 oz. to the ton; silver, 0.5 oz. to the ton. A sample taken from the main vein, just north of this branch vein, across $2\frac{1}{2}$ feet assayed: Gold, 0.88 oz. to the ton; silver, 0.36 oz. to the ton.

The horizontal distance from the portal of the crosscut tunnel to a point vertically below the north end of the open-cut is about 436 feet. The tunnel has advanced a distance of 191 feet and is being run on a bearing S. 50° E. (mag.), the last 35 feet being deflected somewhat to the left. Samples taken from the surface exposure of the main vein are not sufficiently numerous to form a definite opinion, but rather suggest that high values may occur in the main vein where it is influenced by branch veins, but not elsewhere. Samples should be taken across this vein at intervals of 5 feet to enable a definite opinion to be formed on this point. The face of the crosscut shows small stringers of quartz carrying pyrite. A sample of these stringers assayed: Gold, 0.07 oz. to the ton; silver, 0.02 oz. to the ton. The crosscut is being run from the Little Snowshoe slope.

About 750 feet north-east of the above-described vein is another prominent parallel quartz vein outcropping at two or three points, and 175 feet north-east of this again are exposed two cross-veins about 125 feet apart. One strikes S. 75° W., and a sample across 20 inches assayed: Gold, 0.94 oz. to the ton; silver, 0.2 oz. to the ton. The other branch vein strikes S. 45° W. (mag.), and a sample of it across 18 inches assayed: Gold, 6.96 oz. to the ton; silver, 1.4 oz. to the ton. Between these two branch veins is exposed a large quartz vein striking N. 45° W. (mag.), dipping north-easterly at 60°. A sample across 8 feet assayed: Gold, 0.24 oz. to the ton; silver, 0.72 oz. to the ton. These values merit further investigation.

PLACER-MINING.

The production of placer gold has been on the decline for some considerable time past. In view of this fact the Honourable the Minister of Mines appointed C. W. Moore, an experienced placer operator, as temporary Assistant Resident Engineer, for the purpose of making a special study of the placer areas of this Mineral Survey District. Field-study supports the view that there are still major possibilities awaiting investigation. Such will be fully dealt with in C. W. Moore's report and it is to be hoped that actual investigation will follow. Generally speaking, there is a very marked difference between the lode-mineral industry and the placer-gold industry in regard to the desire to develop. In the former case the desire to develop good prospects is very keen on the part of operators; in the latter case there are comparatively few in search of placer. In other words, in the one case the market is brisk and in the other case it is stagnant.

CARIBOO AND QUESNEL MINING DIVISIONS.

Water conditions were in general favourable for the hydraulic mines. The major hydraulics in operation were Lowhee Mining Company, Limited (formerly John Hopp Mines), on Lowhee creek, which continued in virgin ground; Carinelle Placers, Limited, operating the *Bullion*; and B. Boe, operating the *Platt* and *Lyne* leases on Cedar creek. The activities of the many smaller hydraulics in and about Barkerville, whose annual total contribution to the output is considerable, were much the same as usual.

Interesting new discoveries were made on Spanish creek by A. Sutherland and A. Anderson, and in the Horsefly section by R. N. Campbell.

Keystone-drilling operations were carried on by the Consolidated Mining and Smelting Company of Canada, Limited, on Swamp river, and by Central B.C. Mines Development Company in Beaver valley, in the Horsefly section.

The dredge formerly owned by the Kafue Copper Development Company, Limited, has been sold to interests in the United States and has been dismantled and shipped to Oregon.

OMINECA MINING DIVISION.

Manson Section.

Among operators in this section may be mentioned the following:—

R. C. and A. McCorkell moved their drag-line scraper equipment from Manson to Germansen creek.

W. M. Ogilvie carried on drilling operations on Slate creek.

W. Fleming and F. Valteau were engaged in prospecting their leases on Manson creek below Slate creek.

Ah Lock continued hydraulicking on his property on Germansen creek.

Lee Tong and associates have started a bed-rock tunnel on Vital creek in place of ground-slucing.

W. McCormick continued his tunnel to tap the old channel on Tom creek.

S. Olson has been working on Quartz creek.

COAL-MINING.

Considerable interest has been shown in the coal areas in and about Telkwa. Telkwa Collieries, Limited, has been operated for the usual number of months in the year.

New discoveries of coal were reported at Cedarvale and on the South fork of the Zymoetz river. Both were investigated, but in neither case were hopeful commercial possibilities apparent. Full reports on these will appear in the Annual Report for 1929.

CENTRAL MINERAL SURVEY DISTRICT (No. 3).

PRELIMINARY REPORT FOR THE YEAR 1929.

By H. G. NICHOLS, RESIDENT MINING ENGINEER (HEADQUARTERS, KAMLOOPS).

This district comprises the seven Mining Divisions of Kamloops, Clinton, Lillooet, Ashcroft, Yale, Nicola, and Vernon. The area includes a variety of topographical and geological conditions, among which are those related to the eastern flank of the Coast range; to a belt of crystalline schists, quartzites, and pebble conglomerates of Palæozoic age; and to the Interior plateau.

In regard to the first of these areas, mineralization is represented chiefly by gold, silver, and copper; in regard to the second, minerals of the lead-zinc-silver type predominate, while the Interior Plateau region and areas affected by the intrusion of batholithic rocks, largely unexposed at the surface, provide a variety of products, including minerals of nickel, mercury, chromium, molybdenum, manganese, and tungsten in addition to those enumerated above.

Large sections of the Interior plateau are covered also by rocks of Tertiary age, and non-metallic products, including gypsum and salts of soda and magnesia, occur in commercial quantities.

Production has increased but has not yet reached a stage commensurate with the ultimate possibilities, the realization of which is dependent upon more intensive development and exploration. Prospecting has been active in the district during the year and has been encouraged to a large extent by the discovery of occurrences of unusual metals.

The work of exploration has been aided by the policy of the Department of Mines in the construction of many mining trails and roads and of trunk trails for the purpose of providing access into areas that have not been available hitherto for pack-horse transportation.

The chief item of production has been derived from the Bridge River area, in the Lillooet Division, where the *Pioneer*, on Cadwallader creek, has been developed to a depth of 1,000 feet; the gold bullion product from this property for the year is estimated to have a gross value of approximately \$185,000.

Another producer of note is the *Planet*, in the Nicola Division, from which shipments of a high-grade silver-lead concentrate are being made to the Selby smelter. Three other properties of less importance have gone into production or have reached that stage during the year.

In the field of non-metallic production the outlook continues to improve by reason of developments in methods of treatment and manufacture. A new process has been evolved for the dehydration of the soda crystal which is found in many lake deposits in Clinton and Kamloops Divisions; while the development of the manufacturing industry in connection with the production of plaster of Paris indicates a future of steadily increasing importance for the gypsum-deposits at Falkland, in the Kamloops Division, and elsewhere.

Some interesting discoveries have been made during 1929, an outstanding item being that of a zone of copper-silver-zinc mineralization in a belt of limestone on the Skagit river near the International boundary.

In the Coquihalla area the discovery of pockets of exceptionally high-grade gold ore at a depth of approximately 100 feet below the point where similar occurrences have been found previously on the No. 2 level of the *Aurum* provides the first tangible indication of the possibility of continuity for the enriched zone. In the North Thompson and Adams Plateau sections new discoveries of bodies of silver-lead-zinc ore have been made, from which interesting results may be expected from further work in the coming season. The Consolidated Mining and Smelting Company of Canada, Limited, has been active in scouting, engineers of the company having investigated a large number of prospects and areas, upon some of which it is understood that development by diamond-drilling will be initiated in the near future. With the exception, however, of work that was carried on during the greater part of the season upon the low-grade copper shear-zones in the granite area near Kamloops, and of some prospecting-work in the Bridge River area, and some extractions of chrome-iron ore from the deposits on Scotty creek, in Kamloops Division, for experimental purposes, this company has not been engaged in actual development-work in the district during 1929.

KAMLOOPS MINING DIVISION.

Ajax and Monte Carlo Groups.—The Consolidated Mining and Smelting Company of Canada, Limited, secured an option upon these two groups, situated about 6 miles south of Kamloops, from G. J. Rodgers, and carried out a programme of diamond-drilling upon two wide zones of shearing in granite, with which a more or less uniform distribution of oxidized copper mineralization is found to be associated in a number of surface workings.

Fourteen diamond-drill holes were put down, which proved that the shearing was continuous, with a width of about 70 feet, for a distance of approximately 700 feet, and to a depth of about 350 feet. Sulphide mineralization was found to be fairly uniformly distributed at this depth, which represented the lowest horizon penetrated by the drill-holes, but it is understood that the average grade of the ore thus far developed was below that required for commercial operations, although some seams of chalcopyrite assaying up to 10 per cent. of copper were found to occur within these zones. Work was suspended temporarily in October.

Copper King.—This property, situated near Kamloops lake, in the same general area as the *Ajax*, was operated under lease by H. R. Graham, and four car-loads of ore were extracted from the old stopes and shipped to the Trail smelter, yielding a net return of approximately \$3,000; values are in copper and gold. A further shipment of four car-loads was made of ore from the old dump. Plans are under consideration for the continuation of development of this property in the coming year, following upon discoveries of ore that were made during the course of the stoping operations.

Cotton Belt.—No further work was done upon this property, situated above Seymour arm.

Copper Chief.—This group of claims has been located by J. T. Lauthers and associates upon a shear-zone in schist of the Bastion formation in the neighbourhood of White lake, between Salmon Arm and Sorrento, on Shuswap lake. There is scattered mineralization with some chalcopyrite in seams within this zone of shearing. A crosscut tunnel was driven at a small depth below the surface. The average grade of the rock encountered was not commercial.

Copper Cup.—This claim, owned by J. Rivers, of White Lake, adjoins the western boundary of the *Copper Chief* group. Some prospecting has been carried out on the same mineral-zone, an extension of which is found on the shores of the lake, about 3 miles distant and about 500 feet vertically below, where the mineralization is represented by sphalerite and galena.

Venus.—This property is situated on Crowfoot mountain to the north of Shuswap lake at Magna bay, at an elevation of approximately 5,500 feet. Bedded seams of silver-lead-zinc minerals are found in the schists of the Bastion formation, in association with bands of limestone. Several of these seams have been opened up in a series of open-cuts and shallow workings, the work of prospecting being handicapped by the plateau-like character of the area. During 1929 some exposures of exceptionally high-grade silver-lead ore were made, but up to the present time information is lacking as to their continuity; in general, it may be said that the formation is fairly well undisturbed and that there are good chances for the finding of ore-bodies of economic importance in this area.

Metal Crest Mines, Ltd.—A company of this name has been incorporated with the avowed purpose of developing properties located on Scotch creek, where some prospecting-work was carried out some years ago upon a series of quartz stringers, in which some scattered mineralization is found to occur. No work of any significance has been done by the company, and without some further discovery to warrant it, there does not appear to be any ground for outlay upon development.

Elsie.—A small amount of prospecting-work was carried out by H. McGillivray, who, with associates of Chase, owns this property, situated on the east side of Adams lake. The occurrences of mineral are similar to those on the *Venus*, but the proof of economic importance depends upon a greater amount of development-work than was carried out by the Granby Mining, Smelting, and Power Company, referred to in the Annual Report for 1928.

Homestake.—This property is situated on the west side of Adams lake, immediately opposite the high land upon which the *Elsie* is located, and the conditions of mineralization are more or less identical, with the exception that in the case of the *Homestake* the occurrence of silver-lead ore is found in association with large bodies of barite carrying low silver values. The history of this property, from which high-grade ore to the total value of \$129,000 was shipped during recent years, has been given in previous Annual Reports. There would appear to be a future for the property in connection with the development of ore of milling grade by means of a

new adit which could be driven through a section of ground which is removed from the faulting action that was responsible for most of the difficulties in connection with the old workings.

Treasure and Signet.—These claims are located on the east side of the *Homestake* and beyond a fault that has been recognized as bounding the ore occurrence in that direction. It is understood that silver-lead-zinc mineral in association with barite has been exposed in open-cut and tunnel workings. The properties are in the name of J. Tenford, of Squaam Bay.

O.K. Group.—This property, including the *Anaconda*, to which reference has been made in previous reports, is situated on Birk creek, Barriere river. The tunnel driven on the flat-dipping mineralized seam was extended to a total distance of 135 feet, without, however, encountering any change in the character of the ground.

A discovery of some interest has been made upon an adjoining claim situated at some distance farther down the creek and owned by one of the partners of the group of prospectors by whom much of the work in this area has been carried out. Upon this claim a body of lead-zinc ore has been discovered, indicating a zone of replacement by these minerals at a lower horizon than the tunnel-workings and lying below the beds of pyritic replacement, of which mention has been made previously, as being exposed in the bed of Birk creek.

White Rock.—Since the date of the last report upon this property a crosscut tunnel has been driven by the White Rock Mining Company, Limited, for a distance of approximately 250 feet, with the object of intersecting the quartz vein with silver-lead content that was exposed in open-cut workings at a point about 150 feet north and at a vertical height of about 100 feet above the tunnel.

The new tunnel penetrated an area of crushed and fractured altered limestone with bands of schist in which there is evidence of considerable faulting movements. This whole area affords evidence of secondary action by aqueous solution, with the development of calcite and powdered silica.

At the point where the quartz vein which constituted the main objective of this work should have been struck a zone of decomposed rock was encountered with mud-seams, calcite, and a small amount of quartz, and there was no encouragement for drifting. This appears most unlikely ground for the occurrence of a vein of any continuity; no such vein has been discovered, and the net result of recent work is not encouraging to further expenditure upon development.

Go'd Hill.—Following upon the operations upon this property, situated near Chu Chua, on the North Thompson river, by the local syndicate referred to in the Annual Report for 1928, an interest in it was acquired by A. E. Day, of Kamloops, and further development was carried on by him.

A total amount of approximately 550 feet of tunnelling-work was carried out in the attempt to establish a workable content in the mineralized zones traversing the property. Of the total amount of work accomplished, about 170 feet consisted of drifting on the No. 1 (or south) zone, and work on the No. 2 zone was carried out at three different horizons, but no satisfactory results as to values were obtained.

Smuggler.—The prospecting-work upon this group of claims, situated at Birch Island, on the North Thompson river, which had been previously carried on in connection with the scattered occurrences of silver-lead ore, was suspended in favour of investigating surface deposits of manganese ore which have been found to cover large sections of the hillside. A number of pits have been dug which indicate a considerable extent of these deposits, resulting from the infiltration of mineralizing solutions which have penetrated the soil to a depth ranging from 3 to 8 feet. There is considerable mixture of vegetable matter with the deposits. Samples of the clean material assay up to 50 per cent. manganese.

Minnesota Girl.—A crosscut tunnel on this property has been advanced by J. Schlichter to a total distance of 287 feet, a change in the formation being encountered near the face, with vertical fractures cutting across the tunnel. Work is being continued by the owner.

Lydia.—This property, which was the subject of considerable exploration some years ago, under the direction of engineers at that time associated with the operations of the Consolidated Mining and Smelting Company of Canada, is situated 6½ miles from Birch Island up the valley of Canyon creek.

Scattered mineralization with copper minerals is found over a considerable area occupied by a fractured greenstone and schist, in contact with a prominent porphyry dyke exposed on a precipitous hillside. Two tunnels were driven into the hill for distances of over 700 feet. The

property was the subject of examination during 1929 by representatives of the Consolidated Mining and Smelting Company.

Red Top.—This property, owned by W. E. Noble and J. Beaton, of Vavenby, is situated 10 miles north of that station, on the Canadian National Railway, in the North Thompson River valley. Three seams of lead-zinc-silver mineralization are found within a zone about 30 feet wide in typical quartzites of the Pre-Cambrian formation, which appears here to be undisturbed, affording good promise of continuity for these ore-bodies. The prospect is attractive.

Sugar Loaf.—This property, owned by Edwin Smith and associates, of Grindrod, is situated about 1 mile south of the *Grandview*, to which reference was made in the Annual Report for 1928 (page 211).

A tunnel approximately 60 feet in length has been driven upon a body of quartz about 7 feet wide in the prevailing quartzite formation. This vein has a north-and-south strike and may be traced for about 200 feet on the surface; it is bounded by fairly well-defined walls, having a steep dip towards the west. With the exception of some scanty mineralization with galena, there are no evidences of valuable content to warrant further underground work at the present time, but systematic open-cutting on the surface might result in more encouraging showings being found.

Transvaal.—This group is situated on Forge mountain, in that part of Highland Valley area lying within the Kamloops Mining Division. A new camp has been constructed by the owner, George Novak, of Rossland, and tunnelling operations have been in progress with a view to opening up the extensive bodies of copper ore that are indicated by the numerous surface exposures. A considerable amount of development-work was carried out several years ago upon this property and adjoining groups, but results so far achieved have been inconclusive. The continuance of exploration is fully warranted in view of the widespread character of the mineralization, and it is understood that work is to be continued during the winter.

Ford.—This claim represents the relocation of an old property 32 miles from Kamloops, on the road leading to Mamit lake. A shipment of copper ore, occurring in a fractured diabaŕe, was made from an old open-cut, but it is understood that returns from the smelter did not come up to expectations. The property is held by a local organization under the name of Meadow Creek Mines, which has also acquired other claims situated on Dupont lake, about 6 miles south of the *Ford*, and which have been relocated as the *Bertha* and *Molly*. On the former of these a body of mineral with copper-glance is exposed in an old shaft. A sleigh-road to this property has been constructed with the intention of shipping ore during the winter months.

Blue Ice and Blue Lead.—These groups include a number of claims staked and relocated during 1929 in the interests of J. Errington, of Toronto, at the head of Hobson creek, in the Clearwater area, and cover the ground originally held by Fred Wells. Extensive bodies of quartz and zones of mineralization identified with a system of crossing fractures are found immediately below the glacier occupying the head of the valley. Very little work was carried out during the year, although a heavy expenditure was made upon the construction of a trail leading to the properties. The physical difficulties to be overcome appear to be too great in the case of two out of three mineralized zones that are indicated. In the third case there is a possibility for development; a quartz ledge having an average width of approximately 4 feet, which is traced on the surface over a distance of 1,000 feet, might be opened up by tunnel-workings to a depth of between 400 or 500 feet. The quartz is heavily pyritized, with associated lead and copper minerals. Gold values up to about \$3 a ton have been obtained from the open-cut workings.

Grizzly Group.—This property is located on the summit of the divide between Azure river and Hobson creek, in the Clearwater area, adjoining the *Summit* group and about 3 miles from the *Blue Ice* group. This group was located by A. P. Horne, of Blue River, and covers some massive quartz veins carrying arsenopyrite and galena with associated gold and silver values. Very little work has been carried out up to the present time, but the prospect is an attractive one and is deserving of further attention.

Summit and Warcolt.—These properties, to which reference has been made in previous reports, were also investigated by J. Errington and some surface-stripping was carried out with a view to establishing the continuity of the veins; it is understood that the results of this work were not encouraging and operations were suspended.

LILLOOET MINING DIVISION.

Pioneer.—Development of this property by Pioneer Gold Mines of British Columbia, Limited, has been extended down to the 1,000-foot level and crosscutting and drifting on three levels is being carried out. The results of this development to date indicate that both the width and average values of the ore-body are maintained with depth. The cyanide-treatment plant has been kept running steadily, mainly with accumulated tailing, pending the completion of the deeper development of the mine above referred to. The value of the bullion product for the year is estimated at approximately \$185,000.

