ANNUAL REPORT

OF THE

MINISTER OF MINES

OF THE PROVINCE OF

BRITISH COLUMBIA

FOR THE

YEAR ENDED 31ST DECEMBER

1935

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by CHARLES F. BANFIELD, Printer to the King's Most Excellent Majesty.
1936.

To His Honour ERIC WERGE HAMBER,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

The Annual Report of the Mining Industry of the Province for the year 1935 is herewith respectfully submitted.

G. S. PEARSON,
Minister of Mines.

Minister of Mines' Office,
May, 1936.

Placer Training Camp, Fraser River at the Mouth of Emory Creek near Yale.

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BRITISH COLUMBIA DEPARTMENT OF MINES.

VICTORIA, B.C.

HON. GEORGE S. PEARSON - - - - - - - *Minister of Mines.*
ROBERT DUNN - - - - - - - - - *Deputy Minister.*
JOHN F. WALKER - - - - - - - *Provincial Mineralogist.*
D. E. WHITTAKER - - - - - *Provincial Assayer and Analyst.*
JAMES DICKSON - - - - - - - *Chief Inspector of Mines.*

Resident Mining Engineers.

P. B. FREELAND, Senior Engineer, Victoria.

J. T. MANDY, No. 1 District, Prince Rupert.
DOUGLAS LAY, No. 2 District, Hazelton.
A. M. RICHMOND { No. 3 District, Penticton. / No. 4 District, Penticton.
H. SARGENT, No. 5 District, Nelson.
B. T. O'GRADY, No. 6 District, Vancouver.
J. S. STEVENSON, Victoria.

District Inspectors.

GEO. O'BRIEN, Nanaimo.
T. R. JACKSON, Nanaimo.
JOHN MACDONALD, Fernie.
JOHN G. BIGGS, Princeton.
CHAS. GRAHAM, Prince Rupert.
JAS. STRANG, *Inspector and Examiner*, Victoria.
H. E. MIARD, *Inspector and Examiner*, Fernie and Nelson.

Mine-rescue Station Instructors.

RICHARD NICHOL, Nanaimo.
J. L. BROWN, Cumberland.
A. GOULD, Princeton.
J. T. PUCKEY, Fernie.

PART A.

THE MINING INDUSTRY.

BY

JOHN F. WALKER.

The value of mine production in 1935 was $48,821,239, an increase of $6,515,942 over the value for 1934. It is approximately the mean of the peak production of $68,245,443 in 1929 and the recent low of $28,798,406 in 1932. The increase for the year was much greater than anticipated, due chiefly to a higher price for silver and lead and a greater volume production for gold.

Gold production again accounted for the greatest increase in value for any one metal or material in 1935, followed closely by lead and silver and then by cadmium, zinc, and structural materials. Coal and copper showed substantial losses.

Gold production established a new all-time high in both volume and value, exceeding the 1934 record by 25.4 per cent. in value.

Zinc established an all-time high in volume production and lead just fell short of the all-time high volume production in 1934.

During the year the larger operations maintained their production at capacity and several new milling plants were brought into production. The most serious set-back to the mining industry was the closing-down of the Granby Consolidated Mining and Smelting Company's mine and smelter at Anyox. Cessation of operations were anticipated, as it had been known for some time that the mine was approaching exhaustion under existing conditions.

The number of shipping metalliferous mines increased from 145 in 1934 to 177 in 1935, and those shipping over 100 tons increased from 69 to 72.

It is estimated that, during the year, 13,737 men were employed in all branches of the mining industry. This is an increase of 752 over the number employed in 1934.

The following list shows the dividends declared by companies engaged in the mining industry in the Province during 1934 and 1935:—

Company.	1934.	1935.
The Consolidated Mining and Smelting Co. of Canada, Ltd.	$1,952,794	$4,232,452
Premier Gold Mining Co., Ltd.	600,000	650,000
Beaverdell-Wellington	3,600	36,000
Bell Mines, Ltd.	29,401	50,501
Highland Lass, Ltd.	46,208	52,369
Bralorne Mines, Ltd.	625,000	300,000
Pioneer Gold Mines of B.C., Ltd.	1,226,225	1,401,400
Reno Gold Mines, Ltd.	.....	255,683
Crow's Nest Pass Coal Co., Ltd.	248,472	372,708
Others	14,205	34,957
Totals	$4,745,905	$7,386,070

	1934.	1935.
Granby Consolidated Mining, Smelting, and Power Co., Ltd. (capital distribution)	.....	$2,250,000
Howe Sound Co.	$1,421,373	1,918,854

The Howe Sound Company is the holding company for the *Britannia* mine in British Columbia and the *El Potosi* and *Calera* mines in Mexico. Dividends paid by this company are therefore derived from the profits on operation of all three mines, so that only part of the dividends paid can be credited to the *Britannia* mine.

The Granby Consolidated Mining, Smelting, and Power Company, Limited, closed down its Anyox operations in August, 1935, and the company went into voluntary liquidation. The capital distribution noted above was declared in December, 1935, at the rate of $5 a share.

A further distribution was declared in March, 1936, at the rate of $8 a share, and this latter figure will be credited to 1936 distributions from British Columbia mines.

Details of production, etc., of the mining industry are set out in Tables Nos. I. to XVII.

GENERAL SITUATION.

With the close of 1935 it is even more difficult to forecast the probable value of the mining industry for 1936 than it was for 1935.

It is anticipated that gold will again show a substantial increase in volume, but not as great as in 1935. It is believed that the average price will be about the same as in 1935.

The average price of silver in 1935 was 17.329 cents higher than in 1934 and it may average about the same in 1936 as in 1934. Therefore, it appears that a very large decrease in the value of production of silver is to be expected even though the volume production is maintained.

In the case of copper, the closing-down of the Anyox operation of Granby Consolidated Mining, Smelting, and Power Company will result in a very heavy decrease in both volume and value production.

The volume of lead production is likely to remain about the same. The present price is appreciably above the average for 1935 and it is anticipated that it will hold fairly steady throughout the year. Therefore, a substantial increase in value production is looked for.

The price of zinc is also higher than the average for 1935 and, with volume production likely to be about the same, an appreciable increase in value production is expected.

Coal showed a decrease in 1935 of 11.8 per cent., bringing production to the lowest point since 1898. It does not seem reasonable that a further decrease should occur in 1936.

Structural materials showed an increase in 1935 over 1934 and an even greater increase may be expected in 1936.

Miscellaneous metals and minerals are likely to maintain the increase attained in 1935.

Offsetting the heavy anticipated losses in silver and copper by increases in gold, lead, and zinc, it is estimated that the value of the mining industry will be about the same in 1936 as in 1935.

METHOD OF COMPUTING PRODUCTION.

The total mine production of the Province consists of the outputs of metalliferous minerals, coal, structural materials, and miscellaneous metals, minerals, and materials, valued at standard recognized prices in Canadian funds.

In the Annual Report for 1925 some changes were made in the methods used in previous years in computing and valuing the products of the industry, but in order to facilitate comparisons with former years the same general style of tables was adhered to. The methods used in the 1925 Annual Report have been followed in subsequent Annual Reports, with the addition of new tables, the first of which, Table No. I., appeared in the 1933 Annual Report, in order to present additional or more informative data.

For the 1934 Annual Report, Table VI., which formerly tabulated the yield of placer gold only, was drawn up to show both placer- and lode-gold values. This will facilitate a rapid view of the total gold production of the Province. Another new table, No. XVII., includes "Mining Companies employing an Average of Ten or more Men." Incorporated in this table, additional data are presented showing the number of operating days at mine and mill, and also tonnage mined and milled. A subsection of the table shows operating days and average men employed at non-shipping mines employing ten or more men.

Table I. presents in summary form the mine statistics of the Province in a form that permits ready comparisons being made with tables of similar design presented annually by the Dominion Bureau of Statistics and other Provincial Statistical Bureaus.

An important change was made in Table I. for 1934, which embodies comparative figures for 1933. In Table I. of the 1933 Annual Report, which also gave comparative figures for 1932, gold production as set forth is valued at the old standard price of $20.671834 per fine ounce, and placer gold value converted to fine ounces at that figure also. In order to show the value of gold in Canadian funds, the calculated so-called "premium" was shown in the table as "Exchange equalization on gold." Commencing with the 1934 Annual Report, all gold will be valued at the yearly average of the current price of gold per fine ounce in Canadian funds.

In the 1934 Annual Report all tables in which the value of gold enters and covering production for the years 1932, 1933, and 1934 are shown with production valued at the yearly average price of gold and not the old standard price. The only tables not brought up to date in the 1934 Annual Report in this regard are Tables VII. and VIII., but these have been changed in this report.

The following notes explain the methods used:—

(1.) From the certified returns of lode mines of ore and concentrate shipments made during the full calendar year by the producers the net recovered metal contents have been determined by deducting from the "assay value content" necessary corrections for smelting and refining losses.

In making comparisons of production figures with previous years, it should be remembered that prior to 1925 in the Annual Reports the total metal production, with the exception of copper, was determined by taking the assay value content of all ores shipped; deductions for slag losses were made by taking varying percentages off the metal prices.

(2.) Gold-placer returns are received from the operators in dollars and the dollar value for the years 1932, 1933, and 1934 were converted to fine ounces at $20.67; previously the price of $17 an ounce, which is believed to represent the average value of placer gold throughout the Province, at the old valuation of gold, was used to convert the dollar value to ounces.

(3.) The prices used in valuing the different metals are: For gold, the average price for the year; for silver, the average New York metal-market price for the year; for lead, the average London metal-market price for the year; and for zinc, the average London metal-market price for the year. As in 1934, copper in 1935 is valued at the average London metal-market price. Prior to 1932 copper was valued at the average New York price. The change was made because very little copper was being marketed in the United States on account of high tariff charges against importations from foreign countries. The bulk of the lead and zinc production of the Province is sold on the basis of the London prices of these metals and they are therefore used. The New York, St. Louis, and Montreal lead- and zinc-market prices differ materially from the London prices of these metals and are not properly applicable to the valuing of the British Columbia production.

By agreement with the Dominion Bureau of Statistics and the Provincial Statistical Bureaus, the following procedure of taking care of the exchange fluctuations has been agreed upon:—

(*a.*) Silver to be valued at the average New York price, adjusted to Canadian funds at the average exchange rate.

(*b.*) Lead, zinc, and copper to be valued at London prices, adjusted to Canadian funds at the average exchange rate.

The following table shows the average metal-market prices from 1931 to 1935 in Canadian funds:—

AVERAGE METAL-MARKET PRICES FOR 1931, 1932, 1933, 1934, AND 1935.

Year.	Silver (New York).	Copper.		Lead.		Zinc.	
		London.	New York.	London.	New York.	London.	St. Louis.
	Cents per Oz.	Cents per Lb.	Cents per Lb.	Cents per Lb.	Cents per Lb.	Cents per Lb.	Cents per Lb.
1931	28.700*		8.116*	2.7101*	4.243	2.554*	3.640
1932	31.671*	6.3802*	5.555	2.1136*	3.180	2.4056*	2.876
1933	37.8328*	7.4548*	7.025	2.3916*	3.869	3.2105*	4.029
1934	47.461*	7.419*	8.428	2.436*	3.860	3.044*	4.158
1935	64.790*	7.795*	8.649	3.133*	4.065	3.099*	4.328

* Prices used in compiling total metal valuations in 1931, 1932, 1933, 1934, and 1935 Annual Reports. Gold average price in 1935 was $35.19; in 1934, $34.50; in 1933, $28.60; and in 1932 was $23.47.

(4.) In 1926 a change was made in computing coal and coke statistics. The practice in former years had been to list coal and coke production (in part) as primary mineral production. Only the coke made in bee-hive ovens was so credited; that made in by-product ovens

was not listed as coke, but the coal used in making this coke was credited as coal production. The result was that the coke-production figures were incomplete. Starting with the 1926 Annual Report, the standard practice of the Bureau of Statistics, Ottawa, has been adopted. This consists of crediting all coal produced, including that used in making coke, as primary mine production. Coke-making is considered a manufacturing industry. As it is, however, of interest to the mining industry, a table included in the Report shows the total coke produced in the Province, together with by-products, and the values given by the producers. This valuation of coke is not, of course, included in the total gross mine production of the Province.

From 1918 to 1930 coal production was valued at $5 per long ton. In 1931 the price used was $4.50, and in 1932, 1933, 1934, and 1935 the price used has been $4.25 per long ton. In making comparisons with former years the decline in dollar value is accentuated by this lowered price.

ADDENDA.

The following figures, compiled from returns on the subject made by companies and individuals, illustrate the amount of capital employed in the mining industry in 1935, the amount of money distributed in salaries and wages, fuel and electricity, and process supplies (explosives, chemicals, drill-steel, lubricants, etc.).

Capital employed includes: Present cash value of the land (excluding minerals); present value of buildings, fixtures, machinery, tools, and other equipment; inventory value of materials on hand, ore in process, fuel and miscellaneous supplies on hand; inventory value of finished products on hand; operating capital (cash, bills and accounts receivable, prepaid expenses, etc.).

Class.	Capital employed.	Salaries and Wages.	Fuel and Electricity.	Process Supplies.
Lode-mining	$94,751,300	$12,109,316	$2,092,488	$3,751,073
Placer-mining	5,444,983	527,235	28,058	16,091
Coal-mining	21,381,112	3,234,964	290,652	619,699
Miscellaneous	18,498,352	532,314	127,372	110,928
Structural	3,164,206	349,538	81,069	54,939
Totals	$143,239,953	$16,753,367	$2,619,639	$4,552,730

TABLE I.—British Columbia Mine Production, 1934 and 1935.

	Quantity, 1934.	Quantity, 1935.	Value, 1934.	Value, 1935.	Per Cent. Increase (+) or Decrease (—). Quantity.	Value.
Metallics.			$	$		
Bismuth			297,771	6,584		— 97.8
Cadmium			91,019	441,203		+384.7
Copper lb.	48,084,658	38,791,127	3,567,401	3,023,768	— 19.1	— 15.2
Gold, lode* oz.	297,130	365,244	10,250,985	12,852,936	+ 22.9	+ 25.4
Gold, placer* oz.	25,181	30,929	714,431	895,058	+ 22.8	+ 25.3
Lead lb.	347,366,967	344,268,444	8,461,859	10,785,930	— 0.9	+ 27.5
Platinum oz.	53	39	2,051	1,275	— 26.4	— 37.8
Silver oz.	8,572,916	9,251,544	4,068,792	5,994,075	+ 7.9	+ 47.3
Zinc lb.	247,926,844	256,239,446	7,546,893	7,940,860	+ 3.4	+ 5.2
Totals			35,001,202	41,941,689		+ 19.8
Fuel.						
Coal (2,240 lb.) tons	1,347,090	1,187,968	5,725,133	5,048,864	— 11.8	— 11.8
Non-metallics.						
Diatomaceous earth			287	428		+ 49.1
Fluxes—limestone, quartz tons	63,863	36,378	89,732	36,673	— 42.9	— 59.1
Gypsum products, gypsite tons			87,982	84,982		— 3.4
Iron oxide			1,600	1,670		+ 4.4
Mica			2,045			—100.0
Phosphate, dolomite, volcanic ash			2,318			—100.0
Slate (crushed), talc tons	484	390	7,187	4,293	— 19.4	— 40.3
Sodium carbonate, magnesium sulphate tons	506	584	7,281	10,395	+ 15.4	+ 42.8
Sulphur† tons	37,367	46,783	361,812	453,528	+ 25.2	+ 25.3
Totals			560,243	591,969		+ 5.7
Clay Products and other Structural Materials.						
Clay Products.						
Brick—						
Common No.	2,765,307	2,388,451	35,122	30,632	— 13.6	— 12.5
Face, paving, sewer brick No.	180,610	910,618	6,815	25,821	+404.2	+278.9
Firebrick, blocks			81,864	77,404		— 5.4
Fireclay tons	513	523	7,737	7,137	+ 1.9	— 7.8
Structural tile—hollow blocks			9,549	14,766		+ 54.6
Drain-tile, sewer-pipe No.	569,297	668,907	42,440	49,328	+ 17.5	+ 16.2
Pottery—glazed or unglazed			7,171	3,508		— 51.8
Bentonite; other clay products			2,512	4,040		+ 60.8
Totals			193,224	212,636		+ 10.5
Other Structural Materials.						
Cement			232,009	314,115		+ 35.4
Lime and limestone tons	62,124	82,902	195,363	133,286	+ 33.4	— 31.8
Sand and gravel			249,129	362,996		+ 45.7
Stone—building, grindstones tons	3,099	4,640	56,491	95,152	+ 49.7	+ 68.4
Rubble, riprap, crushed rock tons	100,428	173,653	92,503	120,532	+ 72.9	+ 30.3
Totals			825,495	1,026,081		+ 24.3
Total value in Canadian funds			42,305,297	48,821,239		+ 15.4

* Canadian funds.

† Sulphur content of pyrites shipped, estimated sulphur contained in sulphuric acid made from waste smelter-gases, and elemental sulphur.

TABLE II.—TOTAL PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1935.

Gold, placer	$81,448,759*
Gold, lode	177,645,062*
Silver	119,654,601
Copper	284,108,357
Lead	201,482,453
Zinc	119,410,520
Coal and coke	360,650,655
Structural materials	71,070,875
Miscellaneous minerals, etc.	9,787,360
Total	$1,425,258,642

* Canadian funds.

TABLE III.—PRODUCTION FOR EACH YEAR FROM 1852 TO 1935 (INCLUSIVE).

1852 to 1895 (inclusive)	$94,547,241	1917	$37,010,392
1896	7,507,956	1918	41,782,474
1897	10,455,268	1919	33,296,313
1898	10,906,861	1920	35,543,084
1899	12,393,131	1921	28,066,641
1900	16,344,751	1922	35,158,843
1901	20,086,780	1923	41,304,320
1902	17,486,550	1924	48,704,604
1903	17,495,954	1925	61,492,242
1904	18,977,359	1926	67,188,842
1905	22,461,325	1927	60,729,358
1906	24,980,546	1928	65,372,583
1907	25,882,560	1929	68,245,443
1908	23,851,277	1930	55,391,993
1909	24,443,025	1931	34,883,181
1910	26,377,066	1932	*28,798,406
1911	23,499,072	1933	*32,602,672
1912	32,440,800	1934	*42,305,297
1913	30,296,398	1935	*48,821,239
1914	26,388,825		
1915	29,447,508	Total	$1,425,258,642
1916	42,290,462		

* Canadian funds.

TABLE IV.—QUANTITIES AND VALUE OF MINE PRODUCTS FOR 1933, 1934, AND 1935.

Description.	1933.		1934.		1935.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer* oz.	23,928	$562,787	25,181	$714,431	30,929	$895,058
Gold, lode* oz.	223,529	6,392,929	297,130	10,250,985	365,244	12,852,936
Silver oz.	7,006,406	2,650,720	8,572,916	4,068,792	9,251,544	5,994,075
Copper lb.	42,608,002	3,176,341	48,084,658	3,567,401	38,791,127	3,023,768
Lead lb.	271,606,071	6,495,731	347,366,967	8,461,859	344,268,444	10,785,930
Zinc lb.	195,963,751	6,291,416	247,926,844	7,546,893	256,239,446	7,940,860
Coal tons, 2,240 lb.	1,264,746	5,375,171	1,347,090	5,725,133	1,187,968	5,048,864
Structural materials		1,024,045		1,017,141		1,238,717
Miscellaneous metals and minerals		633,532		952,662		1,041,031
Totals		$32,602,672		$42,305,297		$48,821,239

* Canadian funds.

TABLE V.—Production of Lode Gold, Silver, Copper, Lead, and Zinc.

Year.	Gold.		Silver.		Copper.		Lead.		Zinc.		Total Value.
	Oz.	Value.	Oz.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
		$		$		$		$		$	$
1887	.....	.....	17,690	17,331	.....	.....	204,800	9,216	.....	.....	26,547
1888	.....	.....	79,780	75,000	.....	.....	674,500	29,813	.....	.....	104,813
1889	.....	.....	53,192	47,873	.....	.....	165,100	6,498	.....	.....	54,371
1890	.....	.....	70,427	73,948	.....	.....	.....	.....	.....	.....	73,948
1891	.....	.....	4,500	4,000	.....	.....	.....	.....	.....	.....	4,000
1892	.....	.....	77,160	66,935	.....	.....	808,420	33,064	.....	.....	99,999
1893	1,170	23,404	227,000	195,000	.....	.....	2,135,023	78,996	.....	.....	297,400
1894	6,252	125,014	746,379	470,219	324,680	16,234	5,662,523	169,875	.....	.....	781,342
1895	39,264	785,271	1,496,522	977,229	952,840	47,642	16,475,464	532,255	.....	.....	2,342,397
1896	62,259	1,244,180	3,135,343	2,100,689	3,818,556	190,926	24,199,977	721,384	.....	.....	4,257,179
1897	106,141	2,122,820	5,472,971	3,272,836	5,325,180	266,258	38,841,135	1,390,517	.....	.....	7,052,431
1898	110,061	2,201,217	4,292,401	2,375,841	7,271,678	874,781	31,693,559	1,077,581	.....	.....	6,529,420
1899	138,315	2,857,573	2,939,413	1,663,708	7,722,591	1,351,453	21,862,436	878,870	.....	.....	6,751,604
1900	167,153	3,453,381	3,958,175	2,309,200	9,997,080	1,615,289	63,358,621	2,691,887	.....	.....	10,069,757
1901	210,384	4,348,603	5,151,333	2,884,745	27,603,746	4,446,963	51,582,906	2,002,733	.....	.....	13,683,044
1902	236,491	4,888,269	3,917,917	1,941,328	29,636,057	3,446,673	22,536,381	824,832	.....	.....	11,101,102
1903	232,831	4,812,616	2,996,204	1,521,472	34,359,921	4,547,535	18,089,283	689,744	.....	.....	11,571,367
1904	222,042	4,589,608	3,222,481	1,719,516	35,710,128	4,578,037	36,646,244	1,421,874	.....	.....	12,309,035
1905	238,660	4,933,102	3,439,417	1,971,818	37,692,251	5,876,222	56,580,703	2,399,022	.....	.....	15,180,164
1906	224,027	4,630,639	2,990,262	1,897,320	42,990,488	8,288,565	52,408,217	2,667,578	.....	.....	17,484,102
1907	196,179	4,055,020	2,745,448	1,703,825	40,832,720	8,166,544	47,738,703	2,291,458	.....	.....	16,216,847
1908	255,582	5,282,880	2,631,389	1,321,483	47,274,614	6,240,249	43,195,733	1,632,799	.....	.....	14,477,411
1909	238,224	4,924,090	2,532,742	1,239,270	45,597,245	5,918,522	44,396,346	1,709,259	8,500,000	400,000	14,191,141
1910	267,701	5,533,380	2,450,241	1,245,016	38,243,934	4,871,512	34,658,746	1,386,350	4,184,192	192,473	13,228,731
1911	228,617	4,725,513	1,892,364	958,293	36,927,656	4,571,644	26,872,397	1,069,521	2,634,544	129,092	11,454,063
1912	257,496	5,322,442	3,132,108	1,810,045	51,456,537	8,408,513	44,871,454	1,805,627	5,358,280	316,139	17,662,766
1913	272,254	5,627,490	3,465,856	1,968,606	46,460,305	7,094,489	55,364,677	2,175,832	6,758,768	324,421	17,190,838
1914	247,170	5,109,004	3,602,180	1,876,736	45,009,699	6,121,319	50,625,048	1,771,877	7,866,467	346,125	15,225,061
1915	250,021	5,167,934	3,366,506	1,588,991	56,918,405	9,835,500	46,503,590	1,939,200	12,982,440	1,460,524	19,992,149
1916	221,932	4,587,334	3,301,923	2,059,739	65,379,364	17,784,494	48,727,516	3,007,462	37,168,980	4,043,985	31,483,014
1917	114,523	2,367,190	2,929,216	2,265,749	59,007,565	16,038,256	37,307,465	2,951,020	41,848,513	3,166,259	26,788,474
1918	164,674	3,403,812	3,498,172	3,215,870	61,483,754	15,143,449	43,899,661	2,928,107	41,772,916	2,899,040	27,590,278
1919	152,426	3,150,645	3,403,119	3,592,673	42,459,339	7,939,896	29,475,968	1,526,855	56,737,651	3,540,429	19,750,498
1920	120,048	2,481,392	3,377,849	3,235,980	44,887,676	7,832,899	39,331,218	2,816,115	47,208,268	3,077,979	19,444,365
1921	135,663	2,804,154	2,673,389	1,591,201	39,036,993	4,879,624	41,402,288	1,693,354	49,419,372	1,952,065	12,920,398
1922	197,856	4,089,684	7,101,311	4,554,781	32,359,896	4,329,754	67,447,985	3,480,316	57,146,548	2,777,322	19,231,857
1923	179,245	3,704,994	6,032,986	3,718,129	57,720,290	8,323,266	96,663,152	6,321,770	58,343,462	3,278,903	25,347,062
1924	247,716	5,120,535	8,341,768	5,292,184	64,845,393	8,442,870	170,384,481	12,415,917	79,130,970	4,266,741	35,538,247
1925	209,719	4,335,269	7,654,844	5,286,818	72,306,432	10,153,269	237,899,199	18,670,329	98,257,099	7,754,450	46,200,135
1926	201,427	4,163,859	10,748,556	6,675,606	89,339,768	12,324,421	263,023,937	17,757,535	142,876,947	10,586,610	51,508,031
1927	178,001	3,679,601	10,470,185	5,902,043	89,202,871	11,525,011	282,996,423	14,874,292	145,225,443	8,996,135	44,977,082
1928	188,087	3,888,097	10,627,167	6,182,461	97,908,316	14,265,242	305,140,792	13,961,412	181,763,147	9,984,613	48,281,825
1929	145,339	3,004,419	9,918,800	5,256,270	101,483,857	18,375,682	302,346,268	15,269,696	172,096,841	9,268,792	51,174,859
1930	160,778	3,323,576	11,289,171	4,307,270	90,421,545	11,738,525	319,199,752	12,535,931	250,287,306	9,010,093	40,915,395
1931	146,039	3,018,894	7,524,320	2,247,514	63,194,299	5,289,363	248,783,508	6,742,282	205,071,247	5,237,520	22,535,573
1932	181,564	4,261,307*	7,130,838	2,258,453	49,841,009	3,179,956	254,488,952	5,378,878	192,120,091	4,621,641	19,700,235
1933	223,529	6,392,929*	7,006,406	2,650,720	42,608,002	3,176,341	271,606,071	6,495,731	195,963,751	6,291,416	25,007,137
1934	297,130	10,250,985*	8,572,916	4,068,792	48,084,658	3,567,401	347,366,967	8,461,859	247,926,844	7,546,893	33,895,930
1935	365,244	12,852,936*	9,251,544	5,994,075	38,791,127	3,023,768	344,268,444	10,785,930	256,239,446	7,940,860	40,597,569
Totals	8,039,234	177,645,062*	210,961,881	119,654,601	1,902,487,465	284,108,357	4,589,926,033	201,482,453	2,606,889,533	119,410,520	902,300,993

* Canadian funds.

TABLE VI.—Value of Gold Production to Date.

Year.	Placer.	Lode.	Total.
1858–1862	$9,871,634	.....	$9,871,634
1863–1867	16,283,592	.....	16,283,592
1868–1872	9,895,318	.....	9,895,318
1873–1877	9,019,201	.....	9,019,201
1878–1882	5,579,911	.....	5,579,911
1883–1887	3,841,515	.....	3,841,515
1888–1892	2,525,426	.....	2,525,426
1893	356,131	$23,404	379,535
1894	405,516	125,014	530,530
1895	481,683	785,271	1,266,954
1896	544,026	1,244,180	1,788,206
1897	513,520	2,122,820	2,636,340
1898	643,346	2,201,217	2,844,563
1899	1,344,900	2,857,573	4,202,473
1900	1,278,724	3,453,381	4,732,105
1901	970,100	4,348,603	5,318,703
1902	1,073,140	4,888,269	5,961,409
1903	1,060,420	4,812,616	5,873,036
1904	1,115,300	4,589,608	5,704,908
1905	969,300	4,933,102	5,902,402
1906	948,400	4,630,639	5,579,039
1907	828,000	4,055,020	4,883,020
1908	647,000	5,282,880	5,929,880
1909	477,000	4,924,090	5,401,090
1910	540,000	5,533,380	6,073,380
1911	426,000	4,725,513	5,151,513
1912	555,500	5,322,442	5,877,942
1913	510,000	5,627,490	6,137,490
1914	565,000	5,109,004	5,674,004
1915	770,000	5,167,934	5,937,934
1916	580,500	4,587,334	5,167,834
1917	496,000	2,367,190	2,863,190
1918	320,000	3,403,812	3,723,812
1919	286,500	3,150,645	3,437,145
1920	221,600	2,481,392	2,702,992
1921	233,200	2,804,154	3,037,354
1922	364,800	4,089,684	4,454,484
1923	420,000	3,704,994	4,124,994
1924	420,750	5,120,535	5,541,285
1925	280,092	4,335,269	4,615,361
1926	355,503	4,163,859	4,519,362
1927	156,247	3,679,601	3,835,848
1928	143,208	3,888,097	4,031,305
1929	118,711	3,004,419	3,123,130
1930	152,235	3,323,576	3,475,811
1931	291,992	3,018,894	3,310,886
1932	395,542	4,261,307	4,656,849*
1933	562,787	6,392,929	6,955,716*
1934	714,431	10,250,985	10,965,416*
1935	895,058	12,852,936	13,747,994*
Totals	$81,448,759	$177,645,062	$259,093,821

* Canadian funds.

TABLE VII.—Output of Mine Products by Districts and Divisions.

Names.	Divisions.			Districts.		
	1933.	1934.	1935.	1933.	1934.	1935.
	$	$	$	$	$	$
North-western District (No. 1)				5,097,666	5,239,054	4,543,389
Atlin, Stikine, and Liard	279,402	307,313	406,378			
Nass River	2,878,808	3,088,657	2,221,212			
Portland Canal	1,841,862	1,700,724	1,636,954			
Skeena, Queen Charlotte, and Bella Coola	97,594	142,360	278,845			
North-eastern District (No. 2)				474,293	780,122	1,717,546
Cariboo and Quesnel	418,378	690,386	1,618,191			
Omineca and Peace River	55,915	89,736	99,355			
Central District (No. 3)				243,863	619,036	564,441
Nicola and Vernon	133,146	214,798	315,550			
Yale, Ashcroft, and Kamloops	104,776	404,238	248,891			
Clinton*	5,941					
Southern District (No. 4)				1,085,336	1,207,845	2,330,201
Grand Forks, Greenwood, and Osoyoos	450,514	694,414	1,799,685			
Similkameen	634,822	513,431	530,516			
Eastern District (No. 5)				17,875,958	24,828,234	28,994,311
Fort Steele	15,955,987	20,042,528	23,067,831			
Windermere and Golden	424,939	1,360,312	530,863			
Ainsworth	21,413	48,246	215,104			
Slocan and Slocan City	30,296	84,719	406,133			
Nelson and Arrow Lake	759,537	1,496,843	1,991,723			
Trail Creek	669,017	1,786,961	2,582,959			
Revelstoke and Lardeau	14,769	8,625	199,698			
Western District (No. 6)				7,825,556	9,631,006	10,671,351
Nanaimo, Alberni, Clayoquot, Quatsino, and Victoria (Vancouver Island)	3,043,331	2,965,047	3,262,171			
Vancouver, New Westminster, and Lillooet	4,782,225	6,466,377	7,172,367			
Yale, Ashcroft, and Clinton (Mainland)		199,582	236,813			
Totals†	36,602,672	42,305,297	48,821,239	32,602,672	42,305,297	48,821,239

* Yale, Ashcroft, and Clinton Mining Divisions included in No. 6 District (Mainland section) from and including 1934.