The prospects for improved production next year appear to be assured and the property is established upon a basis of steady production for some time to come.

Lorne.—The programme of deep development of this property that was commenced in 1928 was continued throughout 1929, with the result that over 6,000 feet of tunnelling has been completed and an ore-body has been opened up on the *King* vein, having a length of approximately 400 feet and depth of about 650 feet below the upper workings. This ore-body, which is being developed by raising and drifting, indicates a reserve of commercial ore that would appear to justify the erection of a treatment plant. The results of this development have not been so satisfactory in regard to the proof of continuity of other veins that are exposed in surface workings. There are, however, many chances for the opening-up of other ore-bodies by means of lateral development on the new adit-tunnel level and at higher horizons.

The work, including the installation of water-power equipment and camp buildings, has been carried out upon a generous scale and in an efficient manner.

Wayside.—Further prospecting-work upon this property was commenced, but operations were suspended during the summer and there is no particular change in the outlook.

Griswold.—The Consolidated Mining and Smelting Company of Canada, Limited, has completed the construction of a trail leading to this property, near the headwaters of Bridge river, from the auto-road, a distance of about 40 miles, and some prospecting-work has been done. It is understood that the further development of this property, upon which some attractive bodies of chalcopyrite have been found in a recently discovered area of granite of a younger age than the predominating batholith, will be proceeded with next year.

McGillivray Gold Mines, Ltd.—This company was formed to develop and operate the properties held formerly by the Anderson Lake Mining and Milling Company on McGillivray creek, as well as placer-ground lying below these gold-quartz ore-bodies. Attention was devoted chiefly to the placer properties and preparations have been made for hydraulicking operations upon bench-gravels. A small amount of development has also been carried out from the tunnels of the old company.

Marion.—A short prospect-tunnel was driven to intersect some seams of cinnabar occurring in the Eldorado formation, near the head of Tyaughton creek, in the Bridge River area, but no ore of commercial importance was exposed.

Cinnabar King.—This claim, owned by Grant White, of Bridge River, is located about 8 miles east from the *Marion*. Some attractive-looking cinnabar-bearing rock was obtained from a zone, stated to be 100 feet wide, that is exposed on the steep side of a ravine. Further prospecting of this zone would appear to be justified.

Index.—This molybdenite property, at the head of Texas creek, has not been further developed, but continues to be of interest in view of the growing demand for molybdenum.

Copper Mound.—This property, owned by John Jacks, of Pemberton, is situated at the head of Wolverine creek, which flows into Lillooet river from Tenquille basin, about 11 miles north-west of Pemberton. Some massive bodies of pyrrhotite occur on this property, containing appreciable quantities of copper with some gold values. During 1929 the property was bonded by a Vancouver syndicate and it is understood that the results of sampling from some new open-cut workings are sufficiently encouraging to warrant the initiation of more extended development in 1930.

Gold King.—This group, owned by C. Barbour, of Pemberton, has been bonded and it is understood that diamond-drilling will be commenced in the spring.

ASHCROFT MINING DIVISION.

Glacier Group.—This group, owned by J. Murphy and associates, of Lytton, is situated at the head of the North fork of Quoieek creek, which flows into Fraser river below Keefers, on the

Canadian Pacific Railway, about 15 miles from the railway and at an elevation of approximately 7,000 feet. A small amount of open-cutting has been done upon a quartz vein, averaging about 2 feet wide, that is exposed along the rock-strewn side of a glacial cirque. Silver values are obtained from certain sections of this vein and there are some indications of greater width and of a gold content being found at a lower level. The property is interesting chiefly from the point of view of indicating mineralization in this area of favourable geological conditions. The quartz vein occurs in a slaty argillite formation near the contact with a belt of greenstone that is considerably sheared with the development of serpentine and asbestos.

Sharp.—This group, covering some deposits of cinnabar, is located on Criss creek. Surface workings indicate the occurrence of the cinnabar under conditions that are typical of the important mercury mining districts of the world. With the exception of one point where there is a streak of high-grade cinnabar ore about 10 inches wide in a finely banded quartz-calcite vein about 2 feet wide, the general character of the exposures is that of a widespread but low-grade deposit. It is considered to be deserving of further exploration.

CLINTON MINING DIVISION.

Activities in connection with metallic minerals have been restricted to minor operations by individual prospectors in the Taseko Valley area and to placer-mining on a small scale on the creeks tributary to the Fraser river. Development of the copper-gold zones in the Whitewater area, which was undertaken by the Consolidated Mining and Smelting Company of Canada and carried on during 1928, was not continued.

Scottie Creek.—Some shipments of chrome-iron ore were made from the deposits that are found along the valley of the Bonaparte river by the Consolidated Mining and Smelting Company of Canada for experimental purposes.

NICOLA MINING DIVISION.

Planet.—Development of the *Enterprise* vein has been continued by the Planet Mines and Reduction Company of Nicola, B.C., Limited, and a flotation plant has been completed and was in operation for the greater part of the year. Ore of an average grade of between \$12 and \$13 to the ton is being stoped from a succession of ore-shoots over a distance of approximately 400 feet, the average width being about 2 feet. The vein has been opened up by means of a crosscut tunnel to a depth of about 320 feet on its dip. It is understood that the crosscut is to be continued for the purpose of developing the whole vein system in this area, and that an intensive programme of development will be undertaken, upon which the profitable continuation of operations will depend.

Leadville.—This group, situated on Iron mountain near Merritt, is held by Comstock of British Columbia, Limited, a Seattle (Washington) company. There are twenty-one claims to which the company has title. A shaft has been sunk to a depth of 105 feet on the principal ore occurrence, which is represented by a vein approximately 5 feet wide, carrying high lead values with a rather erratic silver content. It is understood that a compressor is to be installed with the object of driving a crosscut tunnel, which is calculated to reach the vein at a depth of 175 feet below the surface. This work is to be carried on during the winter and is to be followed by a programme of diamond-drilling in the spring.

Morgan Copper Mines, Ltd. (N.P.L.).—A Vancouver company of this name was incorporated to acquire and develop properties situated at Aspen Grove, where a number of exposures of copper minerals are found in a complicated system of fracturing of rocks of the Nicola series and more recent lava-flows. In regard to the majority of these occurrences, investigations have failed to provide assurance of economic operation, but it is understood that work is now being devoted to the development of a body of mineral occurring upon one part of the properties controlled by the company, that was known formerly as the *Big Sioux*, to which reference has been made in previous Annual Reports, and upon which ore of a grade that is better than the average is found under conditions of some promise.

Turlight.—A shaft has been sunk by J. Graham and associates, of Merritt, upon a body of copper ore consisting largely of bornite in a siliceous gangue that was found to outcrop on the hillside flanking Mill creek, north-east of Nicola. This property, together with five adjoining claims, is under option to Turlight Mines, Limited (N.P.L.), a syndicate with head office at Merritt. At the one point at which this ore-body has been opened up in the shaft its appearance

is such as to warrant fully some further development-work, but up to the present time evidences of continuity are lacking.

Chrome Vanadium.—This group is situated upon the high land lying to the west of the Okanagan valley, at the headwaters of streams tributary to the Coldwater river. It is reached at the present time from Kelowna. Bodies of chrome-iron ore associated with serpentine and peridotite have been discovered and encouraging assays have been obtained from samples that have been brought down. The property was located by A. Raymer, of Kelowna. The area has been little prospected and the result of the further development that is to be carried on in the coming year will be watched with interest.

YALE MINING DIVISION.

Aurum.—A large amount of tunnelling-work has been done upon this property during 1929, and during October workings on the level of the No. 3 tunnel penetrated the area in which the possible downward continuation of the conditions identified with the discovery of high-grade gold ore on the No. 2 level above were to be looked for. In the course of this work a pocket of arsenopyrite with heavy gold content was encountered, similar to the ore found in limited quantities on the level above. This discovery may be said to afford the first tangible indication of continuity and opens up possibilities of development of an ore-bearing zone, associated with shearing in serpentine along the slate-greenstone contact.

Hope Gold Mines, Ltd.—A considerable amount of exploration-work was carried out by this company on its holdings adjoining the *Aurum*, but no ore-bodies of economic importance were developed.

Pacific Mines, Ltd.—Some shears in a wide belt of serpentine exposed along 15-Mile creek at a distance of approximately 3 miles south of the *Aurum* workings, and in which free gold was found to occur, were exposed by ground-sluicing operations carried on by this company. Further surface work was devoted to the purpose of establishing a proof of continuity for these occurrences previous to undertaking underground exploration by means of a long crosscut tunnel which is understood to be contemplated.

Dalhousie Mining Co., Ltd.—Exploration-work was carried on by this company on the south-easterly extension of the same zone of mineralization in which the occurrences on the *Aurum* are found, but this work was suspended during the summer.

Reward Mining Co., Ltd.—This company secured a number of claims in the same area, but no work of importance was carried out.

Columbia Metals, Ltd.—An active campaign of exploration was launched by this company upon its properties, situated on the east side of the Coquihalla river, near Jessica, but with the exception of some occasional seams, in which a gold and silver content was found, in association with zinc in shears within the greenstone, no ore-bodies of economic importance were developed during the season.

Several other individuals and organizations are engaged in the work of prospecting along this attractive mineralized zone.

Dawson Gold Mines, Ltd.—This company continued work upon the *Emancipation*, attention being devoted principally to developing possibilities in connection with the downward continuation of the shoot of high-grade gold ore in the *Dyke* vein.

Pride of Emory and Star of Emory.—The massive bodies of nickel-bearing pyrrhotite occurring on these groups, at the head of Emory creek, are being developed by a local syndicate by means of diamond-drilling. It is understood that the results of this work, which has been carried out upon the main lode, indicate a width of 100 feet over a length of about 600 feet, from which core samples indicate an average content of approximately 3 per cent. nickel; samples assaying over 5 per cent. have been obtained.

Dominion Mineral Development Co., Ltd.—The properties of this company are situated near the summit of a hill, at an elevation of about 5,000 feet, west of Iago, on the Kettle Valley Railway. There is here a wide belt in which a series of quartz veins associated with pegmatite occur in a granite area. There are said to be twenty-six veins within a zone approximately half a mile wide, carrying molybdenum in variable quantities. The continuity of these veins over a considerable distance is indicated, although more work will have to be done before this point can be established. Samples of an attractive character are obtained from many points within this vein system. The property is being developed by the Dominion Mineral Development Company, with headquarters in Vancouver.

Silver Daisy.—Work upon this property in the 23-Mile camp, on the Hope-Princeton trail, was continued throughout 1929, and some small shipments were made from the narrow vein of silver-lead ore which was followed for a distance of about 200 feet in upper tunnels. A lower crosscut tunnel is being driven to explore this vein at depth.

Gold Coin.—A number of claims have been located on the mountain adjoining Steamboat mountain, lying to the east of the Skagit river, about 10 miles below 23-Mile camp. There are here a number of bodies of pyrrhotite with variable contents of copper, lead, and zinc, and with some associated gold and silver values. A considerable amount of prospecting has been carried out by C. Howlett and associates, of Hope. The ore occurrences are found in a sheared greenstone formation and some attractive silver-lead ore is found that is to be identified probably with bands of limestone.

Silent Friend.—This group of five claims was located in 1929 by A. Robinson, of Vancouver. The claims are situated about 6 miles from the Skagit river, close to the International boundary. A wide belt of limestone with copper-silver-zinc mineralization is exposed on the steep sides of a ravine and possibilities are indicated of mining ore of good milling grade over widths of from 25 to 50 feet. The development of this property is being carried on throughout the winter by the owner.

Rainbow and Mammoth.—These properties, in the 23-Mile camp, were acquired under option by the same company connected with the development of the *Silver Daisy*, and some prospecting-work was undertaken but no definite result was achieved. On the former property there are some surface exposures deserving of a little more investigation by means of open-cut work, while on the latter an interesting occurrence is exposed in an open-cut where nickel and tungsten are found in association with the pyrrhotite.

VERNON MINING DIVISION.

Okanagan Copper Mining Co., Ltd.—This Vancouver syndicate has been developing properties situated upon Siwash creek, on the east side of Okanagan lake, where some attractive bodies of copper ore were exposed in a number of open-cuts. The ore-bodies appear to be related to a complicated system of fracturing and shearing in a volcanic and sedimentary formation intersected by porphyry dykes. A crosscut tunnel was driven that intersected a body of chalcocite, which appeared to be approximately 5 feet wide, at a depth of about 30 feet below the surface. In several other surface workings there is a notable content of chalcopyrite. It is understood that this property has been bonded by the Consolidated Mining and Smelting Company of Canada and that diamond-drilling is to be undertaken in the near future.

Payroll.—Upon this group, situated on Deep creek a few miles south of Siwash creek, there is a quartz vein in an argillite formation which has been exposed at the surface in a series of open-cuts over a distance of about 400 feet. The vein is approximately 2½ feet wide and dips at a steep angle. On the hanging-wall side a band of heavy silver-lead mineralization is exposed in the open-cuts. The property is being developed by a local (Vernon) syndicate.

White Elephant.—This property, situated near Ewings Landing, about 9 miles south of Deep creek, is being explored by Pre-Cambrian Mines, Limited, a company incorporated under the laws of Washington, with head office in Seattle. A small pilot-mill was erected in which a method of selective flotation was attempted with a view to producing a concentrate from a body of pyrrhotite in the massive quartz-outcrop, in association with which a high-grade gold-bismuth-telluride was found in the open-cut workings. Some underground work was also initiated at a few feet below the surface from a vertical shaft which had been sunk previously. It is understood that the grade of the concentrate that was produced did not come up to expectations.

Jumbo.—Some further work was carried on upon this property, situated about 4 miles north of Vernon, by H. J. Blurton, who commenced to sink a shaft on the quartz vein from a point in the open-cut workings where free gold is found at surface. At a depth of 12 feet the shaft penetrated a slaty argillite and the vein terminated abruptly.

St. Paul.—Very little further work was carried out upon this property on Monashee mountain. The occurrence of high-grade silver-lead ore, in which the mineral jamesonite is an outstanding feature, is of sufficient importance to warrant further development, but this should be guided by a close study of the geological conditions, which present an interesting problem.

Queen Mary.—This claim is situated on Mission creek, about 12 miles from Kelowna, and has been held by the locator, H. Mills, for a number of years. Placer-mining by Chinese was

carried on along the lower reaches of Mission creek for several years, and these old workings lie below the occurrence upon which this claim is located. There are here some vertical dykes exposed in the deep canyon of the creek which intersect horizontal beds of crystalline schists and quartzites, with the development of bodies of quartz carrying pyrite. Zinc minerals are also found. Values in gold and silver have been obtained from this point, but the occurrences appear to be erratic.

PLACER-MINING.

Gold placer-mining has not been active within the district and, in addition to the instances given above, work has been confined to small-scale operations by individual prospectors and syndicates upon creek gravels and sand-bars; and to certain preparations with the avowed purpose of hydraulicking bench-gravels on Louis creek and Hobson creek, in the North Thompson and Clearwater sections respectively of the Kamloops Division, and of dredging on the Thompson river, in the Ashcroft Division. In each of these cases assurance of returns based upon systematic testing in the first instance is lacking.

NON-METALLICS.

In the Kamloops Mining Division the development of the gypsum-deposits at Falkland has been carried on by quarrying operations conducted by Canada Gypsum and Alabastine, Limited. The production of gypsum rock from these quarries for 1929 is estimated to be about 24,000 tons, from which a manufactured product represented by plaster of Paris and plaster-board has been derived, having a gross value of about \$300,000.

In the Clinton Division the economic production of soda-ash from the lake deposits of soda crystal has been brought nearer to realization by the completion of a plant on the shores of one of the principal lakes near Beaverdam by the B.C. Chemical Company, Limited. This plant, which embodies a process of dehydration involving the use of a cyclone evaporator in which the sprayed salt solution is brought in contact with furnace gases, is calculated to have a daily output of 20 tons of soda-ash ready for the market.

The situation in regard to the coal industry within the district has not altered appreciably during the year. Middlesboro Collieries, Limited, at Merritt, has opened up two new mines, the coal-seams varying from 4 to 10 feet wide. In the Vernon Division it is understood that plans have been completed for developing a seam of coal on Shorts creek, on the west side of Okanagan lake.

SOUTHERN MINERAL SURVEY DISTRICT (No. 4).

PRELIMINARY REPORT FOR THE YEAR 1929.

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

GRAND FORKS MINING DIVISION.

Hecla Mining Co. (Union Mine).—This company has been steadily developing the *Union* in Franklin camp up to the present time. Connections have been made between the No. 4, No. 3, and No. 2 levels to facilitate handling ore. A complete air-compressor plant, blacksmith-shop, pump system from the Granby river, new bunk-house, boarding-house, and two dwelling-houses have been built and machinery installed. A 125-ton flotation plant is being constructed and is expected to be in operation about January 1st. A motor-truck is hauling supplies to the mine from Lynch creek, a distance of about 30 miles. Paul Schulz is superintending the work. The ore carries values in gold and silver.

Halifax.—This claim, situated in Burnt basin near Paulson, has lain idle during the greater part of the year. An interesting deposit of silver-lead-zinc ore has been developed in a limestone-bed by Henry Jackson *et al.*, of Paulson.

Molly Gibson.—New mineralized zones have been uncovered on this property near Paulson by the Molly Gibson (Burnt Basin) Mining Company, Rossland, whilst assessment-work was being done. The ore carries values in gold, silver, and copper, and occurs in a highly altered metamorphosed limestone. Transportation facilities are good.

Montrose.—This claim is situated between the *Molly Gibson* group and the *Halifax*. Mineralized zones and fissures containing silver-lead-zinc ore have been developed in the limestone-beds by shafts, open-cuts, and tunnels.

Fife Quarries.—Continuous shipments of limestone were made from this property at Fife to the Trail smelter.

Rock Candy.—This mine was operated for several months by the Consolidated Mining and Smelting Company, of Trail, and several thousand tons of fluorspar shipped to the smelter.

Bonanza Fraction.—This group, situated on the Granby river, was bonded by the Hercules Consolidated Mining, Smelting, and Power Company, but later the bond was relinquished. No work has been done since the early part of the year. This is a good low-grade prospect close to railway transportation.

Humming Bird Fraction.—This claim, situated on the Granby river, is being developed by Carl Anderson, of Grand Forks. Mineral-zones containing pyrite and pyrrhotite occur in the limestone-beds. Samples taken from this property assay from \$10 to \$20 in gold. Up to the present insufficient work has been done to prove the extent of this deposit.

Clara Charlotte Mining Co.—This company had assessment-work done on the *Black Tail* group. No recent work has been done in the lower tunnel.

Alpha.—This claim, situated on Hardy mountain, about 4 miles north-west of Grand Forks, is owned by Ab. Fee *et al.* Open-cuts have uncovered veins and segregations varying from a few inches to 10 feet of pyrite and chalcopyrite in a fragmentary volcanic rock over an area of about 500 feet square. On the west of this discovery the volcanics are intruded by a porphyry dyke about 100 feet in width. To the west of the dyke much disturbed and tilted limestone-beds occur, also containing pyrite, chalcopyrite, and galena. This discovery warrants more development.

LIGHTNING PEAK CAMP (PART OF).

The boundary-line between Greenwood and Grand Forks Mining Divisions passes through this camp, so that some claims are in each Division. The principal property in the Greenwood Division is the *Waterloo* and a description of the operations now proceeding will be found at the commencement of the section of this report headed "Greenwood Mining Division."

Pay Day.—This group, consisting of eleven claims, is situated at the east end of the camp and is owned by Walter Johnstone and Alf. Williams, of Edgewood. Numerous open-cuts developed a vein varying from 2 to 6 feet in width, striking in a north-easterly direction (mag.) and containing galena, pyrite, and sphalerite. A crosscut tunnel driven about 30 feet below cuts the downward extension of this vein. The width of mixed ore and gangue in this tunnel measured 17 feet, August 12th. Chalcopyrite and pyrite replaced the galena and sphalerite to a great extent. A 10-foot sample of massive ore assayed: Gold, 0.02 oz. to the ton; silver, 30 oz. to the ton; zinc, 9.7 per cent.; copper, 5.3 per cent. A 17-foot sample across the vein assayed: Gold, trace; silver, 10.8 oz. to the ton; copper, 0.2 per cent.; lead, 0.4 per cent.; zinc, 3.6 per cent. This is a very interesting discovery and worthy of development. Discoveries of silver sulphides in the limestone-beds to the north have been made recently.

On the *Killarney*, *First Chance*, *Lumpy*, and other claims, assessment-work has uncovered mineral-zones containing silver and lead.

GREENWOOD MINING DIVISION.

LIGHTNING PEAK CAMP (PART OF).

Waterloo Consolidated Mines, Ltd.—This company was formed during the summer to obtain options to purchase the following claims: *Waterloo No. 3*, *Silver King*, *Silver Cup No. 2*, *Silver Spot Nos. 1, 2, 3, 4, and 5*, *A.U.*, *Gold Coin*, *Gold Plate*, *Gold Bullion*, *Golden Fleece*, *Golden Rod*, *Golden Hair*, *Golden Sunshine*, *Golden Rule*, *Golden Morning*, *Gold Treasure*, and *Silver Spot*, all situated in the Lightning Peak camp. This is the old *Waterloo* property which is commonly referred to as situated in Lightning Creek camp, but is actually on the western slope of the range and therefore situated in Greenwood Mining Division.

A road has been built from what is known as the Crossing on the Edgewood-Vernon road to the camp, a distance of about 18 miles. The central part of this road is wide enough only for a tractor. A camp has been built near the workings of the *Waterloo*. The company expects to

haul ore from the *Waterloo* by tractor in the early winter. Several hundred tons of medium-grade silver-lead-zinc ore is on the dump. This is the first *bona-fide* attempt to develop these properties on a scale commensurable with the possible outlook.

The belt of schist and limestone-beds stretches for 5 or 6 miles around the toe of Lightning peak, and these beds are intruded by granite, diorite, porphyry, and diabase dykes. A series of fissure-veins occur in the schist striking in varied directions. The contact of the veins now covered with deep gravel may prove to be valuable. Wilkins, McNicoll & Oldham, brokers, Penticton, are sponsoring this promotion.

WALLACE MOUNTAIN CAMP.

Bell.—This mine has been the chief producer in the camp since 1916. Under the management of Duncan McIntosh and Henry Lee, regular shipments of silver-lead-zinc ore have been made to the Trail smelter during the year. A new Ruston compressor has been installed and the working-crew increased. Only a small section of this claim has been worked out and there appears to be many years' production ahead.

Sally Mines, Ltd.—This property, adjoining the *Bell*, was worked spasmodically during the early part of the year. At the beginning of October Vancouver financial interests had a survey made of the underground working and at the present time a few men are mining segments of ore from the *Rob Roy* claim. It is understood that the new interests have optioned the property from the Sally Mines, Limited.

Wellington.—This claim, bonded by the Wellington Syndicate, has been steadily operated during the year. The ore-shoot struck early in the year above the main crosscut tunnel was mined above the fault. Since then the main tunnel has been extended and two lower faulted segments of the same shear-zone found. The zone evidently continues below this level. The narrow andesite dyke was found in contact with the new ore in a similar way as the occurrence in the upper levels.

Highland Lass Syndicate, Ltd.—This syndicate has been continuously operating the *Highland Lass*, adjoining the *Bell* on the north-east. In the lower levels to the north the Wallace formation has been encountered. Evidently blocks of this rock have been faulted down into the quartz diorite. The high-grade shear-zones discontinue in the Wallace formation. A ground-tram and hoist have been installed and further shipments of ore may be looked for.

Silver Star Mines, Ltd.—This company ceased operations after working the *Revenge* during the early part of the year. A new road has been built from the lower *Sally* workings to this property, which will greatly facilitate any further operations. One car-load of ore was shipped.

Beaver Silver Mines, Ltd.—More high-grade silver-lead ore was found in the east working of the shaft on the *Beaver* claim, but due to extreme faulting some difficulty was experienced in mining it. On the surface above the old Sutherland tunnel another strike of high-grade ore was made. The wide low-grade mineral-zone found earlier in the year in the Wallace rocks has been crosscut about 100 feet. Similar low-grade silver-lead-zinc was found over the entire length of the working. Other open-cuts to the east showed a similar mineralization. A Radiore survey was made on this property.

Bounty.—Two men were employed on this property during the greater part of the year. The ore-shoot in the main workings was relocated and a shipment made to the smelter. The *Bounty Fraction* was purchased by P. B. S. Stanhope, owner of the *Bounty*. Two outcropping shear-zones were discovered close to the dividing line between these two claims, but very little work has been done to prove their value.

Laurion.—This claim, developed during the early part of the year by Washington interests, has been abandoned and the compressor and engine sold.

Mogul Mining Co., Ltd.—Active development of this company's claims, the *Mogul* and *Silver Dollar* on Horseshoe mountain, ceased during the autumn. A log bunk-house and boarding-house were built and the *Silver Dollar* shaft unwatered and sunk. At the bottom of this shaft the contact of the tuffs and augite-syenite porphyry was struck. A drift was started through the porphyry in the direction of the ore found about half-way down the shaft. According to the manager, A. Gaul, no ore was found by this work. A narrow road has been built about $3\frac{1}{4}$ miles long to the camp from the main Kettle River road. On the *Mogul* nothing more was done since early in the year.

CAMP MCKINNEY.

Le Roi and War Eagle.—An option was taken by A. Thomas on these claims and a Radiore survey made. Extensive indications of mineralization were found, which have not been followed by development up to the present.

GREENWOOD SECTION.

Vendela.—This claim has been worked by J. Wichser, of Greenwood, and a 400-foot crosscut tunnel driven under a mineralized zone containing copper. Several quartz veins carrying pyrite and occasional specks of galena were found, but no minable ore discovered to date. To the south-east several open-cuts uncovered copper carbonates in the fractures of the volcanics near the contact of a porphyry dyke. Further work is being done on this discovery.

Providence.—Nothing has been done on this property since early summer, when the Providence Mining and Leasing Company, of Wallace, Idaho, worked in the south shaft. The property was kept unwatered for some time so that inspection could be made, but no development is being done at present. A compressor, engine, and pumps are installed at the mine ready for work.

Hercules Consolidated Mining, Smelting, and Power Co.—Many of the properties bonded and leased by R. Crowe-Swords for this company at Phoenix and Greenwood have been allowed to lapse. No work has been done since June 30th. Amongst the lapsed claims are the *Brooklyn*, *Stemwinder*, *Crescent*, and the *Anaconda* group.

OSOYOOS MINING DIVISION.

Big Horn Mines, Ltd.—It is understood that an option to purchase the *Horn Silver* group and plant has been taken by Vancouver interests. During the summer five men have been working at the mine and the east drift was extended along the vein. Small segregations of silver-bearing mineral have been found, but up to October 21st no minable ore-bodies had been discovered. The ground is badly faulted and sheared on the vein. In the old workings the best ore occurred in the apex of the folded vein to the north of the present workings. A crosscut in this direction, with occasional upraises to the vein, would prove the possible continuity of this higher-grade ore.

Tiger Gold Syndicate.—The *Tiger* group, reported upon in the 1928 Annual Report, was explored by this syndicate during the year, under the management of A. T. Miller. The old shaft in the *Buller* tunnel was cleaned out and an upraise driven 35 feet on the vein. A winze was sunk about 60 feet on a cross-vein, carrying chalcopryite, to its intersection with the main *Buller* vein, in hopes that minable ore might be found. At the time of examination (October 2nd) this vein intersection appeared to be unattractive and only slightly mineralized. The whole schistose area in which these veins occur has been badly faulted, and sheared on the vein, and does not appear to warrant further development. In the upper workings, about 100 feet above the *Buller* tunnel, a short tunnel has been driven across the vein close to a fault and an open-cut cleaned out. Along the foot-wall about an inch of sheared schist carries variable values in gold. The quartz vein is to a great extent barren. Occasional small segregations of pyrite and chalcopryite are found. An electrical motor-driven rock-drill has been tried on this property and proved unsatisfactory up to the time of examination. It seems advisable to explore other areas on this group of claims, which are said to contain quartz veins, in the hope that less disturbed conditions may be met with.

Hedley Gold Mining Co.—Due to water-shortage, this company operated the *Nickel Plate* at Hedley on reduced capacity part of the time. Developments in the mine are proving satisfactory and it is hoped that sufficient ore may be found so that operations may continue for some time.

SIMILKAMEEN MINING DIVISION.

Granby Consolidated Mining and Smelting Co.—This company operated its mine at Copper mountain and mill at Allenby continuously throughout the year. Development underground consists of blocking out the ore-bodies already found, diamond-drilling, and sinking a shaft from the lowest level to handle ore found below. The new Symons crusher in the primary plant is working fairly satisfactorily. At the mill the management is contemplating a 500-ton increased capacity and probably early next year 3,000 tons a day will be put through.

Wheeler.—This group, situated near the mouth of Friday creek, which flows into the Similkameen about 17 miles south of Princeton, is owned by A. E. Wheeler and associates. A great deal of development-work has been done during the past thirty years, including five

tunnels, two of which are caved, and numerous open-cuts. The mineral-zone where seen occurs in a much-disturbed fracture-plane varying from 2 inches up to 12 feet and chiefly associated with pink pegmatite, epidote, and chlorite. The ore-minerals are bornite and chalcopyrite. In a glory-hole across the creek the rock has been fractured to a great extent and much copper-carbonate stain appears along the fractures. The country-rock appears to be diorite associated with bands and segregations of hornblende and biotite. The relation of these rocks could not be determined owing to caved ground and a heavy top soil. Chalcopyrite and bornite occurred in the hornblende. Several hundred tons of mineralized rock have been piled on the dump. There is a log cabin on the property and a good trail leading from the end of the old Trans-Provincial wagon-road. This is an interesting property and worth close investigation.

Princeton Mining and Development Co., Ltd.—In Bulletin No. 1, 1929, it was stated that this company had passed out of existence early in the year, owing to the fact that the company's free miner's certificate lapsed. This statement is partially incorrect, as the company as such is still in good standing with the Registrar of Companies, but the company's free miner's certificate was allowed to lapse.

Certain claims held by the company, therefore, lapsed owing to the free miner's certificate of the company not being renewed and were later staked by W. R. Gilbert. These claims formed the important part of the Princeton Mining and Development Company's property. Subsequently the Golden Copper Company, Limited, was incorporated and titles to these claims are said to have been transferred to this company by Mr. Gilbert.

Negotiations are said to be proceeding towards recognizing that some equity in the property of the Golden Copper Company should be held for the Princeton Mining and Milling Company.

Golden Copper Co., Ltd.—Walter R. Gilbert, president of this company, employed a few men during the late summer in the No. 2 and No. 3 tunnels in an endeavour to prospect the vein above the levels. A car-load of ore was shipped, which, it is understood, did not pay any returns over and above expenses incurred.

Copper Basin Mines, Ltd.—Under the management of Percy Hugh Fraser, of Vancouver, this company's holdings between 14-Mile creek and Hope summit on Whipsaw creek have been exploited during the year. The geology of the area has been reported upon by Dr. Cairnes, of the Geological Survey of Canada. The theory that the geology is favourable does not mean that ore is sure to occur. Several veins and stringers widely separated and varying from $\frac{1}{2}$ inch to 2 feet in width cut across the schist and altered sedimentaries which cover the west side of the valley. Recent work done consists of a 50-foot tunnel and open-cut and several open-cuts and stripping. A log bunk and cook house was being constructed on September 25th.

The ore-minerals found in these veins are chiefly sphalerite, pyrite with a small percentage of chalcopyrite, and galena. A picked sample from a 6-inch stringer crossing the creek on the old Fitzgerald claims assayed: Gold, 0.44 oz. to the ton; silver, 8.4 oz. to the ton; copper, 0.5 per cent. This property has been acquired by the company.

In the prospectus issued by this company it is stated ". . . to rapidly block out and actually prove the looked-for large bodies of mostly copper-gold-silver ores, sure to occur at greater depths in these favourable contact-formations."

This statement and inference as to large bodies of ore "sure to occur" are decidedly misleading, as there has been no deep development done on these properties and nothing is known at the present time regarding the possibilities of finding minable ore in the lower horizons.

The scale on the map on page 2 of the prospectus is incorrect and places the *Copper Mountain* mine of the Granby Company apparently much closer than it really is to this ground. On page 5 of the prospectus the sample assays quoted under the name of C. E. Cairnes, of the Geological Survey of Canada, were really taken from mineral property that does not belong now to the Copper Basin Mines, Limited.

Pacific Slope Mines, Ltd.—Nothing has been done by this company on the *S. & M.* and *Marion* groups since early in the year. These properties, owned by Sam Spencer, of Princeton, were developed until the early summer by the Pacific Slope Mines, Limited, under the management of Percy Hugh Fraser, of Vancouver (now president and director of the Copper Basin Mines). In default of a payment due the owner in May, the company forfeited its bond.

The long tunnel was advanced and crosscuts driven on both sides under the mineralized zone found above. The tunnel to the left encountered a 12-inch vein which assayed: Gold, trace; silver, 1.6 oz. to the ton; zinc, 10 per cent.

Snowstorm.—This group, situated on Siwash creek and owned by Frank Barber, J. Cunningham, and H. Avery, of Princeton, was developed by driving a No. 2 tunnel, 140 feet long and 60 feet down-stream from No. 1 tunnel. Two veins were cut in this tunnel varying from 2 inches to 2½ feet in width and converging towards each other. The contact of the veins has not been struck at present. It seems likely that the vein found in the face of this tunnel is the downward extension of No. 1 tunnel vein.

The following table shows the assays of samples taken:—

Description.	Gold.	Silver.	Copper.	Zinc.
	Oz.	Oz.	Per Cent.	Per Cent.
(a.) Vein in crosscut, No. 2 tunnel, across 6 inches	Trace	1.6	1.0	13.4
(b.) Face, No. 2 tunnel, across 2½ feet	Trace	1.8	Trace	24.0
(c.) Vein 500 feet down-stream, across 14 inches	Trace	1.6	1.4	16.2
(d.) Open-cut across creek, across 3 feet	Trace	5.0	0.7	.....
(e.) Samples at intervals from bottom of No. 1 tunnel—				
Across 2 feet	Trace	3.0	1.0	7.0
Across 2 feet	Trace	2.0	0.6	2.4
Across 2 feet	0.44	20.4	5.0*	16.0

* Lead.

Shamrock Nos. 1 to 6.—These claims, owned by J. Armstrong *et al.*, of Princeton, are situated about 23 miles up Summers creek, on the west side. A mineralized zone striking in a northerly and southerly direction has been traced for about 1,500 feet along the slope of the side-hill. In open-cuts and a short tunnel near the south end the ore-zone varies in width from 18 inches to 10 feet and is made up of pyrite, chalcopryite, and chalcocite, which has been deposited chiefly in the fractures of the porphyritic rocks. Some very attractive samples of chalcocite assayed high in copper. A shipment of this ore will probably be made late in the year and the value of the deposit may be gauged to some extent by the results.

SUMMIT CAMP, TULAMEEN.

Silver King Mining Co., Ltd.—This company acquired by assignment, from William B. Dornberg, Vancouver, two leases of five mineral claims, one of which is Crown-granted; i.e., *Bluebell, Mary E., Mattie, Lobe, and Allen*, all situated at Summit camp. The leases are for a term of ten years, and one is from the Capitol Mining and Milling Company and C. C. Julian, and the other is from the Cascade Consolidated Silver Mining Company and C. C. Julian, to W. B. Dornberg. The rentals to be paid to the lessee and mortgagee is one-fourth of the net smelter returns from all ore shipped. During the summer, under the management of H. C. Stephenson, Rogers Building, Vancouver, a crew of men was employed on the *Mary E.* in the upper and middle tunnels.

One car-load of ore was shipped before August 26th and another was under way. The first shipment netted about \$68 a ton in silver and lead. This ore was mined from the middle and upper tunnel. A good deal of time was spent cleaning up the old workings and putting in timber so that ore could be stoped. Costs have been figured at: Mining, \$12; hauling 21 miles to Tulameen, \$10; railway freight to Trail, \$8; and smelter treatment, \$9.58 a ton. The vein varies vertically and horizontally from 2 inches to 2 feet, and where clean galena occurs about 100 oz. in silver to the ton can be obtained. The ore is hauled by truck to Tulameen. Operations ceased November 1st until the spring of 1930.

Summit Camp Mines, Ltd.—During the winter the *Queen Bess* claim, situated near Amberty basin in Summit camp, was developed by driving a 171-foot crosscut tunnel, which intersected the vein about 147 feet vertically below the outcrop. A drift was driven 33 feet on the vein each way from the crosscut. In the right drift the vein varied from 1 to 8 inches and was mineralized chiefly with pyrite and sphalerite. In the left drift the vein appeared to be widening at the face and contained segregations of galena intermingled with pyrite and sphalerite. A sample of broken ore taken from this vein assayed: Gold, trace; silver, 10 oz. to the ton; lead, 5.6 per cent.; zinc, 10 per cent. The strike of the vein is N. 36° E. (mag.).

Triangle Fraction.—This group, consisting of five claims, is owned by John Marks, of Tulameen, and is situated about 6 miles up the river from Tulameen. An outcrop extending for over 150 feet along the bank of the river has been stripped and open-cutted in several places. A sample taken by the owner before much work was done assayed high in gold. A general sample taken later across 20 feet of heavily mineralized rock assayed: Gold, *nil*; silver, *nil*; copper, 0.5 per cent. The rock in which this mineral occurs is hornblende impregnated with pyrite and magnetite, with occasional specks of chalcopyrite. The discovery is interesting and probably warrants development at higher elevations.

Hope Range Copper Co.—This company did a small amount of development on the *Liverpool* claim near Lawless creek. A crosscut was driven about 8 feet long from the bottom of the inclined shaft. Massive pyrite containing segregations of chalcopyrite was struck in this tunnel. A 6-foot sample taken across the dip of the vein assayed: Gold, 0.06 oz. to the ton; silver, 0.50 oz. to the ton; copper, 1.26 per cent. A general sample from the face assayed: Gold, 0.14 oz. to the ton; silver, 0.60 oz. to the ton; copper, 1.31 per cent. This ore is part of the main body developed in the tunnel above and in the shaft. An offshoot from the main porphyry dyke cuts the left corner of the tunnel from the shaft. The distance across the mineral-zone cut by the tunnel above is about 60 feet. About 500 feet from this working an open-cut tunnel has developed rock impregnated with copper similar to that which is found near the face of the main tunnel. This is probably on the hanging-wall of the mineral-zone. The property was reported upon in 1927.