† Canadian funds.

TABLE VIII.—PRODUCTION IN DETAIL OF PLACER GOLD, LODE

DISTRICTS AND DIVISIONS.	YEAR.	TONS.	GOLD—PLACER.		GOLD—LODE.		SILVER.	
			Ounces.	Value.	Ounces.	Value.	Ounces.	Value.
				$		$		$
North-western District (No. 1)								
Atlin	1934	1	10,039	284,832	58	2,001	38	18
	1935		**13,227**	**382,797**				
Stikine	1934		376	10,661				
	1935		**363**	**10,522**				
Liard	1934		314	8,901				
	1935		**285**	**8,234**				
Nass River	1934	1,889,748			4,761	164,255	280,026	132,903
	1935	**1,210,308**			**5,567**	**195,903**	**257,081**	**166,563**
Portland Canal	1934	158,857			39,146	1,350,537	687,261	326,181
	1935	**156,855**			**33,611**	**1,182,771**	**674,201**	**436,815**
Skeena	1934	5,726	62	1,759	3,693	127,408	1,314	624
	1935	**12,262**	**102**	**2,956**	**6,632**	**233,380**	**1,476**	**956**
Queen Charlotte	1934		98	2,795				
	1935		**122**	**3,519**				
Bella Coola	1934							
	1935							
North-eastern District (No. 2)								
Cariboo	1934	30,554	3,848	109,158	11,853	408,929	1,333	633
	1935	**73,758**	**6,280**	**181,721**	**35,835**	**1,261,034**	**4,555**	**2,951**
Quesnel	1934		5,358	152,007				
	1935		**4,948**	**143,188**				
Omineca	1934	2,358	1,365	38,744	547	18,871	4,528	2,149
	1935	**1,072**	**1,629**	**47,155**	**261**	**9,184**	**2,622**	**1,699**
Peace River	1934		240	6,797				
	1935		**294**	**8,516**				
Central District (No. 3)								
Nicola	1934	6,095			777	26,806	25,182	11,952
	1935	**7,844**	**1**	**35**	**874**	**30,756**	**25,224**	**16,342**
Vernon	1934	3,159	68	1,932	1,183	40,813	118	56
	1935	**1,843**	**38**	**1,091**	**301**	**10,592**	**304**	**197**
Kamloops	1934	11,316	155	4,382	7,819	269,756	494	235
	1935	**17,757**	**222**	**6,440**	**6,401**	**225,251**	**18,541**	**12,013**
Southern District (No. 4)								
Grand Forks	1934	322			540	18,630	11,691	5,549
	1935	**15,635**	**25**	**739**	**1,731**	**60,914**	**46,149**	**29,900**
Greenwood	1934	29,808	162	4,589	4,339	149,695	631,254	299,599
	1935	**42,252**	**257**	**7,425**	**13,130**	**462,045**	**753,143**	**487,961**
Osoyoos	1934	8,718	2	69	3,732	128,754	3,649	1,732
	1935	**69,328**			**18,934**	**666,287**	**2,520**	**1,633**
Similkameen	1934	431	346	9,833	3	104	4,896	2,324
	1935		**179**	**5,173**				
Eastern District (No. 5)								
Fort Steele	1934	1,744,179	804	22,805	11	379	6,875,663	3,025,958
	1935	**1,861,295**	**640**	**18,510**			**6,673,000**	**4,323,437**
Windermere	1934		37	1,035				
	1935		**11**	**317**				
Golden	1934	94,880	32	897			170,289	80,797
	1935	**55,918**	**11**	**317**			**45,540**	**29,505**
Ainsworth	1934	3,358	49	1,380	20	690	34,108	16,188
	1935	**13,337**	**57**	**1,654**	**11**	**387**	**106,808**	**69,201**
Slocan	1934	1,905			37	1,276	96,431	45,767
	1935	**33,091**			**78**	**2,745**	**404,316**	**261,956**
Slocan City	1934	311	9	241	207	7,141	879	417
	1935	**147**	**4**	**105**	**39**	**1,372**	**4,475**	**2,899**
Nelson	1934	51,865	154	4,382	37,849	1,305,791	104,395	49,547
	1935	**142,428**	**132**	**3,835**	**53,262**	**1,874,290**	**67,635**	**43,821**
Arrow Lake	1934	5	2	69	4	138	380	180
	1935		**15**	**458**				
Trail Creek*	1934	43,088	88	2,484	28,033	967,139	40,850	19,388
	1935	**37,553**	**59**	**1,689**	**23,576**	**829,639**	**28,656**	**18,566**
Revelstoke	1934		35	1,001				
	1935		**83**	**2,393**				
Lardeau	1934	1	163	4,623	3	104	3	2
	1935	**28,823**	**89**	**2,569**	**5,403**	**190,132**	**3,451**	**2,236**
Western District (No. 6)								
Nanaimo	1934	75	9	242	36	1,242	122	58
	1935	**47**	**3**	**71**	**44**	**1,548**	**138**	**89**
Alberni	1934	40	4	104	116	4,002	23	11
	1935	**90**	**6**	**176**	**168**	**5,912**	**78**	**51**
Clayoquot	1934	48	19	621	166	5,727	189	89
	1935	**74**			**231**	**8,129**	**134**	**87**
Quatsino	1934							
	1935		**34**	**985**				
Victoria	1934		38	1,089				
	1935		**9**	**246**				
Lillooet	1934	230,097	434	12,317	133,716	4,613,202	32,076	15,224
	1935	**304,024**	**740**	**21,431**	**140,044**	**4,928,148**	**44,312**	**28,710**
Clinton	1934	3,330	247	7,004	745	25,702	945	449
	1935	**5,800**	**322**	**9,325**	**851**	**29,947**	**1,360**	**881**
Ashcroft	1934	7,217	248	7,038	3,597	124,097	6,880	3,265
	1935	**7,052**	**445**	**12,879**	**4,278**	**150,543**	**7,489**	**4,852**
Yale	1934	140	192	5,451	36	1,242	7	3
	1935	**259**	**83**	**2,393**	**68**	**2,393**	**7**	**5**
New Westminster	1934		184	5,209				
	1935		**214**	**6,194**				
Vancouver	1934	759,702			14,103	486,554	57,942	27,499
	1935	**817,307**			**13,914**	**489,634**	**78,329**	**50,749**
Totals	1934	5,087,334	25,181	714,431	297,130	10,250,985	8,572,916	4,068,792
	1935	**4,916,147**	**30,929**	**895,058**	**365,244**	**12,852,936**	**9,251,544**	**5,994,075**

* Includes zinc recovered from slag and reclaimed slags which cannot be credited to individual mines.

GOLD, SILVER, COPPER, LEAD, AND ZINC IN 1934 AND 1935.

COPPER.		LEAD.		ZINC.		TOTALS FOR DIVISIONS.		TOTALS FOR DISTRICTS.
Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	1934.	1935.	1935.
	$		$		$	$	$	$
								4,479,018
						286,851		
							382,797	
						10,661		
							10,522	
						8,901		
							8,234	
37,070,906	2,750,290					3,047,448		
23,558,968	1,836,422						2,198,888	
6,519	484	725,164	17,665	192,406	5,857	1,700,724		
35,401	2,759	466,233	14,607	69	2		1,636,954	
293	22					129,813		
10,420	812						238,104	
						2,795		
							3,519	
								1,655,759
						518,720		
		54	2	451	14		1,445,722	
						152,007		
							143,188	
		5,556	135	3,089	94	59,993		
		8,173	256	1,261	39		58,333	
						6,797		
							8,516	
								316,949
		178,223	4,342	40,681	1,238	44,338		
		230,395	7,218	58,324	1,808		56,159	
						42,801		
		388	12	238	7		11,899	
45,525	3,377					277,759		
38,448	2,997	38,869	1,218	31,364	972		248,891	
								1,764,169
						24,179		
		15,938	499	20,671	641		92,693	
		446,652	10,880	540,565	16,455	481,218		
		680,369	21,316	614,337	19,038		997,785	
460	34					130,589		
2,334	182	9,759	306	3,549	110		668,518	
		44,191	1,077	7,339	223	13,561		
							5,173	
								26,297,902
		322,000,000	7,843,920	212,000,000	6,453,280	17,346,337		
		330,000,000	10,338,900	213,400,000	6,613,266		21,294,113	
						1,035		
							317	
		19,897,650	484,707	25,817,204	785,876	1,352,277		
		6,267,392	196,358	9,435,300	292,400		518,580	
		344,068	8,382	168,718	5,136	31,776		
		2,070,291	64,862	1,950,610	60,450		196,554	
		724,011	17,637	401,286	12,215	76,895		
		2,832,099	88,730	1,544,252	47,856		401,287	
		294	7	577	18	7,824		
		9,124	286	5,944	184		4,846	
9,001	668	1,922,050	46,821	2,438,576	74,230	1,481,439		
17,471	1,362	873,356	27,362	527,016	16,332		1,967,002	
		175	4	140	4	395		
							458	
1,160,568	86,103					1,075,114		
967,707	75,433	5,979	187	25,550,184	791,800		1,717,314	
						1,001		
							2,393	
						4,729		
155	12	2,841	89				195,038	
								6,978,830
						1,542		
656	51						1,759	
						4,117		
		263	8				6,147	
						6,437		
243	19						8,235	
							985	
						1,069		
							246	
		250	6			4,640,749		
		14,571	456				4,978,745	
3,644	270					38,425		
6,013	468	60	2				40,623	
7,624	566					134,966		
5,847	456						168,730	
						6,696		
							4,791	
						5,209		
							6,194	
9,780,118	725,587	1,078,683	26,276	6,316,263	192,267	1,458,183		
14,147,464	1,102,795	742,290	23,258	3,095,876	95,941		1,762,375	
48,084,658	3,567,401	347,366,967	8,461,859	247,926,844	7,546,893	34,610,361		
38,791,127	3,023,768	344,268,444	10,785,930	256,239,446	7,940,860		41,492,627	41,492,627

TABLE IX.—Coal Production per Year to Date.*

	Tons. (2,240 lb.)	Value.		Tons. (2,240 lb.)	Value.
1836–1885	3,029,011	$9,468,557	1912	2,628,804	$9,200,814
1886	326,636	979,908	1913	2,137,483	7,481,190
1887	413,360	1,240,080	1914	1,810,967	6,338,385
1888	489,301	1,467,903	1915	1,611,129	5,638,952
1889	579,830	1,739,490	1916	2,084,093	7,294,325
1890	678,140	2,034,420	1917	2,149,975	7,524,913
1891	1,029,097	3,087,291	1918	2,302,245	11,511,225
1892	826,335	2,479,005	1919	2,267,541	11,337,705
1893	978,294	2,934,882	1920	2,595,125	12,975,625
1894	1,012,953	3,038,859	1921	2,483,995	12,419,975
1895	939,654	2,818,962	1922	2,511,843	12,559,215
1896	896,222	2,688,666	1923	2,463,223	12,266,115
1897	882,854	2,648,562	1924	1,939,526	9,697,630
1898	1,135,865	3,407,595	1925	2,328,522	11,642,610
1899	1,306,324	3,918,972	1926	2,330,036	11,650,180
1900	1,439,595	4,318,785	1927	2,453,827	12,269,135
1901	1,460,331	4,380,993	1928	2,526,702	12,633,510
1902	1,397,394	4,192,182	1929	2,251,252	11,256,260
1903	1,168,194	3,504,582	1930	1,887,130	9,435,650
1904	1,253,628	3,760,884	1931	1,707,590	7,684,155
1905	1,384,312	4,152,936	1932	1,534,975	6,523,644
1906	1,517,303	4,551,909	1933	1,264,746	5,375,171
1907	1,800,067	6,300,235	1934	1,347,090	5,725,133
1908	1,677,849	5,872,472	1935	1,187,968	5,048,864
1909	2,006,476	7,022,666			
1910	2,800,046	9,800,161	Totals	84,417,920	$334,977,055
1911	2,193,062	7,675,717			

* For all years to 1925 (inclusive) figures are net coal production and do not include coal made into coke; subsequent figures are entire coal production, including coal made into coke.

TABLE X.—Coke Production from Bee-hive Ovens in British Columbia from 1895 to 1925.

	Tons. (2,240 lb.)	Value.		Tons. (2,240 lb.)	Value.
1895–97	19,396	$96,980	1913	286,045	$1,716,270
1898 (estimated)	35,000	175,000	1914	234,577	1,407,462
1899	34,251	171,255	1915	245,871	1,475,226
1900	85,149	425,745	1916	267,725	1,606,350
1901	127,081	635,405	1917	159,905	959,430
1902	128,015	640,075	1918	188,967	1,322,769
1903	165,543	827,715	1919	91,138	637,966
1904	238,428	1,192,140	1920	67,792	474,544
1905	271,785	1,358,925	1921	59,434	416,038
1906	199,227	996,135	1922	45,835	320,845
1907	222,913	1,337,478	1923	58,919	412,433
1908	247,399	1,484,394	1924	30,615	214,305
1909	258,703	1,552,218	1925	75,185	526,295
1910	218,029	1,308,174			
1911	66,005	396,030	Totals	4,393,255	$25,673,600
1912	264,333	1,585,998			

TABLE XI.—Coke and By-products Production of British Columbia, 1934 and 1935.

Description.	1934.		1935.	
	Quantity.	Value.	Quantity.	Value.
Coal used in making coke, long tons	126,256	$644,167	114,104	$494,492
Coke made in bee-hive ovens, long tons	22,182	$154,182	24,170	$160,565
Coke made in by-product ovens, long tons	20,996	213,653	13,316	109,684
Coke made in gas plants, long tons	28,614	197,997	41,177	160,694
Total coke made, long tons	71,792	$565,832	78,663	$430,943
Gas made, purchased, and sold	.....	1,439,287	.....	1,430,057
Tar produced	.....	43,266	.....	44,876
Other by-products	.....	4,976	.....	3,081
Total production value of coke industry		$2,053,361		$1,908,957

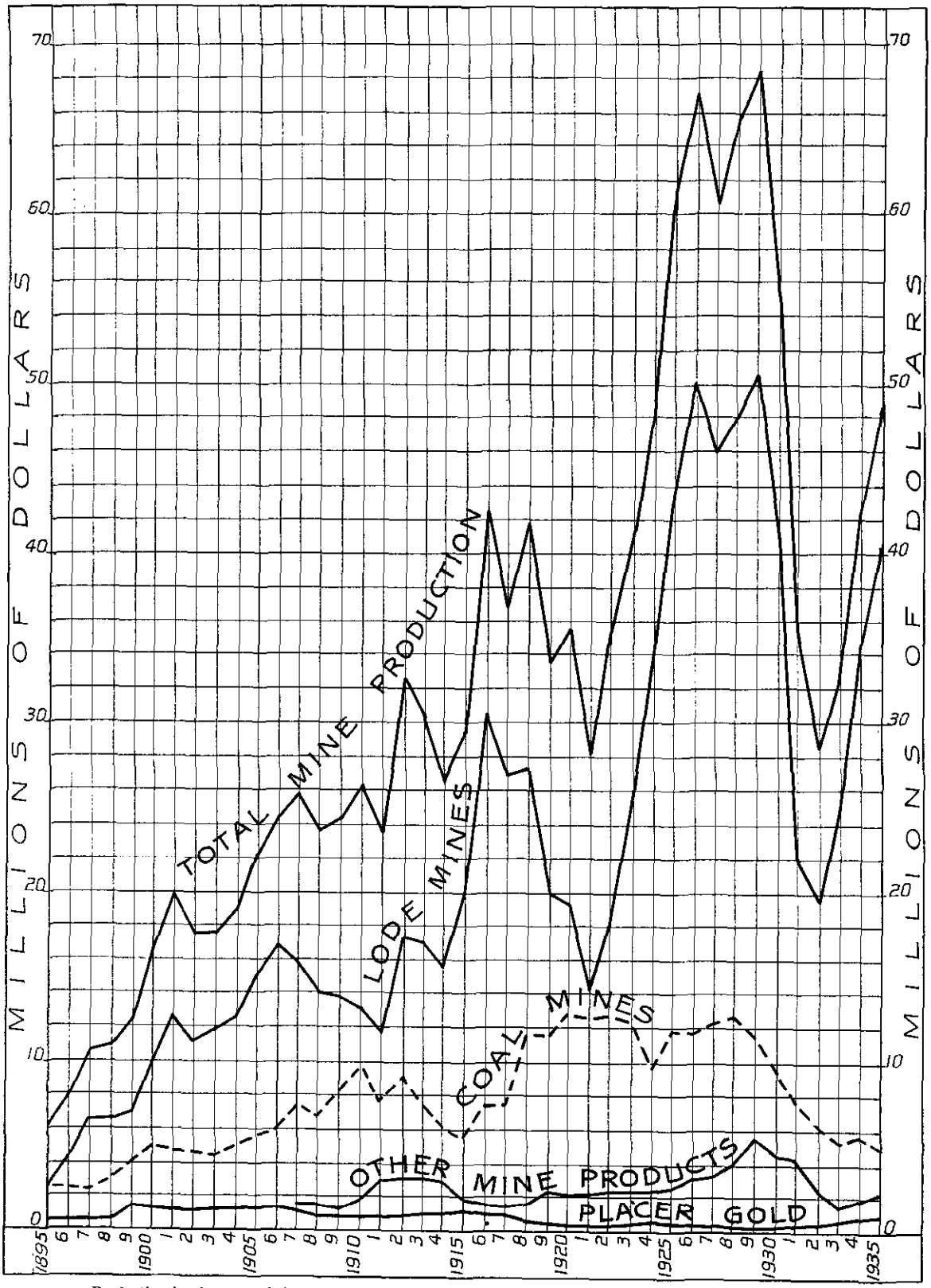
TABLE XII.—Production in Detail of Structural Materials, 1935.

District and Division.	Cement.	Lime and Limestone.	Building-stone.	Riprap and Crushed Rock.	Sand and Gravel.	Brick (Common).	Face, Paving, and Sewer Brick.	Firebrick, Blocks.	Fireclay.	Structural Tile, Hollow.	Drain-tile and Sewer-pipe.	Pottery, Glazed or Unglazed.	Other Clay Products.	Divisions.	Districts.
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
North-western District (No. 1)															42,047
Atlin, Liard, and Stikine				300	4,525									4,825	
Nass River															
Portland Canal															
Skeena and Queen Charlotte				6,030	13,366									19,396	
Bella Coola		9,662		909	7,255									17,826	
North-east District (No. 2)															46,569
Cariboo and Quesnel				1,535	26,505				584					28,624	
Omineca and Peace River					17,945									17,945	
Central District (No. 3)															43,243
Nicola, Vernon, and Kamloops			3,000	2,000	28,140	1,283	4,250			3,700	870			43,243	
Southern District (No. 4)															41,180
Grand Forks and Greenwood				9,250	1,030									10,280	
Osoyoos		4,560		346	16,449									21,355	
Similkameen				397	8,367								781	9,545	
Eastern District (No. 5)															122,015
Fort Steele			300	23,736	19,465									43,501	
Windermere and Golden				5,896	6,000									11,896	
Ainsworth			3,916	447	14,187									18,550	
Slocan and Slocan City															
Nelson			6,341	600	17,322									24,263	
Trail Creek				850	20,688									21,538	
Revelstoke				774	1,493									2,267	
Western District (No. 6)															943,663
Nanaimo and Alberni		103,044	53,429	1,836	11,281	3,790								173,380	
Victoria and Quatsino	314,115	10,108		5,301	29,900	11,884	204			362	7,663	3,508	534	383,579	
Lillooet				1,301	7,055									8,356	
Yale				2,000	9,500									11,500	
Clinton															
Ashcroft				9,112										9,112	
Vancouver			28,166	17,129	44,684									89,979	
New Westminster		5,912		30,783	57,839	13,675	21,367	77,404	6,553	10,704	40,795		2,725	267,757	
Totals	314,115	133,286	95,152	120,532	362,996	30,632	25,821	77,404	7,137	14,766	49,328	3,508	4,040	1,238,717	1,238,717

TABLE XIII.—Production in Detail of Miscellaneous Metals, Minerals, and Materials, 1935.

District and Division.	Bismuth.	Cadmium.	Diatomite.	Flux (Limestone and Quartz).	Gypsum Products.	Iron (Bog and Ochre).	Platinum.	Slate (Crushed).	Soda and Magnesium Sulphate.	Sulphur (Elemental) and Sulphur Content of Pyrite and Sulphuric Acid manufactured.	Talc.	Division Totals.	District Totals.
	$	$	$	$	$	$	$	$	$	$	$	$	$
North-western District (No. 1)													22,324
Atlin, Liard, and Stikine													
Nass River				22,324								22,324	
Portland Canal													
Skeena and Queen Charlotte													
Bella Coola													
North-eastern District (No. 2)													657
Cariboo and Quesnel			428				229					657	
Omineca and Peace River													
Central District (No. 3)													95,377
Nicola, Vernon, and Kamloops					84,982				10,395			95,377	
Southern District (No. 4)													10,100
Grand Forks and Greenwood				9,054								9,054	
Osoyoos and Similkameen							1,046					1,046	
Eastern District (No. 5)													844,177
Fort Steele													
Windermere and Golden						70						70	
Ainsworth													
Slocan and Slocan City													
Nelson and Arrow Lake													
Trail Creek and Revelstoke	6,584	441,203								396,320		844,107	
Western District (No. 6)													68,396
Nanaimo and Alberni				5,295								5,295	
Victoria and Quatsino								3,720			420	4,140	
Lillooet and Clinton											153	153	
Yale and Ashcroft													
Vancouver and New Westminster						1,600				57,208		58,808	
Totals	6,584	441,203	428	36,673	84,982	1,670	1,275	3,720	10,395	453,508	573	1,041,031	1,041,031

BRITISH COLUMBIA MINE PRODUCTION, 1895–1935.



Production in above graph is valued in Canadian funds.

PRODUCTION OF LODE MINES IN BRITISH COLUMBIA, 1913–1935.

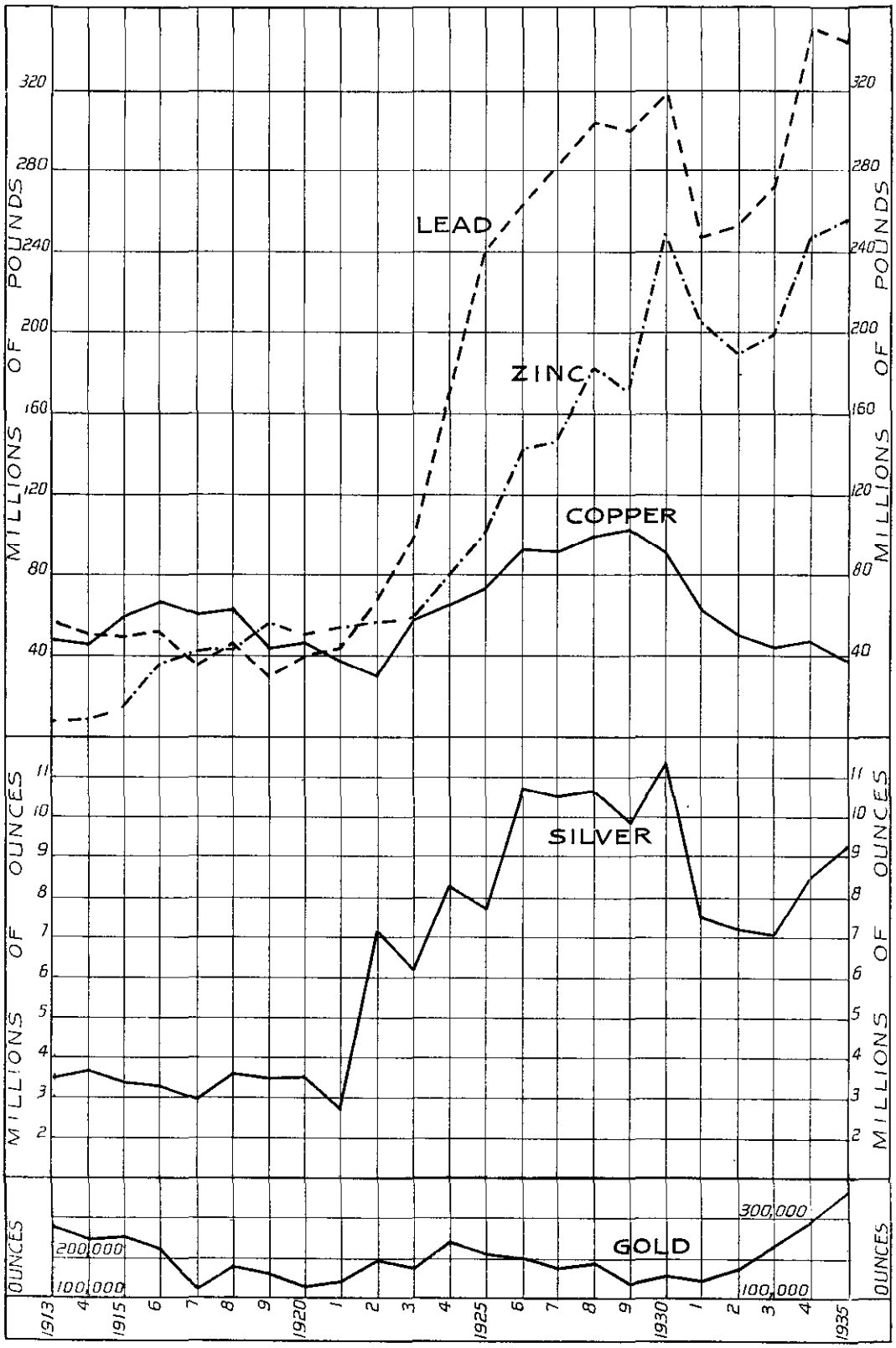


TABLE XIV.—MEN EMPLOYED IN THE MINING INDUSTRY OF BRITISH COLUMBIA, 1935.

District.	Placer-mining.	Lode-mining.			In Concentrators.	In Smelters.	Coal-mining.			Structural Materials.		Miscellaneous.	Total.
		Under.	Above.	Total.			Under.	Above.	Total.	Quarries and Pits.	Plants.		
No. 1	270	401	198	599	78	179	.....	.....	.....	41	1	8	1,176
No. 2	598	201	97	298	27	.....	11	2	13	58	.....	...	994
No. 3	62	51	25	76	45	.....	75	34	109	54	8	7	361
No. 4	70	241	132	373	122	.....	245	129	374	38	.....	1	978
No. 5	176	1,028	590	1,618	376	2,592	614	205	819	81	2	524	6,188
No. 6	115	818	455	1,273	259	.....	1,200	456	1,656	264	259	214	4,040
Totals—													
1935	1,291	2,740	1,497	4,237	907	2,771	2,145	826	2,971	536	270	754	13,737
1934	1,122	2,796	1,729	4,525	631	2,890	2,050	843	2,893	377	187	360	12,985

TABLE XV.—TONNAGE, NUMBER OF MINES, AND NET VALUE OF LODE MINERALS, 1935.

District.	Tonnage.	No. of Shipping Mines, 1935.	No. of Mines shipping over 100 Tons.	Net Value to Shipper of Lode Minerals produced.
No. 1	1,379,425	11	6	$2,261,741
No. 2	74,830	8	3	1,247,621
No. 3	27,444	8	5	262,525
No. 4	127,215	37	19	1,451,670
No. 5	2,172,582	92	30	13,988,213
No. 6	1,134,653	21	9	6,196,144
Totals	4,916,147	177	72	$25,407,914

TABLE XVI.—METALLIFEROUS MINES SHIPPING IN 1935.

Mine or Group.	Location of Mine or Mill.	Owner or Agent.	Rated Daily Capacity.		Operating at.	Date of First Operation.	Process.	Character of Ore.
			1934.	1935.				
			Tons.	Tons.	Tons.			
Dolly Varden	Alice Arm	T. W. Falconer, Alice Arm						Silver.
Bonanza	Anyox	Granby Cons. M.S. & P. Co.						
Hidden Creek	Anyox	Granby Cons. M.S. & P. Co.	5,200	5,200	*	Jan., 1924	Flotation	Copper, gold, silver.
Granby Point	Anyox	Granby Cons. M.S. & P. Co.						
Edye Pass	Refuge bay	F. J. Patterson, Refuge bay						Gold, silver.
Surf Point	Porcher island	N. A. Timmins, Inc., Porcher island	20	20	20	July, 1933	Flotation	Gold.
Surf Inlet	Surf inlet	Surf Inlet Cons. Gold Mines			100†	August, 1917	Table concentration; flotation	Gold.
Knipple	Stewart	Mrs. Chas. Knipple, Stewart						Silver, lead, zinc.
Dunwell	Stewart	Dunwell Mines, Ltd., and Dunwell Syndicate, Stewart	100	100	30‡	1927	Flotation; concentration	Gold, silver, lead, zinc.
Virginia K.	Stewart	Excelsior Prospecting Syndicate, Ltd., Victoria						Silver, lead, copper.
Premier	Stewart	Silbak Premier Mines, Ltd. (Premier Gold Mining Co., Ltd.)	500	500	500	July, 1922	Flotation	Gold, silver, lead, copper.
Black Hill	Stewart	H. D. Rochfort, Stewart						Silver, gold, lead, copper.
Columario	Usk	Columario Cons. Gold Mines, Toronto, Ont.	100	100	§	Sept., 1934	Flotation	Gold, silver.
Garner	Wistaria	A. & O. Harrison, Wistaria						Silver, lead, zinc.
Glacier Gulch	Smithers	S. F. Campbell *et al.*, Smithers						Gold, silver.
Hyland Basin	Smithers	Kean & King, Smithers						Silver, gold, lead, zinc.
Roosevelt	Wistaria	A. & O. Harrison, Wistaria						Silver, lead, zinc.
Vancouver	T.B. mountain	J. M. Sloan						Silver, lead, zinc.
Cariboo Gold	Wells	Cariboo Gold Quartz Mining Co., Ltd., Wells	100	150	150	Jan., 1933	Cyanidation	Gold.
Island Mountain	Wells	Island Mountain Mines, Ltd., Wells	50	100	100	Nov., 1934	Cyanidation	Gold.
Faith	Vernon	G. Dickson, Penticton						Silver, lead, zinc.
Lost Treasure	Vernon	S. Farquharson, Lumby						Silver, lead, zinc.
Pre Cambrian	Ewings Landing	Pre Cambrian Gold Mines, Ltd.	30	30	30§	1934	Flotation	Gold, silver.
Homestake	Kamloops	Kamloops Homestake Mines, Ltd., 475 Howe Street, Vancouver		75	50§	Oct., 1935	Flotation	Silver, gold, lead, zinc, copper.
Windpass	Dunn lake	Windpass Gold Mining Co., Ltd., 608 Pacific Building, Vancouver	40	60	60	March, 1934	Flotation	Gold, silver, copper.
Jenny Long	Stump lake	Jenny Long Gold Mines, Ltd., Stump Lake		30	30‡	Jan., 1935	Flotation; concentration	Gold, silver, lead, zinc.
L.D.	Merritt	L. D. Lawson, 77, 429 Pender Street West, Vancouver						Silver, lead, zinc.