Federation Copper Mines, Ltd.—This company was formed to take over the *Red Bird* group on Rabbit mountain, and is capitalized for \$1,000,000, divided into 1,000,000 shares of the par value of \$1 each. The directors are Frank McMahon, T. E. O'Neill, George E. McFall, Donald Matheson, John Lucy, of Vancouver, and John Speck, of Tulameen. A Radiore survey was made on this group and, according to the owners, attractive results were obtained. Nothing will be known as to the value of results until development-work is done.

Spokane-Motherlode.—This group adjoins the Federation Copper Mines (*see* 1928 Annual Report) and is owned and being developed by John Osborne, Tulameen. Some attractive mineral-zones, containing pyrite and chalcopyrite, over an area several hundred feet long, have been uncovered. The ore occurs in schist.

COAL.

The coal-mines in the neighbourhood of Princeton are developing in a way that promise a bright future for the industry. Amongst those that are shipping for local consumption, as well as the Coast market, are the Pleasant Valley Coal Mines, Lynden Coal Mines, Finlay Creek Coal Mines, Tulameen Valley Coal Company, and a syndicate of local men, mining a 4-foot seam across the Similkameen river. Other prospects are also being opened up.

PLACERS.

John Guest Placer.—A shovel and drag-line, sluice-boxes, pump, and hydraulic equipment were installed on these leases, about 2 miles below Coalmont. A considerable yardage was moved and several clean-ups made. Information as to the total values recovered has not been received at present. A sample of black sand taken from the sluice-boxes after the first clean-up, and after panning out all visible metal, assayed: Gold, 0.80 oz. to the ton; platinum, 0.60 oz. to the ton; or about \$52 a ton in precious metals. No large-scale attempt has been made at present to save these sands by concentration. The residue from the boxes is being piled temporarily. Operations have been hindered to some extent by isolated masses of boulders varying in size up to 2 cubic yards. The shovel can handle most of these boulders once they are loosened. During the time that the shovel is idle the hydraulic 4-inch nozzle is used and the gravel bank sluiced. Until a larger area of bed-rock is uncovered so that it can be properly cleaned and room excavated to take care of the boulders, very little can be said regarding the possibilities of this endeavour.

Granite Creek Mining and Development Co.—This company installed a dredge and sluice-boxes on a small barge in the Tulameen river at the mouth of Granite creek. Due to congestion of sands in the boxes and consequent loss of values, the work was closed down for the present.

Slate Creek Consolidated Placers, Ltd.—Under the management of Norman McCormick, Tulameen, the tunnel under Slate creek is being continued. Up to October about 1,200 feet of drifting has been done without finding bed-rock.

EASTERN MINERAL SURVEY DISTRICT (No. 5).

PRELIMINARY REPORT FOR THE YEAR 1929.

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 REMARKS.

District No. 5 comprises the following twelve Mining Divisions in the West and East Kootenay: Revelstoke, Lardeau, Trout Lake, Slocan, Slocan City, Ainsworth, Nelson, Trail Creek, Arrow Lake, Golden, Windermere, and Fort Steele. Activity has occurred at about 115 mining properties during the period under review. Some seventy-six of these mines are situated in the Slocan, Nelson, and Ainsworth Mining Divisions of the West Kootenay. A very busy season has been experienced and an exceptionally large number of applications have been received for assistance towards improving transportation facilities to mines and prospects. In this connection assistance was given in the case of ninety-seven applications under the "Mines Development Act" in accordance with the policy of the Department to stimulate mining activity with a view to increasing production and creating new industry. A large amount of correspondence has been attended to, advice has been given to prospectors and mining men, and, when possible, capital has been directed to properties worthy of investigation. In this connection information has been freely supplied to visiting engineers and others in search of mining property worthy of development. It is very satisfactory to note that in spite of the slump in mining stocks the business of mining continues to be very active, and there is a constant demand for good prospects and promising properties by responsible mining companies and substantial interests. It is also interesting to record the entry into the district of Eastern mining engineers, who have already taken up property for their principals.

Summarizing the results of exploration during the intensified period of activity which has occurred during the last two or three years, it may be said that the general results are quite satisfactory. While there have been negative or discouraging results in some cases, considerable success has attended several recently inaugurated activities representing a fair proportion of the properties tried out, and in numerous instances where definite results have not yet been arrived at the results of development are very encouraging and give expectation that some new mines will be added in due course. Misleading promotional literature has been restrained as far as possible and the checking of prospectuses of companies offering shares for sale to the public has led to the withdrawal of the objectionable statements. This work now forms an important part of the duties of this office.

NEW DEVELOPMENTS.

Among new developments of exceptional interest may be mentioned: Extensions to the *Sullivan* concentrator which bring its present capacity to 5,200 tons a day, and when the full construction programme at the concentrator is completed within the next few months the capacity will reach 6,000 tons a day; the commencement of the huge construction programme involved by the chemical-fertilizer plant at Trail; the completion of important improvements and additions to existing zinc plants at the Trail smelter which bring its potential zinc capacity to 400 tons a day; the completion of a 300-ton concentrating plant at the *Monarch* mine near Field; continuation of important development-work at the *Reeves-McDonald* on the Pend d'Oreille river; equipping of the *Mammoth* mine near Silverton with a 100-ton mill and 16,000-foot aerial tramway; the operations of the Galena Farm Consolidated Mines, Limited, which include the recent completion of a 150-ton mill and the construction of an aerial tram; the resumption of work at the famous old *Blue Bell* property at Riondel, on Kootenay lake, to which considerable importance is attached.

GEOLOGICAL SURVEY WORK.

Information of considerable value to Eastern Mineral Survey District No. 5 is contained in the 1928 Summary Report of the Geological Survey of Canada, which includes the following reports:—

Geological Reconnaissance in Slocan and Upper Arrow Lakes, Kootenay District, B.C., by C. E. Cairnes.

Big Ledge (Consolidated) Property, Upper Arrow Lake, Kootenay District, B.C., by C. E. Cairnes and H. C. Gunning.

Kootenay Lake District, B.C., by J. F. Walker.

Geology and Mineral Deposits of Big Bend Map-area, B.C., by H. C. Gunning.

The geological work done in District No. 5 this season consisted of areal geology by J. F. Walker in the vicinity of Salmo and the Sheep Creek camp near Salmo.

At the recent meeting of the British Columbia Division of the Canadian Institute of Mining and Metallurgy in Vancouver an address was given by J. F. Walker describing the geology of the Selkirks. It is expected that this interesting correlation of the geology of the district will be made available by publication in the journal of the institute.

POWER SITUATION.

Owing to the dry fall and winter weather experienced up to the present time, small mining and milling operations dependent upon water-power are considerably handicapped and in at least two cases mills are being closed down due to shortage of water. The large power-developments of the West Kootenay Power and Light Company have not yet been affected to any serious extent.

GOLDEN MINING DIVISION.

Monarch.—The new concentrator of 300 tons initial capacity has been completed and is now being tuned up. Development of the ore-bodies of the *Monarch* and *Kicking Horse*, which constitute the property being operated by the Base Metals Mining Corporation, has already blocked out a substantial tonnage of ore of good milling grade, estimated by the management at about 320,000 tons when the mine was visited in October. The three known deposits occur in tabular form in limestone; the principal development has been done on the *West Monarch* ore-body, the dimensions of which were, when inspected in October, about 600 feet long by 140 feet in width and up to 30 feet in thickness. In vertical extent the limits of this shoot have not yet been reached and the ore is strong in the face. The *East Monarch* and *Kicking Horse* ore-bodies are also very promising. Development done, therefore, by the Base Metals Mining Corporation, Limited, under the direction of F. Eichelberger, since the properties were acquired from A. B. Trites, has been successful in proving extensions to the already substantial ore reserves developed by A. W. Davis. To open the *Monarch* for production an incline has been driven to connect the *East* and *West Monarch* ore-bodies with the upper terminal of the aerial tram on the precipitous face of Mount Stephen, about 1,000 feet almost vertically above the level of the mill adjoining the Canadian Pacific Railway tracks.

Giant.—Exploration of this property, situated near Spillimacheen south of Golden, is being financed by A. B. Trites. When the mine was visited in October the low-level crosscut tunnel had recently cut through the vein, which is here about 40 feet wide. Of this, about 26 feet consisted of very low-grade silver-lead mineralization, with which some bornite and chalcopryrite were associated in places. It is understood that drifting has since been done, together with further crosscutting of the wide vein, but the results are not known at the time of writing. Further references to the *Giant* are contained in the Annual Reports for 1927 and 1928.

Witwatersrand Syndicate, Ltd.—The property of this syndicate is located at the head of the North fork of McMurdo creek, 40 miles by trail from the Columbia river at Parson's. The season's work includes extensive repairs to the trail, which has been widened for use of caterpillar-tractor equipment. Work at the mine has recently been resumed and supplies taken in for the winter.

Ruth-Vermont.—This property, situated on Vermont creek, has not been visited during the present year. A small amount of development-work is reported to have been done under the direction of C. W. Riley for the Galena Syndicate. The property is somewhat handicapped by lack of good transportation facilities, but this condition will no doubt be remedied in proportion to the results of development of the showings, which are reported to be exceptionally interesting.

United Resources Development Co., Ltd.—Reports, allegedly written by Julius Rickert, self-styled mining engineer and geologist of Calgary, have recently been circulated in connection with "titanium and iron-ore deposits" at the head of Moose creek, in North-east Kootenay. A blue-print accompanying the typed report, allegedly signed by J. Rickert, includes an exaggerated

section through the mountain indicating vast bodies of titanium and magnetite. In the body of the report the following definite statements occur which substantiate the impression given by the section: "The whole mountain is mineral"; "immense iron and titanium deposits at the head of Moose creek"; "millions of tons of these minerals are awaiting extraction."

The explanation of all these superlatives can be found in the Summary Report of the Geological Survey for 1925 under "Knopite and Magnetite Occurrence, Moose Creek," by J. F. Walker; also in Geological Survey Memoir 55, "Geology of the Field Map-area," by J. A. Allen. J. Rickert's report evidently refers to the basic rocks of the area as described in these publications. These rocks contain titanite in most cases, but this is only of scientific interest and no great body of valuable "mineral" is known. The United Resources Development Company is not registered in British Columbia and has no company free miner's certificate.

WINDERMERE MINING DIVISION.

Paradise.—This property is situated on Spring creek, off Toby creek. When the property was visited in October four men were employed and drifting by hand was being done on *Shamrock* ground. No further news concerning the mill and aerial-tram construction programme is yet available.

Pretty Girl.—A small amount of development-work was done on this property, tributary to Boulder creek, by the North Kootenay Mines, Limited, which recently discontinued work.

Windermere Mining Co., Ltd.—Work has been recently resumed by this company at the *Mineral King*, on the north side of Toby creek just above Jumbo creek. A new crosscut tunnel is being driven to test the deposits at further depth.

Kootenay Metals Corporation, Ltd.—No further activity is reported in connection with the *Outcrop and Outlet* property on Delphine creek, on which a small amount of work has been done at intervals.

Lead Queen.—At this property, on Frances creek near Brisco, operations have been suspended pending the consideration of further plans for developing the property. The results of the season's work are reported to be encouraging.

FORT STEELE MINING DIVISION.

Sullivan.—At Kimberley the immense operations at the *Sullivan* dominate all other operations in District No. 5. At the present time about 5,200 tons a day are being put through the concentrator and this will be increased to 6,000 tons within the next few months. Although the ore reserves developed above the main haulage-level are known to be sufficient for many years' continuous operation, a sinking programme is already under consideration to block out the ore reserves explored by diamond-drilling at deeper horizons. From a cursory inspection of the vast ore-bodies already developed, which are up to 260 feet in width, it would seem that the scale of production from the *Sullivan* is only limited by existing treatment facilities at the Trail smelter, which facilities are being continually expanded in proportion to the increase in power-development by the West Kootenay Power and Light Company, whose great plants are being added to as rapidly as possible. It is interesting to note that the difficult problem of ultimately withdrawing huge pillars of ore in the *Sullivan* is already being studied, and it is believed that a way will be found to turn to account vast quantities of ore tied up in these pillars.

Kootenay King.—On Wildhorse creek diamond-drilling exploration is being continued by the Britannia Mining and Smelting Company. Drilling from underground points has been proceeding. According to recent press dispatches, C. P. Browning, manager of the company, announces that development-work has been disappointing and the company will probably drop its option.

Small development operations have been carried on by the Kootenay Selkirks Mining Company, Limited; the St. Eugene Extension Mines, Limited; at the *Boy Scout* group; and on the *Estella*. Diamond-drilling was continued at the last-mentioned property by the Consolidated Mining and Smelting Company. In regard to the *St. Eugene Extension* property, it is understood that larger plans of development are being formulated, involving a new base of operations from the old *St. Eugene* across the lake. Other minor activities which have been reported are on the *Homestake* on Perry creek, where a small amount of work has been done under the direction of J. F. Hutchcroft, and on the *Lead* group, which is being developed in a small way by the Blake Bros. A small amount of work has been done on the property of the Moyie River

Mining and Development Company, situated on Moyie River, 12 miles above Lumberton. P. V. Parkes is reported to be opening up the *Empire and Strathcona* property near Jaffray.

PHOSPHATE.

Two phosphate-deposits are being developed by the Consolidated Mining and Smelting Company on Lizard creek near Fernie, and near Crowsnest. These developments are in connection with the great chemical-fertilizer plant being erected on Warfield flats near Trail. The phosphate-deposits were found after intensive systematic exploration under the direction of the company's geologists and constitute a very intelligent piece of scientific prospecting.

GYPSUM.

Gypsum is mined at Mayook Siding east of Cranbrook, the output being shipped to the cement-works at Exshaw, in Alberta.

SLOCAN MINING DIVISION.*

Mining conditions in the Slocan Division are only fair. There are several bright spots, but it is also true that some things are not as bright as promised to a speculatively minded public by many overoptimistic brokers and a few engineers. However, there are many improvements in general mining conditions in the district that are worthy of note and approval.

During the past year the Consolidated Mining and Smelting Company of Canada reduced the penalty on the zinc content in lead ores, as well as reducing milling-charges at the Tadanac mill for such milling-ores as are sent them. This is a direct gain to the mine-owner and indicates improved metallurgical work at Trail.

General development in the Division is more active than for many years, and in most cases the work is being done under capable technical direction and good value obtained for the money so spent. During the year several very beneficial changes in technical direction of properties were effected, some unprofitable milling operations were temporarily closed, and the general tone of mining in the Slocan improved by the introduction of businesslike and scientific engineering policies. At several properties in the district accurate surveys, maps, and geological sections have been made, and the introduction of this basic type of engineering-work so necessary for the understanding of mining problems is to be highly commended. It is to be hoped that some of the smaller properties will benefit in a realization that, in order to properly and economically understand underground mining problems, accurate maps are absolutely necessary.

During the early part of the year some milling operations were seriously handicapped for lack of water, and due to the past dry season and lack of snowfall, to date, it is to be expected that several operations depending on this source of power will be forced to somewhat curtail operations early in the coming year.

It is gratifying to note that improvements in metallurgy throughout the district have permitted milling operations to continue, even in spite of the present low prices returned to the mine-owners for their silver, lead, and zinc. In this connection it is well to realize that the mine-owner receives a settlement for his lead and zinc based on the London price of these two metals, in pounds sterling per long ton (2,240 lb.). The average price returned to owners for lead and zinc varies according to the grade of zinc or lead concentrates; penalties and bonuses for sulphur, lime, etc.; deduction for refining treatment, freight, etc.; and is about 1.5 to 3 cents per pound of metal, depending on the market.

As noted before, development is extremely active, a very healthy sign; some new developments of promise have occurred during the year and, fundamentally, it is quite evident that general mining conditions and developments have improved somewhat during the past year.

ZINCTON.

*Lucky Jim.**—This mine is situated at Zincton, on the Kaslo-Nakusp Railway. Milling operations were suspended on February 1st, 1929, and will not be started again until such time as metal prices, especially zinc prices, improve to a point where it is possible to operate the mine and mill economically and profitably. A systematic development plan under the direction of H. H. Yuill has been carried out by P. Price and assistants. Results of this exploration-work have been very good to date and have disclosed a body of zinc ore between the No. 5 and No. 6 levels, the grade of which should average about 15 per cent. zinc, with small amounts of lead and

silver. Conservative estimates of tonnage by the management would indicate about 100,000 to 150,000 tons of the above grade material. This ore-body has been opened up by drifts and crosscuts on the 500-foot, 675-foot, 650-foot, 610-foot, and the 600-foot levels over a vertical distance of 400 feet. The ore occurs as a replacement of sphalerite in limestone.

SANDON CAMP.

*Ruth-Hope.**—This mine, situated at Sandon, adjoins the *Silversmith* and is operated by the Ruth-Hope Mining Company. During the first few months of the year milling operations were discontinued, due to water-shortage and freeze-up. The mill has been operated steadily throughout the summer and fall months and is still operating as this is written (December 5th). A very good grade of silver-lead-zinc mill-feed has been obtained from mining operations. The grade of the ore to the mill-bins runs about 14 to 17 oz. silver, 6 to 8 per cent. lead, and 7 to 9 per cent. zinc. An average of 50 to 55 tons a day is treated.

Mining has been confined to the area adjacent to the *Silversmith* ground and several interesting discoveries of good milling-ore made during the year. The property has not been visited since July of this year, when conditions were briefly summarized in Bulletin No. 1, 1929. A recent discovery reported was a good width of milling-ore in a raise being driven from No. 6 level to No. 5 level.

*Noble Five.**—This mine, situated at Cody, is owned and operated by the Noble Five Mines, Limited. The mill has been operated steadily throughout the greater part of the year and the present tonnage of mill-feed from the mine is in the neighbourhood of 95 tons a day. A very fair grade of mill-feed averaging between 12 to 16 oz. silver, 6 to 8 per cent. lead, and 6 to 8 per cent. zinc has been obtained from stoping operations in the *Deadman* ore-shoot and from stopes on the 800-foot level in what is called the *Noble Five* vein. Several very interesting pieces of development-work are in progress at the present time, and the objectives, according to plans of the management, should be reached early in the coming year. A crew of eighty men is employed for mining and milling operations. A more detailed description of the mine is contained in the Annual Report for 1928 and in Bulletin No. 1, 1929.

*Silversmith.**—Operations at this property, situated at Sandon, have been confined to exploratory work on the downward continuation of the *Slocan Star* ore-shoot. A crew of seven or eight men has been employed on this work. The winze from the 1,000-foot level has been deepened to the 1,400-foot level and some lateral development-work completed. Announcements were made through the press early in the year that milling operations would be resumed in June of this year, but, according to the management, the drop in lead and zinc prices has prevented this plan being carried out. More detailed information on this property is contained in the Annual Reports for 1928 and 1927.

*Leadsmith.**—A small crew of men was employed at this property, situated 2 miles above Cody, on Cody creek. During the summer a Radiore survey was made of the property and several conductors located. It is intended to further explore the surface by trenching at the points indicated by the Radiore work in an endeavour to find ore of sufficient quantity and grade for commercial production.

*Slocan King.**—Development-work on this property has been confined to the extension of the No. 10 level of the *Silversmith* to get under ore showing in the bottom of No. 8 level of the *Slocan King*. At the time of visiting the property in November there still remained several hundred feet of drifting to be done to reach the desired objective.