* Closed down, August, 1935. † New mill started intermittent operations in 1935. ‡ Intermittent. § Idle at present.

			Tons.	Tons.	Tons.			
Planet	Stump lake	Nicola Mines & Metals, Ltd., 1015 Rogers Building, Vancouver	100	100	100‡	1929	Flotation	Silver, lead, zinc.
Ironclad	Grand Forks	A. W. Davis, Greenwood						Silver, gold, lead, zinc.
Lightning Peak	Edgewood	B. F. Lundy, Vancouver						Silver, lead, zinc.
Keno	Greenwood	S. Bombini, Box 564, Greenwood						Silver, gold, lead, zinc.
Paladora	Edgewood	S. P. Pond, Nelson						Gold, silver.
Union	Granby river	J. F. McCarthy, Grand Forks	200	200	200§	Jan., 1930	Cyanidation	Gold.
Waterloo	Edgewood	Jack McLeod, Edgewood						Silver, zinc, lead.
Yankee Boy	Grand Forks	Reigel Mines, Ltd., Grand Forks						Gold, silver, lead, zinc.
Grandoro	Oro Fino mountain	Grandoro Mines, Ltd., 102 Pacific Building, Vancouver		40	40‡	Jan., 1935	Amalgamation; cyanidation	Gold, silver.
Kalamalka	Vernon	Kalamalka Gold Mines, Ltd., Vernon						Gold, silver, copper.
Kelowna	Hedley	Kelowna Exploration Co., Hedley		200	200	Sept., 1934	Amalgamation; cyanidation	Gold, silver.
Mak Siccar	Similkameen	Mak Siccar Gold Mines, Ltd., Vancouver						Gold, silver.
Morning Star	Osoyoos	Morning Star (Fairview) Gold Mines, Ltd., Vancouver		75	75	Sept., 1935	Amalgamation; blanket-tables; flotation	Gold, silver, lead, zinc.
Olalla	Olalla	Olalla Gold Mines, Ltd., Vancouver						Gold, silver.
Osoyoos	Osoyoos	Osoyoos Mines, Ltd., Osoyoos			50	March, 1936	Flotation	Gold, silver.
Viking	Cawston	Viking Gold Mines, Ltd., Vancouver						Silver.
Bay	Greenwood	W. E. McArthur, Jr., Greenwood						Gold, silver.
Beaver	Greenwood	Beaver Silver Mines, Ltd., Vancouver						Silver, lead, zinc.
Bell	Greenwood	Bell Mine, Ltd., Penticton						Silver, gold, lead, zinc.
Butcher Boy	Carmi	Carmi Gold Mines, Ltd., Carmi						Gold, silver.
Carmi	Carmi	Carmi Gold Mines, Ltd., Carmi						Gold, silver.
Crescent	Greenwood	Crescent Syndicate, Grand Forks						Silver, gold, lead, zinc.
Dentonia	Greenwood	Dentonia Mines, Ltd., Vancouver	100	100	100	April, 1934	Flotation	Gold, silver, lead.
Elkhorn	Greenwood	Geo. White, Greenwood						Silver, gold, lead, zinc.
Gold Drop	Greenwood	Jarvis & Gillanders, Greenwood						Gold, silver.
Highland Lass	Beaverdell	Highland Lass, Ltd., Kelowna						Silver, gold, lead, zinc.
Imperial	Greenwood	Imperial Leasing Syndicate, Rock Creek						Silver, gold, zinc, lead.
Last Chance	Greenwood	W. E. McArthur, Jr., Greenwood						Gold, silver.
North Star	Greenwood	W. E. McArthur, Jr., Greenwood						Gold, silver.
North Star	Greenwood	Superior Gold Mines, Ltd., Vancouver						Gold, silver, lead.
Number Seven	Greenwood	W. E. McArthur, Jr., Greenwood						Silver, gold, lead.
Providence	Greenwood	Wm. Madden, Greenwood						Silver, gold, lead, zinc.
Providence	Greenwood	Superior Gold Mines, Ltd., Vancouver						Silver, gold, lead, zinc.
Revenge	Greenwood	Revenge Mining Co., Princeton						Silver, gold, lead, zinc.
Sally	Beaverdell	Sally Mines, Ltd., Penticton						Silver, gold, lead, zinc.
Skylark	Greenwood	W. E. McArthur, Jr., Greenwood						Silver, gold, lead, zinc.
Standard Fraction	Beaverdell	W. H. Rambo, Beaverdell						Silver, gold, lead, zinc.
Superior	Jewel lake	Superior Gold Mines, Ltd., Vancouver		50	50‡	Nov., 1934	Flotation	Gold, silver, lead, zinc.

‡ Intermittent. § Idle at present.

TABLE XVI.—METALLIFEROUS MINES SHIPPING IN 1935—*Continued.*

Mine or Group.	Location of Mine or Mill.	Owner or Agent.	Rated Daily Capacity.		Operating at.	Date of First Operation.	Process.	Character of Ore.
			1934.	1935.				
			Tons.	Tons.	Tons.			
Tiger	Beaverdell	J. L. Nordman & Partner, Beaverdell						Silver, lead, zinc.
Wellington	Beaverdell	Beaverdell Wellington Syndicate, Greenwood						Silver, gold, zinc, lead.
Little Cariboo	Rock Creek	J. A. Carmichael, Rock Creek						Silver, gold, lead, zinc.
Black Colt	Sandon	E. J. Vandergrift, New Denver						Silver, gold, lead, zinc.
Black Grouse	Three Forks	Stevenson & Johanson, Sandon						Silver, zinc, lead.
Bosun	New Denver	J. L. Irwin, agent, New Denver						Silver, zinc, lead.
Canadian	Slocan	A. Jarvis, Silverton						Silver, lead, zinc.
Chapleau	Slocan	Atlas Gold Mines, Ltd., Slocan City						Gold, silver.
Cliff	Silverton	Jackson Mines, Ltd., Vancouver						Silver, zinc, lead.
Comstock	Silverton	Lancaster & Mortimer, Silverton						Silver, lead, zinc.
Hewitt	Silverton	Galena Farm Cons. Mines, Ltd., Vancouver						Silver, zinc, lead.
Ivanhoe	Sandon	Joe Fanchin, Sandon						Silver, lead, zinc.
Mammoth	Kaslo	Western Exploration Co., Ltd.			150	July, 1935	Table concentration; flotation	Silver, lead, zinc.
Metallic	Silverton	G. T. Robinson, Silverton						Silver, zinc, lead.
Molly Hughes	New Denver	Molly Hughes Mining Co., New Denver						Silver, gold, lead, zinc.
Mountain Chief	Slocan	J. Cechelero, Sandon						Silver, gold, zinc, lead.
Noble Five	Sandon	Noble Five Mines, Ltd.		100	30‡	1920	Table concentration; flotation	Silver, lead, zinc.
Palmita	Slocan	C. Cunningham, Alamo						Silver, lead, zinc.
Payne	Sandon	Payne Mines, Ltd., Montreal						Silver, lead, zinc.
Reco	Sandon	Reco Mining & Milling Co., Sandon						Silver, lead, zinc.
Rio	Silverton	W. R. Roberts, Silverton						Silver, lead, zinc.
Ruth Hope	Sandon	Ruth Hope Mining Co., Ltd., Vancouver		100	§	1927	Table concentration; flotation	Silver, lead, zinc.
Shannon	New Denver	Bank of Montreal, New Denver						Silver, zinc, lead.
Slocan Rambler	Rambler	Ross Mining Syndicate, Nelson	75	75	90‡	1912	Table concentration; flotation	Silver, zinc, lead.
Standard	Sandon	Western Exploration Co., Silverton						Silver, lead, zinc.
Victor	Sandon	E. Doney, Sandon						Silver, lead, zinc.
Western	Three Forks	G. T. Gormley, Nelson						Silver, lead, zinc.
Wonderful	Sandon	H. Peterson, Sandon						Silver, lead, zinc.
Fishermaiden	Silverton	Fisher Maiden Mining Co., Spokane						Silver, lead, zinc.
Sullivan	Kimberley	Consolidated M. & S. Co. of Canada, Ltd., Trail	6,000	6,000	6,000	August, 1923	Table concentration; flotation	Silver, lead, zinc.
Alma	Slocan	R. F. Ainslie, Slocan City						Silver, zinc, lead.
Buster	Slocan	Chas. Lundstrom, Slocan City						Silver, zinc, lead.
Cub	Slocan	A. G. Ewing, Slocan City						Silver, lead, zinc.

‡ Intermittent. § Idle at present.

			Tons.	Tons.	Tons.			
Dayton	Slocan City	P. W. Munro, Slocan City						Silver, gold.
Gold Viking	Slocan City	Geo. Henderson, Slocan City						Silver, gold.
Little Daisy	Slocan City	A. Erickson, Silverton						Gold, silver.
L.T.	Slocan City	B. E. O'Neail, Slocan City						Silver, lead, zinc.
Meteor	Slocan City	R. J. Johnson, Slocan City						Silver, gold.
Morning Star	Springer creek	Wm. Clements, Slocan						Silver, gold, lead, zinc.
Port Hope	Slocan	H. L. Fife, Slocan						Silver.
Republic	Slocan City	C. W. Tipping, Slocan						Silver, gold.
Riverside	Silverton	T. Elsmore, Silverton						Silver, lead, zinc.
White Hope	Slocan	C. W. Tipping, Slocan						Silver, gold, lead, zinc.
Daybreak	Retallack	D. P. Kane, Kaslo						Silver, lead, zinc.
Lucky Thought	Silverton	H. V. Dewis, Silverton						Silver, zinc, lead.
Utica	Kaslo	Utica Mines, Ltd., Vancouver						Silver, lead, zinc.
Whitewater	Retallack	Ross Mining Syndicate, Nelson	125	125	50‡	1927	Table concentration; flotation	Silver, lead, zinc.
Monarch	Field	Base Metals Mining Corp., Field	300	300	300§	Nov., 1929	Table concentration; flotation	Silver, zinc, lead.
Meridian	Beaton	Meridian Mining Co., Ltd., Vancouver		100	100	Jan., 1935	Flotation	Gold, silver.
Grimmett	Gerrard	A. M. Grimmett, Gerrard						Silver, lead, copper.
Arlington	Erie	Oscarson Bros., Erie						Gold, silver.
Athabasca	Nelson	Noble Five Mines, Ltd., Nelson		25	§	1920	Amalgamation; cyanidation	Gold, silver.
Bayonne	Tye	Bayonne Mining Co.				1936	Cyanidation	Gold, silver.
Boulder City	Salmo	Clubine Comstock Gold Mines, Ltd., Nelson						Gold, silver.
California	Toad mountain	*Anton J. Nilson, Nelson*						*Gold, silver.*
Catherine	Nelson	W. Jarvis, Nelson						Silver, gold, lead.
Dundee	Ymir	Ymir Dundee Gold Mines, Ltd., Nelson						Gold, silver, lead, zinc.
Euphrates	Nelson	Euphrates Mining Co., Nelson						Gold, silver.
Fawn	Nelson	Fawn Mining Co., Ltd., Vancouver						Gold, silver.
Gold Fern	Nelson	Gold Fern Mines, Ltd., Toronto						Gold, silver.
Good Hope	Nelson	Ailport and Martin, Nelson						Gold, silver.
Granite	Taghum	Livingstone Mining Co., Taghum	25	25	25	Sept., 1934	Amalgamation; concentration	Gold, silver.
Great Eastern	Nelson	John Sheplak, leaser, Nelson						Gold, silver.
Keystone	Erie	Fred Golightly, Erie						Gold, silver.
Kootenay Belle	Sheep creek	Kootenay Belle Gold Mines, Ltd., Vancouver	50	50	50	Oct., 1934	Amalgamation (blanket); flotation	Gold, silver.
Lakeview	Nelson	Gerald Timmons, Sanca						Gold, silver.
Michaely	Nelson	Michaely Silver Lead Mines, Ltd., Trail						Silver, lead, zinc.
Kelly, A. W.	Nelson	A. W. Kelly, Nelson						Silver, gold, copper.
Perrier	Nelson	Perrier Gold Mines, Ltd., leaser, Nelson	50	50		1936	Flotation	Silver, gold, lead, zinc.
Porto Rico	Nelson	B. A. Pickering, Nelson						Gold, silver.
Reno	Sheep creek	Reno Gold Mines, Ltd., Nelson	100	120	120	Dec., 1932	Cyanidation	Gold, silver.
Relief-Arlington	Erie	Relief Arlington Mines, Ltd., Erie	35	70	70‖	1933	Cyanidation	Gold, silver.
Rover	Nelson	R. Barron, Nelson						Gold, silver, lead, zinc.

‡ Intermittent. § Idle at present. ‖ Changed from flotation.

TABLE XVI.—METALLIFEROUS MINES SHIPPING IN 1935—*Continued.*

Mine or Group.	Location of Mine or Mill.	Owner or Agent.	Rated Daily Capacity.		Operating at.	Date of First Operation.	Process.	Character of Ore.
			1934.	1935.				
			Tons.	Tons.	Tons.			
Silver Reef	Nelson	R. Barron, Nelson						Silver, gold, lead.
Venus-Juno	Nelson	G. T. Gormley & Sons, Nelson						Gold, silver.
Wilcox	Ymir	Wilcox Mining Syndicate, Rossland	20	20	20‡	1933	Amalgamation; concentration	Gold, silver, lead.
Yankee Girl	Ymir	Ymir-Yankee Girl Gold Mines, Ltd., *Ymir*	100	100	100	Dec., 1934	Cyanidation; flotation	Gold, silver, lead.
Ymir-Con.	Ymir	Ymir Cons. Gold Mines, Ltd., Vancouver	150	100	100§	July, 1935	Amalgamation; flotation	Gold, silver, lead, zinc.
Sheep Creek	Sheep creek	Sheep Creek Gold Mines, Ltd., Vancouver		150	150	May, 1935	Cyanidation	Gold, silver.
Bluebird	Rossland	Bluebird Mining Co., Rossland						Silver, gold, lead, zinc.
Cliff	4-Mile creek	S. J. Hackney, Rossland						Gold, silver.
Cliff	4-Mile creek	Hatfield & Grubisic						*Gold, silver.*
Evening Star	Rossland	Evening Star Syndicate, J. Heap, Rossland						Gold, silver.
Georgia	Rossland	C. E. Fraser, Rossland						Gold, silver.
Hattie	Rossland	C. W. Hutton, Rossland						Gold, silver.
I.X.L.	Rossland	I.X.L. Lessors, Ltd., Rossland						Gold, silver.
Jumbo	Rossland	Jumbo Leasing Syndicate, Rossland						Gold, silver.
Lily May	*Rossland*	*Johnson & Manning, Rossland*						Silver, gold, zinc, lead.
Mayflower	Rossland	Woogman, Scorgie & Herman, Rossland						Silver, gold, zinc, lead.
Midnight	Rossland	Midnight Syndicate, Rossland						Gold, silver.
Mighty Midas	Violin lake	M. M. Butorac, Trail						Gold, silver.
Silverine	Rossland	Fried & Penny, Rossland						Gold, silver.
O.K.	O.K. mountain	O.K. Leasing Syndicate, Rossland						Gold, silver.
Ural	Trail	C. J. Butorac, Trail						*Gold, silver.*
Velvet	Rossland	Velvet Gold Mining Co., Seattle, Wash.	50	50	50	1934	Concentration	Gold, silver, copper.
Rossland properties	Rossland	Leasers from Cons. M. & S. Co. of Canada, Ltd.					Concentration	Gold, silver, copper.
W.W.W.	Alberni	Franklin River (British Columbia) Gold Mines, Ltd., Vancouver						Gold, silver, lead.
Vancouver Island	Alberni	Vancouver Island Gold Mines, Ltd., Vancouver			40	Feb., 1936	Flotation; cyanidation	Gold, silver.
Grange	Kelly creek	Grange Mines, Ltd., Vancouver	50	50	50‡	Jan., 1934	Amalgamation; flotation	Gold, silver, copper.
Taylor Windfall	Taseko lake	Taylor Windfall Gold Mining Co., Vancouver	5	5	5‡	August, 1934	Amalgamation	Gold, silver.
Bralorne	Cadwallader creek	Bralorne Mines, Ltd., Vancouver	450	450	450	Feb., 1932	Amalgamation; flotation	Gold, silver.

‡ *Intermittent.* § *Idle at present.*

			Tons.	Tons.	Tons.			
MacInnes	Lillooet	G. L. MacInnes, Lillooet						Gold, silver.
Minto	Bridge river	Minto Gold Mines, Ltd., Vancouver	75	50	50	Dec., 1934	Amalgamation ; flotation	Gold, silver.
Pioneer	Cadwallader creek	Pioneer Gold Mines of B.C., Ltd., Vancouver	400	300	300	Feb., 1928	Cyanidation (first mill in 1900)	Gold, silver.
Wayside	Bridge river	Wayside Cons. Gold Mines, Ltd., Vancouver	50	20	20¶	Nov., 1934	Amalgamation ; flotation	Gold, silver.
Vidette	Savona	Vidette Gold Mines, Ltd., Vancouver	40	35	35	Dec., 1933	Flotation	Gold, silver.
Privateer	Zeballos river	A. Bird & Partners, Ceepeecee						Gold, silver.
Abco	Ahousat	Abco Mines, Ltd., Vancouver						Gold, silver, copper.
Danzig	Nootka sound	Danzig Mines, Ltd., Seattle, Wash.						Gold, silver.
Ashloo	Squamish	Ashloo Gold Mining Syndicate, Vancouver						Gold, silver, copper.
Golden Gate	Loughborough inlet	Loughborough Gold Mining Co., Ltd., Vancouver						Gold, silver.
Britannia	Britannia Beach	Britannia M. & S. Co., Ltd., Britannia Beach	6,000	6,000	5,000	Jan., 1923	Flotation	Copper, gold, silver.
B. & D.	Thurlow	Burton & Dewhurst, Shoal Bay via Thurlow						Pyrite concentrate.
Roadside	Powell River	Wm. Young, Powell River						Silver, copper.
Northern	Thurlow	Northern Mining & Milling Co., Thurlow						Gold, silver, copper.
Santiago	Phillips arm	R. Crowe-Swords, Vancouver						Gold, silver.
Home Gold	Yale	Home Gold Mining Co., Vancouver		25	25‡	Nov., 1934	Table concentration ; flotation	Gold, silver.

‡ Intermittent. ¶ New 100-ton mill in operation December, 1935.

TABLE XVII.—Mining Companies Employing an Average of Ten or more Men during 1935.

Shipping Mines.

Name of Mine or Company.	Days Operating.		Average Number of Men.		Tonnage.	
	Mine.	Mill.	Mine.	Mill.	Mined.	Milled or Shipped.
Granby Cons. M.S. & P. Co., Ltd.—						
Bonanza	211	212	55	65	65,570	65,570
Hidden Creek	212	212	367	65	1,132,123	1,135,820
Granby Point	212		15		8,907	8,907
Surf Point	345	340	20	7	12,113	12,113
Surf Inlet						137
Dunwell Syndicate	74	116	8	4	3,022	3,021
Dunwell Co.	100	15	12	5	3,851	3,851
Premier Gold Mining Co.	364	298	144	30	149,672	149,671
Cariboo Gold Quartz	365	365	125	12	43,269	43,418
Island Mountain Mines Co.	365	365	61	13	30,340	30,340
Windpass Gold Mining Co.	364	355	35	25	14,535	15,732
Jenny Long Gold Mines	259	113	16	7	700	700
Nicola Mines & Metals	168	134	25	5	7,241	7,141
Pre Cambrian Gold Mines	184	59	7	7	1,838	1,838
Riegel Mines, Ltd.	300		15	3	908	908
Union Mine	108	161	6	16	8,530	14,737
Beaverdell-Wellington	310		16		529	529
Bell Mine, Ltd.	298		18		1,829	1,829
Dentonia Mines, Ltd.	333	359	52	9	32,447	32,447
Highland Lass, Ltd.	305		11		1,092	1,092
Sally Mines, Ltd.	360		20		629	629
Grandoro Mines, Ltd.	340	335	17	7	7,972	7,972
Kelowna Exploration Co.	276	304	71	99	55,314	54,032
Morning Star (Fairview)	225	122	5	6	5,112	5,112
Monarch (Base Metals)	197	193	60	20	57,715	55,918
Sullivan	278	312	589	235	1,876,105	1,859,221
Whitewater (Ross Mining Syndicate)			15	5	11,000	11,000
Utica	148		12			
Mammoth	180	180	32	13	20,165	20,165
Noble Five	170	101	12	6	2,303	2,303
Rambler (Slocan)		100		25	9,000	9,000
Fawn Mining Co.	245		14			
Gold Fern	260		10			
Granite-Poorman	280	60	8	2	833	600
Kootenay Belle	307	306	45	7	17,100	14,650
Relief-Arlington	365	323	42	8	16,799	12,998
Reno Gold Mines, Ltd.	365	365	96	33	39,917	39,862
Sheep Creek Gold Mines	218	220	57	10	28,197	28,197
Ymir Cons. Gold Mines	365	139	40	9		11,450
Ymir Yankee Girl, Ltd.	365	348	61	17	31,480	31,480
Velvet Gold Mining Co.	68	70	5	8	3,000	2,850
Meridian Mining Co.	365	266	42	18	28,813	28,813
Franklin River (B.C.)	150		10			
Vancouver Island Gold	290		10		75	75
Vidette Gold Mines, Ltd.	338	241	48	6	7,330	7,062
Abco Mines, Ltd.	343		12		160	46
Grange Mines, Ltd.	325	210	38	4	4,402	4,300
Bralorne Mines, Ltd.	348	348	273	18	145,113	145,113
Minto Gold Mines, Ltd.	315	365	23	11	20,558	20,558
Pioneer Gold Mines	349	349	200	25	135,781	135,467
Wayside Cons. Gold Mines	279	169	13	7		2,693
Ashloo Gold Mining Syndicate			13			
Britannia M. & S. Co., Ltd.	336	170	376	200	817,250	817,250

TABLE XVII.—MINING COMPANIES EMPLOYING AN AVERAGE OF TEN OR MORE MEN DURING 1935—*Continued.*

Non-shipping Mines.

Name of Mine or Company.	Days Operating.		Average Number of Men.		Tonnage.	
	Mine.	Mill.	Mine.	Mill.	Mined.	Milled or Shipped.
Big Missouri	365	.....	40	.....	.....	.....
Nicholson Creek	260	.....	15	.....	.....	.....
Dictator Gold	155	.....	14	.....	.....	.....
Fairview Amalgamated Gold	275	.....	12	.....	.....	.....
Hedley Mascot	.....	.....	7	30	.....	.....
Durango Gold	365	.....	10	.....	.....	.....
Gold Belt	355	.....	20	.....	.....	.....
Salmo Malartic	365	.....	11	.....	.....	.....
Thunderbird Mines	79	.....	19	.....	.....	.....
Wesko Mines, Ltd.	365	.....	26	.....	.....	.....
Alico Silver	365	.....	23	.....	.....	.....
Bonanza Cache	123	.....	12	.....	.....	.....
B.R.X. Gold Mines	.....	.....	27	.....	.....	.....
Pacific Eastern	365	.....	32	.....	.....	.....
Lytton Gold Mines	250	.....	10	.....	.....	.....

LECTURES TO PROSPECTORS.

The series of fourteen lectures on geology and mining, prepared by the Provincial Mineralogist in 1934, was again presented during the winter of 1935–36 by the Resident Mining Engineers and other instructors at the following centres throughout the Province:—

Burnaby (two classes).	Michel-Natal.	Penticton.
Burton.	Kelowna.	Prince Rupert.
Nakusp.	Hazelton.	Princeton.
Sanca.	Prince George.	Premier.
Boswell.	Smithers.	Rossland.
Cranbrook.	Usk.	Savona (Vidette mine).
Fort Steele.	Kimberley.	Vancouver (three classes).
Wardner.	New Denver.	Victoria (two classes).
Fernie.	North Vancouver.	Slocan.
Grasmere (Flagstone Station).		

The estimated total average attendance at the lectures prior to the completion of the course was 1,268. This work was carried out in conjunction with the Department of Education and it is expected that the lectures will be given during the winter of 1936 and 1937.

PLACER TRAINING CAMPS.

The Provincial Government Department of Labour created a plan whereby unmarried, physically fit, unemployed men between the ages of 21 and 25 years were given an opportunity to learn Placer-mining. Instruction was carried out under the direction of the Senior Engineer. Camp-sites were not chosen with the idea of finding bonanza deposits of Placer gold, but locations were made close to transportation where a sufficient amount of gold was procurable to demonstrate mining methods. To fulfil this idea, four placer-mining training camps were established in reserved areas a mile long, as follows: On the Nanaimo river; on Emory creek; at Cherry Creek; and on the Fraser river 10 miles north-east of Quesnel. Each camp held twenty-five men. Two instructors were appointed to each tent-camp, one to teach Placer-mining methods in all its different phases; the other to instruct the men in the art of camp-cooking and how to look after themselves in the hills. This included "first-aid" instruction. Food and equipment supplied was similar to that used by prospectors.

Instruction lasted from a month to six weeks, according to ability to learn. In some camps such as Emory creek tuition lasted longer because more construction was necessary to bring water for sluicing to the workings.

A total of about fifty men in groups of five, after training was completed, were equipped and sent out prospecting within reasonable distances from transportation.

This plan was considered advisable on account of the lateness of the season when training stopped.

Gold recovered whilst in training was shared amongst the trainees. When prospecting all recoveries were shared by parties of five.

GEOLOGICAL SURVEY OF CANADA.

By an arrangement made at the time the Province of British Columbia entered Confederation, all geological investigations and mapping in the Province were to be carried on by the Geological Survey of Canada; this agreement has been fully adhered to by the Dominion Government and has proved of great benefit to the mining industry of the Province. Each year several geological parties are kept in the field, and in the aggregate a vast amount of information is made available to the prospector and the mining engineer in the many excellent reports and maps covering British Columbia which have been issued by the Geological Survey of Canada.

For some years a branch office of the Geological Survey has been maintained in Vancouver, where copies of maps and reports on British Columbia can be obtained. The officer in charge of the British Columbia office is W. E. Cockfield and the address is 512 Winch Building, Vancouver, B.C.

During the season of 1935 the Geological Survey of Canada had the following officers employed on field-work in British Columbia:—

George Hanson with D. A. McNaughton carried out geological reconnaissance in the Eagle River-McDame Creek area, north and east of Dease lake. E. D. Kindle made detailed examinations of mineral properties in the vicinity of the Prince Rupert branch of the Canadian National Railways east from Terrace. M. S. Hedley conducted a reconnaissance survey on a scale of 4 miles to the inch in the Sibola district. A. Lang carried out a detailed survey in the Keithley Creek area of the Cariboo. C. E. Cairnes continued detailed geological mapping in the Bridge River district. H. C. Horwood conducted a reconnaissance survey on 4 miles to the inch west of the Fraser river, southerly from the Nahatlatch river. M. F. Bancroft examined the gold-bearing deposits on the west coast of Vancouver island from Alberni canal to north of Esperanza inlet. N. F. G. Davis carried out a reconnaissance survey on a scale of 4 miles to the inch in the Camp McKinney area. H. V. Warren carried out similar work in the David Creek area. W. E. Cockfield made detailed examinations of mineral properties in the Ymir-Nelson area. H. M. A. Rice completed geological mapping on a scale of 1 mile to the inch in the Cranbrook area.

R. Bartlett in charge and A. C. Tuttle carried out topographic mapping on a scale of 4 miles to the inch in the Eagle River-McDame Creek area; W. H. Miller in charge and S. M. Steeves on the Smithers sheet; H. A. S. West on the Fort Fraser sheet; J. A. McDonald on the Giscome sheet; and R. C. McDonald on the Ashcroft and Hope sheets, carried out topographic mapping on a scale of 4 miles to the inch.

SYNOPSIS OF MINING LAWS OF B.C.

BY

ROBERT DUNN.

Mineral Act and Placer-mining Act.

The mining laws of British Columbia are very liberal in their nature and compare favourably with those of any other part of the world. The terms under which both lode and placer claims and placer leaseholds are held are such that a prospector is greatly encouraged in his work, and the titles, especially for mineral claims and placer-mining leaseholds, are perfect. The fees required to be paid are as small as possible, consistent with a proper administration of the mining industry, and are generally lower than those commonly imposed elsewhere. Provision is also made for the formation of mining partnerships practically without expense, and a party of miners is enabled to take advantage of these sections of the Acts so that such miners may work their claims jointly.

Placer-mining leases are granted for a period of twenty years and are approximately 80 acres in size. On a lode claim of 51 acres the expenditure of $500 in work, which may be spread over five years, is required to obtain a Crown grant, and surface rights are obtainable at a small figure, in no case exceeding $5 per acre.

The following synopsis of the mining laws will be found sufficient to enable the miner or intending investor to obtain a general knowledge of their scope and requirements; for particulars, however, the reader is referred to the Acts relating to mining, which may be obtained from any Mining Recorder, or from the Department of Mines or the King's Printer, Victoria, B.C.

Free Miners' Certificates.

Any person over the age of 18, and any joint-stock company, may obtain a free miner's certificate on payment of the required fee.

The fee to an individual for a free miner's certificate is $5 for one year. To a joint-stock company having a capital of $100,000, or less, the fee for a year is $50; if capitalized beyond this, the fee is $100.

The free miners' certificates run from date of issue and expire on the 31st of May next after its date, or some subsequent 31st day of May (that is to say, a certificate may be taken out a year or more in advance if desired). Certificates may be obtained for any part of a year, terminating on May 31st, for a proportionately less fee.

The possession of this certificate entitles the holder to enter upon all lands of the Crown, and upon any other lands on which the right to so enter is not specially reserved, for the purpose of prospecting for minerals, locating claims, and mining.

A free miner can only hold, by location, one mineral claim on the same vein or lode, but may acquire others by purchase. Under the "Placer-mining Act," a free miner may locate one placer claim or leasehold in his own name and one placer claim or leasehold for each of two free miners for whom he acts as agent, on any separate creek, river-bed, bar or dry diggings. Other placer claims or leaseholds may be acquired by purchase.

In the event of a free miner allowing his certificate to lapse, his mining property (if not Crown-granted) reverts to the Crown (subject to the conditions set out in the next succeeding paragraph), but where other free miners are interested as partners or co-owners the interest of the defaulter becomes vested in the continuing co-owners or partners *pro rata*, according to their interests.

Six months' extension of time within which to revive title in mining property which has been forfeited through the lapse of a free miner's certificate is allowed. This privilege is given only if the holder of the property obtains a special free miner's certificate within six months after the 31st of May on which his ordinary certificate lapsed. The fee for this special certificate in the case of a person is $15 and in that of a company $300.

It is not necessary for a shareholder, as such, in an incorporated mining company to be the holder of a free miner's certificate.

Mineral Claims.

Mineral claims are located and held under the provisions of the "Mineral Act."

A mineral claim is a piece of land not exceeding in area fifty-one and sixty-five one-hundredths acres. The angles must be right angles unless the boundaries, or one of them, are the same as those of a previously recorded claim.

No special privileges are allowed for the discovery of new mineral claims or districts.

A mineral claim is located by erecting three "legal posts," which are stakes having a height of not less than 4 feet above ground and squared 4 inches at least on each face for not less than a foot from the top. A tree-stump so cut and squared also constitutes a legal post. A cairn of stones not less than 4 feet in height and not less than 1 foot in diameter 4 feet above the ground may also be used as a legal post.

The "discovery post" is placed at the point where the mineral in place is discovered.

Nos. 1 and 2 posts are placed as near as possible on the line of the ledge or vein, shown by the discovery post, and mark the boundaries of the claim. Upon each of these three posts must be written the name of the claim, the name of the locator, and the date of location. On No. 1 post, in addition, the following must be written: "Initial post. Direction of Post No. 2 [*giving approximate compass bearing*] ——— feet of this claim lie on the right and ——— feet on the left of the line from No. 1 to No. 2 posts."

The location-line between Nos. 1 and 2 posts must be distinctly marked—in a timbered locality by blazing trees and cutting underbrush, and in bare country by monuments of earth or rock not less than 2 feet in diameter at the base, and at least 2 feet high—so that the line can be distinctly seen.

Mineral claims must be recorded in the Mining Recorder's office for the mining division in which they are situate within fifteen days from the date of location, one day extra being allowed for each 10 miles of distance from the recording office after the first 10 miles. If a claim is not recorded in time it is deemed abandoned and open for relocation, but if the original locator wishes to relocate he can only do so by permission of the Gold Commissioner of the district and upon the payment of a fee of $10. This applies also to a claim abandoned for any reason whatever.

Mineral claims are, until the Crown grant is issued, held practically on a yearly lease, a condition of which is that during such year assessment-work be performed on the same to the value of at least $100, or a payment of such sum be made to the Mining Recorder. Such assessments must be recorded before the expiration of the year, or the claim is deemed abandoned. If, however, the required assessment-work has been performed within the year, but not recorded within that time, a free miner may, within thirty days thereafter, record such assessment-work upon payment of an additional fee of $10. The actual cost of the survey of a mineral claim, to an amount not exceeding $100, may also be recorded as assessment-work. If, during any year, work is done to a greater extent than the required $100, any further sum of $100—but not less—may be recorded and counted as further assessments; such excess work must be recorded during the year in which it is performed. All work done on a mineral claim between the time of its location and recording may be counted as work done during the first period of one year from the recording. As soon as assessment-work to the extent of $500 is recorded and a survey made of the claim, the owner of a mineral claim is entitled to a Crown grant on payment of a fee of $25, and giving the necessary notices required by the Act. Liberal provisions are also made in the Act for obtaining mill-sites and other facilities in the way of workings and drains for the better working of claims.

Placer Claims.

Placer-mining is governed by the "Placer-mining Act," and by the interpretation clause its scope is defined as "the mining of any natural stratum or bed of earth, gravel, or cement mined for gold or other precious minerals or stones." Placer claims are of four classes, as follows:—

"'Creek diggings': any mine in the bed of any stream or ravine:

"'Bar diggings': any mine between high- and low-water marks on a river, lake, or other large body of water:

"'Dry diggings': any mine over which water never extends:

"'Precious-stone diggings': any deposit of precious stones, whether in veins, beds, or gravel deposits."

The following provisions as to extent of the various classes of claims are made by the Act:—

"In 'creek diggings' a claim shall be two hundred and fifty feet long, measured in the direction of the general course of the stream, and shall extend in width one thousand feet, measured from the general course of the stream five hundred feet on either side of the centre thereof:

"In 'bar diggings' a claim shall be:—

"(*a.*) A piece of land not exceeding two hundred and fifty feet square on any bar which is covered at high water; or

"(*b.*) A strip of land two hundred and fifty feet long at high-water mark, and in width extending from high-water mark to extreme low-water mark:

"In 'dry diggings' a claim shall be two hundred and fifty feet square."

The following provision is made for new discoveries of placer-mining ground:—

"If any free miner, or party of free miners, discovers a new locality for the prosecution of placer-mining and such discovery be established to the satisfaction of the Gold Commissioner, placer claims of the following sizes shall be allowed to such discoverers, namely:—

"To one discoverer, one claim..... 600 feet in length;

"To a party of two discoverers, two claims amounting together to ...1,000 feet in length;

"And to each member of a party beyond two in number, a claim of the ordinary size only.

"The width of such claims shall be the same as ordinary placer claims of the same class: Provided that where a discovery claim has been established in any locality no further discovery shall be allowed within five miles therefrom, measured along the watercourses."

Every placer claim shall be as nearly as possible rectangular in form, and marked by four legal posts at the corners thereof, firmly fixed in the ground. On each of such posts shall be written the name of the locator, the number and date of issue of his free miner's certificate, the date of the location, and the name given to the claim. In timbered localities boundary-lines of a placer claim shall be blazed so that the posts can be distinctly seen, underbrush cut, and the locator shall also erect legal posts not more than 125 feet apart on all boundary-lines. In localities where there is no timber or underbrush, monuments of earth and rock, not less than 2 feet high and 2 feet in diameter at base, may be erected in lieu of the last-mentioned legal posts, but not in the case of the four legal posts marking the corners of the claim.

A placer claim must be recorded in the office of the Mining Recorder for the mining division within which the same is situate, within fifteen days after the location thereof, if located within 10 miles of the office of the Mining Recorder by the most direct means of travel. One additional day shall be allowed for every 10 miles additional or fraction thereof. The number of days shall be counted inclusive of the days upon which such location was made, but exclusive of the day of application for record. The application for such record shall be under oath and in the form set out in the Schedule to the Act. A claim which shall not have been recorded within the prescribed period shall be deemed to have been abandoned.

To hold a placer claim for more than one year it must be rerecorded before the expiration of the record or rerecord.

A placer claim must be worked by the owner, or some one on his behalf, continuously, as far as practicable, during working-hours. If work is discontinued for a period of seventy-two hours, except during the close season, lay-over, leave of absence, sickness, or for some other reason to the satisfaction of the Gold Commissioner, the claim is deemed abandoned.

Lay-overs are declared by the Gold Commissioner upon proof being given to him that the supply of water is insufficient to work the claim. Under similar circumstances he has also the power to declare a close season, by notice in writing and published in the Gazette, for all or any claims in his district. Tunnel and drain licences are also granted by him on the person applying giving security for any damage that may arise. Grants of right-of-way for the construction of tunnels or drains across other claims are also granted on payment of a fee of $25, the owner of the claims crossed having the right for tolls, etc., on the tunnel or drain which may be constructed. These tolls, however, are, so far as the amount goes, under the discretion of the Gold Commissioner.

Co-owners and Partnerships.

In both the "Mineral" and "Placer-mining" Acts provision is made for the formation of mining partnerships, both of a general and limited liability character. These are extensively taken advantage of and have proved very satisfactory in their working. Should a co-owner fail or refuse to contribute his proportion of the expenditure required as assessment-work on a claim he may be "advertised out," and his interest in the claim shall become vested in his co-owners who have made the required expenditure, *pro rata* according to their former interests.

It should not be forgotten that if any co-owner permit his free miner's certificate to lapse, the title of his associates is not prejudiced, but his interest reverts to the remaining co-owners; provided that said co-owner has not taken advantage of the six months' period of grace allowed for the taking-out of a special free miner's certificate, thus reviving the title to his interest.

Placer-mining Leases.

Leases of unoccupied Crown lands approximately 80 acres in extent may be granted by the Gold Commissioner of the district after location has been made by staking along a "location-line" not more than one-half a mile (2,640 feet) in length. In this line one bend, or change of direction, is permitted. Where a straight line is followed two posts only are necessary—namely, an "initial post" and a "final post." Where there is a change of direction a legal post must be placed to mark the point of the said change. The leasehold is allowed a width not in excess of one-quarter mile (1,320 feet), and the locator, both on his "initial post" and in his notice of intention to apply, which is posted at the office of the Mining Recorder, is required to state how many feet are included in the location to the right and how many feet to the left of the location-line.

That section of the Act dealing with the staking of placer-mining leases follows:—

"105A. (1.) For the purpose of locating a placer leasehold, a line to be known as the 'location-line' shall be marked on the ground by placing a legal post at each end, one post to be known as the 'Initial Post' and the other as the 'Final Post.' The direction of the location-line may change at not more than one point throughout its length, and an intermediate legal post shall be placed at the point at which the direction changes. The total length of the location-line, following its change of direction (if any), shall not exceed two thousand six hundred and forty feet.

"(2.) Upon the initial post and the final post shall be written the words 'Initial Post' and 'Final Post' respectively, together with the name of the locator and the date of the location. On the initial post shall also be written the approximate compass-bearing of the final post, and a statement of the number of feet of the leasehold lying on the right and on the left of the location-line, as viewed from the initial post, not exceeding in the aggregate a width of thirteen hundred and twenty feet, thus: 'Direction of Final Post, . feet of this claim lie on the right and feet on the left of the location-line.' In addition to the foregoing, where there is a change of direction in the location-line as marked on the ground, the number '1' shall be written on the initial post; the number '2' shall be written on the intermediate post; and the number '3' shall be written on the final post. There also shall be affixed to the initial post a notice to the following effect, namely: 'Application will be made under the "Placer-mining Act" for a lease of the ground within this location.'

"(3.) The location-line shall at the time of location be marked between the legal posts throughout its length so that it can be distinctly seen; in a timbered locality, by blazing trees and cutting underbrush, and in a locality where there is neither timber nor underbrush, by placing legal posts or monuments of earth or stones not less than two feet high and not less than two feet in diameter at the base, so that the location-line can be distinctly seen.

"(4.) Where, from the nature or shape of the surface of the ground, it is impracticable to mark the location-line of a leasehold as provided by this section, the leasehold may be located by placing legal posts as witness-posts, as near as possible to the location-line, and writing on each witness-post the distance and compass-bearing of some designated point on the location-line from the witness-post; and the distances and compass-bearing so written on the witness-posts shall be set out in the application for the lease and in any lease granted thereon.

"(5.) The locator shall, within thirty days after the date of the location, post a notice in Form 1 in the office of the Mining Recorder, which notice shall set out:—

"(*a.*) The name of the intending applicant or each applicant if more than one, and the numbers of their free miners' certificates:

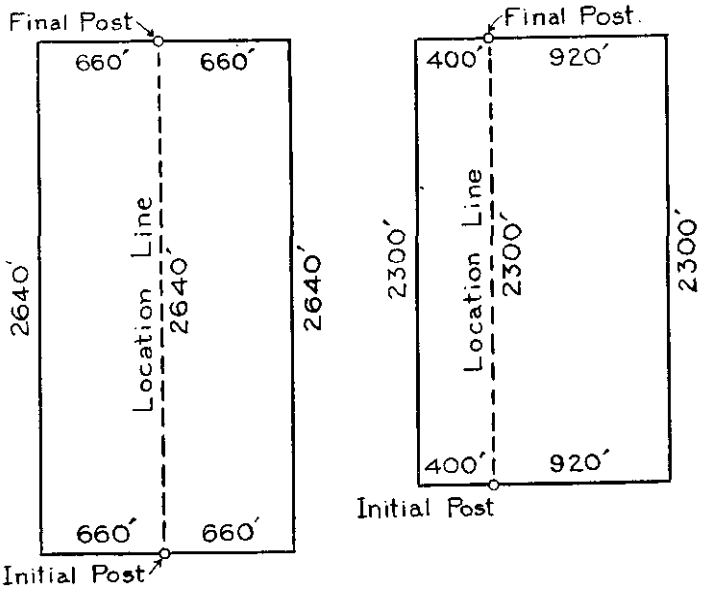
"(*b.*) The date of the location:

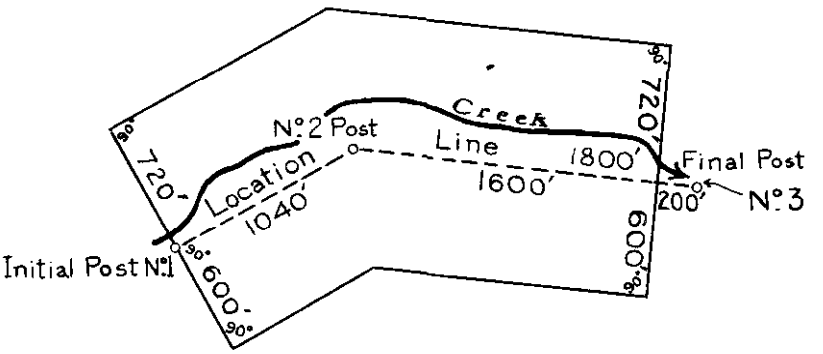
"(*c.*) The number of feet lying to the right and left of the location-line, and the *approximate area or size of the ground.*

The words written on the initial post and final post shall be set out in full in the notice; and as accurate a description as possible of the ground to be acquired shall be given, having special reference to any prior locations it may join, and the general locality of the ground to be acquired.

EXAMPLES OF VARIOUS METHODS OF LAYING OUT PLACER LEASEHOLDS.

Showing Areas secured with Location-lines of Various Lengths.





"(6.) The location and area of the placer leasehold shall be determined by establishing its end lines running from or through the initial post and from or through the final post, at right angles to the course of the location-line at those posts, respectively; and by establishing its side-line parallel to the course or courses of the location-line, and distant one thousand three hundred and twenty feet from each other."

Another provision is that there must be affixed to the "initial post" and to the "final post" a numbered metal identification tag furnished by the Mining Recorder with each free miner's certificate issued. These tags may be attached to the posts, or placed in a container within a cairn, either at the time of location or some time during the succeeding year, but must be so placed before the Mining Recorder will grant the first certificate of work in respect of the leasehold.

The annual rental on a placer-mining lease is $30, and the amount to be expended annually on development-work is $250.

Dredging leases on rivers for 5 miles below low-water mark are also granted. Section 122 of the Act establishes a definite method of staking such mining ground. Authority also has been given for the granting of placer-mining leases for dredging purposes in locations other than has been defined.

For more detailed information the reader is referred to the complete "Placer-mining Act," which may be obtained from the King's Printer, Victoria, B.C.

Table of Fees, Mineral Act and Placer-mining Act.

Individual free miner's certificate, annual fee	$5.00
Company free miner's certificate (capital $100,000 or less), annual fee	50.00
Company free miner's certificate (capital over $100,00), annual fee	100.00
Recording mineral or placer claim	2.50
Recording certificate of work, mineral claim	2.50
Rerecord of placer claim	2.50
Recording lay-over	2.50
Recording abandonment, mineral claim	10.00
Recording abandonment, placer claim	2.50
Recording any affidavit under three folios	2.50
Per folio over three, in addition	.30
Records in "Records of Conveyances," same as affidavits.	
Filing documents, "Mineral Act"	.25
Filing documents, "Placer-mining Act"	1.00
Recording certificate of work, placer-mining lease	2.50
For Crown grant of mineral rights under "Mineral Act"	25.00
For Crown grant of surface rights of mineral claim under "Mineral Act"	10.00
For every lease under "Placer-mining Act"	5.00

Provisional Free Miners' Certificates (Placer) Act.

This Act was passed at the 1932 session of the Provincial Legislature and provides for the issuance of "provisional free miners' certificates" for the locating, recording, representing, and working of placer claims of a size, and according to the terms, and in the manner set out in Parts II. and III. of the "Placer-mining Act." Any person over 18 years of age who has resided in the Province continuously for a perod of not less than six months prior to date of his application may, on application accompanied by a statutory declaration or other satsfactory evidence as to his age and period of residence in the Province, obtain from any Gold Commissioner or Mining Recorder a provisional free miner's certificate. No fees are payable in respect of such certificate, and it abolishes the fees payable in respect of the recording or rerecording of placer claims, but no record or rerecord of a claim shall be granted for a longer period than one year without the payment of fees. It should be pointed out that the provisional free miner's certificate does not carry the privileges of an ordinary free miner's certificate as to the staking and working of placer-mining leases or mineral claims.

An amendment passed at the 1933 session of the Legislative Assembly gives the Lieutenant-Governor in Council, as a means of unemployment relief, power to make provision for the establishment, equipment, maintenance, and operation of one or more placer training camps at suitable locations, at which unemployed persons who hold provisional free miners' certificates and are British subjects may acquire knowledge and training in the art of placer-mining and may be afforded gainful work in the recovery of minerals by placer-mining. Reserves for the location of such camps shall not exceed one mile in length by one-half a mile in width, and the

right is given to enter into agreements with private holders under the Act for the development of their ground by means of unemployment relief camps.

Mines Development Act.

When it is shown to the satisfaction of the Minister of Mines that ore-bodies exist in quantity and of commercial value sufficient to warrant the expenditure of public moneys, the Minister of Mines may authorize the expenditure of so much of the public money as may be required for the construction, reconstruction, or repair of trails, roads, and bridges to facilitate the operation and development of such mineral or placer claims.

Furthermore, the Minister of Mines may authorize the expenditure of public money towards the building or repairing of trails and bridges in or to any mineral district for the purpose of facilitating the exploration of the mineral resources of the district, such expenditure not to exceed 50 per cent. of the cost of the work. If such roads, trails, or bridges have been built by any person or company having mining interests in the district, the Minister of Mines may refund to such person a portion, not exceeding 50 per cent. of the cost of such construction.

Mineral Survey and Development Act, 1929.

PART I.—MINERAL SURVEY.

A mineral survey of the Province has been established, to be carried on continuously and records thereof kept.

For this purpose the Province has been divided into Mineral Survey Districts, and there are five Resident Engineers who, with such assistance as is necessary, devote their whole time to carrying out the provisions of this Act, reporting direct to the Minister.

PART II.—AID TO PROSPECTORS.

The Resident Engineer in each district shall aid prospectors, as far as practicable:—

(*a.*) By giving information as to mineral indications and as to ground open for location as mineral claims or placer claims as a result of knowledge gained during the carrying-out of the mineral survey of his district:

(*b.*) By examining samples and applying such tests as may be possible on the ground or in his office and advising as to the nature of any mineral and as to the best available methods of analysis, sampling, assay, and test:

(*c.*) By forwarding samples to the Minister of Mines for further examination and tests whenever in his opinion such course is necessary or expedient:

(*d.*) By reporting to the Minister of Mines the location and approximate cost of such roads, trails, and bridges as in his opinion are reasonably necessary in order to render possible the development of any mineral resources; and

(*e.*) Generally, by giving such advice, information, and directions as may be of assistance to miners and prospectors within his district.

PART III.—PROTECTION OF WAGE-EARNERS.

1. Every person giving or making a working bond or a lease, with or without any option for sale, of any mining property shall insert therein a provision that during the currency of the bond or lease all free miners and wage-earners employed on or about the mining property shall be paid their wages semi-monthly, and shall demand and receive a letter, to be procured by the holder of the bond or lease from a Gold Commissioner or Government Agent or Mining Recorder, stating that security for such wages has been given pursuant to this section, otherwise the person giving or making the bond or lease shall be under personal liability to pay all such wages.

2. Every person taking a right or option to work or purchase any mining property shall furnish to the nearest Gold Commissioner, or Government Agent, or Mining Recorder adequate security from time to time for the payment semi-monthly of the wages of all free miners and wage-earners employed on or about the mining property, on the terms that every such security shall be forthwith realized and payment of wages made upon any default; and every Gold Commissioner, Government Agent, and Mining Recorder shall have full power and authority

to realize upon the security lodged with him so as to make payment of any wages in default, and shall make payment thereof up to the amount realized.

PART IV.—PROTECTION OF INVESTORS.

Each Resident Engineer shall, upon receiving notice of any advertised or solicited sale of shares in any company or in any claim or mine or mineral property whatsoever, upon statements or terms not in accordance with actual facts and conditions, notify the Minister of Mines, who, upon investigation, may, if found necessary, give such notice, either personal or public, as may be necessary to prevent any injury to investors; and every notice given under this section by the Minister of Mines shall be absolutely privileged.

Iron and Steel Bounties Act, 1929.

The Lieutenant-Governor in Council may enter into an agreement with any person whereby the Crown will pay to that person, out of the Consolidated Revenue Fund, bounties on pig-iron and steel shapes when manufactured within the Province, as follows:—

(*a.*) In respect of pig-iron manufactured from ore, on the proportion produced from ore mined in the Province, a bounty not to exceed three dollars per ton of two thousand pounds:

(*b.*) In respect of pig-iron manufactured from ore, on the proportion produced from ore mined outside the Province, a bounty not to exceed one dollar and fifty cents per ton of two thousand pounds:

(*c.*) In respect of steel shapes of commercial utility manufactured in the Province, a bounty not to exceed one dollar per ton of two thousand pounds.

Bounty, as on pig-iron under this Act, may be paid upon the molten iron from ore which in the electric furnace, Bessemer or other furnace, enters into the manufacture of steel by the process employed in such furnace; the weight of such iron to be ascertained from the weight of the steel so manufactured.

Bounty on steel shapes under this Act shall be paid only upon such steel shapes as are manufactured in a rolling-mill having a rated productive capacity per annum of at least twenty thousand tons of two thousand pounds per ton.

Phosphate-mining Act, 1925.

This Act takes the mineral tricalcium phosphate out of the "Mineral Act" for the purpose of administration. This is done to make possible the staking of phosphate claims one mile square in area.

Any person desirous of securing a licence to prospect for phosphate is required to stake the land he may wish to acquire and work; and after such staking shall post in the office of the Gold Commissioner for the mining division in which the land is situated a notice of his intention to apply for a licence. Then the applicant is required to make application in writing to such Gold Commissioner for a prospecting licence over the land for any term not exceeding one year. The Gold Commissioner shall forward this application to the Hon. the Minister of Mines, who may grant to the applicant a prospecting licence. Application shall be accompanied by a licence fee of $100. The land to be acquired shall be of a rectangular shape and shall not exceed 640 acres for each licence, measuring 80 chains by 80 chains, and boundary-lines shall be run true north and south and true east and west. A renewal of the licence may be obtained for a second period of one year upon payment of further licence fee of $100, and furnishing proof that he has explored for phosphate and has expended not less than $50 in such exploration-work. An extension of the term for a third period of one year may be granted upon like conditions and terms. Provision is made for the payment of $150 in cash in lieu of exploration-work. The cost of the survey of the land, not being less than $150, can be counted as exploration-work. If during any one year work is done to a greater extent than the required $50—but not less—same may be applied as work for any subsequent year that the licence remains in force.

The Lieutenant-Governor in Council may grant a lease of the land covered by a prospecting licence to any licensee who during the existence of his licence, or within thirty days following the expiry of same, gives satisfactory evidence that he has discovered phosphate on such lands. He shall at the same time pay a sum sufficient to cover the first annual rental

and also shall have expended not less than $50 per licence in exploration-work during the term of the last renewal licence or tender in lieu thereof the sum of $50 per licence. Such lease shall be granted for a term of five years, renewable for three years, and for a further three years after the expiry of the first renewal. A lease shall not be issued until the land has been surveyed by an authorized land surveyor. An annual rental rate of 15 cents per acre shall be payable under said lease.

The lease provides for the expenditure of not less than $100 per annum in the development of a mine, or the payment of $100 in lieu of such development-work. Excess work done in any one year may be applied as work to subsequent years. Provision is also made for the purchase of phosphate-mining rights.

Metalliferous Mines Regulation Act.

At the 1935 session of the Provincial Legislature " An Act to amend and consolidate the Enactments regulating the Working of Metalliferous Mines, Quarries, and Metallurgical Works " was passed. This Act is known as the " Metalliferous Mines Regulation Act," and, in its general tone, its clear purpose is to maintain the highest standard in respect of safety and of healthy conditions, both on the surface and underground in mining operations. The idea is to not only assure, as far as practicable, the protection of workmen against injury, but to establish those conditions best calculated to safeguard the health of the men employed. The Act also provides for the drafting of regulations, if such are found necessary, for the protection of men who are working under conditions which may lead to pulmonary disability.

This Act may be divided into six parts, as follows:—

(1.) Administration:
(2.) Duties of owners, managers, and others:
(3.) Special Rules for protection of miners:
(4.) General Rules, having reference to: (*a*) Employees; (*b*) Ventilation; (*c*) Explosives and blasting; (*d*) Fire-protection; (*e*) Connection between mines; (*f*) Mine signals; (*g*) Aid to injured; (*h*) Prevention of dust; (*i*) Handling of water; (*j*) Sanitation; (*k*) Protection of working-places, shafts, winzes, raises, etc.; (*l*) Ladder-ways; (*m*) Shaft equipment and operation; (*n*) Testing of brakes; (*o*) Haulage; (*p*) Protection from machinery; (*q*) Electrical installations:
(5.) General Rules for quarries:
(6.) Supplemental.

SUMMARY OF ACTS SPECIALLY RELATING TO MINING.

(The complete Acts may be obtained from the King's Printer, Victoria, B.C.)

Mining Licences under the Coal and Petroleum Act.

Any person desiring to prospect for coal, petroleum, or natural gas upon any unsurveyed unreserved lands in which these resources are held by the Crown may acquire a licence to do so over a rectangular block of land not exceeding 640 acres, of which the boundaries shall run due north and south and east and west, and no side shall exceed 80 chains (1 mile) in length. Before entering into possession of the said lands he shall place at the corner of such block a legal stake, or initial post, and shall inscribe thereon his name and the angle respresented by such post, thus: "A. B.'s N.E. corner," or as the case may be, and shall post in a conspicuous place upon the said land, and also in the Government office of the land recording district, notice of his intention to apply, as well as publishing the same in the B.C. Gazette and local newspaper once each week for four consecutive weeks. If the area applied for is surveyed no staking is required, but the same procedure with regard to advertising notice of intention to apply is necessary.

The application for said licence shall be in writing, in duplicate, and shall contain the best written description possible, with a diagram of the land sought to be acquired, and shall be accompanied with a fee of $100. The application shall be made to the Commissioner of Lands for the district, and by him forwarded to the Minister of Lands, who will grant such licence—provided no reasons arise to the contrary—for a period not to exceed one year, and at the expiration of the first year an extension of such licence may be granted for a second or third year at a fee of $100.

Where coal is discovered during the existence of licence or within thirty days after expiration, the land held under licence, having been surveyed and licence conditions fulfilled, may be leased for five years at rental of 15 cents an acre, subject to renewals for five successive periods of three years each, renewal fee being $100 for each lease, in addition to annual rental.

Lessees, on showing continuous work has been done and reasonable expenditure made for development, may, after carrying out the provisions of the lease, purchase at $20 per acre where surface is available, or $15 per acre for under-surface rights where surface is not available. Lands under the sea may be purchased at $15 per acre. Provided also that, in addition to the rental or purchase price, there shall be paid to the Government as a royalty 2½ cents a barrel (35 imperial gallons) of crude petroleum raised or gotten from such land. (*See* chapter 162, R.S.B.C. 1924.)

Taxation Act.

A preliminary note is essential to the understanding of this Act. As the law has stood, a Crown-granted mineral claim on which taxes were in arrears for a number of years was offered for sale by the Government at a *tax* sale, with arrears of taxes plus interest and charges and Crown-grant fees as an upset price. If no sale was made the property remained in the hands of the Assessor until desired by some one, when it could only be purchased by tender. It was not open to location under the "Mineral Act" and a prospector had no protection, and to relieve the situation an amending Act was passed.

Under the amended Act such reverted Crown-granted mineral claim may be obtained by any person under a lease for one year upon payment of $25, and a renewal of such lease may be granted upon payment of further $25 for a further period of one year, but no longer. During the period of such lease the lessee has the right to enter, prospect, and mine on such mineral claim, save for coal, petroleum, and natural gas, and during such time the lessee has the option to purchase such Crown-granted mineral claim upon payment of all taxes, costs, and interest which remained due and unpaid on such claim on the date of its forfeiture to the Crown, together with an amount equal to all taxes and interest which, except for its forfeiture to the Crown, would have been payable in respect thereof from the date of the lease to the date of application for a Crown grant. If, however, the lessee establishes to the satisfaction of the Gold Commissioner that he has expended upon the claim in mining-development work a sum of not less than $200 a year during the continuance of the lease, then the payment of the sum in

respect of taxes and penalties from the date of the lease to the date of application for a Crown grant shall not be required. Provision also is made for the grouping of adjoining claims, not exceeding eight in number, and the performing on one of such claims mining-development work for all of the claims.

A person may obtain a lease, or interest in a lease, of eight such claims in the same mining division.

Such leases are not transferable and are subject to the rights any person may already hold to any portion of the surface of such Crown-granted mineral claim.

Taxation of Mines.

Crown-granted mineral claims are subject to a tax of 25 cents per acre. The tax becomes due on April 1st in each year, and if unpaid on the following June 30th is deemed to be delinquent.

All mines, other than coal, are subject to an output tax (payable quarterly) of 2 per cent. on gross value of ore, less cost of transportation from mine to reduction-works and the cost of treating same at reduction-works or on the mining premises.

Any such mine, not realizing on ore shipments a market value of $5,000 in any one year, is entitled to a refund of the output tax paid.

All mines are subject to a tax upon income, subject to the exemptions and allowances given in the " Income Tax Act "; provided, in the case of those mines paying an output tax, that an income tax is only collected if such tax prove greater than the output tax, and the output tax is then regarded as part payment of the income tax.

In addition to the ordinary working expenses, mines are allowed to deduct from their income a charge for:—

(1.) Development—being such proportion of this capital expenditure as is ascertained to be chargeable to the year's operation:
(2.) Depreciation of buildings and plant:
(3.) Depletion—being such proportion of the capital cost of the mine as, being a wasting asset, is ascertained to be chargeable to the year's operation.

The above-mentioned charges are allowable at the discretion of the Minister of Finance, subject, however, to an appeal to the Lieutenant-Governor in Council.

The rate of income tax varies from 1 per cent. up to a maximum of 10 per cent. on incomes of $19,000 and over.

Coal is subject to a tax of 10 cents per ton of 2,240 lb., except coal shipped to coke-ovens within the Province. Tax payable monthly.

Coke is subject to a tax of 10 cents per ton of 2,240 lb., except in respect of coke produced from coal upon which this tax has already been paid. Tax payable monthly.

Coal land from which coal is being mined (Class A) is taxed at 1 per cent. upon the assessed value, in addition to any other tax.

Unworked coal land, known as " Coal Land, Class B," is subject to a tax of 2 per cent. upon the assessed value.

For further particulars *see* the " Taxation Act," also the " Public Schools Act," which are obtainable from the King's Printer, Victoria, B.C.

ASSAY OFFICE.

BY

D. E. WHITTAKER.

During the year 1935 there were made by the staff in the Government Assay Office 6,548 assays or quantitative determinations and 279 analyses; of these the majority were for the Department of Mines or for the other departments, for which no fees were received.

The fees collected by the office were as follows:—

Fees for analyses	$122.00
Fees for assaying	63.50
Fees for assayers' examinations	300.00
Total cash receipts	$485.50

Determinations and examinations made for other Government departments, for which no fees were collected:—

Attorney-General's Department	$393.00
Agricultural Department	2,098.00
Board of Health	865.00
Forest Branch	210.00
Other departments	95.00
Treasury	232.00
	$3,893.00

Value of work done outside of Mines Department work.... $4,378.50

One hundred and fifty-five lots of gold was received from the Gold Commissioners, who are purchasing amounts up to 2 oz. to aid the prospector in disposing of his gold.