*Canadian Brandon.**—This property, owned by J. Brandon, of New Denver, is located on the ridge back of Sandon, between Carpenter and Silverton creeks. During the summer a limited amount of prospecting and development was done by the owner. Three or four men were also leasing in the No. 1 level of the mine and had opened up a very good-looking but narrow (9- to 12-inch) lens of galena of shipping grade in a winze, down 30 feet when the property was visited. A small wire tramway was built during the fall for transportation of ore from the No. 1 level down to the trail at the *Ivanhoe* camp and several tons of sorted ore shipped.

*Colonial Slocan Mines, Ltd.**—This company is developing the *Colonial* and *Freddy Lee* properties, situated near Cody. A crew of twelve to fifteen men under L. McPhee has built substantial winter quarters and during the fall made a shipment of high-grade sorted ore from the property. The intention is to carry on exploratory work throughout the winter months.

Carnation.*—The Carnation Silver Lead Mines, Limited, under the direction of R. H. Stewart, resumed work at this property early in the summer. The property is located on the ridge forming the divide between Carpenter creek and Silverton creek (4-Mile creek). A 3-drill air-compressor and a 90-horse-power Diesel engine were installed and a crew of twelve to fifteen men employed in surface work, stripping, and in the continuation of the No. 3 tunnel from the Sandon slope. A Radiore survey was also made of the property. The results of tunnelling to date have been somewhat disappointing, and efforts are now being made to pick up the ore by crosscutting to the west in the belief that the No. 3 tunnel is too far to the east of the ore in the foot-wall.

Mercury.*—A small amount of development-work was done on this property, situated near the old *Payne*, by George Clark and associates. A total of 262 feet of drifting, 10 feet of cross-cutting, and 14 feet of sinking was done by the crew employed.

Majestic.*—A crew of three men, under the technical direction of H. A. Turner, has been steadily engaged throughout most of the summer in driving No. 4 tunnel ahead to get under showings in the bottom of the No. 3 tunnel, some 100 feet above. The tunnel, when visited, had approximately 180 feet still to be driven. This property is situated on the east side of Carpenter creek, about 2 miles below Sandon.

Wonderful.*—This property, situated westerly from Sandon, has been taken under lease and bond by the Standard Silver Lead Mining Company, which is doing development-work.

Black Colt.*—During November, Paulsen, Pfeffer & Porter, Inc., Spokane brokers, optioned the Queen Bess Consolidated Company's properties, including the *Queen Bess*, *Idaho*, *Alamo*, *Silver Ridge*, *Black Colt*, and *Palmita* properties, as well as the Cunningham mill at Alamo. Winter operations of the new company are to be confined to the *Black Colt* side of the ridge, and it is planned this winter to ship sorted ore by tractor to the *Wonderful* tram and to tram from this point to the railway-bins. Interesting developments have been reported from both the *Palmita* and *Black Colt* claims during the summer and very encouraging results obtained. W. L. Bell, of Vancouver, is in charge of a crew of twenty men employed at the property.

Monitor.*—Leasing operations by George Gormley, of Three Forks, have been carried out during the year at this old property, situated just south and west of Three Forks.

Victor.*—George Petty is the owner of this very nice, small property and during the summer has employed three to four men in mining and sorting for shipment high-grade silver-lead ore. This property is situated between the *Monitor* and *Black Colt* and has shipped some rich carloads of silver-lead ore.

Blue Bird.*—This property, being operated by the Bluebird Mines, Limited, is situated on the ridge between Carpenter creek and Jackson basin and is best reached by road and trail from Retallack, a station on the Kaslo-Nakusp Railway. Underground development-work is being continued with a crew of about twelve men on the Jackson Basin side of the ridge. Exploration-work to date in the low-level tunnels has not disclosed any appreciable tonnage of commercial-grade ore. During the summer a Radiore survey of the property was made.

Rambler-Cariboo.*—This property, operated by the Slocan Rambler Mining Company, Limited, is situated south-easterly from Rambler Siding on the Kaslo-Nakusp Railway. The present crew of eight to twelve men is engaged in drifting on the twelfth level of the mine, where it is reported there are interesting possibilities for ore discoveries. The ore developed on the fourteenth level when visited had a length of approximately 200 feet and a width of approximately 3 feet. Assay values are not known and the commercial importance of the development can only be determined after systematic sampling and valuations made on the basis of present metal prices.

Atmoona Mines, Ltd.*—This property, situated 1½ miles north-west of Sandon, on the Sandon-Three Forks road, was the subject of a detailed examination and report given in Bulletin No. 1, 1929. The promoters of the company, Baldwin-Zachman & Kirschner, of Seattle, issued sales literature containing grave misstatements of fact. Among other exaggerations and misstatements, the claim was made to 100,000 tons of indicated ore having a gross value of \$3,000,000. The truth of the matter is that at the present time it is not possible to estimate other than a very small tonnage of very low-grade milling material. During the early months of the summer a bunk-house and office building was erected to house twenty men, but since unfavourable attention was drawn to this company promotion, development has been very limited.

*Mary Ryan Mines, Ltd.**—This property, situated at 6,000 to 7,000 feet elevation, on the ridge separating McGuigan and Washington basins, was the subject of a detailed examination during the summer to check up on the amazing statements of the promoters, Baldwin-Zachman & Kirschner, of Seattle. Statements were made in the promotional literature of the company that 120,000 tons of known and probable ore, of a gross value of \$3,600,000, had been developed at the property. The truth is that when the property was visited in July no appreciable tonnage of ore had been developed that could be profitably mined and treated. Since July a crew of men has been engaged in development drifting in the mine. New equipment consists of a Gardner-Denver compressor and a Petter oil-engine and several improvements and additions were made to the camp buildings. It is intended to carry on development-work through the winter months.

*Helenita Mines, Ltd.**—When visited in July of this year this property, situated in McGuigan basin, was idle, and since that time no activity at the property, formerly called the *Rio*, has been reported.

*Silver Bell.**—This property is located in McGuigan basin, above the old *Rambler-Cariboo* mill buildings, and lies between the *Mary Ryan* and *Rio* properties. The late W. E. Zwicky, of Kaslo, had a crew of four men contract crosscutting during the summer to pick up the *Silver Bell* vein. Results of this development-work are not known at this time.

*Payne Mines, Ltd.**—No activity has materialized to date in connection with the *Payne*, situated north-west of Sandon. It is understood that negotiations are proceeding whereby this once famous property will be reopened and reinvestigated by the *Payne Mines, Limited*, of Vancouver.

Other activities in this section include a small amount of contract drifting at the *Victoria*, owned by Sandon Silver-Lead Company, Limited, at Sandon. Further development-work was done at the *Snowstorm* and *Good Day* in McGuigan basin by Jack Wilson and partner.

THREE FORKS.

*McAlister.**—This property, situated 4 miles north-east of Three Forks, is owned by the Slocan Silver Mines, Limited, a subsidiary company of the Standard Silver-Lead Company, Limited. During 1929 shipments were made to Trail, where a very favourable direct smelting rate obtains for ore of this dry type, consisting of silver values in a quartz gangue. It is understood that mining operations have recently been curtailed due to the low price of silver.

SILVERTON.

*Galena Farm Consolidated Mines, Ltd.**—In the spring of this year the *Galena Farm* and *Hewitt* properties were amalgamated to form the above company. With the above properties are also included the *Hazard*, *Noonday*, *Metallic*, and *Lake Shore* groups of claims, comprising in all about thirty claims along the *Hewitt* shear-zone. The *Galena Farm* and *Hewitt* properties had been equipped with 50-ton flotation-mills by the former owners and these were closed down during the month of April. The *Galena Farm* mill has since been redesigned and revamped so as to have a daily capacity of from 100 to 150 tons of ore a day. This mill has been operating for the past two months on tailings from the old *Galena Farm* jig and table mill, producing a bulk silver-lead-zinc concentrate which is shipped to Trail for further treatment and refining. Production has been at the rate of 100 tons of tailings a day, or 10 to 12 tons of bulk concentrate a day, averaging about 20 to 30 oz. silver, 20 to 25 per cent. lead, and 40 to 45 per cent. zinc content. When the property was visited in November there remained about 3,000 to 4,000 tons of tailings for mill-feed.

Underground work at the *Galena Farm* mine has extended the *Noonday* drift under the vein on the 100-foot level and a raise from this 150-foot level to the 100-foot level shows in the upper end some 35 feet of excellent mill-feed, averaging about 4 feet in width. A crosscut off the *Noonday* drift to the north-east failed to pick up ore of commercial grade. Recent development-work in a winze from the *Noonday* has disclosed some fair milling-ore down to 50 feet below the 150-foot level. The drifts on the vein at the bottom of the winze down 75 feet have not disclosed ore of commercial grade.

At the *Hewitt* property development-work is confined to the driving of the No. 10 level east and No. 10 level west drifts through the mountain. When completed this tunnel will have a total length of over 6,000 feet and will join the eastern terminal of the new 8,800-foot aerial tramway, built this summer to the *Hewitt* mine proper. There still remains some 1,900 feet of

drifting to be done before a connection is made. Progress is at the rate of 400 to 500 feet a month. Recently the eastern level, called No. 10 level east, encountered the hanging-wall of ore believed to be the downward continuation of the Cunningham stope. When visited the drift had extended some 200 feet along this hanging-wall, but no crosscuts had been put into the ore-body to test the values obtainable, although the results of test drill-holes put into the ore-body are said by the management to be very satisfactory.

*Van Roi.**—At this property, which adjoins the *Hewitt* to the east, a crew of twenty-five men is employed by the Van Roi Mines, Limited, doing development-work. Results of this work have not been made known to date and the property still has to be visited before the annual report is written.

*Mammoth.**—The *Mammoth*, situated on Silverton creek, is being equipped for production by the Western Exploration Company, with R. A. Grimes in charge. A 100-ton flotation plant is being built at the shore of Slocan lake on the site formerly occupied by the *Standard* mill, which was burned down a few years ago. A 16,000-foot high-speed aerial tramway is almost complete from the No. 7 level of the *Mammoth* to the crushing-bins at the beach. Much underground work has been done during the year on the *Mammoth* proper, and ore has been opened up on several levels. When visited in the summer wide faces of milling-ore, and impressive showings of clean galena in places, indicated tonnages which have apparently warranted the construction programme undertaken. The mill will be ready to operate in January of the coming year, when all machinery now on order will have been delivered and installed. In addition to reserves at the *Mammoth*, recent leasing operations at the *Standard* have indicated worth-while possibilities. An appreciable tonnage of jig and table tailings discarded by the old *Standard* mill and allowed to run into Slocan lake are to be re-treated in the new flotation plant.

*Wakefield.**—Several tons of sorted ore were shipped during the year from the *Wakefield* property by A. Jarvis, who has the property under lease.

NEW DENVER.

*Bosun.**—During the early part of the year this mine, situated on Slocan lake near New Denver, was operated by the owner, Colin Campbell, of New Denver. Operations were suspended in July and several leasing operations started in the upper workings and on the dumps. Development-work by the Campbell interests consisted of 200 feet of drifting on No. 7 level east. Above this a stope averaging 60 oz. silver, 20 per cent. lead, and 25 per cent. zinc was mined and between 600 and 700 tons shipped to the Trail smelter.

*Molly Hughes.**—This property, situated north of New Denver, has been idle most of the year. It is owned by the Pinto Mines, Limited.

*Mountain Chief.**—This property, together with the *Apex* and *Mammoth*, has been operated by leasers under J. Chalcallers, of New Denver. Several shipments to the Trail smelter were made during the past year. The property is located 2 miles east of New Denver on the New Denver-Sandon road.

SLOCAN CITY MINING DIVISION.

*Enterprise.**—The *Enterprise* property, situated some 6 miles from Slocan lake on Enterprise creek (locally called 10-Mile creek), is reached by a fair branch road from the main Slocan City-Silverton highway. This property, controlled by the Yankee Girl Consolidated Mines, Limited, was actively developed by a crew of ten to twelve men during the early part of the year. Approximately 600 feet of drifting, crosscutting, and raising was done on the No. 7 level of the mine, and 300 feet of drifting on the 4,687-foot level of the No. 2 vein, with another 140 feet of drifting on the No. 3 vein. The jig and table concentrator of the company was destroyed by fire on July 8th and the compressor, supplying air for development mining, badly damaged. When visited in October of this year but two men were employed at the property. Future plans of the company are not known at this time.

*Piedmont.**—The *Hope No. 2* property, situated on Lemon creek and controlled by the Piedmont Mines, Limited, has been shut down during the year and future plans have not been made known.

*White Hope.**—The development-work at the *White Hope* property, situated on the Slocan-Silverton road about 5 miles from Slocan, has been discontinued.

*Arlington.**—The Bayview Mining Company, of Vancouver, has stopped exploration-work at the *Arlington* property on Springer creek, and it is understood that the option on the property has been dropped.

AINSWORTH MINING DIVISION.

AINSWORTH AND KOOTENAY LAKE SECTIONS.

Kootenay-Florence.—At this property the scope of operations has been somewhat reduced latterly, about ten men being employed. Exploration in the deep workings now aggregates about 9,500 feet of development-work. Recently a new small body of ore was struck in the south end of the workings and towards the *Lakeshore* ground. This ore-body is T-shaped, with dimensions of about 45 to 47 feet, being in part ore along a fissure and partly replacement ore in the limestone cut by the fissure. The width of the ore, which consists of a mixture of iron, lead, and zinc sulphides, will average around 4 feet. No further work has been done on the fissure ore-body described in Bulletin No. 1, 1929.

Princess Creek Mining Co., Ltd.—No activity has yet materialized in connection with this recently organized company, the property of which adjoins the *Kootenay-Florence* holdings to the north.

Krao.—Situated south-west of Ainsworth, this mine is being developed by the Krao Mines, Limited, a company sponsored by the late W. E. Zwicky. When the property was visited in the fall the long tunnel was being continued to prove additional depth on ore developed in the old shaft-workings. Ten men were employed, a portable gas-driven compressor being in use.

Blue Bell.—Resumption of work at this famous old property, situated at Riondel, is of outstanding interest. The Blue Bell Mines, Limited, recently formed by S. S. Fowler and B. L. Eastman, is being financed by the Consolidated Mining and Smelting Company with a view to ultimate control if exploration is successful in proving large tonnage. An inclined shaft is being sunk on the *Comfort* claim, about 1,400 feet northerly from the extreme north limit of the old *Blue Bell* mine-workings. The shaft is sunk at an angle of 38° and on the foot-wall side of a strong surface showing previously opened up. The lower 75 feet of the shaft develops ore in which galena predominates. The intervening ground between this working and the *Blue Bell* mine is flat and contains no outcrops, but ore in the old mine was worked to the boundary-line of the *Blue Bell* property before the *Comfort* claim was acquired, and important lateral ore extensions are expected, while the possibilities at depth are by no means exhausted. Under the new conditions much is expected of the *Blue Bell* property, which is credited with a past production of about 500,000 tons.

Berengaria.—This property is situated at Deanshaven. A crosscut tunnel is being driven to explore for the source of the immense boulder of ore found by R. T. Deane. The work, according to report, is being financed on a 65-35 per cent. basis by the Goldfield Consolidated Mines Exploration Company of Nevada and the Mining Corporation of Canada.

Mineral Dyke.—An interesting discovery of platinum-bearing ore by C. Rossiter, of Kaslo, has just been reported. He recently staked four claims on the low divide separating Kootenay bay and Crawford bay. Specimens shown the writer consisted of oxidized decomposed material in which pyrite and chalcopyrite could be recognized. Assay certificates showing commercial values in platinum were obtained by the owner. Further information will be obtained as soon as possible.

White Eagle.—This group is situated at the head of Cascade creek, about 12 miles from the railway. Development-work has been continuously carried on with a small crew by J. Gallo on behalf of the Keene Mountain Gold and Silver Mines, Limited. The property is described in the Annual Report for 1928. Since then the principal ore-body has been further developed by a shaft; and a crosscut tunnel, gaining a vertical depth of about 124 feet on the upper workings, has been driven approximately 500 feet. As the vein was not encountered in this lower tunnel, an inclined raise was put up from near the face, which is reported to have cut the vein at about 80 feet up. Trail improvements have been made to facilitate work being continued during the winter months, when snowslides formerly interrupted communications.

KASLO.

Properties Tributary to Kaslo-Nakusp Railway.

*Whitewater.**—The *Whitewater*, situated at Retallack, on the Kaslo-Nakusp Railway, was operated steadily until the end of July, 1929. Results did not come up to expectations and milling operations were stopped. A crew of fourteen men under the technical direction of H. H. Yuill and P. Price has been actively engaged since that time, in accurately mapping and

surveying the underground workings, plotting and making geological sections, and prospecting by means of drifts and crosscuts for the extension downward and upwards of the lime-slate contact along which the ore forms in the limestone. Development crosscutting has been confined to the 1,472-foot level and the eleventh and twelfth levels. Recent results are not to hand and the property still has to be visited before the publication of the Annual Report of the Department of Mines. The resumption of milling operations will depend on the blocking-out of sufficient tonnage of ore of such grade as will permit of a profitable operation with present low prices of zinc and lead.

*Wellington.**—This property, owned by the Wellington Mines, Limited, adjoins the *Whitewater* to the west. The property has been actively developed throughout the past year. The *Hazel* crosscut tunnel face, in some 1,600 feet from the portal, and at approximately the same elevation as the No. 10 level of the *Whitewater*, failed to locate the *Whitewater* shear.

*Jackson.**—Development-work at this property, controlled by the Silver Basin Mines, Limited, and situated in Jackson basin to the south of Retallack, was discontinued early in the year.

*Utica.**—Development-work was resumed at the *Utica* mine by the Utica Mines, Limited, early in the summer. The No. 5 tunnel, in some 2,500 feet, has been lengthened about 200 feet, and it is estimated that 100 feet of tunnel remains to be driven before reaching the downward extension of the No. 4 level, east vein. Development-work has been handicapped throughout the summer by lack of water for running the compressor plant, and it has been possible to drill only on alternate days by storing sufficient run-off water for this source of power. Eight men are employed at the mine, which is located 6 miles up 12-Mile creek from the Kaslo-Nakusp Railway.

A considerable tonnage of mill tailings from the old *Whitewater* mill were reclaimed from Kaslo creek by the 100-ton flotation-mill of the Metals Recovery Company under the direction of M. S. Davys, of Kaslo. Milling operations have been carried on at intervals throughout the summer months.

KEEN CREEK AREA.

*Cork-Province.**—This property, controlled by the Cork-Province Mines, Limited, is situated on Keen creek, some 5 miles by road from Zwicky, a station on the Kaslo-Nakusp Railway. The property is equipped with a 150-ton mill and an automatic hydro-electric plant of 436 horse-power, said to have cost \$67,000. Milling operations were started in July of this year and stopped the last week of November, during which time approximately 7,900 tons of ore was milled. It is understood that the prevailing low metal prices and shortage of water and expensive and unsatisfactory mining conditions have prevented the mine working at a profit, and the shut-down was made until metal prices reach a point where the mill can be operated at a profit.