FREE DETERMINATIONS.

In addition to the above quantitative work, about 703 qualitative determinations, or tests, were made in connection with the identification and classification of rocks or minerals sent to the Assay Office for a report; for these no fees were charged, as it is the established custom of the Department to examine and test qualitatively, without charge, samples of minerals sent in from any part of the Province, and to give a report on the same. This has been done for the purpose of encouraging the search for new or rare minerals and ores, and to assist prospectors and others in the discovery of new mining districts, by enabling them to have determined, free of cost, the nature and probable value of any rock they may find. In making these free determinations, the Department asks that the locality from which the sample was obtained be given by the sender.

EXAMINATION FOR ASSAYERS.

The writer has the honour, as Secretary, to submit the Annual Report for the year 1935 of the Board of Examiners for Certificates of Competency and Licence to Practise Assaying in British Columbia, as established under the "Department of Mines Act, 1934."

A meeting of the Board of Examiners was held on May 31st, July 22nd, and December 14th, 1935. Two candidates applied for examination on May 27th and one passed the examination. One candidate applied for examination on December 9th and passed the examination. One candidate applied for exemption under section 10, subsection (2), of the Act on July 22nd. One candidate applied for exemption under section 10, subsection (2), of the Act on December 9th. The Board recommended that certificates be issued to the above-mentioned four candidates.

In accordance with the recommendations of the Board, certificates have been duly issued by the Honourable the Minister of Mines to the four successful candidates.

GOLD COMMISSIONERS AND MINING RECORDERS.

The following list shows the Gold Commissioners and Mining Recorders of the Province:—

Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Deputy Recorder.
Atlin	Atlin	H. F. Glassey	H. F. Glassey	
Sub-office	Telegraph Creek			J. V. Boys.
Sub-office	Haines (U.S.)		(Com. for taking Affidavits)	B. A. Barnett.
Sub-office	Squaw Creek via Atlin			Mrs. F. Muncaster.
Sub-office	Tulsequah			H. L. Fraser.
Sub-office	Juneau (U.S.)		(Com. for taking Affidavits)	Harold E. Brown.
Stikine	Telegraph Creek	J. V. Boys	J. V. Boys	
Sub-office	Boundary via Telegraph Creek			Duncan Miller.
Sub-office	Burns Lake			T. E. Taylor.
Liard	Telegraph Creek	J. V. Boys	J. V. Boys	
Sub-office	McDame Creek			R. J. Meek.
Sub-office	Fort St. John			F. W. Beatton.
Sub-office	Fort Nelson			J. S. Clark.
Sub-office	Dease Lake Townsite			John Fleming.
Skeena	Prince Rupert	N. A. Watt	N. A. Watt	
Sub-office	Kitimat			Chas. E. Moore.
Sub-office	Copper River			L. G. Skinner.
Sub-office	Terrace			O. T. Sundal.
Sub-office	Stewart (Portland Canal)			H. W. Dodd.
Sub-office	Rosswood			Mrs. Alberta Smith.
Sub-office	Kimsquit			Percy Gadsden.
Nass River	Anyox	N. A. Watt	E. Ross Oatman	
Sub-office	Alice Arm			Mrs. L. Cummings.
Sub-office	Stewart			H. W. Dodd.
Portland Canal	Stewart	N. A. Watt (at Prince Rupert)	H. W. Dodd	
Bella Coola	Prince Rupert	N. A. Watt	N. A. Watt	
Sub-office	Bella Coola			C. A. Brynildsen.
Sub-office	Bella Bella			
Sub-office	Ocean Falls			Geo. H. Hill.
Sub-office	Kimsquit			Percy Gadsden.
Queen Charlotte	Queen Charlotte	N. A. Watt	G. A. Charter, M.D.	
Sub-office	Jedway			W. T. Reavley.
Sub-office	Masset			T. D. Brunton.
Sub-office	Lockeport			
Omineca	Smithers	H. B. Campbell	H. B. Campbell	
Sub-office	Fort Grahame			L. T. Kempple.
Sub-office	Bella Coola			C. A. Brynildsen.
Sub-office	Finlay Forks			A. MacKinnon.
Sub-office	Fort St. James			Alec Kynoch.
Sub-office	Manson Creek			W. B. Steele.
Sub-office	Telkwa			T. J. Thorp.
Sub-office	Prince George			Geo. Milburn.
Sub-office	Hudson Hope			F. F. Monteith.
Sub-office	Kimsquit			Percy Gadsden.
Sub-office	Fort St. John			F. W. Beatton.
Sub-office	Whitewater (Finlay River) via Fort Grahame			James Ware.
Sub-office	Fort McLeod			J. E. McIntyre.
Sub-office	Cedarvale			John Thompson.
Sub-office	Terrace			O. T. Sundal.
Sub-office	Fort Fraser			J. D. Moore.
Sub-office	Vanderhoof			Geo. Ogsden.
Sub-office	Pacific			T. H. McCubbin.
Sub-office	Hazelton			Wm. Grant.
Sub-office	Burns Lake			T. E. Taylor.
Sub-office	Usk			Jas. L. Bethurem.
Sub-office	Takla Landing			Mrs. Wilhemina Aiken.
Sub-office	Copper River			L. G. Skinner.

GOLD COMMISSIONERS AND MINING RECORDERS—*Continued.*

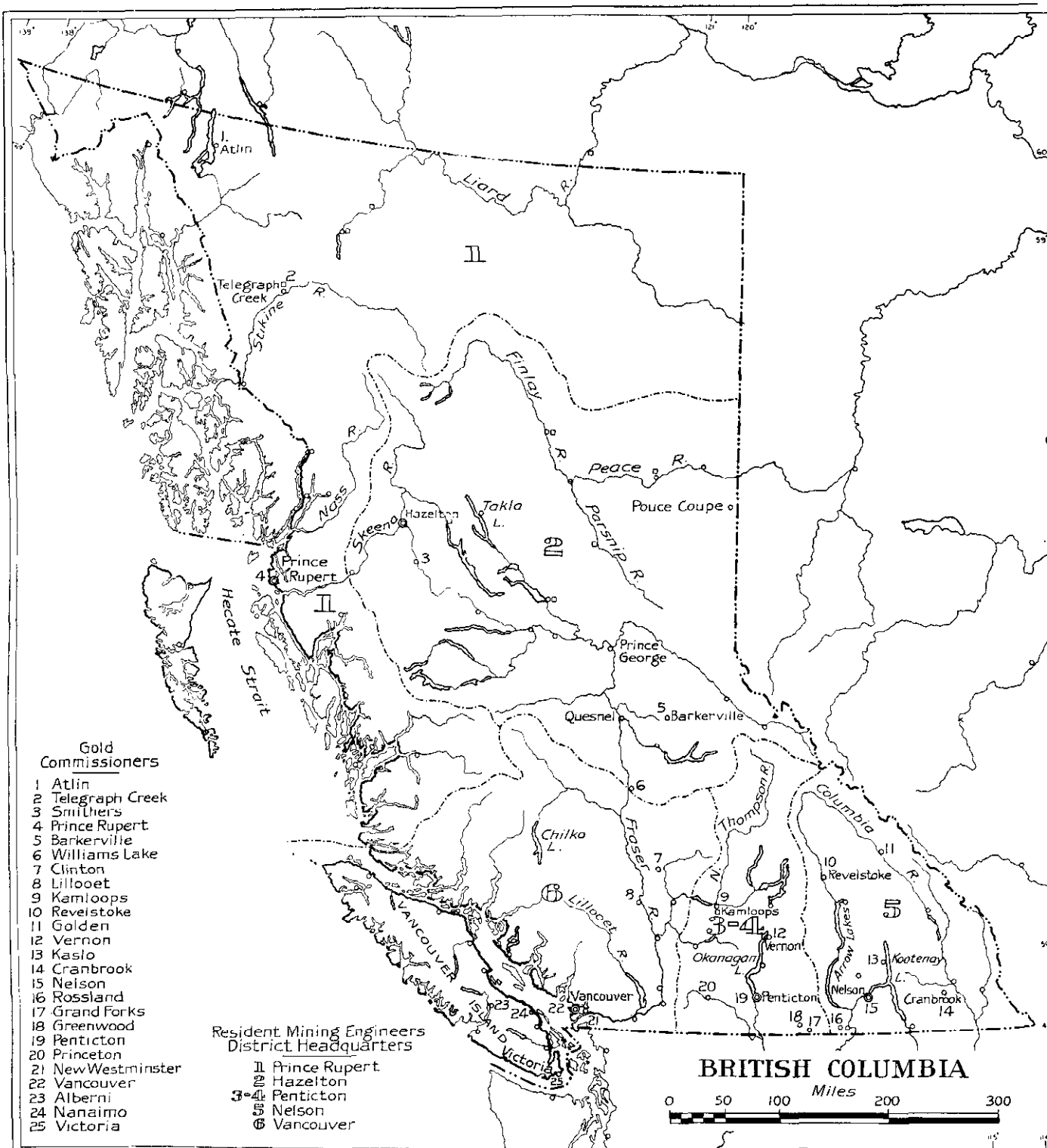
Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Deputy Recorder.
Peace River	Fort St. John	H. B. Campbell (at Smithers)	F. W. Beatton	
Sub-office	Prince George			G. Milburn.
Sub-office	Finlay Forks			A. MacKinnon.
Sub-office	Hudson Hope			F. F. Monteith.
Sub-office	Pouce Coupe			M. S. Morrell.
Cariboo	Barkerville	J. P. Scarlett	J. P. Scarlett	Miss L. D. Boyd.
Sub-office	Quesnel			E. C. Lunn.
Sub-office	Prince George			Geo. Milburn.
Sub-office	McBride			R. McKinlay.
Quesnel	Williams Lake	L. C. Maclure	L. C. Maclure	
Sub-office	Quesnel			E. C. Lunn.
Sub-office	Likely			A. Morrison.
Sub-office	Barkerville			J. P. Scarlett.
Sub-office	Horsefly			A. B. Campbell.
Sub-office	Keithley Creek			Hugh Adams.
Clinton	Clinton	R. J. A. Dorrell	R. J. A. Dorrell	
Sub-office	Williams Lake			L. C. Maclure.
Sub-office	Haylmore, Bridge River P.O.			W. Haylmore.
Sub-office	Hanceville			Edwin Rennie Hance.
Kamloops	Kamloops	E. Fisher	E. Fisher	
Sub-office	Chu Chua			George M. Fennell.
Sub-office	Vavenby			H. Finley.
Sub-office	Salmon Arm			A. P. Suckling.
Ashcroft	Ashcroft	E. Fisher (at Kam.)	W. C. Adam	Geo. D. Mead.
Sub-office	Lytton			J. A. Carmichael.
Nicola	Merritt	E. Fisher (at Kam.)	A. G. Freeze	
Yale	Hope	E. Fisher (at Kam.)	H. Beech	J. W. Chadwick.
Sub-office	Lytton			J. A. Carmichael.
Similkameen	Princeton	Chas. Nichols	Chas. Nichols	
Sub-office	Hedley			R. E. Baxter.
Vernon	Vernon	R. M. McGusty	R. M. McGusty	F. H. C. Wilson.
Sub-office	Kelowna			C. W. Dickson.
Greenwood	Greenwood	L. A. Dodd	L. A. Dodd	
Sub-office	Kettle Valley			G. B. Gane.
Sub-office	Beaverdell			T. W. Clarke.
Sub-office	Oliver			W. H. Laird.
Grand Forks	Grand Forks	E. Harrison	E. Harrison	
Osoyoos	Penticton	W. R. Dewdney	W. R. Dewdney	
Sub-office	Keremeos			L. S. Coleman.
Sub-office	Hedley			R. E. Baxter.
Sub-office	Oliver			W. H. Laird.
Golden	Golden	A. W. Anderson	A. W. Anderson	H. C. Moore.
Windermere	Windermere	A. W. Anderson (at Golden)	A. M. Chisholm	
Fort Steele	Cranbrook	J. E. Kennedy	J. E. Kennedy	
Sub-office	Fernie			H. R. Bryant.
Ainsworth	Kaslo	Ronald Hewat	W. M. H. Dunn	
Sub-office	Trout Lake			Jno. E. Jones.
Sub-office	Poplar Creek			A. Robb.
Slocan	New Denver	Ronald Hewat (at Kaslo)	Frank Broughton	
Sub-office	Sandon			W. J. Parham.
Slocan City	Slocan	Ronald Hewat	T. McNeish	W. E. Graham.
Nelson	Nelson	J. Cartmel	J. Cartmel	
Sub-office	Creston			R. H. Hassard.
Sub-office	Ymir			Wm. Clark.
Sub-office	Salmo			M. C. Donaldson.
Arrow Lake	Nakusp	J. Cartmel (at Nelson)	N. A. Herridge	
Revelstoke	Revelstoke	Wynfield Maxwell	W. Maxwell	
Lardeau	Beaton	Wynfield Maxwell (at Revelstoke)	Stephen Rowe	
Sub-office	Trout Lake			Jno. E. Jones.

GOLD COMMISSIONERS AND MINING RECORDERS—*Continued.*

Mining Division.	Location of Office.	Gold Commissioner.	Mining Recorder.	Deputy Recorder.
Trail Creek	Rossland	W. H. Reid	W. H. Reid	
Nanaimo	Nanaimo	C. L. Monroe	C. L. Monroe	
Sub-office	Ladysmith			J. A. Knight.
Sub-office	Alert Bay			Jos. Howe.
Sub-office	Vananda			Henry Carter.
Sub-office	Shoal Bay, Thurlow P.O.			C. C. Thompson.
Sub-office	Granite Bay			Henry Twidle.
Sub-office	Powell River			A. C. Sutton.
Sub-office	Cumberland			S. B. Hamilton.
Alberni	Alberni	W. H. Boothroyd	W. H. Boothroyd	
Clayoquot	Clayoquot	W. H. Boothroyd (at Alberni)	W. T. Dawley	
Sub-office	Ceepeecee			P. McGregor.
Quatsino	Quatsino	W. H. Boothroyd (at Alberni)	Ed. Evenson	
Victoria	Victoria	R. J. Steenson	R. J. Steenson	J. P. Mulcahy.
New Westminster	New Westminster	A. P. Grant	A. B. Gray	
Sub-office	Chilliwack			Chas. J. Whittaker.
Vancouver	Vancouver	A. S. Tyrer	R. A. Burgoyne	
Lillooet	Lillooet	L. J. Price	L. J. Price	T. B. Williams.
Sub-office	Haylmore, Bridge River P.O.			W. Haylmore.

GOLD COMMISSIONERS' AND MINING RECORDERS' OFFICE STATISTICS, 1935.

District and Division.	Free Miners' Certificates.			Lode-mining.					Placer-mining.				Revenue.		Total.	
	Individual.	Company.	Special.	Mineral Claims recorded.	Certificates of Work.	Bills of Sale, etc.	Certificates of Improvements.	Leases of Re-verted Crown-granted Mineral Claims.	Placer Claims recorded.	Placer Leases recorded (Bench, Creek, and Dredging).	Certificates of Work, Placer Leases.	Bills of Sale, etc.	Free Miners' Certificates.	General.	Mining Divisions.	Districts.
North-western District (No. 1)																**$23,536.75**
Atlin	379	6	3	65	126	14	.....	5	83	89	136	60	$2,175.50	$8,869.25	$11,044.75	.....
Stikine	139	.....	1	6	.....	12	.....	.....	.....	3	12	5	660.25	789.00	1,449.25	.....
Liard	116	.....	.....	217	120	29	.....	.....	1	8	37	12	357.75	2,990.25	3,348.00	.....
Nass River	62	2	.....	47	179	4	.....	.....	.....	.....	.....	.....	452.50	756.80	1,209.30	.....
Portland Canal	192	3	.....	197	624	16	34	.....	4	1	.....	11	1,210.75	2,524.55	3,735.30	.....
Skeena	152	1	.....	72	69	17	.....	13	4	.....	.....	1	743.00	806.75	1,549.75	.....
Queen Charlotte	29	.....	.....	28	11	7	.....	.....	3	13	9	15	128.00	885.65	1,013.65	.....
Bella Coola	16	.....	.....	5	26	5	.....	1	.....	.....	.....	.....	76.25	110.50	186.75	.....
North-eastern District (No. 2)																**77,111.46**
Cariboo	504	6	3	1,577	1,425	359	20	.....	58	360	355	220	3,346.25	40,125.25	43,471.50	.....
Quesnel	632	3	3	289	351	45	.....	.....	71	134	188	124	2,246.00	15,988.75	18,234.75	.....
Omineca	583	6	2	379	1,079	148	21	12	36	82	170	128	3,400.50	11,949.71	15,350.21	.....
Peace River	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	55.00	55.00	.....
Central District (No. 3)																**12,596.69**
Nicola	69	.....	2	119	113	20	.....	.....	.....	.....	.....	.....	311.50	800.60	1,112.10	.....
Vernon	344	3	1	239	135	47	.....	3	40	11	19	18	1,605.00	3,216.64	4,821.64	.....
Kamloops	649	1	5	436	356	89	4	4	30	20	2	32	2,884.50	3,778.45	6,662.95	.....
Southern District (No. 4)																**23,005.40**
Grand Forks	115	.....	.....	100	91	13	.....	41	.....	.....	3	1	515.75	1,725.30	2,241.05	.....
Greenwood	298	5	1	219	435	62	.....	28	10	11	31	14	1,376.75	4,160.65	5,537.40	.....
Osoyoos	334	9	.....	488	630	137	3	25	1	1	.....	.....	2,111.75	3,794.45	5,906.20	.....
Similkameen	366	3	1	199	282	46	1	1	17	103	67	102	1,839.00	7,481.75	9,320.75	.....
Eastern District (No. 5)																**33,282.05**
Fort Steele	388	5	2	214	259	121	.....	7	9	25	86	32	2,054.50	6,298.20	8,352.70	.....
Windermere	44	2	1	43	91	7	.....	.....	4	6	.....	.....	333.25	849.75	1,183.00	.....
Golden	80	3	1	43	65	20	.....	.....	.....	2	11	17	527.25	977.85	1,505.10	.....
Ainsworth	140	3	2	83	205	19	1	58	12	1	.....	.....	942.25	2,434.25	3,376.50	.....
Slocan	59	1	.....	41	42	8	.....	.....	.....	.....	.....	.....	382.75	376.50	759.25	.....
Slocan City	35	.....	.....	75	75	12	.....	.....	.....	.....	.....	.....	170.50	408.85	579.35	.....
Nelson	540	16	5	598	716	110	6	95	25	10	5	12	3,912.75	7,565.20	11,477.95	.....
Arrow Lake	34	.....	.....	25	16	6	.....	.....	.....	9	.....	.....	160.50	137.75	298.25	.....
Trail Creek	183	5	1	31	42	6	.....	22	.....	10	.....	7	1,169.50	983.85	2,153.35	.....
Revelstoke	114	1	3	70	119	20	.....	8	6	2	17	12	590.25	1,819.55	2,409.80	.....
Lardeau	62	3	.....	33	173	9	.....	.....	.....	.....	.....	.....	550.00	636.80	1,186.80	.....
Western District (No. 6)																**73,835.34**
Nanaimo	156	.....	1	155	279	67	4	6	.....	.....	.....	.....	635.70	1,675.45	2,311.15	.....
Alberni	61	.....	.....	39	65	14	.....	8	2	.....	2	.....	292.75	1,062.50	1,355.25	.....
Clayoquot	34	.....	.....	137	153	30	.....	.....	4	.....	7	1	165.25	1,047.40	1,212.65	.....
Quatsino	25	.....	.....	13	11	1	.....	.....	.....	.....	.....	.....	110.50	62.50	173.00	.....
Victoria	333	17	11	56	26	8	.....	25	14	4	14	3	2,816.50	3,008.20	5,824.70	.....
Lillooet	549	25	2	1,225	2,311	299	32	3	6	9	46	7	4,834.25	15,261.80	20,096.05	.....
Clinton	142	2	1	129	371	82	.....	.....	34	12	19	18	906.50	2,952.30	3,858.80	.....
Ashcroft	227	2	.....	343	455	90	4	.....	3	4	14	5	1,162.25	3,345.90	4,508.15	.....
Yale	200	8	3	301	500	41	.....	.....	65	6	53	5	1,643.00	4,054.80	5,697.80	.....
New Westminster	236	3	1	242	248	64	.....	5	8	15	17	1	1,192.00	2,502.64	3,694.64	.....
Vancouver	2,159	171	30	159	148	12	.....	1	.....	.....	.....	.....	24,274.00	829.15	25,103.15	.....
Totals	10,780	315	86	8,737	12,422	2,116	130	371	550	951	1,322	871	$74,267.20	$169,100.49	$243,367.69	**$243,367.69**



B.C. Dept. of Mines.

PART B.

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

BY

J. T. MANDY.

SUMMARY.

Chief interest in mining has been in gold deposits and development-work carried out in recent years indicates the probability of increased gold production in the near future.

Although an increased silver price has stimulated several small operations, a material increase in activity of silver properties is dependent upon a stable price for this metal.

Prospecting shows an increase over 1934 and has been very active throughout the district. In this respect an increasing interest has materialized in the Unuk, Stikine, Liard, and Atlin sections. New discoveries have been made in the Unuk River, Taku River, and in the McDame Creek sections.

Normal production has continued from the *Premier* mine, Stewart, since March 9th, when installation was completed of a new power plant to replace the one destroyed by fire. Towards the end of the year an agreement embracing the formation of the Silbak-Premier Mines, Limited, was consummated whereby the Premier Company undertakes the further development and operation of the adjoining B.C. Silver and Sebakwe Company holdings. This will result in commencement of production from these latter properties during 1936. Production from *Surf Point* mine, Porcher island, has continued normally. A feature in the Stewart area has been the increasing interest in small operations by individuals or syndicates aiming at small-tonnage production of high-grade shipping-ore. Interest in this phase of operation is also materializing in the Alice Arm area. Small shipments have been made from: The Surf Inlet Consolidated, Princess Royal island; the *Edye Pass*, Porcher island; *Dunwell, Blackhill, Lakeview, Spider, Ben Ali, Ida, Virginia* (Excelsior Syndicate), and *Moonlight* (Northern Prospectors) in the Stewart area; and the *Dolly Varden* in the Alice Arm area.

Active exploration was carried out on many properties throughout the district. Encouraging results indicative of possible production in the near future have been achieved at the *Big Missouri*, Stewart, by Consolidated Mining and Smelting Company of Canada, and at the *Whitewater* property, Taku river, by Duluth, Minnesota, interests. The expansion of exploration and the interest of large operating companies in the district is further indicated in the active exploration of the *Salmon Gold*, Stewart, by the Consolidated Mining and Smelting Company of Canada, and of the McKay Syndicate property, Unuk river, by the Premier Gold Mining Company. Continuation of both these operations is planned for 1936.

Placer-gold mining and prospecting by individuals, syndicates, and substantial company interests has increased, especially in the Atlin area, where a feature has been the inauguration of increased steam-shovel operations and the successful reopening by individuals of old drift-workings.

Facilities for aeroplane transportation have improved in the district. Two efficiently organized and operated local northern companies, the Northern Air Express and the Northern Airways, based at Atlin, B.C., and Carcross, Y.T., have facilitated exploration of the more remote interior sections.

During the year the Granby Consolidated Mining and Smelting Company, Limited, closed down its copper mine and smelter at Anyox and sold them to the Consolidated Mining and Smelting Company of Canada. This action was the result of the exhaustion of ore reserves to a stage where the company decided to close down rather than carry on for the possible short remaining life of the mine.

The writer desires to express his thanks to prospectors, operators, and all those with whom he has come in contact during the conduct of his work, for their co-operation.

The following is the gold production from No. 1 District during 1935: Lode, 45,810 oz.; placer, 14,099 oz.

LODE-GOLD DEPOSITS.

Coast Area.

Campania. This group of claims is owned by R. Knox Paton and associates, of Vancouver, and is located on Whale channel, on the north-west side of Princess Royal island, 95 miles south-easterly from Prince Rupert and about 4 miles south of Leading point. The area is most conveniently reached by launch from Butedale, the nearest port of call of coastwise steamers, on the east coast of Princess Royal island. The claims commence at the beach, which is characterized by a rugged, rocky, and densely timbered shoreline. The topography of the area is featured by a hillocked foreshore with a 25- to 35-degree slope, which gradually steepens to mountain domes and ridges of about 5,000 feet elevation forming the central part of the island.

The formation consists of hornblende-schist of the Prince Rupert series contiguous to, and probably underlain at shallow depth by, granitic rocks of the Coast Range batholith. In places granitic rocks outcrop and numerous acidic dykes intrude the schists. The mineral deposit consists of a high-temperature quartz vein, in places pegmatitic, striking north 57 degrees west and dipping 60 degrees north-east. The vein is from 6 to 8 feet wide and very sparsely mineralized with thin films of marcasite in minute cracks, some chalcopyrite and magnetite.

The ground comprises a restaking in 1934 of the old *Moose* group, referred to in the Annual Report of the Minister of Mines for 1920 under the heading of "Whale Channel Mines, Limited." The Belmont-Surf Inlet Mines are reported to have worked on the claims during 1923. In recent years no work has been done.

The appearance of the work done, consisting of several open-cuts, one shaft, and one short adit distributed along the strike of the vein for a distance of about 1,200 feet between elevations of 250 and 800 feet, indicates it was completed previous to the present restaking. In these workings a width of from 6 to 8 feet of very sparsely mineralized quartz is exposed. At elevation 450 feet an adit 72 feet in length is driven in a winding direction along the vein. It starts on the vein at the portal, but gradually leaves it, passing through the hanging-wall. At 51 feet it turns towards the vein and passes through it, continuing on the foot-wall side to the face. At an elevation of 550 feet and about 500 feet south-easterly from the adit an inclined shaft, filled with water at the time of examination and reputed to be 18 feet in depth, is sunk on the vein.

A composite sample of the best mineralization selected from the various dumps and exposures assayed: Gold, 0.10 oz. per ton; silver, 0.1 oz. per ton; copper, 0.2 per cent. The described mineralization is very sparingly distributed through the quartz exposed in all the workings.

Edye Pass. This group, owned by F. T. Patterson, of Porcher island, consists of the *Jeanie* and *Nabob* Crown-granted mineral claims and three adjoining claims held by location. The property adjoins the *Surf Point* mine on the north and is situated on the westerly side of Porcher island about 25 miles south-westerly from Prince Rupert. Porcher island is reached by launch from Prince Rupert.

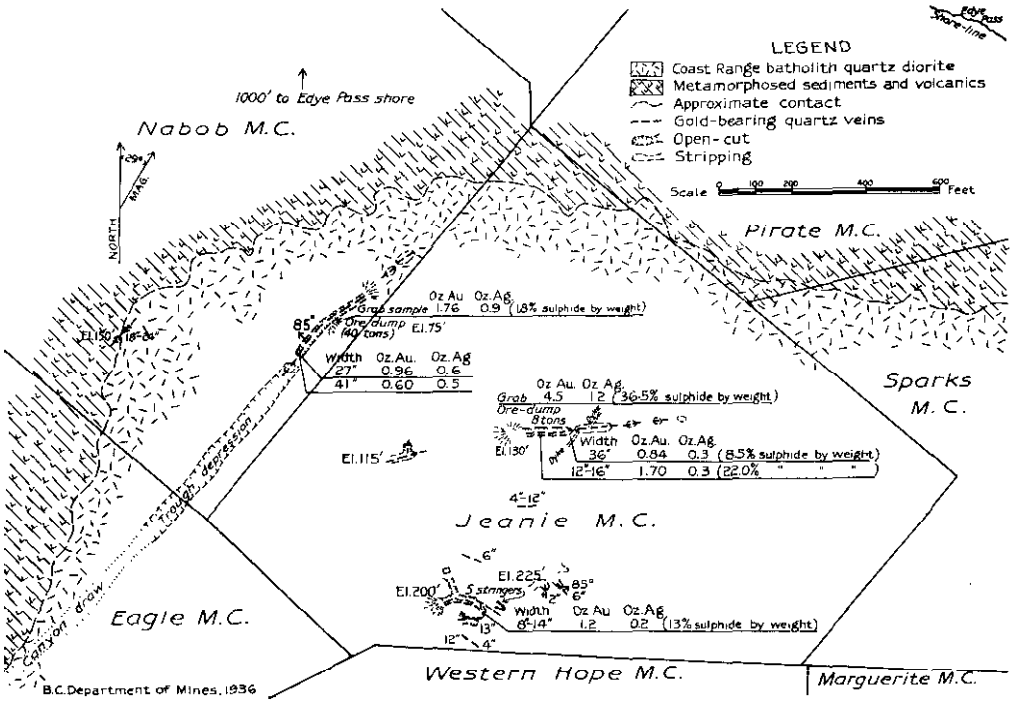
The topography of the area is featured by a comparatively flat or hillocked foreshore deeply covered with muskeg and of about 300 feet general elevation bordering the steep slopes to mountain domes or ridges of from 4,500 to 5,000 feet elevation that form the central part of the island. This characteristic topography is conformable to the flat and doming structure of the intrusive batholithic rocks, the low hillocked areas generally marking flat roof-horizons of the batholith with remnants of preserved roof-rocks. It is in this flat roof-horizon that the mineral deposits occur. Quartz veins, mineralized with gold-bearing pyrite, occur in the roof-horizon of a quartz-diorite phase of the Coast Range batholith contiguous to the contact of the quartz diorite with Triassic sediments and volcanics of the overlying Prince Rupert series. The veins, varying in width from a few inches to several feet, outcrop along a rather flat benched area of the diorite and strike generally easterly to north-easterly and dip about vertically. They appear to occupy joint-planes in the diorite and are lenticular, erratic, and, except where shearing as well as fracturing has taken place, restricted in continuity.

Quartz veins and lenses similar in character to those occurring on the *Surf Point* have been discovered on this property. Several lenses and veins of quartz well mineralized with

gold-bearing pyrite have been exposed by extensive open-cutting and stripping and small shipments of high-grade ore have been made from time to time.

Recent operations have been carried out on the *Jeanie* and *Nabob* claims.

On the *Nabob* claim, adjoining the *Jeanie* on the west, a trench 170 feet long, continuing in an open-cut about 120 feet long, exposes a quartz vein in a well-defined shear varying from 6 to 41 inches in width. Samples taken from the face of this cut assayed as follows:—Across 41 inches: Gold, 0.6 oz. per ton; silver, 0.5 oz. per ton. Across 27 inches: Gold, 0.96 oz. per ton; silver, 0.6 oz. per ton. A grab sample from about 40 tons of sorted ore on the dump at this cut assayed: Gold, 1.76 oz. per ton; silver, 0.9 oz. per ton; sulphides, 18 per cent. by weight.



Edye Pass Group, Porcher Island.

About 30 feet south of the face of this cut the vein is exposed again and shows a width of 30 inches of well-pyritized quartz. Farther south the projection of the vein is covered with muskeg, but its possible continuity is marked by a trough-like depression which extends into the adjoining *Eagle* claim in alignment with a deep draw about 1,000 feet south of these claims.

About 500 feet westerly of the main *Nabob* cut a lenticular quartz vein 18 to 24 inches wide and well mineralized with pyrite is exposed for about 50 feet by stripping and two pits in low muskeg ground. Continuity of this showing is obscured by muskeg overburden.