Underground exploration on No. 5 level west has disclosed an ore-body 7 feet wide by 75 feet long, averaging 2.4 oz. silver, 2.6 per cent. lead, and 4.6 per cent. zinc. Development-work on the No. 5 level east has shown an ore-body 5 feet wide by 115 feet long, averaging 5.4 oz. silver, 5.5 per cent. lead, and 4.9 per cent. zinc. The average back in each case still to be mined above No. 5 level is 80 feet. To what depth the ore extends is not known on account of lack of development-work below No. 5 level.

Some stoping was done in the foot-wall stope on No. 3 level, the main haulage-level of the mine, and some 225 feet above No. 5 level.

*Revenue.**—This property, situated on Sturgis creek, about 16 miles from Kaslo, is controlled by the Sturgis Creek Mines, Limited, under F. T. Harbour, president and manager. Development-work has been carried on throughout the summer with a crew of eight to ten men. Development-work early in the summer disclosed some lead-zinc mineralization in a granite shear-zone on the intermediate level. Work during the latter part of the year has been confined to the upper level, and from a small stope above this level 42 tons of sorted ore was shipped to Trail smelter.

*Silver Bear.**—F. Helme, with three or four men, is working this high-grade sorting lease, which is located some 15 miles from Kaslo on Keen creek. Several shipments were made during the summer.

*Flint.**—J. A. Carter is doing some development-work on the *Flint* group, situated on Dago creek, a tributary of Keen creek.

*Daybreak.**—The buildings at the lower terminal of the Daybreak Mining Company's tramway were destroyed during the summer by fire. There has been no mining activity during the year at this property, which is involved in litigation.

HOWSER LAKE AND DUNCAN RIVER.

Further extensions were made during the year to the Duncan River trunk trail, which, it is expected, will be completed during the coming year.

Riverside.—Work was recently suspended by the Omo Mines Corporation, of Spokane, on the *Riverside* property on the east side of the Duncan river. A small crew had previously been employed on superficial exploration of the quartz vein described in the Annual Report for 1927, and latterly a crosscut tunnel was being driven to test the vein at an estimated approximate depth of about 150 feet below the outcrop.

President.—This property has been worked with a small crew by R. S. Gallop, representing the President Mines, Limited, of Victoria. When the property was visited in the fall three men were employed drifting on a mineralized streak encountered in the lower crosscut tunnel, which had attained a length of between 800 and 900 feet.

Lardeau River Placers.—No activity has yet materialized in connection with this proposition, to which attention was directed in Bulletin No. 1, 1929.

REVELSTOKE MINING DIVISION.

Snowflake Mining Co.—The property of this company has not been visited since the description published in Bulletin No. 1, 1929, but a trip will be made shortly to report progress for the Annual Report for 1929. It is understood that exploration of the interesting silver-tin bearing vein has been carried on by drifting westerly from the lower crosscut tunnel and by continuation of the raise in the east drift.

Regal Silver Mines, Ltd.—Since Bulletin No. 1, 1929, was published the property of the Regal Silver Mines, Limited, has not been visited. It is understood that exploration has been considerably stimulated by the discovery of stannite on the adjoining *Snowflake* property and on Regal Silver ground. Additional compressor equipment has been installed and exploratory work is proceeding simultaneously at several points. The property will be visited shortly.

Woolsey Mines, Ltd.—The property of this company, which includes the *Donald* and *Round Hill* claims, is situated near Flat Creek Siding on the main line of the Canadian Pacific Railway. Exploratory work has been continued during the season, a small crew being employed. Some very promising showings have been opened up.

Wigwam.—This property is situated on Akolkolex creek (Isaac creek), about 6 miles from the Revelstoke-Arrowhead branch of the Canadian Pacific Railway. Exploratory work done by the Wigwam Mining Company during the last six years includes diamond-drilling, numerous trenches and open-cuts, together with several short crosscut tunnels distributed over a length of several thousand feet of outcrop. The mineralization exposed in these superficial workings consists chiefly of iron sulphides, with a considerable development of zinc-blende in places and occasional accompanying lead-sulphide mineralization. The deposits occur as replacements in limestone-bands.

BIG BEND.

The Big Bend district extends northerly from Revelstoke along the Columbia river to Canoe river. This area contains numerous old superficially explored properties and prospects which have, to a considerable degree, escaped attention owing to their remoteness from transportation. This district is considered to have mineral potentialities meriting investigation, and the proposed new highway around the Columbia river from Revelstoke to Beaver mouth is expected to stimulate activity in connection with the numerous long-dormant prospects, scattered along a mineral-belt extending from the main line of the Canadian Pacific Railway to Mica creek.

Interesting and valuable information is contained in "Geology and Mineral Deposits of the Big Bend Map-area," by H. C. Gunning, published in the Summary of the Geological Survey for 1928. The principal mining activity was at the placer property of the French Creek Development Company, where hydraulic operations have been carried on for the past two seasons. When the property was visited towards the end of September, one monitor was being operated. The

bench on which the workings are situated is covered with soil, boulders, and heavy timber. A large area of bed-rock had been uncovered, but no appreciable quantity of gold-bearing gravel had yet been located.

During the summer months minor activity also occurred in connection with four separate placer propositions on McCulloch and Camp creeks. In the winter months these placer-miners are chiefly engaged in trapping.

At the *A. and E.* group on Kelly creek a small amount of development-work was done by A. Kitson and the late E. McBean. The ore contains values in gold, silver, lead, and zinc.

TROUT LAKE MINING DIVISION.

Swede.—This group is situated on the southern side of Poplar creek. Some trenching was done by J. Gallo, who has the property under option, across a wide zone of rusty and partially decomposed schist containing stringers and masses of quartz in places. Native gold is occasionally seen in association with quartz, but more importance is attached to the possibility of the schist containing sufficient concentrations of auriferous pyrite in places to constitute a commercial deposit.

Spyglass.—A small amount of development-work has been done by the Spyglass-McLeod Mining Company on the *Spyglass* property on Poplar creek, about 13 or 14 miles from the railway. E. Foley Bennett, of Penticton, has taken over the management from R. G. McLeod. Recent work has been concentrated on exploration of wide showings near the creek.

Spyglass Extension.—Adjoining the *Spyglass* property to the east, some nineteen claims were staked on behalf of R. G. McLeod on September 28th of last year. On September 18th of the present year, or about ten days before the claims would run out, a crew of about seven men, including two packers, arrived at the property and work was started on the building of trails and cabins. Good progress was made in this work, in charge of W. J. Scorgie, and when the property was visited early in November preparations were being made to start underground work. Previous rock-work by McLeod had apparently been confined to one large open-cut and some light stripping. A sample in the open-cut across a width of 10 feet, where the strongest mineralization was seen, assayed: Gold, 0.01 oz. to the ton; silver, 1.6 oz. to the ton; lead, 0.61 per cent.; zinc, 0.46 per cent. Following alleged failure of McLeod to pay their wages, most of the men came out in November and are reported to be applying for a lien against the property. In connection with this proposition R. G. McLeod is endeavouring to promote the Spyglass Extension Mining Company.

Lucky Boy.—This property is situated on the western side of the valley at the northern end of Trout lake. George Yuill, the owner, had developed some very high-grade silver ore in a small vein.

True Fissure.—Situated above Ferguson, this property has for some years been the mainstay of the Ferguson camp as far as employment of men is concerned. During the year under review mining activities were suspended, but the new road has been completed by Dave Morgan, who reported that a small concentrator is to be erected near the mine.

LARDEAU MINING DIVISION.

In the Camborne mining area new activities have recently materialized which have put new life into the camp.

Multiplex.—This property has been taken under bond by R. J. Jowsey and associates, of Toronto, and fifteen men are now employed under the technical direction of A. Renick. Work is being concentrated on showings recently opened up, which will be explored at depth. Work is being done by hand, but it is intended to furnish compressor equipment, which will be installed next season, when the scope of operations will be increased.

Teddy Glacier.—At this property, situated at the head of the Middle fork of Sable creek, a small crew has until recently been engaged in underground development-work. Considerable improvements were also made to the trails leading to the property. G. Jorgensen was in charge for the Bush & McCulloch interests, some thirteen men being employed. Under present conditions the mine is handicapped for winter operation.

Lead Star.—Situated on the South fork of Sable creek, this property has been developed continuously on a small scale by D. McIntosh. According to reports just received, some exceptionally good ore has been opened up.

Oyster-Criterion.—At this property, near Camborne, a small crew was recently engaged in reconditioning the old aerial tram and in other works preparatory to resumption of operations. Arthur Cole was in charge for the Camborne Mines, Incorporated, of Seattle.

In addition to the above activities, the *Big Showing* and *Scout* groups have recently been taken under bond by R. J. Jowsey and associates, of Toronto. Active development-work at these two properties is to be started in the early part of 1930.

ARROW LAKE MINING DIVISION.*

The activity of the Consolidated Mining and Smelting Company at the *Hailstorm* property has increased interest in the Arrow Lake Mining Division around Burton, and several new properties have been staked and old ones re-examined during the past season.

Hailstorm.—This property is situated on the divide between the head of Canyon creek and Caribou creek, at an elevation from 6,000 to 7,300 feet above sea-level. It is reached by auto-road 10 miles from Burton and an 8-mile trail up Canyon creek. A crew of fifteen men has been employed throughout the summer, and to the end of November a total of 850 feet of underground drifting and crosscutting had been done. The crosscut tunnel, some 300 feet vertically below the outcrop, was driven in hopes of finding silver mineralization in a calcite gangue worthy of further development and commercial production. Very good silver values were obtained in the surface cuts and in a short crosscut at 7,300 feet elevation, where a width of 20 feet averaged about 20 oz. silver to the ton. At the present time some fourteen men are actively engaged on the development programme, which it is planned to continue until the property is definitely proved to be of value, or vice versa.

Meadow View.—This property, controlled by the Cotton Belt Mines, Limited, under the direction of B. F. Lundy, is situated some 30 miles from Edgewood on the Vernon-Edgewood road. At the time of the writer's visit in October a crew of ten men was engaged in hand-drifting on the lowest tunnel-level. It is understood development-work will be carried on throughout the winter. Recent work has disclosed the faulted portion of the vein as lying to the north and below the surface portion of the vein.

In the neighbourhood of Burton other activities include the staking of the *Poorman* group on Blue Grouse creek by F. Bradley. The *Chieftain* group on Caribou creek is being reopened. The Production Mining Company, of Vancouver, formed to operate the *Promestora* and adjoining five claims, has been inactive during the summer, due to failure of negotiations to secure the *Promestora*. J. C. Anderson is reported to have done some trenching and surface work on the *Ora Granda* Crown-granted claim adjoining the *Promestora*.

NELSON MINING DIVISION.

There has been activity this year at some twenty-seven mining properties in this Division. The leading development operations are those at the *Reeves-McDonald* and *Yankee Girl*.

NELSON SECTION.

Silver Reef.—Situated on Anderson creek, this property has been worked in a small way by the Silver Leaf Mines, Limited. Exploration has been disappointing and no appreciable tonnage of ore has yet been developed.

Granite-Poorman.—This property, situated west of Nelson, has not been visited since the publication of Bulletin No. 1, 1929. However, no work has been done in the low-level tunnel for the past two months.

Kootenay Premier Mines, Ltd.—The situation remains unchanged at this company's property, situated west of Nelson, no activity having occurred.

Forty-nine Creek Placers, Ltd.—Work has been discontinued at this company's placer leases on Forty-nine creek.

Golden Age.—This property is situated on the Great Northern Railway south of Nelson. At intervals a small amount of work has been done. The mine was recently being worked under lease by Carl Anderson, of Spokane, who, with one man, was driving on the "lead" in the lower tunnel.

Euphrates.—This property is situated on the opposite side of the Salmo River valley from the *Golden Age*. The new lower tunnel had been advanced to between 550 and 600 feet in from the portal when the mine was visited recently. In this working the vein is well defined, but

extremely narrow, being only a few inches wide throughout the greater length of the tunnel. The gold values are concentrated in streaks of oxidized material, and no body of ore was seen in this working which could be worked at a profit. This tunnel has some distance to go to get under the upper tunnel, in which some pockets of high-grade ore were developed. While there are on the property some other wider showings of ore, these have not yet been sufficiently developed to enable an opinion to be formed as to their continuity.

Attention is therefore directed to the exaggerated importance attached to this prospect in literature which has been circulated for promotional purposes. The present developed showings on the property in no way justify these exaggerated statements.

Perrier.—No further activity has materialized in connection with this little gold-mine, situated on the Great Northern Railway south of Nelson.

KOOTENAY LAKE.

Wisconsin.—This property, situated on Midge creek, about 14 miles from Kootenay lake, has been bonded to Eastern interests and a campaign of diamond-drilling and surface prospecting is planned for next year. The old superficial workings develop large widths of low-grade gold-silver ore in a very wide vein. The ore, consisting of large masses of oxidized material with some sulphides, also contains appreciable values in copper, lead, and zinc. Arsenical iron, in all stages of oxidation, is present in large quantities. The results of diamond-drilling will be awaited with considerable interest.

Sanca Mines, Ltd.—A small amount of development has been done on the property of this company, comprising numerous claims in the vicinity of Sanca creek and Ginol's Landing. Work was chiefly concentrated on the *Iolanthe* vein at the southern end of the company's property.

Iva Fern.—Development-work has been continuously carried on at this property, situated on Cultus creek, by the Consolidated Mining and Smelting Company.

Spokane.—This property, on Canyon creek, 18 miles from Kootenay lake, has been worked intermittently by the owners, the Laib Bros. Latterly their efforts have been concentrated on improving the upper part of the Cultus-Canyon Creek trunk trail.

Bayonne.—This property is situated at the head of Summit creek and was formerly reached by rough pack-trail crossing over the summits from the *Nugget-Motherlode* mill on Sheep creek. A natural outlet connecting with the Cultus-Canyon Creek trail has now been provided. Supplies have been taken in for continuous operation throughout the winter months.

North Wind.—This group, situated on Canyon creek, about 2 miles from the *Spokane* property, is being worked with a small crew by the St. Bernard Mines, Limited. Preliminary work includes trail and cabin construction.

YMIR SECTION.

Yankee Girl.—The big low-level tunnel on the Wildhorse Creek side had been advanced to about 2,800 feet in from the portal at the end of November. The rate of progress for some months has been reduced, one shift only having been employed.

Hunter V.—Operations at this mine, situated south-east of Ymir, have been discontinued by the Consolidated Mining and Smelting Company. The property had been worked in connection with the fluxing requirements of the Trail smelter.

Howard.—Operations at this mine, situated on the South fork of Porcupine creek, have been limited during the latter part of the year. A thorough study has been made by F. W. Holzheimer, mining engineer in charge, of the geology of the region and results indicate interesting possibilities along the whole trend of the granite-quartzite contact. In this connection it is interesting to note that there is an indefinite but noticeable mineralization wherever this contact is exposed in the workings. It is being considered that the *Peck* ore-body is a concentration of this general mineralization along the contact and plans are being formulated for more intensive exploration of the marginal contact-zone for other similar concentrations.

Big Horn.—On this old prospect, situated at the head of the South fork of Porcupine creek, some surface prospecting was done by J. W. Peck.

Consolidated-Alabama.—A small amount of preliminary work was done on these old claims near Ymir under the direction of A. R. MacDonald, representing Seattle interests.

ERIE CREEK (NORTH FORK OF SALMO RIVER) AND VICINITY.

Second Relief.—Situated on Erie creek, 13 miles from the railway, this property has been worked by the Relief Arlington Mines, Limited. The mill was recently closed down owing to shortage of water. Preparations are being made to ship crude ore, which, according to the management, will assay about \$55 in gold to the ton. Caterpillar equipment has been purchased and shipments will commence when the snowfall is sufficient to afford good hauling conditions. An Ingersoll-Rand gas-driven compressor has also been provided to temporarily replace the compressor driven by water-power. Investigation of the *Arlington* near Erie has been made by the same company with a view to resumption of activity.

Juno and Last Chance.—In the same vicinity a few men have been employed on development of this property, owned by Joe Bernard. The work is financed by Seattle interests.

SHEEP CREEK AND SOUTH OF SALMO.

Reno Gold Mines, Ltd.—At the property of this company, situated on Fawn creek, the small new cyanide-mill has been in operation since the middle of August. Up to November 15th about \$25,000 worth of gold bullion is reported to have been produced. According to the management, an average of about 32.7 tons a day was milled and the heads averaged a little more than \$20 to the ton. The output is obtained from shoots of high-grade ore above No. 3 level, but in mining the small vein considerable dilution occurs.

Salmo Consolidated Mines, Ltd.—No further activity has occurred at the property of this company, situated on Elk creek, since Bulletin No. 1, 1929, was issued.

Salmo-Malartic Mines, Ltd.—Since the last mention of this company's *Aspen* property on Deer creek some further development-work was done to check up the diamond-drilling done previously. No definite commercial mineralization was encountered and operations were suspended in November.

Queen.—W. A. Lavigne and associates, of Spokane, are reported to have completed the purchase of this well-known gold property on Sheep creek. Some more definite activity is now expected in connection with the *Queen*, which has only been intermittently worked in a small way during recent years.

Molly Molybdenite.—At this property, situated on Lost creek, some surface prospecting was done by the Consolidated Mining and Smelting Company.

Silver Dollar.—A small amount of work is reported to have been done by the owner, L. Clubine, who recently sponsored a company to develop the property. No appreciable activity has yet materialized in connection with the new venture.

Reeves-McDonald.—Good progress in driving the low-level (River) tunnel has continued to be made and the face had recently been advanced to about 3,050 feet from the portal. This tunnel is now closely approaching the *Reeves* ore-body at a horizon slightly lower than the mineralization proved by previous diamond-drilling. This tunnel is about 800 feet vertically below the *Reeves* tunnel, where the ore is crosscut at short intervals.

Briefly recapitulating the information which has appeared in past published reports, this ore-body in the *Reeves* tunnel has a length of 620 feet and an average width of 32 feet. The average values computed from several thousand samples is given as: Silver, 0.5 oz. to the ton; lead, 1.7 per cent.; zinc, 6.6 per cent. The River tunnel will be extended easterly beyond the *Reeves* ore-body to explore at depth successively the *B.L.*, *Norcross*, *O'Donnell*, and *Prospect* ore-zones. Of these the *B.L.* and the *O'Donnell* are apparently the most important. Both are located beyond the sharp fold or fault which displaces the ore-bearing limestone to the north; they have not been thoroughly prospected as yet, but present strong evidence for additional important tonnage.

The *B.L.* shoot is opened by surface-trenching, and three diamond-drill holes, 125 feet apart, have proved its continuity for a distance of at least 250 feet along the strike and 100 feet in depth. These drill-holes show an average width of 26 feet of ore, which averaged about 1.6 per cent. lead and 8.4 per cent. zinc, with the usual low silver content. The superficial exploration of the *O'Donnell* ore-zone shows 80 feet of mineralization averaging 6 per cent. combined metals, of which a 20-foot width averages about 8 per cent. combined metals. This shoot, however, is not yet developed sufficiently to give much information as to its dimensions or average grade.

The *Norcross* shoot has been opened by a surface trench and one shallow diamond-drill hole, both in a carbonate zone, indicating mineralization 30 feet wide. The *Prospect* shoot is a comparatively small showing containing more silver and lead, but not enough work has been done to determine its possible importance. The extension of the River tunnel easterly beyond the *Reeves* ore-body will therefore explore ground where superficial prospecting and some shallow diamond-drilling has exposed large widths of mineralization which give reasonable expectation of adding very substantially to the already large reserves of zinc-lead ore. Other ore-bodies which are possible factors in the ultimate development of the property are the sulphide zone, of undetermined extent, exposed along the edge of the Pend d'Oreille river and the *McDonald* carbonate zone opened by the *McDonald* tunnel and exposed for a length of several hundred feet in the River tunnel towards the portal.