On the *Jeanie* claim, about 600 feet south-easterly of the main *Nabob* cut, a quartz vein from 12 to 36 inches in width, strike north 89 degrees east, dip vertical, is exposed in an open-cut 130 feet long. A sample representing a length of 6 feet and a width of 12 to 16 inches exposed in the floor of the cut 52 feet from its mouth assayed: Gold, 1.7 oz. per ton; silver, 0.3 oz. per ton; sulphides, 22 per cent. by weight. A sample across 36 inches of vein in the centre of the face of the cut assayed: Gold, 0.84 oz. per ton; silver, 0.3 oz. per ton; sulphides, 8.5 per cent. by weight. A grab sample of 8 tons of sorted ore on the dump at the mouth assayed: Gold, 4.5 oz. per ton; silver, 1.2 oz. per ton; sulphides, 36.5 per cent. by weight. This vein has been traced intermittently in muskeg-covered ground for about 300 feet westerly and 200 feet easterly of the cut.

About 400 feet south-westerly from the last-mentioned cut a deep open-cut about 120 feet in length has been excavated on a well-mineralized quartz vein varying from about 6 inches

to 3 feet in width. Several cross-stringers are exposed in the face of this cut and a sample of the face, 8 feet high, in which a vein varying from 8 to 14 inches in width is exposed, assayed: Gold, 1.2 oz. per ton; silver, 0.2 oz. per ton; sulphides, 13 per cent. by weight. At the time of examination about 35 tons of sorted ore was on the dump at the mouth of the cut. Several other veins and stringers, some of which are well mineralized with pyrite, are exposed by open-cuts and stripping between 100 feet southerly and 240 feet northerly of the face of this cut.

BEAR RIVER AREA, PORTLAND CANAL.

Gipsy. This claim constituted part of the original holdings of the old Portland Canal Mining and Development Company, Limited, which was organized in 1907. The properties have recently been purchased for taxes by L. S. Davidson, of Stewart. During operations by the old Portland Canal Company only some superficial open-cutting and stripping was done and a shallow shaft sunk on the *Gipsy* claim. Whereas higher silver values were found in the vein opened up in the old main workings, gold values seem to predominate in the *Gipsy* vein.

The property is located in the southern section of what is known as the "Portland Canal Fissure Zone" on the south side of Glacier creek, about 1½ miles south-easterly from the *Dunwell* mill. A good pack-horse trail following a generally steep grade leads to the property from the Bear River road at the *Dunwell* mill.

The vein outcrops along a comparatively flat, thickly timbered and overgrown bench intervening along the north side of the hill, which slopes about 30 degrees to Glacier creek, about 1,500 feet below.

In this locality the argillites of the Bitter Creek formation (Lower Hazelton group) have been intruded by a small cupola of granitic rock and by several lamprophyre and acidic dykes.

The mineral deposit consists of a quartz vein varying from a few inches to about 42 inches in width, striking north 74 degrees east and dipping 60 degrees south. Due to the proximity of the granitic intrusive the argillites are highly silicified and cherty. The vein outcrops at an elevation of 1,825 feet in the draw of a small creek, is adjacent to a granitic dyke, and has been traced by a series of open-cuts and stripping for a distance of about 200 feet.

On the east side of the creek, contiguous to the main cut, an old shaft filled with water and reported to be 60 feet in depth has been excavated. In the main open-cut at an elevation of 1,825 feet the vein is 42 inches in width and composed of quartz and calcite gangue mineralized with pyrite, galena, sphalerite, arsenopyrite, and some chalcopyrite.

A sample across 42 inches in this cut assayed: Gold, 0.50 oz. per ton; silver, 1.8 oz. per ton; copper, *nil;* lead, 6 per cent.; zinc, 5 per cent. At the easterly extremity of the work done at an elevation 1,840 feet an open-cut exposes the vein about 12 inches in width.

Roosevelt. This group consists of the *Miller* (Lot 893), *Pontiac* (Lot 894), *Roosevelt No. 1* (Lot 895), *Roosevelt* (Lot 805), *Northern Hill* (Lot 897), Crown-granted claims, and three mineral claims staked in 1934 and held by location. The property is owned by Messrs. Feezey and Oliver and associates, of Victoria, and is located about 1 mile up the North fork of Bitter creek, about 5 miles from the Bear River road and 12 miles from Stewart, in the Portland Canal Mining Division. It adjoins the *Mayou* and *Alamo* groups on the west. A good pack-horse trail extends from the road at elevation 450 feet to the cabin at elevation 1,500 feet. The mountainous and rugged topography of the Coast range characterizes the area. The mineral deposits occur in a canyon section of the North fork with steeply sloping rock bluffs.

The rocks underlying the area are argillites of the Bitter Creek formation of probably Triassic age (Lower Hazelton group) striking northerly and dipping about 50 degrees west. Intruding and disturbing this formation are numerous dykes of acidic or granitic character. The mineral deposits consist of quartz veins with two different types of mineralization: (1) Galena, sphalerite, pyrite, and silver minerals, with the latter predominating, and varying gold values; (2) chalcopyrite and pyrite with appreciable gold but low silver values. The veins occur in the argillite adjacent to or between granitic dykes.

The history of this property is interesting in that it had the distinction of being named the "*Grizzly*" by David James Rainey in 1899, and was the first claim staked in the Stewart area. The holdings were originally incorporated into the Grizzly Mining Company, financed by Seattle interests. This company is reputed to have spent about $30,000 on exploration of

the showings and shipped about 10 tons of ore to Tacoma. The Grizzly Mining Company allowed the ownership of the property to lapse and it was restaked as the *Roosevelt* in 1901 by Rainey in partnership with Graham Chambers, of Nass Harbour, and the Roosevelt Mining Company was organized in 1907. This company is reported to have spent about $8,000 on exploration and held the claims for several years. The property was finally bought for taxes in 1933 by Messrs. Feezey and Oliver and associates, of Victoria. Some cursory exploration was carried out on the showings during the season of 1934, and in the late autumn of 1935 further operations under contract were commenced by Arthur Cameron and Jack Lenehan, of Stewart, which are reported to consist of drifting on the galena vein. The property was examined on September 29th before the commencement of the latter operations, so that this report covers exposures only in the old workings.

At an elevation of 1,575 feet on the west side of the canyon and about 20 feet above the creek-bed a quartz vein outcrops in the steep canyon-wall, in crushed and sheared argillite between two granitic dykes. The vein is from 10 to 25 inches in width, consisting of stringers and lenses of quartz and calcite mineralized mainly with galena, sphalerite, and pyrite, striking north-westerly and dipping 85 degrees south-westerly. It can be traced up the canyon-wall, which slopes about 70 degrees, for about 40 feet above the lowest outcrop. Continuity up the mountain is obscured by overburden and the vein on the east side of the creek has not been found. At the lowest exposure No. 2 adit has been driven on the vein mineralized with irregular patches, blebs, and stringers of sulphides for about 30 feet. At the face of the adit the vein is 25 inches wide in the roof and 10 inches wide in the floor and consists of stringers of quartz and calcite with some pyrite, galena, and sphalerite. A sample across 16 inches of vein in the centre of the face assayed: Gold, 0.06 oz. per ton; silver, 32.8 oz. per ton; copper, trace; lead, 5 per cent.; zinc, 2 per cent.

About 750 feet northerly from this showing and on the same side of the canyon a quartz vein 6 feet in width adjacent to a granitic dyke outcrops in the steep canyon-wall about 20 feet above the creek. This vein, strike north 64 degrees west, dip 80 degrees south, is mineralized mainly with pyrite and chalcopyrite. The vein has not been traced up the mountain-side or across the creek. No. 1 adit, 79 feet in length, was started on this vein, but for the first 36 feet veered away from it into the hanging-wall side. The last 43 feet gradually veered back towards the vein and followed the hanging-wall for 20 feet, showing fair mineralization of pyrite and chalcopyrite. A sample of 18 inches of well-mineralized quartz in the centre of the vein exposed at the portal assayed: Gold, 0.12 oz. per ton; silver, trace; copper, 1.2 per cent.

About 15 feet northerly from this showing a small open-cut exposes 13 inches of sheared quartzose vein-matter in argillite adjacent to and between two granitic dykes. This vein, mineralized mainly with pyrite and chalcopyrite, strikes north 48 degrees west and dips 85 degrees south-west. Its southerly projection should intersect with the southerly projection of the vein exposed in No. 1 adit. A sample across 12 inches in the bottom of the cut assayed: Gold, 0.40 oz. per ton; silver, 1 oz. per ton; copper, 5 per cent.

Salmon River Area, Portland Canal.

Mineral Basin. This group of Crown-granted claims, *Mineral Basin*, *Mineral Basin No. 1*, *Mineral Basin No. 2*, *Mineral Basin Fraction*, and *Golden Fraction*, totalling 117 acres, is owned by Yail Rogenstain, W. L. Duff, and associates, of Hyder. It is situated towards the southerly end and on the comparatively steep easterly slope of the Missouri ridge, about 13 miles from the town of Hyder, Alaska, and about 15 miles from Stewart, at the head of the Portland canal. The property is reached by the Salmon River motor-road to the Premier power-house; thence 2 miles by a good trail with a comparatively easy grade, rising about 500 feet to the showings. The claims were staked in 1918 and Crown-granted in 1923, but until recently very little exploration-work has been done on them.

The showings are located in the steep and rock-bluffed section of the upper ridge terrain, which flattens below the showings to a general slope of about 15 degrees to Cascade creek.

The rocks are Triassic andesitic tuffs and some porphyritic lavas of the Bear River formation (Hazelton group), intruded by several wide granitic dykes. On the *Mineral Basin Fraction* two parallel shear-zones about 90 feet apart, striking north-westerly and dipping about 60 degrees south-westerly, occur in tuffs near the south-westerly corner of this claim at elevations of 1,700 and 1,775 feet respectively. These can be seen outcropping across the

faces of small bluffs, and can be traced along their natural exposures for about 200 feet, but are obscured by overburden at the extremities of these outcrops. A parallel feldspar-porphyry dyke 10 feet wide outcrops about 20 feet easterly from the westerly zone. The easterly zone is crosscut by a feldspar-porphyry dyke about 8 feet wide striking east-west. At an elevation of 1,720 feet an open-cut in the east zone exposes some oxidation and a patch of siliceous and calcareous replacement 3 feet wide mineralized with galena, sphalerite, pyrite, and some chalcopyrite. A sample of this mineralization assayed: Gold, 0.30 oz. per ton; silver, 16.8 oz. per ton; copper, trace; lead, 16 per cent.; zinc, 6 per cent.

Twenty feet below this cut an open-cut 14 feet long continuing in an adit 18 feet long and bearing south 89 degrees east had been made with the idea of intersecting the shear. The working is adjacent to the feldspar-porphyry dyke and follows a cross-fracture. Some patches of quartz and calcite veinlets are seen in the pyritized tuffs exposed in this working. A crew of four men was employed on this work, but at the time of examination (September 15th) the adit had not progressed far enough to intersect possible continuity of the shear.

Silver Basin. This group, owned by Fitzgerald Bros., of Hyder, Alaska, is situated on the east side of the Salmon River glacier, on the westerly slope of Missouri ridge about 20 miles from Stewart, Portland Canal Mining Division, and adjoins the *Hercules* group on the west, the *Rambler* claim of the *Big Missouri* holdings, and the *Day No. 3* claim of the *Day* group. The property is reached by motor-road to the *Big Missouri*, a distance of 18 miles, from where a trail continues for about 2 miles along the east side of the Big Missouri ridge to its crest at an elevation of 3,500 feet and descends to the showings on the westerly ridge-slope to the Salmon glacier. In former years a little work was done on silver-lead-zinc mineralization occurring in a shattered zone in argillite on the *Silver Basin* claims just above the glacier. This showing occurs on the north wall of a small canyon in the steep hill-slope to the glacier.

Recent work has been done on showings located at a higher elevation towards the south-east corner of *Last Chance No. 1* claim, situated south-east of the *Silver Basin* claims. These were examined in 1934 but have not as yet been described. The topography of the immediate locality is a rugged, hillocked, and ridged area varying from 3,000 to 3,500 feet in general elevation.

The showings are distributed over a gently sloping, meadowed, lightly timbered, knolled, and bluffed section of the westerly ridge-slope. The rocks are mainly andesitic tuffs, with possibly some porphyries, of the upper Bear River series (Hazelton group), close to and easterly from the contact of these rocks with the overlying upper Jurassic sediments of the Salmon River and Nass series.

The mineral deposits consist of siliceous replacements in tuffs, generally sparsely mineralized in places with pyrite, some chalcopyrite, sphalerite, and galena. These appear to follow structures striking generally north-easterly and dipping from 50 to 70 degrees north-westerly. The most definitely defined structure observed outcrops in a creek-draw at an elevation of 3,325 feet, on which an open-cut exposed a width of 7 feet of silicified tuff and quartz stringers, sparsely mineralized with pyrite, some sphalerite and galena. Several adjacent quartz stringers indicated a more extended width of silicification than exposed in the cut.

At an elevation of 3,350 feet, about 500 feet north 31 degrees west from this cut, an open-cut exposes silicified tuff 6 feet wide, with some pyrite mineralization. At an elevation of 3,325 feet and about 300 feet south 69 degrees west from this an open-cut exposes a silicified shear-zone 5 feet wide mineralized with pyrite, some galena, sphalerite, and chalcopyrite. At an elevation of 3,275 feet and about 100 feet south-westerly from this cut a similar occurrence is exposed by a small open-cut. At elevations of 3,225 and 3,255 feet and about 150 feet south 80 degrees west from this cut an open-cut exposes a similar occurrence. About 100 feet southerly from this an adit has been driven north 64 degrees east for 20 feet with the objective of intersecting silicified tuffs exposed on the bluff 30 feet above. About 600 feet south-easterly at an elevation of 3,200 feet several small open-cuts expose silicified tuffs with quartz and calcite stringers, sparsely mineralized with pyrite, some sphalerite and galena over a width of 15 feet. A sample across 5 feet of the best mineralization exposed in these cuts assayed: Gold, 0.02 oz. per ton; silver, 0.6 oz. per ton.

Further work was carried out on these showings during the season of 1935, but this was not examined.

Unuk River Area.

The Unuk river and its tributaries drain an area of about 850 square miles in the Coast mountains in the region of latitude 56 degrees 30 minutes and longitude 130 degrees 30 minutes. The mouth of the Unuk river at Burroughs bay, Alaska, is 124 miles north-westerly from Prince Rupert. The barrier of ice on the summit between the Unuk river and the Salmon-Bowser troughs prohibits efficient or convenient accessibility into the Unuk area from the latter valleys except by means of aeroplane. The only possible route from this side would be along the Bowser River trough to Treaty creek, from the headwaters of which there is a comparatively low and glacier-free pass to the headwaters of Ketchum creek, a north-easterly branch of the Unuk river, a total distance of about 50 miles from Tide lake, or about 85 miles from Tidewater at Stewart.

The natural route into the area is up the Unuk River valley through Alaskan territory. The mouth of the Unuk river may be reached by coastwise steamers from Prince Rupert to Ketchikan, a distance of 98 miles, and from thence by launch to Matney's ranch at the river-mouth, a distance of 75 miles. It is stressed that on account of the involved hazards no individuals, unless they are thoroughly experienced in swift-water navigation and have intimate knowledge of this particular stream, should undertake the navigation of the Unuk river alone. For navigation up the Unuk river especially constructed flat-bottomed shovel-nose river-boats powered with outboard motors are required.

The river is navigable to the first canyon, a distance of about 16 miles from Matney's ranch at the mouth. This stretch can be covered in one day. At favourable stages of water the First canyon is also navigable to near its head, where a sharp bend in the upper river-channel produces an extremely dangerous overfall and whirlpool. Navigation is at its best when the ice goes out in the early spring, usually about the beginning of May. At about the middle of November navigation begins to be impeded by ice. During part of the winter, dog-team transportation over the frozen river may be possible. Except under very favourable conditions, the stretch of the river between the First canyon and the Boundary, a distance of about 7 miles, is not navigable and can only be negotiated by means of continuous and arduous "lining."

Starting at the International boundary, a trail extends for a distance of approximately 17 miles along the west bank of the river to a point about 1½ miles above Sulphurets creek. Along this trail convenient cable crossings have been constructed across Harrymel (North Fork) creek, across the Fourth canyon to the south side of Sulphurets creek, and across Ketchum creek 1½ miles above this creek.

Accommodation at the mouth of the river can be arranged with Messrs. McQuillan and King and farm produce may be procured from the ranch of Harvey Matney.

Arrangements for transportation up the river can be made with Messrs. McQuillan and King or Bruce and Jack Johnstone, of Ketchikan, who are familiar with the intricate, swift-water navigation of the stream. Quoted rates covering people and freight are 9 cents per pound to the Boundary and 16 cents per pound from the Boundary to Sulphurets creek. With the completion of trail facilities and the planned introduction of pack-horses, rates from the Boundary on may be proportionately reduced.

On the Alaskan side of the Boundary, camps and cabins are situated at the mouth of the river, at 12 miles, and at the mouth of the First canyon. On the British Columbia side of the Boundary T. S. McQuillan has established cabins at the Boundary, the head of Third canyon, the mouth of Fewright creek (2), and at the mouth of the Fourth canyon below Sulphurets creek. In the upper area on Ketchum creek a cabin ("Jimmy the Bear") is located on the west bank about 6 miles above Sulphurets creek, and the Mackay Syndicate has constructed cabins at the foot of Prout plateau about 8 miles north of Sulphurets creek. These cabins are indicated on the accompanying map.

Very little is known about climatic conditions in the Unuk River area. The part under discussion lies within the central and eastern part of the Coast mountains and rainfall is therefore less than on the west or coast side. Reliable reports indicate comparatively low winter temperatures but moderate snowfall.

Excellent stands of spruce, hemlock, cedar, balsam, and cottonwood are seen on the hillocked and benched areas adjacent to the river-bank. In some sections dense growths of underbrush, especially "devil's-club," blueberries, and salmon-berries, thrive.

Spawning salmon of various varieties were observed in Ketchum creek as far inland and slightly beyond the mouth of Sam Coulter creek in the headwaters section. Border creek and lake are remarkable for the number and variety of salmon and Dolly Varden and cut-throat trout. Numbers of a small variety of Dolly Varden trout were observed in some of the clear spring streams along the east bank of the main river above the junction of Ketchum creek. Many fur-bearing animals, especially mink and martin, are reported by T. S. McQuillan and several fine specimens of mink were seen. Geese and ducks frequent the slough areas and lakes, especially Border lake. Wolves and bear, both black and grizzly, are frequently seen. Moose are scarce, but a few are to be found, especially in the flat area between the main stream and Sulphurets creek. Mountain-goat are plentiful in the higher altitudes. Some grouse were seen, but they are generally rare. With the exception of fish and possibly mountain-goat, edible game is, however, comparatively scarce and prospectors are warned not to rely on this means of subsistence.

The Ketchum Creek fork of the Unuk river rises in a comparatively low divide of approximately 3,500 feet elevation at the westerly edge of the Interior Plateaux country and the main stream in its central part cross-sections the Coast mountains. The main tributaries feeding it have their source in glacier-tongues connected with continuous ice-fields of the mountainous and rugged Coast mountains. With the exception of four canyons, the main stream occupies a bed from ½ to 1 mile wide and is featured by innumerable shallow, fast-flowing and continuously changing channels separated by sand and gravel bars and many small islands. The valley of the river varies from about 1 to 2 miles in width. The chief tributaries, Harrymel, Ketchum, and Sulphurets creeks, are extensive and rapid streams, with equivalent and greater volume of water and valley-width in comparison to the Bear and Salmon rivers of the Portland Canal area.

Densely timbered and rugged mountain-slopes terminating in domed ridges and precipitous peaks that vary from approximately 6,000 to 8,000 feet altitude confine the valley-trough. Continuous glacier-fields feature the tops of the mountain ranges on both sides of the river.

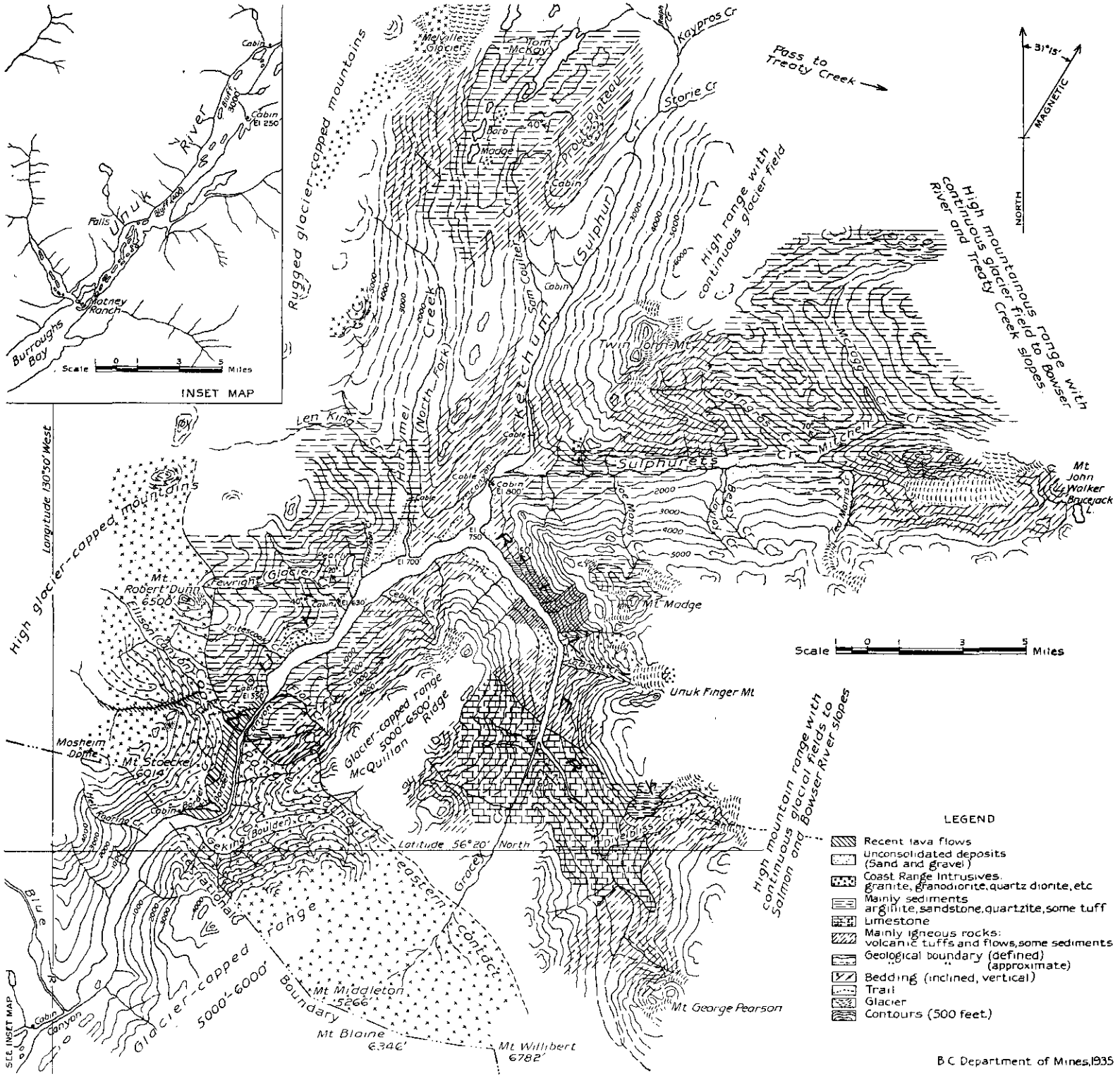
The physical features of the Unuk river are typical of the larger glacier-fed streams of the north Pacific area that have cut their way through the Coast mountains to the sea. Large quantities of silt, continuously carried down from the upper ridges, have resulted in numerous bars, sloughs, low-lying islands flooded at high water, and a network of channels. From the mouth to the International boundary the river has a gradient of about 15 feet to the mile. From this point to Sulphurets creek the gradient steepens to about 27 feet to the mile and river conditions generally preclude any navigation of the stream except by means of practically incessant lining.

Many small streams flow into the Unuk river from both banks. The most important tributaries in British Columbia territory are Border, Len King, Ellison (Canyon), Fewright (Glacier), Harrymel, Ketchum, and Sulphurets creeks. These tributaries and subsidiary creeks all offer the best means of access to prospecting of the area.

During 1934 the writer entered the headwaters area by aeroplane from Stewart and in 1935, after a preliminary reconnaissance by aeroplane, the area was entered by way of the river to the International boundary, and from there by foot up the main river and its chief tributaries.

No topographical or geological mapping has been done in this area. The nearest section mapped by the Geological Survey of Canada is the adjoining Salmon River area to the southeast, which is described in Memoir 132, 1922; Summary Report, 1931, Part A; and in Memoir 175, 1935.

On account of the increasing interest in the north-westerly extension from the Salmon River district of the eastern contact area of the Coast Range batholith an examination of the Unuk River area was deemed advisable. As very little was known about the mineral possibilities of this area, a rough geological map of the section was made with the object of showing the relative areas of igneous and sedimentary rocks. These factors are incorporated in the accompanying sketch-map, which it is hoped will furnish a working basis for prospectors and others interested.



Geological Sketch-map of Unuk River Area.

The first discovery of mineral in the area is credited to a prospector named O'Hara, who is said to have come out of the Unuk in 1893 with placer gold. As a result of this several prospectors are reported to have outfitted at an old fishing camp named Loring, about 20 miles from the present site of Ketchikan, Alaska, and entered the Unuk River country in 1894. Some extensive cuts in bench-gravels are still to be seen at the mouth of Mitchell creek, and at this spot, in comparatively good condition, is an old cabin. Over its door is an inscription: " F. E. Gingras, H. W. Ketchum, C. W. Mitchell, 1898." At the mouth of Sulphurets creek and around Mitchell creek scattered decayed remnants of several old-timers' cabins and a few crude tools were found in the dense forest underbrush.

A few sketchy reports concerning the area indicate that some fairly extensive development was done between the years 1900–1903. In 1900 the Unuk River Mining and Dredging Company purchased a group of five claims from Ceperley, Rounsefell & Company, of Victoria. In the British Columbia Minister of Mines' Annual Report for 1901 a reference is made to the *Globe* and *Cumberland* groups, and in 1903 the construction of a wagon-road by the Unuk River Mining, Smelting, and Transportation Company was started from Tidewater on Burroughs bay to the *Cumberland* group on Sulphurets creek. This road was completed to the " Landing " at the head of Third canyon, a total distance of about 31 miles from seaboard, of which about 6 miles was in British Columbia.

Machinery destined for the *Cumberland* group never reached the property and its rusted remains are to be seen scattered along the remnants of the old road. Erosive action of the river, undergrowth, and windfalls have practically obliterated the old road, with the exception of a few sections, the longest of which is in British Columbia.

In 1905 F. E. Wright, of the United States Geological Survey, visited the Unuk River area in connection with his work on the Alaskan side and submitted a short report to the Canadian Government. In 1920 George Clothier, of the British Columbia Department of Mines, travelled up the river to the International boundary.

Doubtless, owing to difficulties and hazards of transportation, no further interest, with the exception of that of one or two trappers, was displayed in the area from about 1903 to 1929, when some cursory prospecting was done by Thomas McQuillan and T. Terwilligen, of Ketchikan. In 1930 Arthur Skelhorne and Terwilligen, prospecting for the Mining Corporation of Canada, explored the area up Lake Creek valley and down Gracey creek to the *Globe* group on the main river. In 1931, 1932, and 1935 Ted Morris, a Stewart prospector, crossed the glacier-covered divide from Bowser river into the headwaters section of the Unuk. In 1932 a prospecting expedition into the Ketchum Creek area, with the aid of aeroplane transportation from Stewart, was undertaken by T. S. Mackay, A. H. Melville, and W. A. Prout, representing a syndicate of Premier, British Columbia, interests. This resulted in the discovery of a wide area of mineralization in which gold values occur. Further exploration of these discoveries was carried out by the MacKay Syndicate during 1933 and 1934, and in 1935 by the Premier Gold Mining Company. This activity was accompanied by the influx of other prospectors from Stewart and Prince Rupert and the staking of several more groups of claims in the headwaters area. During 1934 and 1935 T. A. McQuillan, G. E. King, Bruce and Jack Johnstone, of Ketchikan, Alaska, also entered the section by means of river navigation from seaboard and staked several groups of claims in the central part of the area.

The Unuk river cuts across the Coast Range batholith, the eastern contact being about 3½ miles north-east of the International boundary. At this point the batholith plunges easterly under a sedimentary and igneous rock-complex, the contact, strike north-westerly, crossing the river at the mouth of Ellison creek. Recent lava-flows cover Ellison Creek valley-bottom and were observed along the length of First, Second, and Third canyons. The geology of the headwaters area is described in the 1934 Annual Report.

In the lower and central sections of the drainage-troughs examined in 1935 the sediments consist mainly of dark-coloured calcareous argillite. Towards the confluence of Gracey creek and the main river a wide band of limestone, strike north-westerly, dip 60 degrees north-east, extends from the vicinity of the headwaters of the Unuk to somewhere on the summit between the Unuk river and Gracey creek. The argillaceous sediments of the Ketchum Creek section (1934 report) differ from those of the lower area, in that they are darker or black in colour, are intercalated with tuff-beds, and grade into a sandy complex. In general the sediments of the lower and central areas are severely disturbed and folded. At the easterly end of

Sulphurets Creek canyon the sediments are vertical and towards the mouth of Fewright creek severe and intricate folding is evident. In the vicinity of the batholith and other intrusive contacts the argillites are silicified and cherty and in places epidote and biotite are developed.

The development of pyrite in the argillites and the resultant rusty, weathered outcrops are also evident around igneous contacts. In places, notably on the south side of Sulphurets creek in the area of Bejay and Jayjay creeks, the argillites are schistose.

The older rocks of the lower and central area are a complex of tuffs and crystalline rocks mainly andesitic in type. The tuffs are generally calcareous, fine-grained and dense in texture, and purplish, greenish, and dark grey in colour. The crystalline rocks are dense holocrystalline and porphyritic in texture, and greenish, greenish-brown, and grey in colour. A definitely porphyritic phase occurs at the head of Sulphurets creek and holocrystalline rocks are found between LaBrant and Gracey creeks. Structural evidence and texture indicate that the crystalline group of older igneous rocks consists of lava-flows and intrusives. The contacts of these rocks with the sediments are unconformable. Tongues of igneous rocks cut the Gracey Creek limestone and epidote and garnet are developed in the contact-zone. They were observed cutting the sediments at the head of Divelbliss creek, on the east bank of the Unuk near the mouth of Gracey creek, south of Sulphurets Creek mouth, and east of the confluence of Len King and Harrymel creeks.

Dykes of various kinds and sizes, granitic bosses and stocks which are satellitic to the batholith, intrude the older sedimentary and igneous complexes. Such bosses are seen at the heads of Divelbliss and LaBrant creeks, also westerly and northerly from Harrymel creek, an outstanding example being Mount Helen.

Mineralization is widespread in the area. Although general geological conditions are favourable for the occurrence of mineral deposits, some sections are more favourable for gold deposits than others. Mineral deposits of the Ketchum Creek area are described in the 1934 Annual Report. Fractures striking generally north-easterly are characteristic of the lower and central sections.

Well-mineralized float is common in the creek-beds, especially on Sulphurets and the upper stretches of the main stream. This varies from small pebbles to fair-sized boulders and consists of quartzose material containing mainly pyrite, pyrrhotite, chalcopyrite, sphalerite, galena, and in some instances tetrahedrite (grey copper). Close to the mouth of Sulphurets Creek canyon, in a pebble 4 inches long, native gold was observed in association with pyrite, galena, and sphalerite. An average sample from a boulder in the bed of Divelbliss (Cabin) creek about a quarter of a mile above its mouth assayed: Gold, 0.20 oz. per ton; silver, 6 oz. per ton; copper, *nil;* lead, 16 per cent. The sand-bars at the mouth of Sulphurets creek and above the canyon contain abundant alluvial pyrite. A composite sample of this material assayed: Gold, 0.03 oz. per ton; silver, trace; copper, trace; lead, *nil;* zinc, *nil.*

Mineral discoveries have been made in several places and many claims staked. Those in the headwaters section are described in the 1934 Annual Report. From the upper end of Sulphurets Creek canyon at about Jayjay creek to Mitchell creek, a distance of about 3 miles, gold-bearing gravels are known to occur on low benches. The gravels are somewhat rusty in colour. Very little prospecting has been done and it is not known whether the old-timers' workings penetrated to bed-rock.

The Johnstone Bros. prospected reconcentrations around the mouth of Bejay and Jayjay creeks. Several creek claims and leaseholds have been staked on these deposits as well as on those between the mouth and canyon of Mitchell creek. The heavy timber on this bench-ground and the probable presence of boulders would make operations somewhat difficult. The Ketchikan interests controlling this ground plan its further exploration by test-pitting and by drilling with an "Aeroplane" Keystone drill which is at present being transported to the ground.

On the *Gold Run* group on Geking creek a narrow gold-bearing quartz vein mineralized with pyrite, galena, and sphalerite has been discovered in granitic rocks. On the *Unuk Jumbo* group, on the west side of the Unuk and 1 mile south of LaBrant creek, an extensive contact-metamorphic zone is reported to have been discovered. The oxidized outcrop of this zone can be seen along the face of precipitous bluffs. Quartz veins with sulphide mineralization carrying gold values have been discovered on the old *Globe* group of claims, Crown-granted in 1902, on the west side of the Unuk, about 1 mile above Divelbliss creek.

On the newly located *Florence* group, 1 mile south of the *Globe*, the discovery of a wide quartz vein mineralized with pyrite, chalcopyrite, and galena with gold values is reported. At the head of Sulphurets creek an extensive area of pyritic mineralization occurs. In this section zones containing quartz veins of the replacement-type were discovered and claims staked on them in 1935. The *Big Showing* group in this area is described in detail. The old *Cumberland* group of claims, Crown-granted in 1902, situated near the mouth of Sulphurets creek, is also described in detail. Subsequent to the present reconnaissance, claims were also staked on visible oxidized outcrops on the south-westerly ridge of Twin John mountain. Prominent oxidized outcrops also occur in the canyon of Mitchell creek about 1 mile above its mouth. Decayed posts indicate that this may at one time have been staked by the "old-timers." Oxidized outcrops are also plainly visible along the northerly edge of the Gracey Creek limestone-belt. Several prominent rusty outcrops are also seen in the areas adjacent to the granitic bosses around the heads of LaBrant and Divelbliss creeks.

Possibilities for the occurrence of lode-gold deposits are in the areas of igneous rocks indicated on the accompanying map, and especially in the vicinity of the granitic boss between Mount Madge and Unuk Finger mountain, as well as in the vicinity of the granitic boss around the head of Divelbliss creek.

Cumberland. This group, sometimes referred to as the *Daly* group, consists of the *Cumberland*, *Silver Pine*, *Middlesex*, *Xyphis*, and *Ougma* Crown-granted claims and is owned by George E. Olmsted, Madison and Walnut streets, Danville, Ill. The property is situated on the Mount Madge ridge-slope to the south side of Sulphurets creek, about 2 miles from its mouth. The main showings are at elevations of 1,200 and 1,350 feet. Densely timbered and rugged slopes rise to the crest of the ridge, which is about 5,500 feet in elevation. The ridge-crest continues easterly for about 2 miles and then rises abruptly to the precipitous triangular peak of Mount Madge, the elevation of which is approximately 7,500 feet.

The property is reached by trail to the mouth of Sulphurets creek. The old trails that once extended up the mountain-slope to the property are now so densely overgrown that the easiest route through the "bush" is followed.

The property was staked about 1898 by H. W. Ketchum, who later in association with a man named Daly and with Ceperley, Rounsefell & Company, of Victoria, sold the claims in 1900 to the Unuk River Mining and Dredging Company, of which E. Olmsted was secretary. During the subsequent two years some development-work was carried out on the property and in 1903 the construction of a wagon-road from Burroughs bay was started. The attempt to transport machinery to the property failed and operations ceased. In 1931 the group was purchased by the present owner at a tax sale, but no further work has been done. At an elevation of 1,400 feet and about 300 feet westerly from the upper adit the decayed remains of a bunk-house and assay office overgrown by dense underbrush may be seen.

The rocks of the locality include argillites and dense andesitic tuffs and lavas intruded by several light-coloured siliceous dykes and lamprophyre dykes. The mineral deposits occur close to the contacts of the sediments and volcanics and have been developed by two short adits. The mineral deposits include two types:—

(1.) A sheared fissure-vein mineralized with quartz, calcite, barite, pyrite, galena, sphalerite, stibnite, tetrahedrite (grey copper), and argentite. The values are mainly in silver.

(2.) A quartz replacement-zone mineralized mainly with pyrite, pyrrhotite, chalcopyrite, sphalerite, and galena, and carrying appreciable gold values.

At an elevation of 1,200 feet a sheared and brecciated zone intersected by a lamprophyre dyke occurs in volcanics. The zone strikes north 39 degrees west, dips steeply north-easterly, and contains small and irregular lenses and stringers of quartz, barite, and calcite. With the exception of some pyrite, the zone is practically barren of sulphide mineralization where exposed. On the north side of the dyke an adit, timbered for 20 feet from the portal, has been driven for 51 feet in a direction south 39 degrees east. An irregular quartz vein up to 10 inches in width, also some barren quartz and calcite patches and stringers, are seen in this adit between the timbering and the face. The latter is in crushed rock with a few horizontal seams of calcite. A slip striking north and dipping a few degrees east crosses the working about 15 feet from the face. The presence in a near-by small dump of cobbed vein material of quartz, calcite, and barite gangue well mineralized with pyrite, galena, sphalerite, tetra-

hedrite (grey copper), stibnite, and some argentite indicates that some mineralization occurred in this working. The location of this mineralization may now be obscured by the timbering. A grab sample taken from the dump assayed: Gold, 0.02 oz.; silver, 104.6 oz. per ton; copper, 0.5 per cent.; lead, 8 per cent.; zinc, 4 per cent. A reported dump of 20 tons of similar mineralization prepared for shipment could not be located.

At an elevation of 1,350 feet, several hundred feet north-easterly from this showing, a zone containing quartz veins of the replacement-type over a width of 20 to 30 feet outcrops up the face of a bluff which slopes at 70 degrees to the canyon of Sulphurets creek 500 feet below. The rusty outcrop can be plainly traced down the bluff-face for about 150 feet and is a prominent feature of the landscape when viewed from the north side of Sulphurets creek. The zone, striking north 15 degrees west and dipping 70 degrees east, occurs in a dense, highly altered and generally silicified volcanic rock. At the top of the bluff a deep open-cut continued as an adit follows the foot-wall of the zone for 30 feet and then crosscuts it for 21 feet in a direction of south 64 degrees east. In this working veinlets and replacement-lenses of quartz are accompanied by stringers, patches and disseminations of chalcopyrite, pyrrhotite, pyrite, sphalerite, and galena. A representative sample taken from a dump of about 15 tons at the portal of the adit assayed: Gold, 0.26 oz. per ton; silver, 2.4 oz. per ton; copper, 0.3 per cent.; lead, 3 per cent.; zinc, 10 per cent.

Big Showing.

This group consists of the *Big Showing No. 1, No. 2, No. 3, No. 4, No. 5, Cedar,* and *Summit No. 1* and *No. 2* mineral claims, staked in the summer of 1935. The group is owned by Bruce and Jack Johnstone, Ketchikan, Alaska, who, it is understood, staked some adjoining claims in the autumn. The property is located on the north side of the head of Sulphurets creek, about 12½ miles from its mouth, and is reached by following an indistinctly blazed trapper's trail along the north side of the creek. The source of Sulphurets creek is in a glacier-filled basin about 4 miles long and from ½ to 1½ miles wide.

The rocks of the locality are pyritized tuffs intruded by andesites in part porphyritic. The mineral deposit consists of a silicified zone from 200 to about 300 feet wide in the andesites adjacent to their contact with the tuffs. The zone contains quartz and calcite stringers, numerous areas replaced by quartz accompanied by both massive and disseminated, fine-grained pyrite. A few small crystals of arsenopyrite and some specks of chalcopyrite also occur in the quartz veinlets. The zone forms a very prominent feature of the north side of Sulphurets Creek glacier. Starting on the steep bluff-face above the end moraine, its rusty outcrop can be seen striking about north 70 degrees east and apparently dipping steeply south-east. It maintains this strike for about 2 miles and then it appears to trend about north 45 degrees east.

No work has as yet been done on this zone and, on account of its lateral and horizontal extent, even adequate preliminary sampling would require extensive open-cutting and channelling. A chip sample across a section 50 feet wide assayed: Gold, trace; silver, 1 oz. per ton. This section contains quartz veinlets and stringers and small amounts of chalcopyrite and arsenopyrite.

In the neighbourhood of Brucejack lake, at the head of Sulphurets creek, the Johnstone Bros. have also discovered a deposit of barite. This was not examined.

McDame Creek Area, Dease River.

Reconnaissance.

This area is on the Arctic slope. McDame creek flows into the Dease river on its left bank, about 60 miles north-easterly from Dease lake.

The area is reached by regular steamer service to Wrangell, Alaska, from where the Stikine river is navigated by the river-boat service of the Barrington Transportation Company as far as Telegraph Creek. Rates for this service are: Passengers, up-river $35, down-river $5; freight, about $40 per ton. A motor-road 72 miles in length crosses the divide to the Arctic slope close to Dease lake, and connects Telegraph Creek with Dease Landing on Dease lake. The journey from Dease Landing down Dease river to McDame Post, a distance of about 70 miles, is made by small flat-bottomed powered river-boats. From McDame Post a good wagon-road suitable for light motor-trucks extends up McDame creek from McDame Post to

within 3 miles of Centreville; from the end of this road a good pack-horse trail extends to "Quartz City" on Quartz creek, a total distance of about 32 miles.

To supply their trading-posts at Dease Landing, McDame Post, and Liard Post, the Hudson's Bay Company operates a freighting service by tractor and trailer between Telegraph Creek and Dease lake. From thence down Dease lake, the Dease and Liard rivers, a boat of 5 tons capacity is navigated by the Hope & Marion transportation system. The rates are as follows:—

Passengers (to McDame Post), $10 per passenger and 50 lb. of baggage (board yourself).

Freight: Telegraph Creek to Dease Landing, 4 cents per pound; Dease Landing to McDame Post, 3 cents per pound; Dease Landing to Liard Post, 6 cents per pound.

The time involved in travelling is: Wrangell to Telegraph Creek, from 2 to 3 days; Telegraph Creek to Wrangell, 1 day; Telegraph Creek to Dease Landing, 1 day (dependent on road conditions); Dease Landing to McDame Post, 1 day; McDame Post to Liard Post, 1 day.

Coming up the river from Liard Post the time involved is: Liard Post to McDame Post, 2½ days; McDame Post to Dease Landing, 2 days.

Transportation up the Stikine river from Wrangell by the Barrington Transportation Company begins about the middle of May; the time is, of course, dependent upon ice conditions. The beginning of lake and river transportation from Dease Landing depends upon the freedom of Dease Lake from ice and the first trip is usually about the middle of June.

Supplies can be purchased locally from the Hudson's Bay stores at Telegraph Creek, Dease Landing, McDame Post, and Liard Post.

At Dease Landing R. F. Latimer also conducts a well-supplied store and furnishes hotel accommodation. Hudson's Bay quotations for supplies are as follows:—

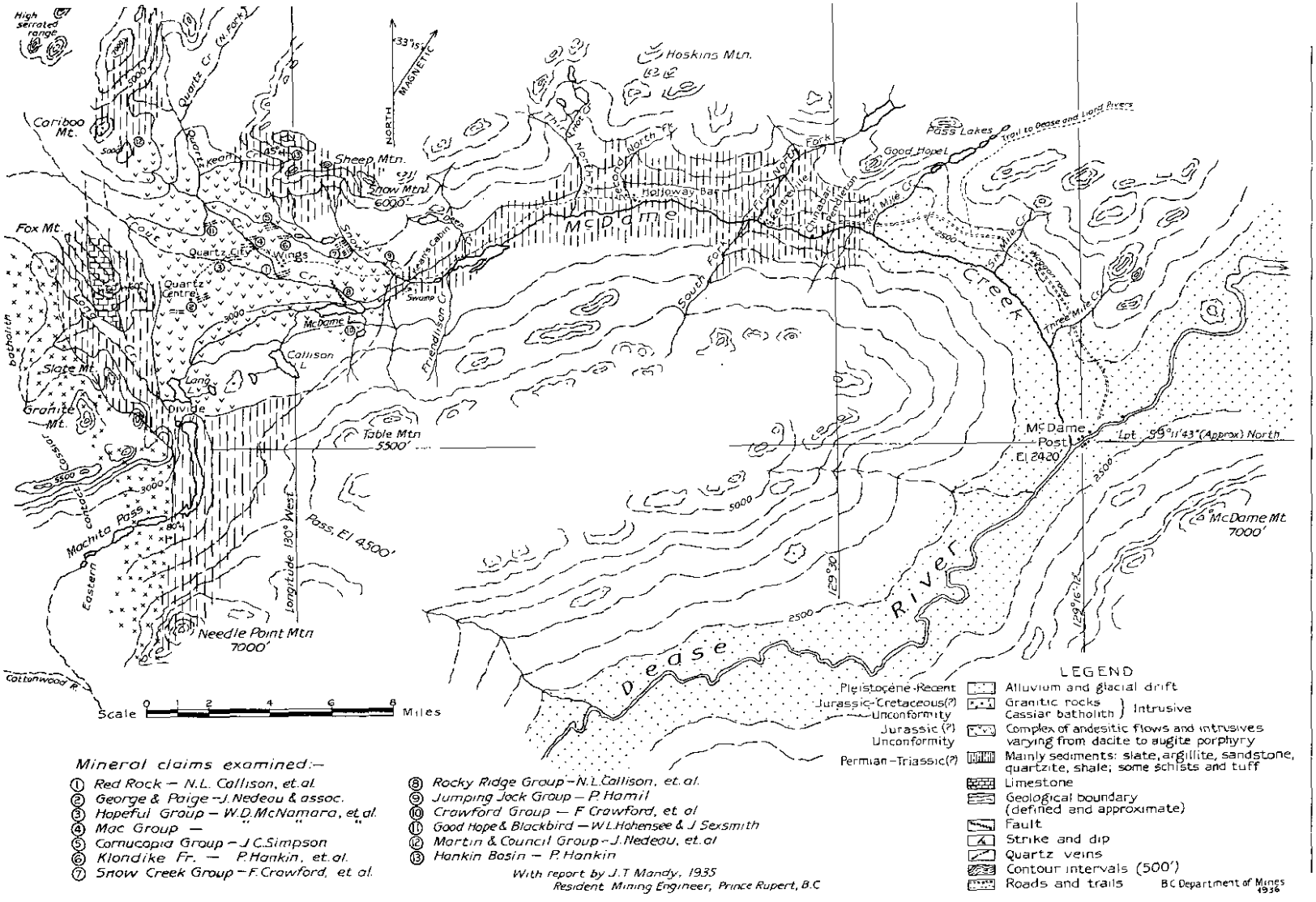
Telegraph Creek—

Flour (100 lb.)	$6.90
Beans (per lb.)	.11
Rice (per lb.)	.08½
Fruits, dried (per lb.) (average)	.20
Tobacco (tin) (about city prices)	1.80
Tea (per lb.)	.50–.70
Canned fruit (2-lb. cans)	.25–.35
Jams (4-lb. cans)	.75–.85
Bacon (per lb.)	.45
Butter (canned)	.45
Gasoline (case)	6.50
Coffee (per lb.)	.55–.65
Lubricating-oil (gal.) (about)	1.75
Dried milk (per lb.)	.50
Lard (per lb.)	.25–.30
Baking-powder (12 oz.)	.25–.35
Syrup (5 lb.)	.75
Salt (per lb.)	.07
Pepper (spices), two for	.25
Soap (cake or bar)	.10

To these costs add, for Dease Landing, 4½ cents per pound; for McDame Post, 8 cents per pound: for Liard Post, 11½ cents per pound.

The Provincial Police established a post at McDame Post during 1935 in charge of Constable R. J. Meek. A radio broadcasting set is installed here and, in this isolated locality, is proving very useful. At Dease Landing an amateur broadcasting set is also operated by R. F. Latimer.

The area is situated in the dry belt of the Interior Plateaux country and has a rainfall of approximately 25 inches per annum. The snowfall is light and does not exceed an average of from 3 to 4 feet. Winter temperatures are low, with probably an extreme average of about 20 degrees below zero, but the ground is not permanently frozen. No glaciers occur in the area. During the summer months comparatively high, but not excessive, temperatures prevail in the daytime, but the nights are usually cool.



Mineral claims examined:—

1. *Red Rock — N.L. Callison, et al.*
2. *George & Paige — J. Nedeau & assoc.*
3. *Hopeful Group — W.D. McNamara, et al.*
4. *Mac Group — "*
5. *Cornucopia Group — J.C. Simpson*
6. *Klondike Fr. — P. Hankin, et al.*
7. *Snow Creek Group — F. Crawford, et al.*
8. *Rocky Ridge Group — N.L. Callison, et al.*
9. *Jumping Jack Group — P. Hamil*
10. *Crawford Group — F. Crawford, et al*
11. *Good Hope & Blackbird — W.L. Hohensee & J. Sexsmith*
12. *Martin & Council Group — J. Nedeau, et al*
13. *Hankin Basin — P. Hankin*

With report by J.T. Mandy, 1935
Resident Mining Engineer, Prince Rupert, B.C.

LEGEND

- Pleistocene-Recent — Alluvium and glacial drift
- Granitic rocks (Cassiar batholith) — Intrusive
- Jurassic-Cretaceous(?) — Complex of andesitic flows and intrusives varying from dacite to augite porphyry
- Unconformity
- Jurassic (?) — Mainly sediments: slate, argillite, sandstone, quartzite, shale; some schists and tuff
- Unconformity
- Permian-Triassic(?) — Limestone
- Geological boundary (defined and approximate)
- Fault
- Strike and dip
- Quartz veins
- Contour intervals (500')
- Roads and trails

B.C. Department of Mines 1936

Geological Sketch-map of McDame Creek Area.

Hardy vegetables can be cultivated to maturity and wild berries grow in abundance, especially soap-olallie, saskatoon, and cranberry; the obnoxious devil's-club of the coastal areas is absent here. The lower valley-slopes support open woods of spruce up to about 18 inches in diameter, pine, balsam, larch, and birch, but the valley-bottoms contain alder and willow. Moose, mountain-goat, mountain-sheep, grouse, ducks, and geese thrive and are numerous, but caribou, rabbits, and grizzly bear are few. Grayling, trout, whitefish, and pike are abundant in the Dease river and lakes. Mosquitoes and black-flies are very plentiful during the summer months.

The area occupies part of an upland plateau varying in average elevation from 2,500 to 4,000 feet. The bare peaks and ridges of the Cassiar mountain range rise above the plateau to altitudes which vary from approximately 5,000 to 7,000 feet in elevation. The area is situated at the north-easterly margin of this range. Dissecting the plateau is the main drainage system of the Dease river, flowing into the Liard river in a general north-easterly direction. McDame creek is a major tributary of the Dease river and flows in a general west to east direction, draining an area of about 350 square miles. The elevation at the mouth, at McDame Post, is 2,420 feet above sea-level, and at Snow creek, about 25 miles up the creek from McDame Post, it is approximately 3,000 feet above sea-level, and the head of the main valley is about 3,250 feet in elevation; this is at Lang lake in Machita pass, which leads to the Cottonwood valley. The tributaries of Lang, Trout, and Quartz creeks drain an extensive section north-westerly from the main valley.

The Dease River trough is a broad drift-filled valley, rock-outcrops being scarce along the stretch from Dease lake to McDame Post. The average gradient of the valley is low. McDame Creek valley is a deeply entrenched, partly drift-filled depression from a half to three-quarters of a mile wide in the lower section between McDame Post and Snow creek. Above Snow creek the gradient of the stream flattens perceptibly and the valley broadens into a basin about 9 by 9 miles in extent. The main tributaries, Lang creek, Trout creek, and Quartz creek, each in well-defined valleys, flow into the north-westerly quadrant of this basin.

Placer gold was discovered in McDame creek in 1874 and up to 1895 the yield was $1,597,500 (?). Subsequent to that date placer-mining declined and only minor quantities of gold were produced. Although several lode claims were staked during the early period, only meagre lode-prospecting and no lode-mining was done. In the British Columbia Minister of Mines' Annual Report for 1931 placer operations are described in detail and the lode-gold possibilities of the area are indicated. In subsequent Annual Reports the eastern contact margin of the Cassiar batholith has been recommended to prospectors as a favourable area for the occurrence of lode-gold deposits.

In 1934 J. F. Callison visited the area from Fort Nelson and prospected the prominent zone of quartz veins in Quartz Creek canyon, from which occurrence this creek derives its name. These veins are mentioned in the 1931 Annual Report. Callison discovered native gold in these and other quartz veins and subsequently prospected them. The news of these discoveries resulted in a small rush into the area in the autumn and winter of 1934 and by October, 1935, about 350 claims had been staked. The discovery of sparsely distributed native gold on some of these claims sustained and increased local interest. Many of these claims had been staked for speculative purposes by agents of outside people. At the time of this examination in July about thirty men were in the section. Very little work had been done or was in progress other than general prospecting and small amounts of open-cutting and stripping on some of the main showings. This limitation of work was mainly due to lack of funds and to the fact that no powder was available in the section.

The McDame Creek trough extends easterly from the eastern contact of the Cassiar batholith. Lang Lake, at the head of the main valley, is about 2 miles east from the contact. The rocks of the lower and central sections are mainly of metamorphic and sedimentary character and consist of brownish-coloured and thinly bedded shale and slate, greyish-coloured sandy argillite, quartzite, limestone, dolomite, calcareous schists, and some calcareous tuff-beds. Argillaceous and calcareous sediments, including some bedded tuffs, occur at the higher elevations encircling the headwaters basin-area of McDame creek. A complex of dense altered andesitic flow-rocks and an altered series of rocks that are probably intrusives underlie the low-lying hillocked basin. The andesitic flows are greenish to grey-brown in colour, fine textured and highly altered, carbonatization being the dominant feature of the alteration.

The intrusives are of a granitic to a coarse diabasic texture, are altered to varying degrees and grade in composition from dacite to augite porphyry.

All the 1934 and 1935 discoveries of quartz veins have been made in the igneous rock-complex underlying the wide basin-area of the headwaters section of McDame creek. In this section isolated quartz veins and zones of veins, sometimes of very appreciable width, commonly occur in the andesitic flows, dacite and augite porphyry. They occur chiefly in the andesitic flows and are apparently localized at or near the contacts of these with the dacite-augite porphyry complex.

The known vein systems may occupy three fairly parallel fracture-zones, each several hundred feet wide and about 2 miles apart and striking north-easterly. Intermittent quartz-outcrops of generally appreciable width and fair continuity occur, as well as smaller, isolated vein systems laterally to the main zones. The southerly vein system occurs in the locality of McDame lake. The central vein system outcrops about 3 miles up Snow creek on the *Snow Creek* group, crosses the *Red Rock* group in the canyon of Quartz creek at its confluence with Trout creek, and probably continues as the vein system on the *George* and *Paige* groups to the south-west, a total distance of approximately 5 miles. The northerly vein system is exposed on the *Hopeful* group on the north side of Trout creek, on the *Mac* group about 1½ miles north-easterly, and on the *Cornucopia* group about 1 mile north-easterly of the *Mac*, a total distance of approximately 2½ miles. The central vein system is probably the most extensive of the three series. The quartz occurs in the zones as lenses usually of fair length, appreciable width and frequency, and accompanied by numerous smaller connecting veins and stringers which branch in various attitudes from the main quartz-masses.

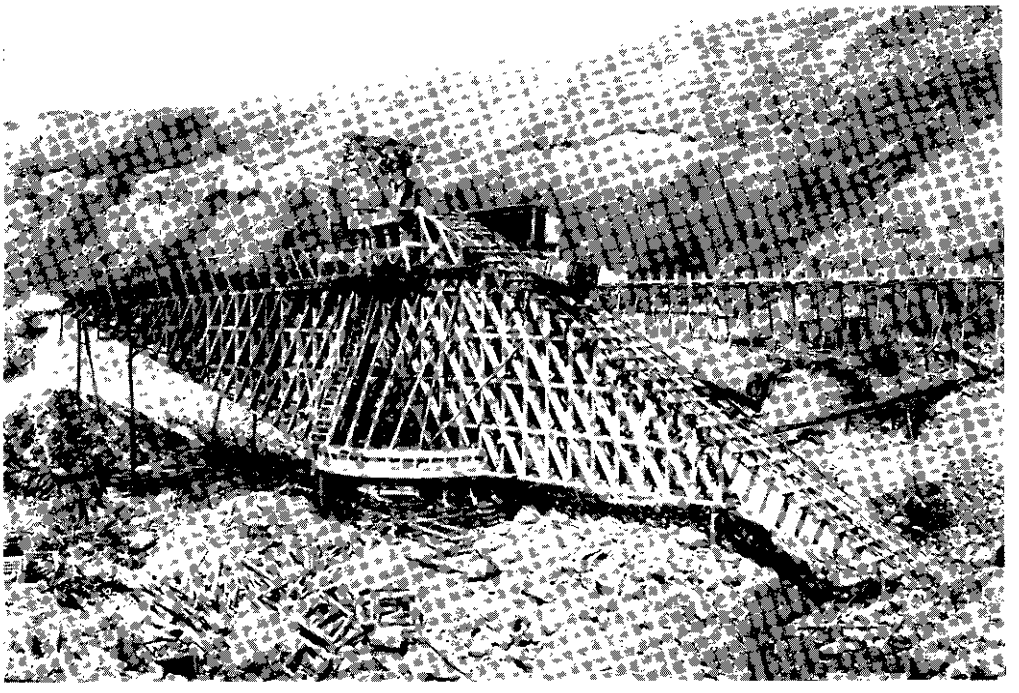
Mineralization is sparse in the quartz-outcrops and these are generally excessively leached. In some cases honeycomb-structure and angular cavities indicate the pre-existence of sulphide minerals, and in a few instances of stripping and open-cutting a little pyrite and tetrahedrite has been found in the veins. Small particles of native gold and a few occurrences of coarser specks are seen, mainly in the honeycombed quartz of the smaller veins and especially where residual limonite is present, indicating a previous association of gold and pyrite. Although such occurrences of native gold were seen in several outcrops, they are comparatively rare. Because of the indication that gold values are or have been mainly associated with sulphide mineralization and because the unmineralized quartz is generally barren of values, the commercial importance of the quartz veins is mainly dependent upon the discovery and development of a gold-bearing sulphide mineralization sufficiently extensive to constitute ore-shoots.

Available time did not permit examination of every quartz-exposure and claim-group in the area. To exemplify the areal occurrence, however, the chief exposures and groups were examined. Only exposures of mineralized quartz were sampled and where native gold was observed it is mentioned.

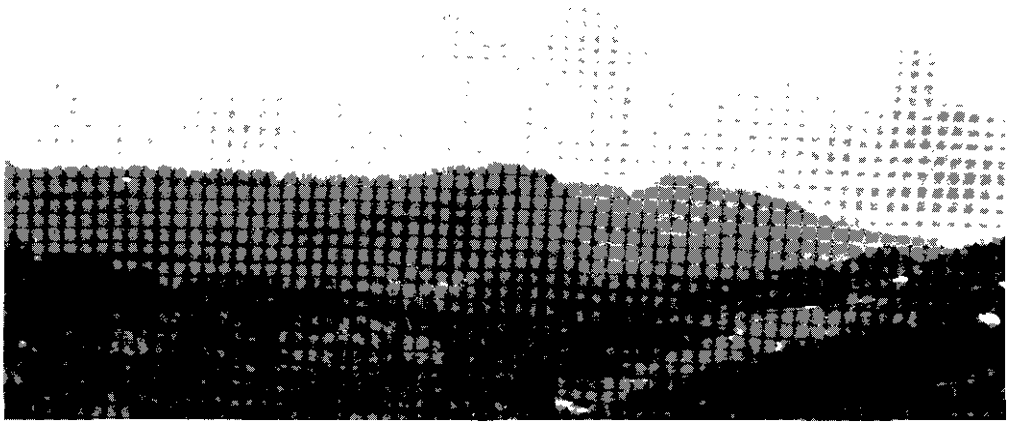
Snow Creek. This group of six claims and about seventeen adjoining claims is owned by F. Crawford, of McDame Creek, and associates. The property is located on the southerly slope of Snow mountain, about 2 miles up Snow creek on the north side of McDame creek, and is reached by a trail connecting with the main McDame Creek trail.

The rocks of the locality constitute a complex of altered andesitic flows and altered, probably intrusive, dacite. Alteration is more complete in the andesitic flows; however, in both rock-types it is mainly carbonatization accompanied by the development of lesser amounts of epidote, chlorite, and kaolin.

At an elevation of 3,650 feet approximately parallel quartz veins traverse two belts of highly carbonatized and oxidized andesitic flows respectively 160 feet and over 130 feet wide, which are separated by a band of a dense greenish mixture of andesitic flows and dacite that is 200 feet wide. These showings outcrop on the steep westerly bank of Snow creek, but have not been traced to the heavily overburdened easterly bank. The upper belt, although the width is obscured by overburden, is probably over 130 feet wide. Six quartz veins about equally spaced, striking north-easterly and varying in width from 6 inches to 4 feet, occur in this belt. Owing to surface disturbance the actual dip is not clear, but it appears to be generally steeply south. A small amount of open-cutting and stripping has been done on these veins. The exposures are generally oxidized, but a small amount of pyrite was observed. On the dump from the upper vein a few specimens were seen showing some minute specks of gold associated



Columbia Development Co., Spruce Creek, Atlin. Drag-line Scraper, Sluicing and Tailings-disposal Equipment.



Twin John Mountain—looking South-east from Proud Plateau, Unuk River Area.

Quartz Vein, Crawford Group, McDame Creek, Dease River Area.