Summarizing impressions in general, on the basis of present incomplete knowledge of the deposits, it would seem that the future of the property is largely dependent upon the market price of zinc. The very favourable physical conditions, together with the large widths of the ore-zones, should with other factors make for exceptionally cheap mining, while metallurgical tests indicate high recoveries at a low cost.

Red Bird.—On the opposite side of the Pend d'Oreille river and located along the extension of the *Reeves-McDonald* mineralized limestone zone, this property has been diamond-drilled by the Boundary Basin Mines, Limited. The ore, entirely oxidized in the mine-workings, carries good zinc values with some lead.

Shenango Canyon.—This property, owned by M. C. Monaghan and situated on the Salmo river north of the *Reeves-McDonald*, was recently being explored by the Consolidated Mining and Smelting Company. Diamond-drilling was done for a short period preceding the advent of cold weather.

TRAIL CREEK MINING DIVISION.

The year under review witnessed an important step in the expansion of the great metallurgical works at Trail and a new industry was born which promises to be of outstanding importance. This has reference to the projected great chemical-fertilizer plant, for which ground has been broken and a start made on preliminary construction. Considerable information has been published on this subject, but it is interesting to recall that this project involves an outlay of several million dollars in power-development and plant equipment. Important additions and improvements have been made to existing zinc plants which bring their potential output capacity to 400 tons of zinc a day. Progress at the Trail smelter will be dealt with more thoroughly in the coming Annual Report.

Mining activities in this Division were chiefly confined to the small *Norway* operation at Trail and intermittent work at some of the small high-grade gold properties near Rossland. In connection with these more information will be available for the Annual Report for 1929.

WESTERN MINERAL SURVEY DISTRICT (No. 6).

PRELIMINARY REPORT FOR THE YEAR 1929.

By GEO. A. CLOTHIER, RESIDENT MINING ENGINEER (HEADQUARTERS, VANCOUVER).

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. It therefore covers Vancouver island, the intervening islands, and that portion of the Mainland south of Seymour inlet and east to the summit of the Coast range. There are, therefore, two distinct geological conditions, the Vancouver series of the Vancouver Island range and the included belts in the Coast Range granodiorite.

Mining has been active throughout the district in 1929 in all its branches—prospecting, development, and production. In the latter class there is as yet only one shipping property of great importance, the Britannia Mining and Smelting Company, Limited. However, there are signs of others entering the producing stage; for instance, the Island Copper Company, Limited, on Alberni canal, shipped 225 tons of chalcopryrite ore during 1929 from surface workings.

Prospecting has been general over the district, but concentrated to a greater extent in the vicinity of Nimpkish lake because of the remarkable surface ore-exposures on the Kinman property.

Vancouver island is, however, receiving more prospecting attention, and the included belts in the western slope of the Coast range are being better understood and the possibilities of other *Britannias* more appreciated.

Development has had a noticeable impetus this year and the list of probable future producers is now fairly encouraging. The *Alpha-Beta*; the Island Copper Company, Limited; the Coast Copper Company, Limited; the *Jeune* group; the *Alice Lake* group; the Kinman property; the *Alexandria*; the old *Marble Bay*; Central Gold Copper Company, Limited; and the Pitt Mining Company, Limited, evidence the fact that development is beginning to give some promise.

Several trails have been undertaken during 1929 with the idea of making available new areas to the prospector. The trail from Cowichan lake through to Alberni canal has been partially reconditioned, the trail from Kennedy lake up Elk river to Sproat lake was built as far as the summit, and the Fire Mountain trail from the head of Harrison lake was made serviceable for 12 miles, as well as several others.

The Geological Survey of Canada had a party under H. C. Gunning in the northern portion of Vancouver island, of which little is definitely known geologically. The advantages of this survey are already apparent and it is particularly desirable that it be continued next year. Dr. Gunning is favourably impressed with the Nimpkish Lake section as a probable copper area. Trails will therefore be recommended to make the country from Nimpkish lake south to the Campbell lakes accessible for prospecting and development.

The Consolidated Mining and Smelting Company of Canada has acquired the Kinman property and has already started intensive exploratory work. It is therefore easy and reasonable to predict that, in the event of these copper-deposits going to depth, it will mean a large development in many ways for the northern part of Vancouver island in particular and the Coast in general.

The mining situation will be briefly reviewed under the headings of the Mining Divisions.

VICTORIA MINING DIVISION.

The Sunloch Mines, Limited, property, controlled by the Consolidated Mining and Smelting Company, was not under operation this year.

The *Gabbro* group, adjoining the *Sunloch*, was bonded in 1929 by the British Metals Corporation, of London, England. A Radiore survey was made of the property, and sufficiently encouraging results obtained to justify verification by diamond-drilling. This has been carried on all season, but with discouraging results. The ground is much fissured and broken by watercourses and consequently hard to drill, and the mineralization and values have not met expectations. I understand that operations have been temporarily suspended pending further arrangements with the owners.

Bauxite.—On Demaniel and Stony creeks at Sooke, about 26 miles from Victoria, is an extensive deposit of what might be called low-grade bauxite, as its alumina content is only about 28 per cent. and therefore unsuitable for the manufacture of aluminium. Because of the high percentage of iron oxides it may be termed an ochre.

Laboratory experiments show that aluminium salts such as alum can be made from it; and also, by grinding, it can be utilized for paint and stain pigments, the darker shades being made by calcining.

There is apparently a large supply of the material, as it is exposed to a depth of 50 feet along the bank of the creek and test-holes have proven it a further 15 to 20 feet. If a market can be obtained for the products from this material it might be developed into an important industry.

The Kootenay Central Mining and Development Company, Limited, has done some preliminary survey-work for water-power estimates on its placer-ground at the mouth of the Sombrio river, on the west coast of Vancouver island, about 8 miles below Port San Juan. Several examinations have been made of the property, and it seems to be the general opinion that the possibilities of making it a producer of placer gold are sufficiently encouraging to justify the installation of a preliminary small plant, with which sufficient ground can be sluiced and tested to demonstrate values and working conditions that might warrant a large plant.

The *Alpha-Beta* group, situated about 12 miles up Robertson creek, which empties into the south-east end of Cowichan lake, has had considerable work done on it this year by a Vancouver syndicate. The property is situated a short distance from the logging-road of the Victoria Lumber Company, thus ensuring transportation. This work, especially the surface stripping and trenching, is disclosing some very promising ore-bodies. The mineralization is of the contact-metamorphic type, containing much garnetite throughout, which is disseminated chalcopyrite, which occurs also in bunches and small veins.

A string of holes was shot out along the east bank of the river, disclosing 4 per cent. copper ore across about 40 feet. A short tunnel in on this also shows ore all the way. A crosscut tunnel, 300 or 400 feet up a small tributary creek, shows a mixture of formations and only a slight mineralization. I am informed that, however, about 200 feet up the hill and 400 feet farther south from the first ore-showing, another body has been stripped across, which is about 60 feet wide, and that 30 to 40 feet of this sampled 4.5 per cent. copper. It has not been proven yet whether the belt lies on the hill or strikes into it. At any rate, the showings are certainly very encouraging.

I understand that some work has been done on the *El Capitan* and *Silver Leaf* groups on the north side of Cowichan lake. They are promising small properties carrying good values in gold, silver, and copper. A small company is being organized to go ahead with the *El Capitan*.

The old trail from Cowichan lake through to Alberni canal has been repaired a part of the distance and recommendations will be made for further improvements next year, as this trail traverses a good copper-prospecting section. Several groups have been staked in there this season.

ALBERNI MINING DIVISION.

On Alberni canal and vicinity there has been considerable activity both in prospecting and development work.

The Island Copper Company, Limited, of Port Alberni, acquired the *Modoc* and *Kitchener* Crown-granted claims and seven adjoining claims, about 12 miles down the canal. The old camps on the beach were reconditioned, a road built to the mine-workings, only a few hundred feet back from tide-water, ore-bunkers constructed on the beach, and an appreciable amount of development-work done, resulting in the shipping of approximately 225 tons of copper ore.

I have not seen the property lately, but when examined a couple of months ago three or four very promising ore-bodies had been exposed on the surface. These ore-exposures appear to occur in sheared belts in the andesite volcanics, in a hornblende gangue, and are exposed by the erosion of the overlying belt of limestone. The granite-mass lies about 1,000 feet to the east.

Should these showings go to depth in the volcanics, this property stands a good chance of making an important producer. The chalcopyrite carries up to \$10 to the ton in gold values, which is rather unusual for copper ores on Vancouver island.

At Sechart, in Barkley sound, the Canadian Quicksilver Company, Limited, reconditioned the old trail from the beach to the showings, put up a new camp, unwatered the shaft, and did some further open-cutting. Assays from the different ore-exposures show a mercury content of 6 to 12 lb. a ton, which, at the present price of \$1.50 a pound, makes a commercial ore. It is hoped that the company will be successful in financing this through to a definite conclusion.

Other properties have been bonded this year on Alberni canal and up to the west coast, but very little development has resulted.

The *Sunshine* near Kildonan, the *Snug Basin* properties, and two or three on Henderson lake are worth investigation.

CLAYOQUOT MINING DIVISION.

The *White* group, about 1½ miles up Tofino creek from the head of Tofino inlet, has just been bonded to Vancouver interests. Tons of fine chalcopyrite are found in a heavy rockslide apparently coming out of a canyon. Ore is showing in the face of the canyon and, judging from the amount of float, the possibilities are good for finding ore up the hill. The old road will be opened up and a compressor installed at once.

From Kennedy lake the Department of Mines in 1929 built a trail to the pass leading to the Taylor river and Sproat lake. This will open up a section for prospecting, showing promising gold-bearing quartz veins. The completion of this trail to the Taylor River trail

from Sproat lake will be recommended. It is very rightly hoped that in the near future this will be a main highway from Alberni through to Long beach on the west coast.

Several properties in this Division up the Coast were bonded, but apparently could not be adequately financed to go ahead with work.

QUATSINO MINING DIVISION.

On Kyuquot sound two large groups have been staked at the head of Kokshittle arm and companies organized to finance them. At the present stage they only represent ground in the vicinity of the Coast Copper Company, Limited, holdings over the range on Elk lake.

The Coast Copper Company, Limited, is proceeding with development-work along the same lines as in former years. Many improvements designed to give more economical development have been installed during 1929; additional power has been harnessed on Raging river which has permitted the installation of electric lighting throughout the mine, electric haulage on the eighth and tenth levels, electric hoists, pumps, etc. The main work underground has been the continuation of No. 10 level south, with satisfactory results so far as ore is concerned; and the sinking of the shaft an additional 200 feet. It is now down to the fourteenth level, 1,800 feet on the dip of the vein and 100 feet below sea-level. Drifting on the vein will be proceeded with from the fourteenth level and in the meantime the shaft will be sunk another 200 feet.

There is nothing spectacular about the Coast Copper Company's property either in values or quantity of ore, but just a steady increase in tonnage as development goes on and a noticeable increase in values at greater depth. The company can see the return of its investment with good interest when production is started.

This company has also taken on the old *Jeune* group, about a mile east of Alice lake. A considerable amount of work was done on this several years ago, including a tunnel over 400 feet long. Some diamond-drilling was done by the Coast Copper Company, which seems to have indicated a different strike and dip to the ore-body than supposed in the earlier work. A camp and compressor have been installed and a crew of fourteen men is proceeding with exploratory work, which may prove very interesting.

The *Alice Lake* group between Alice lake and Jeune Landing has had the tunnel extended to 55 feet by the owners, the last 40 feet showing a 2-foot vein of \$40 to \$50 lead-zinc ore in limestone.

The Quatsino Gold-Copper Mines, Limited, did some prospecting-work during the season and drove a 75-foot tunnel towards cutting a contact between limestone and volcanics, which shows some mineralization. I am informed that the company is making preparations for a diamond-drilling programme. This property adjoins the Coast Copper Company's mine on the south and apparently contains the continuation of the zone in which the ore occurs on that company's ground.

On the *Millington* group, at the head of the West arm of Quatsino sound, the owners have done some further work this year and have shown up some very nice bornite ore. This occurs disseminated and in bunches and small veinlets in a basaltic rock. The property had two diamond-drill holes put in in 1928, but in the light of further exploratory work it seems doubtful whether their negative results can be taken as conclusive as to the downward extension of the mineralization.

NANAIMO MINING DIVISION.

Caledonia Mines, Ltd.—This property, which is situated 5 miles north of the Port Hardy-Coal Harbour road, has been under development for three or four years and this year was bonded by the Consolidated Mining and Smelting Company. A considerable amount of work was done by this company during the comparatively short period of its option. Some 250 feet of underground work was done, and about twelve open-cuts put in, tracing a vein of magnetite on the brow of the hill, about 350 feet vertically higher than the old showings. The Caledonia Mines, Limited, had opened up some fair showings of copper-lead-zinc ore on the surface in the limestone in contact with granite.

It was naturally concluded that the ore would follow the contact to depth, and a compressor was installed and a crosscut tunnel started below in the granodiorite. This was driven to the contact, which here proved to be between the granodiorite and volcanics and contained little ore. A drift was then run from the crosscut to a point under the best surface showing and a

raise put up, which, however, did not enter the limestone until a few feet below the surface cut and ore-exposure.

It was at this stage that the Consolidated Company acquired the property. A drift 180 feet long was run east, or in the opposite direction to the company drift. This last work showed a mixture of formations of granite, volcanics, and limestone-belts with no ore of consequence. A small seam of ore was drifted on west in the granite for about 50 feet, but came to nothing. A shaft was sunk about 20 feet deep above the main surface showing in the limestone all the way. Altogether the work by the Consolidated gave no encouraging results and the option was dropped. The old company proposes going ahead in the spring and shipping the ore obtainable from the surface, which will not only be of financial benefit, but will enable them to follow the ore and obtain information as to its occurrence.

NIMPKISH LAKE SECTION.

On the east side of Vancouver island much interest has been taken in the Nimpkish Lake section on account of the remarkable surface copper-showing exposed on the Kinman property. A year ago this May E. L. Kinman went into that section on information of copper float having been found years ago. In the fall of 1928 he had staked five groups, put in a trail 4 miles up Lime creek from the head of the lake, built a camp, and had in winter's supplies before the snow came. He and two partners worked all winter stripping and trenching and were more than successful.

The ore occurs in limestone within a width, so far as known, of 300 to 400 feet along its contact with a granodiorite-mass. The limestone-bed covers the lower portion of the hill below the granodiorite, but erosion has probably thinned it near the granodiorite. That this limestone-bed is shallow, probably up to 500 to 600 feet, is evidenced by the fact that small creeks coming down the hill follow the volcanics under the limestone and appear on the surface farther down the hill. While some of the stripping and open-cutting shows masses of limestone and chalcopryite together, there are little or no evidences of contact metamorphism.

The north showing has been stripped across about 60 feet. The lower 15 feet of this will average 20 per cent. or more copper, the next 15 feet probably 10 per cent., and the remainder shows bunches of chalcopryite. This showing is probably over 200 feet east of the granodiorite, and I think further work will in all probability show mineralization to the granite-contact. Two other strippings south of this show masses of chalcopryite, and in one place, lower and as a replacement in the limestone, a mass of zinc-blende 12 to 20 feet wide has been exposed. Still south, and about 3,000 feet from the first-mentioned or south showing, an open-cut along the north side of a deep canyon shows a width of 25 feet of 20-per-cent. chalcopryite carrying about \$3.50 to the ton in gold values.

I think these are the best surface copper-showings I have seen, and there is no doubt that should these croppings continue at depth it will make an outstanding property. However, no structural information has been gained yet and underground exploration may put a different complexion on it.

The Consolidated Mining and Smelting Company has it under option and at present a crew of between sixty and seventy men is at work. A road has been built from the lake, power machinery and mining equipment taken in, and two diamond-drills started. Such intensive exploration will take a comparatively short time to demonstrate the worth of the property. I venture to predict that if it fulfils expectations it will be an important factor in the early construction of a smelter on the Coast, and in conjunction with the Coast Copper Company's property will lead to immense development in other ways of the north end of Vancouver island and the Coast in general.

A number of prospectors have been in the vicinity of Nimpkish lake this season, resulting in over 200 claims being staked. What little prospecting has been done on these recently staked claims has had very encouraging results and shows very favourable probabilities that showings rivalling the Kinman property will be exposed. Altogether the area has wonderful possibilities so far as surface ore-exposures are concerned, but deep exploration will of course demonstrate their real value.

Trails will be recommended to make other areas of this section available to the prospector and to assist the owners in development-work.

The Geological Survey of Canada has had a party under the supervision of H. C. Gunning in this field this season, covering the Nimpkish Lake and Quatsino Sound sections.

Buttle Lake.—Some further prospecting has been done in this area at the south end of the lake on Myra and Price creeks. Several groups have been held in here for a number of years, staked on a wide belt in which are shear-zones containing lenses of galena, zinc-blende, chalcopryite, and pyrite. There are some very promising ore-exposures in these zones, but the minerals are not concentrated into a high-grade ore, and therefore because of the remoteness of the section very little attention has been paid to it. It is, however, a good prospecting country, and with the probabilities of a logging-railway being built through to the north end of the lake within a year or two it is worth investigating by operators.

It was reported early in the season that platinum-bearing rock had been found near Mount Albert Edward, east of the southerly end of Buttle lake, but samples submitted by the owner failed to substantiate returns received from an assayer in Oregon.

Just back of Cumberland an interesting find of native copper in a basaltic flow was found this summer. Fine veinlets of copper can be seen in the creek-bed, but whether they are of sufficient frequency to constitute an ore remains to be seen. The occurrence warrants some exploratory work. In the same vicinity are shears containing chalcopryite, but no work of any kind has been done on them as yet.

This formation directly underlies the Cumberland coal formation, as there is a bed of sedimentaries carrying coal just above this, and the main coalfields are below it to the east. There is a similar occurrence to this on the north coast of Vancouver island in the vicinity of the Squash coal areas, except that the copper is disseminated as fine specks instead of sheets as at Cumberland.

The Cambria Copper Company, a Vancouver company, has been investigating some copper-showings on Knight inlet in one of the included belts of altered sedimentaries in the Coast Range granodiorite. The company has driven a tunnel 370 feet long in a belt of limestone. Small unimportant bunches of chalcopryite were encountered. A lower tunnel is now being driven, in which some chalcopryite is being found in a garnetite gangue. The work has been well carried out, but unfortunately has not proven as yet very productive of ore.

Farther south on Phillips arm the Alexandria Mining Company, Limited, has been working steadily on its property. The main working is a tunnel at tide-water about 500 feet in; of which some 300 feet shows a gold-bearing pyritized quartz vein averaging about \$8.20 to the ton in gold for an average width of 5 feet. Work above this tunnel shows the formation to be more or less broken up and the quartz and values very erratic. It was therefore decided to sink a shaft from the lower tunnel. This has been sunk to approximately 100 feet, showing, on my last visit to the property, the vein coming across one end of it. I am informed that this has been crosscut since, giving a width of 12 feet of \$10 ore. Drifts will be run on this level to demonstrate the extent of the ore-body. This certainly looks very promising and naturally increases the probability of the property developing into a profitable undertaking. The property is equipped with a small compressor plant, pump, etc., and is ideally located for cheap production and transportation. The ore will be very amenable to flotation concentration.

Some promising showings have been opened up on the *Enid* group, belonging to the Morton Woolsey Company, north of and adjoining the Alexandria Mining Company's property.

The old *Doratha Morton* will be put under development again at once. I am informed that supplies have been taken in and a contract let for a 200-foot tunnel.

On the property of the Thurlow Gold Mines, Limited, situated on the east end of Thurlow island and reached by Coast boat to Shoal Bay, some work was done earlier in the year. The showings extend from the beach for 1,500 feet to the main surface croppings and tunnel at about 300 feet elevation. The vein is gold-bearing pyritized quartz similar to the *Alexandria*, in a granite country-rock. The vein is up to 5 feet wide and will average about 2 to 2½ feet, carrying gold values, depending mainly on the pyrite content. This spring, camps were built, compressor and equipment installed, and the tunnel advanced to about 90 feet, where a cross-fault cut it off. Some work was done underground beyond the fault, as well as surface-trenching, in an endeavour to pick up the extension of the vein, but without success.

There is, as stated, 1,500 feet of the vein between the face of the tunnel and the beach which is worth developing at present, leaving the finding of the extension of the vein to the future. A shaft sunk some years ago on the vein about 300 feet below the face of the tunnel shows good ore and would indicate an ore-body from there to the face of the tunnel. This shaft could be deepened to 100 feet and the vein drifted at that depth to demonstrate whether the size and

values of the vein are commercial or not. From present work and indications it looks as if, with strict economy and efficient handling, it can be made a small profitable mine.

North-west of this and probably on the same vein the owners of the *White Pine* group are preparing for exploratory work.

Directly north of the Thurlow Gold Mines property and just up from Shoal bay the *Douglas Pine* group has been optioned by Vancouver interests. A trail has been built from the beach to the site of a crosscut tunnel which is proposed to cut a number of veins showing on the surface, from which good gold values in pyritized quartz have been obtained. The tunnel, which it is estimated will be 650 feet in length to cut the surface veins, has been driven 70 feet, cutting in that distance two blind veins—one, 29 inches, assaying \$8.60 in gold to the ton, and another, 21 inches, assaying \$6 in gold to the ton. Work has been suspended pending the instalment of a compressor plant.

The Nimrod Mining Company has only done some surface work this season in tracing the *Blue Bells* vein down the hill. The property is situated on the north side of the entrance to Frederick arm and adjoins the old *Blue Bells* on the south.

The Colossus Copper Company, Limited, was organized in May, 1929, at Vancouver and acquired the old *Colossus* group on Estero basin, which is entered at the head of Frederick arm. This property was first worked in 1899 and altogether had about 3,000 feet of underground work done on it, mainly in three tunnels. The two upper tunnels have opened up the ore-zone, but the lower tunnel did not encounter ore, due to a flat fault above it.

The ore, mainly chalcopyrite and pyrite, occurs in a broken-up belt of granodiorite and basic dykes, as impregnations of mineral and mineral-bearing quartz deposited along the irregular lines of weakness resulting from the shearing action; as well as some infiltration into the granite.

The work done shows the belt to vary in width up to 40 feet. In the upper tunnel drifts have been run east and west within the shear for a total of 100 feet. In No. 2 tunnel, 80 feet vertically below, 200 feet of drifting has been done on the ore-zone and an 80-foot shaft sunk to an intermediate level 70 feet above the lower level. All this work shows erratic mineralization, of which several samplings range from 1.5 to 3.5 per cent. copper, carrying negligible amounts of gold and silver. A depth of 340 feet has been obtained on the ore and a greatest length of 200 feet, which further drifting will no doubt extend. The nature of the ore-deposition is so irregular that it would require the extraction and treatment of a considerable tonnage from each level to arrive at a fair estimate of the values. I think the ore indications justify further exploration underground, assisted probably by diamond-drilling.

The *Santa Anna* group, about a mile north of Bold point on the east side of Quadra island, is an old property on which two tunnels, one about 100 feet long and another about 120 feet, were driven twenty years ago. An old ore-chute on the surface from the tunnel to a loading-bin below is evidence that ore was shipped or at least contemplated. The ore is pyrite and chalcopyrite occurring in a metamorphic rock along the contact of granite and limestone. No work has been done for a number of years, but I am informed that, after thorough examination, arrangements are under way to resume exploratory work, either underground or by diamond-drilling.

The *Inca* group on Hyacinthe bay, Quadra island, has had some work done on it by the owners, showing a quartz vein from 2 to 5 feet wide, mineralized with pyrite and chalcopyrite, carrying no gold values. The country-rock is andesite. On the surface the vein shows about a foot on one wall fairly well mineralized with chalcopyrite, while at the bottom of a 15-foot shaft the vein is about 5 feet wide, but very sparsely mineralized. The owners are driving a crosscut to the vein to enable them to do some further drifting on it.

The Malaspina Mines, Limited, property, situated near the beach about 12 miles north of Powell river, was not operated during 1929. The property has had a lot of work done on it for two or three years, exposing some lenses of good-grade copper-zinc ore in limestone, but apparently none that would furnish a tonnage of shipping-ore.

Farther south on Goat island in Powell lake the Romana Copper Mines, Limited, a Vancouver company, has been developing a property all season with a small crew.

The ore-deposits of chalcopyrite and pyrite are of the contact-metamorphic type, occurring in a belt a couple of hundred feet wide. Surface work disclosed several promising-looking

lenses of ore and a tunnel is being driven to see whether the surface exposures extend to any depth. The tunnel will give a depth of about 85 feet. It has now been driven about 135 feet and I am informed that the results have been satisfactory, in that ore has been encountered which is presumably the ore-shoot exposed in the big open-cut on the surface. At 90 feet in the tunnel a crosscut of 10 feet to the left shows some very good chalcopyrite ore which could be hand-sorted to a shipping grade. Another crosscut to the left at the face of the tunnel has been in milling-grade ore for the last 20 feet. I am informed by the management that the main tunnel is now being continued straight ahead and showing good ore.

The season's work has materially increased the possibilities of opening up commercial bodies of ore. The property is equipped with new camps, a tramway from the showings at about 1,000 feet elevation down to the lake, and a compressor at the mine. The company also has a boat on the lake.

TEXADA ISLAND.

On Texada island there has been a great deal of activity during 1929 and several properties are under development.

The Pacific Lime Company, operating lime-quarries and a sawmill at Blubber Bay, employs about 175 men. The kilns have a daily capacity of about 200 tons of limestone, producing between 900 and 1,000 barrels of lime. The undersize is shipped to Anyox for fluxing purposes. The sawmill produces lumber for the company's own barrel-making machine and the refuse is used in the lime-burning process. The company operates its own boat for shipment of its products to Coast markets, principally San Francisco.

I am informed that a Radiore survey of the *Nancy Bell* this summer indicates ore-bodies worth investigation.

On the west side of Texada island there are extensive showings of magnetite up to 60 feet in width, occurring in a contact-zone between granite and limestone. Several hundred feet of tunnels have been driven and extensive open-cutting and stripping has been done. The property is now being diamond-drilled, but I have no information as to the results of this work. The property has ideal shipping facilities for a large production of iron ore.

The Central Copper and Gold Company, Limited, has been steadily carrying on exploratory work on the old Van Anda Copper Company's properties—*Little Billie*, *Copper Queen*, and *Cornell*—on Texada island. A thorough Radiore survey was made of the ground and the indications tested by some twenty diamond-drill holes. The drilling not only verified the existence of important ore-bodies, but gave important information of structural conditions pertaining to the location of ore-bodies.

Deductions from the work resulted in a lot of surface-stripping being done along the different ore-zones, with satisfactory results. I am informed that further work will consist of underground exploration from some of the upper levels of the old workings. This has been one of the major exploration undertakings in the district for the past three years and there is every reason to believe that these properties will again be brought into production.

The old *Marble Bay* at Vananda on Texada island has been bonded and some surface work undertaken. It will be remembered that this property was mined to a depth of 1,600 feet years ago and over 300,000 tons of copper ore shipped, which carried also low values in gold and silver. The persistent exploration of the adjoining properties of the Central Copper and Gold Company has resulted in the resumption of prospecting on the *Marble Bay*. It is reported that surface finds on Lot 5 have been encouraging.

The *Stromberg* group was bonded by a Vancouver syndicate this summer and a programme of diamond-drilling outlined, but only one hole was drilled about 400 feet. I understand that the results of this hole were satisfactory, but financial conditions necessitated the suspension of further work for a time.

VANCOUVER MINING DIVISION.

Pacific Copper Co., Ltd.—The work by this company on its property up from the head of Salmon arm has not been very encouraging and has not borne out the rather glowing picture painted in the stock-selling campaign of last winter. The work in 1929 consisted of building a storehouse on the beach at the head of the arm, a 7-mile trail from there up to the camp, and a camp near the showings. A Radiore survey was made of the property, but on account of the

nature of the ore-bodies, scattered small bunches, gave little encouragement. It is the intention of the company to prospect the ground as thoroughly as possible next season before attempting any underground work. The finances of the company are sound and have been well administered by the present secretary, Mr. Brewis.

The Bowena Copper Company on Bowen island is an old property that has had a good many ups and downs. A lot of work has been done, showing in places good chalcopryrite ore, but never enough to make a mine. This year a Radiore survey was made of the ground and I am informed by the management that the indications of ore-bodies are sufficiently strong to justify further work.

The Britannia Mining and Smelting Company has had a very successful year, with production up to that of last year, approximately 41,000,000 lb. of copper. Additional improvements have been made to expedite ore-handling at the mine and better extraction in the mill, the precipitation plant capacity has been increased, and everything done by a sound organization to better efficiency. The engineering staff has been busy in the field and the company now has under development such properties as the *Toric*, *Dolly Varden*, and others at Alice arm.

The Radiant Copper Company, organized in December, 1928, had a Radiore survey made of its property on Rae creek, about 5 miles from Squamish. The results obtained indicated the presence of eight or nine mineralized zones, the radiore reactions showing that they are probably wide bodies of disseminated sulphides.

Later several open-cuts were put in across one of the indicated ore-bodies to ascertain just what sulphide content would give the readings obtained. This work showed a content of from 10 to 20 per cent., mainly pyrite with a small percentage of chalcopryrite. The question before the company is whether the showings justify diamond-drilling to prove whether the sulphides are copper or iron.

The *McVicar*, *Manson*, and *Tocher* groups on Goat creek, about 12 miles from Squamish, have had some further work done by the owners this year. In 1928 these groups were combined and bonded to the Britannia Company, which first did a lot of surface stripping and trenching with fairly encouraging results. An electrical survey was then made of them and the findings later tested by diamond-drilling. The results were not at all up to expectations and the company relinquished the bond. The work this year, consisting entirely of surface work, has exposed several copper-showings, which would, under ordinary conditions, be considered very promising. The veins are contained in a wide shear-zone in one of the included belts in the Coast Range granite, the ore occurring in lenses, apparently better where there has been some silicification. The minerals are mainly pyrite, chalcopryrite, galena, and zinc-blende. One showing in particular has been exposed by open-cuts showing the lense to be approximately 200 feet long, and one open-cut shows 12 feet in width of 6 per cent. copper ore. Yet two diamond-drill holes under it failed to locate anything like it. Several other promising copper-showings have been found, from which a fair tonnage of ore could be extracted on the surface.

NEW WESTMINSTER MINING DIVISION.

In the Pitt Lake section the Pitt Mining Company has carried on development all year and has installed an hydraulic power plant. Water was procured from lakes at an elevation of 1,500 feet above the main tunnel-level; 550 feet of flume was constructed and 1,500 feet of 14- to 12-inch extra heavy wood pipe laid, giving a head of over 600 feet for a 36-inch Pelton wheel directly connected to a generator which will develop about 300 horse-power; a 600-foot compressor has been installed at the mine and a full mine equipment provided.

The mine, which is an old property, has been opened up by a 550-foot tunnel, from which there is a raise 180 feet long through to the surface. Two short levels have been run from this raise, from which some ore has been extracted. The ore-shoot in the main tunnel is about 150 feet in length. There are very promising surface indications beyond the face of the tunnel. The main tunnel is now being extended while the concentrator machinery is being installed. The ore will average about 4 feet in width and assays \$1.20 gold to the ton, \$2.40 silver to the ton, and about 4 per cent. copper. It is ideally situated for transportation and I expect will make a profitable small property.

Farther up the lake at the mouth of Scott creek the *Katanga* group was staked in the summer of 1929. The showing consists of a mineralized light-grey dyke in the granodiorite.

An open-cut shows this to be 20 feet wide, of which there is 2 feet of fairly solid chalcopryite and the remainder fairly well mineralized with veinlets and bunches of pyrite and chalcopryite. It deserves some deeper development.

Several groups containing some 120 claims have been staked by Marcus Cox on Volcanic mountain at the head of Scott creek, which empties in near the head of Pitt lake.

Some clean chalcopryite ore has been brought in, but practically no development-work has been done on the claims. They are reached by going 7 miles up Pitt river from the head of the lake and swinging around the west slope of the mountain for another 8 miles.

I am informed that a highly capitalized company is in process of organization for the exploitation of this property. It would seem that an undeveloped prospect would be totally inadequate upon which to base such a high-powered organization.

Mining interest is being revived in the Agassiz and Harrison Lake sections. Some of the older properties are being investigated and some staking done. The old Fire Mountain trail, extending for 15 miles from the head of Harrison lake to Fire mountain, also known as Tipella, has been reconditioned this year by the Department of Mines and is now serviceable for pack-horses. Several years ago a great deal of interest was taken in, and some very substantial development-work done on, a number of groups on Fire mountain. My information is that the showings are free-milling gold-quartz veins. Prospectors are assured that this whole area is now very accessible.

The Sleese Creek Basin area is reached by motor 12 miles from Chilliwack up the Chilliwack river to the "Packers camp." From that point there is a pack-horse trail up the Chilliwack river, crossing to the south side about 2 miles up, through to Chilliwack lake.

Sleese creek, flowing in from the south, is 7 miles from the end of the road. The basin is then 8 miles up Sleese creek. The pack-trail up the creek has been kept in good repair, as it is utilized by the Boundary-Red Mountain Company in taking in supplies to its property and bringing out shipments of gold bullion. The mine is situated a short distance south of the International boundary. This property, I understand, is under lease to five men, who with an additional ten men are making good wages operating 15 stamps of the 40-stamp mill.

The predominating formation of the area is a stock of diorite in which gold-bearing quartz veins occur.

The Sleese Creek Mining and Development Company, Limited, organized in June, 1929, with holdings of thirteen mineral claims and fractions extending up Canyon creek, operated only a short time. A tunnel has been driven about 100 feet, from which it is proposed to crosscut to the west to cut a vein indicated in the bluffs above.

Surface ore-exposures are rather meagre not only on this property, but on the *Lentz* claims adjoining, but the basin probably deserves further surface prospecting.

COAL-MINING.

PRELIMINARY REPORT FOR THE YEAR 1929.

BY JAMES DICKSON, CHIEF INSPECTOR.

The production of coal during the year 1929 in British Columbia is estimated at 2,313,900 long tons. This is a decrease of 212,800 tons, or approximately 8.5 per cent., as compared with the year 1928, when the production was 2,526,702 long tons.

Vancouver Island mines, with an estimated output of 1,166,000 tons, show a decrease of 61,533 tons as compared with 1928, when the output was 1,227,533 tons.

Nicola-Princeton District, with an estimated production of 248,500 long tons, shows an increase of 2,513 tons as compared with 1928, when the gross output was 245,978 long tons.

Telkwa Colliery, in the Northern District, will probably have a total output of 1,400 tons, as compared with 1,668 tons in 1928.

In the East Kootenay District the estimated output will be 898,000 long tons, a decrease of 103,528 tons as compared with the year 1928, when the output was 1,001,523 long tons.

ESTIMATED COAL PRODUCTION FOR THE YEAR 1929.

VANCOUVER ISLAND DISTRICT.

	Tons.	Tons.
Canadian Collieries (D.), Ltd.—		
Comox Colliery	279,000	
Extension Colliery	105,000	
South Wellington, No. 5 mine	40,000	
Wellington-Extension, No. 9 mine	4,300	
Western Fuel Corporation, Ltd.—		428,300
No. 1 mine	326,000	
Reserve mine	158,000	
Wakesiah mine	64,000	
Other collieries—		548,000
Granby Consolidated M.S. & P. Co.	175,000	
Fiddick mine	3,000	
Little Ash mine	6,600	
Lantzville Colliery (Diamond Jubilee) ..	4,000	
Biggs' mine	400	
Richardson mine	700	
		189,700
Total for Vancouver Island District		1,166,000

NICOLA-PRINCETON DISTRICT.

Coalmont Collieries, Ltd.	160,000	
Middlesboro Collieries, Ltd.	43,500	
Tulameen Coal Mines, Ltd.	37,600	
Blue Flame Colliery (formerly Lynden) ..	4,500	
Normandale Colliery	170	
Pleasant Valley Coal Mining Co.	1,700	
Gem Domestic Coal Co.	450	
Black Coal Mine	580	
Total for Nicola-Princeton District		248,500

NORTHERN DISTRICT.

Telkwa Colliery	1,400
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EAST KOOTENAY DISTRICT.

Coal Creek Colliery	384,000	
Michel Colliery	346,500	
	730,500	
Corbin Coals, Ltd.	167,500	
Total for East Kootenay District		898,000
Total for Province		2,313,900

SUMMARY OF PRODUCTION, 1929.

Vancouver Island	1,166,000
Nicola-Princeton District	248,500
Northern District	1,400
East Kootenay District	898,000
Total for Province	2,313,900

On Vancouver island a number of coal-mines suspended operations for several months during the summer months, due to lack of market, and one mine has not yet resumed operation.

There is much activity in the Princeton area, where several coal-mines are in the process of development and expansion. It is expected that a large percentage of the output from this area will be sold in Washington.

The continued heavy importations of fuel-oil and the increase in the development and use of hydro-electric power are the main reasons for the difficult position in which the coal-mining industry has found itself for a considerable number of years.

The Department of Mines has carried on considerable investigation regarding the use of pulverized coal, with a view to increasing the demand for British Columbia coals.

Visits have been made during this year to pulverized-coal power plants in British Columbia and Alberta, also to similar plants at Seattle and Spokane, for the purpose of obtaining data regarding the value of this method of using coal.

With a view to thoroughly establishing the value of the different coals produced in British Columbia, the Minister of Mines arranged a meeting in Victoria during October of this year between representatives of the Dominion Department of Mines, representatives of all the important coal-producing companies of British Columbia, and officials of the Provincial Department of Mines.

It was arranged at this meeting that full use be made of the new fuel-testing station of the Dominion Government by forwarding full-size commercial samples for testing, under actual working conditions, in the new pulverized-coal installation at this station.

No time has been lost in taking advantage of the facilities of this new testing-station, as some car-loads of British Columbia coals have already arrived at the station for test purposes and the resulting data will be available at an early date.

The information gained by the Department so far has been of service, resulting in a pulverized-coal unit being incorporated in the new power plant at the Provincial Mental Hospital at New Westminster.

Approximately 140,000 tons a year of British Columbia coal is used in the pulverized form in the different industries.

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