Vein on Edye Pass Group, Porcher Island.

with limonite. A sample of this vein across 2 feet exposed in a small cut assayed: Gold, trace; silver, 1.5 oz. per ton. A sample across 4 feet of oxidized quartz, containing a small amount of pyrite, in the central vein of this belt assayed: Gold, trace; silver, trace. A sample of the lowest vein of this belt, 6 inches wide, showing oxidized quartz and some sericite in ribboned fractures, assayed: Gold, trace; silver, trace.

At an elevation of 3,775 feet on the top of the ridge, and about 500 feet south-westerly, the probable continuation of this belt has been picked up in stripping and trenching across about 150 feet. This work exposed five similar quartz veins from 30 inches to 6 feet wide, striking from north 43 degrees east to north 53 degrees east and dipping vertically.

In the lower belt, about 160 feet wide, nine quartz veins 12 to 18 inches wide and several smaller quartz stringers are exposed in highly oxidized and carbonatized andesitic volcanics. The veins in this belt strike approximately parallel to those in the upper belt. A sample from the upper vein in this belt across 18 inches of oxidized quartz, in which native gold was reported to have been found, assayed: Gold, trace; silver, trace.

Several other quartz veins are reported to have been discovered on other claims of this property, but these were not examined.

Jumping Jack. This group of twelve claims is owned by Pete Hamlin, of McDame Creek, and is located on the southerly slope of Snow mountain on the north bank of Snow creek, adjoining the *Snow Creek* group. At the time of examination no work had been done on these claims. The rocks are close to the contact of the igneous complex and include argillaceous sediments and bedded tuff that is somewhat schistose. At an altitude of 3,360 feet three parallel white quartz veins from 3 to approximately 5 feet in width are exposed by intermittent outcrops along a distance of about 120 feet. The attitude of these veins is not clear. No mineralization was observed in the veins and they are generally unoxidized.

About 200 feet northerly from these exposures the discovery of three similar parallel quartz veins, about 3 feet in width, is reported. These were not examined.

Crawford. This group of eight claims is located on the south side of McDame lake and is owned by F. Crawford, of McDame Creek, and associates, who also own two adjacent blocks of four claims. The property is reached by a branch trail from the main McDame Creek trail. The showings examined are in a flat area of about 3,030 feet elevation on the *Camp* and *Porcupine* mineral claims, about half a mile south of the easterly end of McDame lake. The rock formation is an intrusive rock of granitic to coarse diabasic texture. It is altered by carbonatization and by the development of epidote, chlorite, and kaolin, but may have originally possessed the composition of dacite.

A white quartz vein 2 feet wide and about 30 feet long, striking north-easterly and dipping 45 degrees north, is exposed on the south side of a small knoll. Its continuity is obscured by overburden. A few specks of gold up to about the size of rice and a little pyrite are seen in the exposure. A selected sample from this exposure showing sparsely distributed pyrite and oxidized material in somewhat honeycombed quartz assayed: Gold, 0.10 oz. per ton; silver, trace. About 200 feet south-westerly from this exposure a well-defined white quartz vein 20 inches wide, striking north-easterly and dipping 75 degrees south, is exposed in an open-cut and by natural outcrop for a length of approximately 45 feet. The easterly end of this occurrence is obscured by overburden, but the vein did not appear in the rock-outcrops at the westerly end. No mineralization was seen in this vein. About 90 feet north of the most north-easterly exposure an open-cut uncovers a quartz vein 18 inches in width, striking north-easterly and dipping 75 degrees south. A possible continuation of this vein has been found at a place up about 100 feet to the south-west, where a quartz vein 9 inches in width, striking north-easterly and dipping 75 degrees south, outcrops. A few minute specks of gold were observed in dump specimens from this vein. At the westerly end of McDame lake, shallow open-cuts have been excavated on several veins that range from 2 to 5 feet in width.

Rocky Ridge. This group of three claims, owned by N. L. Callison, of Fort Nelson, is located on Trout creek about 1½ miles from its mouth. It is reached by branch trail about 3 miles from Wing's cabin on the main McDame Creek trail or by trail from the aeroplane-landing on McDame lake. The showings are on the south side of the deep canyon in the lower section of Trout creek. The rocks of the area are a highly altered complex of andesitic flows and probable intrusives of the dacite-augite porphyry

complex. In the vicinity of the showings the rocks are extensively disturbed by shearing and possible faulting.

At an elevation of 3,200 feet, about 75 feet above the canyon-bottom, a trench and open-cut expose a well-defined quartz vein 30 inches in width for about 30 feet. This vein, strike north 18 degrees east and dip 60 degrees east, contains a little pyrite, chalcopyrite, and tetrahedrite. Fine specks of native gold are reported to have been discovered in this exposure, but none were found during the examination.

In the canyon-bottom at an elevation of 3,125 feet an open-cut has been driven into the canyon-wall on an oxidized and sheared zone. This zone contains a shattered quartz-lens varying from 2 to 3 feet in width and three oxidized stringers which are 8, 15, and 27 inches in width respectively. A sample from this open-cut across 3 feet of the oxidized material containing some pyrite assayed: Gold, trace; silver, trace. In a small oxidized quartz stringer 1 to 2 inches in width, exposed for about 15 feet on the east side of this cut, fine specks of native gold were seen. A composite sample from this oxidized stringer over a length of about 15 feet assayed: Gold, 1.40 oz. per ton; silver, 0.4 oz. per ton.

Along the steep face of the canyon on the south side of Trout creek at a place about 600 feet south-easterly from the above showings a sheared quartz vein 2 feet wide and two oxidized quartz stringers 6 inches in width are exposed in a highly disturbed and oxidized belt of andesitic flow-rocks. These veins strike north-westerly and dip steeply south-westerly. Fine specks of gold were seen in the oxidized material of the two 6-inch stringers. A sample representative of the most westerly stringer across 6 inches assayed: Gold, 1.36 oz. per ton; silver, 0.4 oz. per ton. The veins in this exposure occur above a pronounced fault striking east-west and dipping about 20 degrees south.

Red Rock. This group of seven claims, owned by N. L. Callison and associates, of Fort Nelson, is located in the canyon-area of the mouth of Quartz creek, about 30 miles west of McDame Post, and is reached by the main road and trail up McDame creek. A complex of highly carbonatized andesitic flows and irregularly intruded masses of altered dacite comprise the rocks of the locality. The showings consist of a remarkable belt of quartz veins and lenses outcropping to a height of 150 feet and across a width of about 700 feet along both walls of the precipitous canyon at the mouth of Quartz creek. This is the exposure from which the creek derives its name. About 30 per cent. of the total width of this exposure is quartz, which in the lower section of about 200 feet constitutes 75 per cent. of the exposure. Bands of highly oxidized, sheared, and altered andesitic flows and altered dacite intrusives are exposed between the quartz lenses, veins, and stringers. Ribbon-structures and slickensiding of the quartz indicate shearing movement in the zone subsequent to the deposition of the quartz. The zone frequently contains veins and lenses of solid quartz, 5 to 15 feet in width, which are usually connected by cross-stringers. The zone strikes about north 73 degrees east and dips about 60 degrees south. The main quartz-structures are conformable to the attitude of the zone except on the lower or hanging-wall side near the confluence of Quartz and Trout creeks. Here a possible major fault striking north-west has caused pronounced distortion and reverse dips of the veins. This dislocation is also indicated in the absence of the expected continuity across Trout creek, about 500 feet to the south-west.

Much of the quartz is white, but iron-stained areas, small cavities, honeycombed quartz, and crevices are frequently seen. Sulphides are extremely scarce and occur only as occasional grains of pyrite and patches of tetrahedrite. Very fine gold can be panned from the fine oxidized talus at the foot of the canyon bluff. This may, however, be partly the result of high-water concentration by the creek. Fine gold can also be panned from oxidized faces, vugs, and crevices in some of the quartz veins along the base of the bluff. This may be partly the result of accumulation of fine gold being gradually washed down the bluff-face and trapped in these locations. To obtain information pertaining to this possibility the following samples were taken from a heavily iron-stained outcrop of ribbon-quartz 11 feet in width occurring at the base of the bluff and stated to contain good values:—

(1.) Dense quartz lightly iron-stained: Gold, trace; silver, trace.

(2.) Selected honeycomb quartz containing limonite: Gold, 0.44 oz. per ton; silver, 12 oz. per ton.

(3.) Selected gossan, iron oxide, and fine wash-sand scrapings from faces and crevices: Gold, 0.30 oz. per ton; silver, 1.5 oz. per ton.

These results, together with those of a preliminary panning, indicate at least some residual and gravitational gold accumulation (eluvial) in suitable traps.

A selected sample from an isolated and rare patch showing blebs of grey copper in quartz towards the central section of the zone assayed: Gold, 0.20 oz. per ton; silver, 80 oz. per ton.

With the exception of a few superficial cuts and general prospecting, no recent work has been done on this exposure. Several years ago, in the central part of the zone on the east side of the canyon and from a place 15 feet above the creek-bed, a short adit was driven in a direction north 53 degrees east through solid quartz and occasional patches of rock. A little pyrite was observed in this working.

On the upper or foot-wall side of the zone a sheared structure crosses the creek about midway along D. Wing's hydraulic sluice-boxes. This is mineralized with quartz stringers and veinlets, some bands and patches of fine granular pyrite, and some disseminated acicular crystals of arsenopyrite. A grab sample across about 15 feet of this structure, taken by the writer in 1932 and reported in Bulletin No. 1, 1932, assayed: Gold, 0.10 oz. per ton; silver, 0.10 oz. per ton; arsenic, 3.6 per cent. No work has been done on this structure.

George. This group of eight claims is located at what is known as " Quartz Centre," which is between Trout and Lang creeks and about 3 miles from " Quartz City," or 2 miles from Trout creek. The property is owned by J. Nadeau and associates, of Juneau, and is reached by trail from " Quartz City." The hillocked and ridged lowland topography of McDame Creek basin, with small and shallow subsidiary creeks, characterizes the locality. A complex of medium-grained intrusive augite porphyry, altered, carbonatized andesitic flows, and altered schistose sediments underlies the locality.

The main showings consist of a very extensive outcropping of white quartz veins and of lenticular masses near the northerly boundary between *George No. 5* and *George No. 6* claims. The exposures occur between elevations of 3,410 and 3,470 feet on a comparatively level benched area of the gentle southerly slope of an east-west-striking ridge. The quartz-zone appears to strike north 50 degrees east, diagonally across the ridge, but its approximate dip could not be determined. It occurs in a band of highly oxidized and carbonatized rocks about 600 feet wide that lies between altered andesitic volcanics on the west and altered, medium-grained augite porphyry on the east. Approximately 50 per cent. of this 600-foot width consists of intermittent outcrops of quartz in the form of stringers, veins, and lenticular masses. In the central section of the zone close, intermittent quartz-outcrops at elevation 3,425 feet indicate a width of about 100 feet of nearly continuous white quartz. On either side of this central section several quartz veins from 3 to 10 feet wide may be traced by short intermittent outcrops for distances varying from 20 to about 300 feet. These veins strike approximately parallel with the zone and in one a dip of 50 degrees south was observed.

Sulphide mineralization is extremerly rare in these outcrops and where observed consists of specks and small blebs of pyrite. Occasional small jagged cavities indicate the pre-existence of sulphides. The outcrops are generally bleached white and show only small amounts of iron oxide, rarely copper-carbonate stain, and in one open-cut across 10 feet a pronounced development of manganese oxide. At the time of examination two open-cuts had been excavated on this showing.

On the *George No. 1* and *No. 2* claims, about 1,800 feet south-easterly from these showings, two open-cuts about 300 feet apart expose an iron-stained quartz vein 4 feet wide which contains sparse blebs of pyrite. No intermediate tracing has been done between these cuts, but their alignment indicates that they may be on the same vein. About 300 feet farther to the south-east a shallow open-cut and some stripping on a small knoll exposes a width of 12 to 15 feet of iron-stained quartz. A sample of this exposure assayed: Gold, trace; silver, trace. The formation in the vicinity of these showings is mainly coarsely crystalline augite porphyry.

Paige. This group of eight claims joins the *George* group on the south and is owned by J. Nadeau and associates, of Juneau. The main showings are about 5,000 feet south-westerly from those on the *George No. 5*. The area is close to the contact of the igneous complex and the sedimentary series, and the rocks consist of oxidized and altered andesitic flows associated with some bands of limy argillite, sandstone, shale, and schist.

At about elevation 3,400 feet, on the slope of a ridge, open-cutting and stripping exposes a quartz vein for a length of 50 feet, its continuity being obscured by overburden. The vein is about 15 feet wide, strikes north 80 degrees east, and dips 60 degrees south. The outcrop is oxidized and shows only a little pyrite. About 100 feet south-westerly a quartz-outcrop 4 feet wide may possibly be aligned with this showing. Two similar outcrops about 50 feet southerly probably belong to other veins.

About 4,500 feet north-westerly from these showings much quartz float is seen in the bed of a shallow creek and beaver-dam lake, in a formation of sandstone and calcareous argillite. Adjacent to the lake two open-cuts and stripping expose a white quartz vein 5 feet wide, strike north 83 degrees east for a distance of 200 feet. No mineralization was observed in these exposures.

Hopeful. This group of eight claims is owned by P. McNamara and associates, of Telegraph Creek. The property is located in the Trout Creek valley easterly from "Quartz City" and is reached by trail from the main McDame Creek trail. The rocks of the locality are mainly altered augite porphyry and some irregularly distributed carbonatized andesitic flows.

The main showings are located about 1 mile easterly of "Quartz City" at elevation 3,450 feet on the ridge-slope to the north side of Trout creek, extending from 180 to 500 feet from the creek-bed. They consist of three main parallel quartz veins about 30 and 50 feet apart respectively, striking south 87 degrees east and dipping about 70 degrees south. The northerly vein has been traced by natural outcrops and some stripping for a distance of about 350 feet. An open-cut at elevation 3,425 feet at the easterly end exposes a 10-foot width of quartz sparsely mineralized with pyrite, siderite, ankerite, and some tetrahedrite. A sample from the best mineralized section of this cut assayed: Gold, trace; silver, trace. The central vein can be traced by intermittent outcrops showing iron oxidation and a little pyrite up to 5 feet wide for about 400 feet. No work has been done on it.

The southerly vein is traced by stripping and intermittent outcrops for about 450 feet. Near the westerly end an open-cut on a small knoll exposes a width of 6.5 feet showing a few blebs of pyrite and some iron oxidation.

Some isolated quartz-outcrops on either side of these veins and also on the north and south banks of Trout creek indicate that additional veins occur in this locality.

Mac. This group of eight claims is owned by P. McNamara and associates, of Telegraph Creek, and covers the easterly and westerly sides of Quartz creek in the vicinity of "Quartz City." This locality is underlain by a complex of carbonatized, andesitic flows and dacite intrusives. On the *Mac No. 1* claim, a short distance north-westerly from "Quartz City," a series of eleven approximately parallel veins and stringers outcrop across 300 feet of the south-westerly slope towards a small gulch. They vary in width from a few inches to 6 feet, strike east-west, and are usually vertical. A small amount of open-cutting and stripping has been done on them. On the westerly side of the gulch an open-cut in the face of a steep bluff on the *Mac No. 3* claim exposes a vein 3 feet wide which may be the westerly continuation of one of the structures about 400 feet to the east. With the exception of some iron-stain and oxidized patches, no mineralization was observed in these exposures.

On the *Mac No. 2* claim, about 350 feet northerly from the showings on the *Mac No. 1* claim, an open-cut in the easterly bank of Quartz creek exposes a quartz stringer 2 inches wide which is adjacent to a granitic dyke. This stringer strikes north 68 degrees east, dips 50 degrees north, and contains pyrite, some arsenopyrite, and oxidation products. Small particles of gold were seen in samples reported to have been taken from this stringer. An assay representative of the mineralization exposed in the vein in this cut assayed: Gold, trace; silver, trace. Two hundred and fifty feet easterly from this showing an open-cut has been excavated in the east bank of Quartz creek, exposing a quartz vein 12 inches wide, striking north 78 degrees east, dipping 70 degrees south, and fairly well mineralized with pyrite and some arsenopyrite. Both walls adjacent to this vein are altered and slightly silicified and contain cubic crystals of pyrite. A sample across 12 inches of well-mineralized vein exposed at the bottom of this cut assayed: Gold, 0.80 oz. per ton; silver, 0.6 oz. per ton.

Klondike Fraction. This property, owned by Phil Hankin and partner, is on the southerly slope of Sheep mountain, about 1 mile north-easterly from "Quartz City." The rocks are mainly altered andesitic flows close to the contact with the sediments exposed at higher elevations. At an elevation of 3,680 feet an open-cut 6 feet long exposes a quartz vein 30 inches wide striking north 73 degrees east and dipping 80 degrees south, which is mineralized with a little pyrite, a few crystals of arsenopyrite, and an occasional bleb of a soft, grey, unidentified mineral. Thirty-two feet north-easterly from this exposure an open-cut exposes an oxidized quartz vein 5 feet in width striking about east-west and dipping 70 degrees south. Blebs of the soft, grey, unidentified mineral, cited as occurring in the previous cut, were noted and a speck of gold was observed in the oxidized quartz gangue. This vein is probably the continuation of the vein exposed at elevation 3,680 feet. Fifty feet north-westerly from this cut, surface-stripping exposes 5 feet of quartz and highly oxidized material which may possibly represent a parallel vein.

Cornucopia. This group of seven claims is owned by J. C. Simpson, of Telegraph Creek, and adjoins the *Klondike Fraction* on the west and the *Mac* group on the north-east. The rocks exposed include altered andesitic flows and some beds of tuff which strike north 50 degrees west and dip 70 degrees north-east. At the time of examination no work had been done on these claims and only quartz-outcrops were observed.

About a quarter of a mile north 50 degrees west from the *Klondike* showings a quartz vein outcrops for 25 feet along the southerly slope of a small knoll at elevation 3,660 feet. The vein is well defined, from 12 to over 18 inches in width, and strikes about east-west and dips 85 degrees south. Westerly from this showing three other parallel veins varying from 10 inches to 1 foot in width strike transversely across the ridge of this knoll.

Superior and Dawson. These claims are owned by P. Hankin and partner, of Telegraph Creek, and adjoin the *Cornucopia* group on the north-west. At the time of examination no work had been done on the property, but outcrops of several parallel quartz veins and stringers varying from a few inches to about 3 feet wide were observed at an elevation of 3,800 feet striking transversely across the north-westerly continuation of the Klondike ridge.

Kean Creek Basin.—Kean creek has its source in a wide basin on the north-westerly slope of Sheep mountain. In this locality altered argillaceous sediments and tuff-beds are unconformably in contact with the igneous complex of McDame Creek basin. The sediments strike north 5 degrees east and dip 45 degrees west. At the head of the basin a coarse-grained granitic dyke about 100 feet wide and striking east-west cuts the sediments, accompanied by silicification of the contacts. At an altitude of 5,700 feet a band of oxidized quartz lenses, veins, and stringers about 40 feet wide cuts transversely through the dyke, but does not continue into the bordering sediments. The dyke material between the quartz is highly altered by carbonatization and oxidized. No mineralization was observed in these veins other than iron oxide and carbonate.

Good Hope and Blackbird. These claims are owned by W. L. Hohensee and J. Sexsmith, of Telegraph Creek, and are located on a benched area of the south-easterly slope of Cariboo mountain, on the east side of Quartz creek, about 2 miles south-easterly of "Quartz City." Highly carbonatized andesitic flow-rocks underlie the locality. Two well-defined quartz veins, 30 feet apart and respectively 5 feet and over 12 feet plus in width, are exposed in shallow open-cuts at an elevation of 3,700 feet. The veins are parallel, strike north 78 degrees east, dip 75 degrees south, and show typical iron-oxidation products along fractures and in cavities and small amounts of pyrite. The veins have been traced for about 100 feet by outcrops and stripping.

Martin and Council. These adjoining groups of eight claims each are owned by J. Nadeau and associates, of Juneau, and are in the basin on the easterly slope of Caribou mountain, about 5 miles north-west of "Quartz City." The rocks are altered argillaceous sediments and bedded andesitic tuffs associated with some altered, carbonatized andesitic flows, along the contact of the sedimentary series of the higher elevations and the igneous complex of McDame Creek basin. At the time of examination no work had been done on these claims. At an altitude of 4,700 feet a quartz vein 3 feet wide outcrops in a bluff in mixed sediments and andesitic flow-rocks. This vein strikes north 73 degrees east and is traced for 100 feet up the bluff-face, where it terminates in comparatively

unaltered andesitic rocks. Some iron oxide and a little pyrite was observed in the quartz. Outcropping adjacent to this is a quartz-lens 5 feet wide and 15 feet long.

Dease Lake Area.

Dalvenie. This group of eight claims, and two additional claims staked in 1935, is owned by the Dalvenie Syndicate, of Victoria. It is situated on the easterly slope of a prominent unnamed mountain ("Dalvenie") rising above the plateau to an altitude of 6,000 feet on the divide between Gnat creek, a tributary of the upper Tanzilla river, and Ptarmigan creek, a tributary of the upper Stikine river. The group is about 22 miles in a direction south 12 degrees east from Dease Landing at the head of Dease lake. The property is reached by following the Tanzilla trail for about 2 miles from the Telegraph Creek–Dease Lake road to the Tanzilla river. At this point the Tanzilla river is crossed and, as there is no trail, the most unobstructed route is taken across country through a lightly timbered and extensively burnt-over rolling plateau which gradually rises to the slope of "Dalvenie" mountain. The mineral deposit was first staked in 1899 as the *Big Chief* group by Joseph Clearihue and has been restaked several times since, most recently by the Dalvenie Syndicate.

The rolling lowlands of the plateau are extensively covered by deep glacial drift and rock-outcrops are scarce. Rising about 3,000 feet above the plateau-level, "Dalvenie" mountain, about 4 miles long and 2 miles wide, forms an outstanding feature of the topography. The prominent form of this mountain is composed of a boss of gabbro varying in texture from fine to coarsely holocrystalline and from fine to coarsely porphyritic. This intrudes slates and quartzites. About 5 miles westerly from the north-easterly-striking axis of "Dalvenie" mountain there is a parallel mountain of about 6,000 feet elevation which is composed of oxidized limy slate and limestone. Several thin remnants of pyritic quartzite roof-rocks, in places hybridized by partial digestion in the intrusive, are preserved along the easterly slope of "Dalvenie" mountain. These are generally characterized by rusty outcrops. Along the lower elevations of the easterly slope the slate roof-rocks are more common.

The mineral deposit consists of a replacement-zone with an indicated width of 20 to 34 feet traced for 1,200 feet by thirteen shallow open-cuts and one pit 3 feet deep on the *Dalvenie No. 3* claim. The zone strikes north 10 degrees east between an elevation of 5,075 feet at the southerly end and 5,100 feet at the northerly end; the dip could not be determined definitely. In places the zone contains horses and tongues of barren or sparsely replaced gabbro and quartzite. The zone occupies the upper horizon of the gabbro boss, mineralization occurring in both the gabbro and the hybrid slate, but apparently not extending into sections roofed by quartzite. The northerly 600 feet of the zone is marked by a depression about 30 feet wide in which short cuts have been driven into the west rim, exposing heavily oxidized material. The most extensive work has been done along about 500 feet of the southerly end of the zone in gently sloping and swampy ground. All exposures are extensively oxidized, but in the deeper cuts there is considerable pyrite, pyrrhotite, chalcopyrite, and arsenopyrite in a gangue of altered rock, quartz, and some barite.

In a cut, 40 feet long, transversely across the west side of the zone at its southerly end, a sample of unoxidized sections mineralized with pyrrhotite, pyrite, chalcopyrite, and arsenopyrite, with quartz and barite gangue, assayed: Gold, trace; silver, trace; copper, 0.3 per cent.; arsenic, 2.3 per cent. At the north end of this cut a compass-deflection of 62 degrees east was observed. In an open-cut 22 feet east from the south end of this cut, a sample across 15 feet of the east side of the zone assayed: Gold, trace; silver, trace; copper, 0.3 per cent.; arsenic, 2.1 per cent. A sample across 22 feet of the easterly side of the zone exposed in an open-cut midway along the zone at an elevation of 5,100 feet assayed: Gold, trace; silver, trace; copper, 1.7 per cent.; arsenic, 2 per cent.

About 2,500 feet north 8 degrees east from the cuts on the *Dalvenie No. 3*, a possible continuation of the zone has been exposed on the *New Deal No. 1* claim adjoining the *Dalvenie No. 6* on the north. Here, at an elevation of 5,000 feet, a cut 10 feet long exposes heavily oxidized material and honeycomb quartz with some patches of pyrite. A selected sample of pyrite in this cut assayed: Gold, 0.02 oz. per ton; silver, trace.

SILVER-LEAD-ZINC DEPOSITS.

STEWART-PORTLAND CANAL AREA.

Glacier Creek Mining Co., Ltd.

This company was incorporated in 1909 with a capitalization of 1,000,000 shares of 50 cents par value, all of which are reported as issued. R. Stewart, of Victoria, is managing director and the registered address is 101 Pemberton Building, Victoria. The property consists of the *Nellie V.*, *Riverside*, *Last Chance*, *Lucky Boy*, *Lulu*, and *Victory* Crown-granted claims adjoining the *Dunwell* on the south and situated on the north side of Glacier creek, about 4 miles by road from Stewart. The property was inactive until 1934, when the crosscut was continued for about 200 feet to the intersection of a vein at 795 feet from the portal. Drifting on this vein was carried out in the early spring of 1935 and ceased in May.

The deposit, consisting of quartz veins sparingly mineralized with pyrite, galena, and sphalerite occurs in argillaceous sediments of the Lower Hazelton (Bitter Creek Series) group. The area embraces part of the westerly limb of an open anticlinal structure. The veins occupy shears striking north-westerly and dipping from about 30 degrees to 60 degrees south-westerly and are partly conformable to the attitude of the formation. They are brecciated and contain unaltered fragments of the argillite wall-rock. With the exception of one vein occurring on the *Lucky Boy* at elevation 600 feet, all the known veins on this property occur between two major faults which strike north and dip west and constitute what is known as the " Portland Canal Fissure Zone." The structural difference between the veins on this property and those on the adjoining *Dunwell* is that, if projected, they will intersect the hanging-wall of the east fault, whereas the *Dunwell* veins will intersect the foot-wall of the west fault. This difference may have influenced the process of mineralization. The projection of the *Lucky Boy* vein will intersect the hanging-wall of the west fault. Another factor which possibly affected mineralization is the location of the Glacier Creek veins in a higher horizon than the southerly-plunging Ben Ali stock in which the *Dunwell* veins occur. Exposures of the veins in the adits show no evidence of oxidation, leaching, or secondary enrichment; because of the small amount of back above the adit it is not probable that this condition would alter towards the surface.

A feature of the area is the number of more or less parallel quartz veins varying from a few inches to several feet in width. Where exposed on surface and in the underground workings they contain very little mineral. The best mineralization observed on the property is exposed in the main adit, elevation approximately 1,000 feet, along the 1935 north and south drifts.

A sample taken across 12 feet of the vein as exposed in a crosscut from the north drift and about 60 feet from the main adit assayed: Gold, 0.08 oz. per ton; silver, 1 oz. per ton; lead, *nil;* zinc, 4 per cent. A selected sample of the best mineralization exposed in the north drift in bands and stringers of pyrite with some galena and sphalerite assayed: Gold, 0.20 oz. per ton; silver, 5.6 oz. per ton; lead, 4 per cent.; zinc, 4 per cent. A sample of the muck from the face of the south drift assayed: Gold, trace; silver, 0.30 oz. per ton; lead, *nil;* zinc, trace. A selected sample of the best mineralization showing in the south drift in pyritized argillite and quartz stringers assayed: Gold, 0.06 oz. per ton; silver, 0.08 per ton; lead, *nil;* zinc, 2 per cent.

In the *Little Wonder* adit (*Victory* mineral claim) at about elevation 940 feet a lens of good mineralization about 15 feet long and from 2 to 18 inches wide occurs in a small stope above the adit. A representative sample of this assayed: Gold, 1.84 oz. per ton; silver, 4 oz. per ton; lead, 5 per cent.; zinc, 6 per cent. Another lens of fair mineralization about 10 inches wide and 30 feet long occurs in the floor of this adit about 60 feet from the face. A composite sample of this lens assayed: Gold, 0.28 oz. per ton; silver, 4.6 oz. per ton; lead, 6 per cent.; zinc, 8 per cent.

Virginia K. and Virginia K. Extension.

(*See* Annual Reports for 1930 and 1932 and Geological Survey of Canada Summary Report, 1931, Part A, under Excelsior Prospecting Syndicate.) The property, consisting of eleven claims and eight fractions, is situated near the head of American creek on the east side, about 25 miles from Stewart. The claims are reached by the Bear River motor-road for 14 miles to American creek and thence by trail along the west side of the creek and across the

glacier to the camp-site at altitude 2,300 feet. A horse could be used over this trail for about the first 9 miles. The ground covered by the claims on the west side of American creek extends from the valley-bottom at elevation 1,550 feet to the crest of the glacier at almost 4,500 feet. On the east side the *Virgina K.* claim extends from the valley to about an altitude of 3,800 feet.

The formation in this area consists of argillites, sandy argillites, sandstone, conglomerates, tuffs, and breccias, gently folded and occurring near the boundary between the underlying Bitter Creek and the overlying Bear River series. Where the formation has not been subjected to acute folding it has a general easterly dip of from 15 to 20 degrees. The sedimentaries in this section are generally gently, in some places acutely, folded and are intruded by tongues of a porphyritic andesite lava.

Three types of ore deposit are represented: (1) Replacement shear-zone in argillite; (2) bed-veins between interbedded sandstone, sandy argillite, and tuffs occurring near the top of the Bitter Creek series; (3) fracture-zone consisting of quartz veins and veinlets in reticulated structure.

On the replacement-zone on *Virginia K. No. 3* eight open-cuts have been excavated between elevations 3,500 and 3,740 feet, along a distance of about 1,000 feet. The zone strikes north 81 degrees east and dips 77 degrees north, with widths exposed in the cuts of from 10 to over 20 feet of severely crushed, decomposed, and highly manganiferous vein-matter. In places appreciable horses of rock occur in the structure. In some of the cuts seams of unoxidized ore in a quartz gangue carrying a mineralization of galena, sphalerite, and pyrite can be seen. As sampling of the oxidized portions of the structure would give no information regarding values that might be contained in the sulphide ore, this was not sampled. However, representative samples of the exposed unoxidized ore were taken, and assayed as follows:—

No. 1 cut: Gold, trace; silver, 3 oz. per ton; lead, *nil;* zinc, 4.1 per cent.

No. 4 cut, elevation 3,640 feet: Gold, trace; silver, 2 oz. per ton; lead, *nil;* zinc, 11.8 per cent.

Slightly westerly of the replacement-zone on *Virginia K. No. 5*, open-cuts have been excavated on bed-veins, exposing widths of from 3 to 4 feet of highly oxidized vein-matter striking north 19 degrees west and dipping about 15 degrees east, conformable to the formation. It would seem fairly certain that these structures do not represent, as they were formerly thought to, the continuation of the replacement-zone, but are entirely unassociated from this structure. They occur in what appears to be a gradation of sedimentary and tuffaceous rocks on the border between the Bitter Creek and Bear River series.

Near the south-east corner of *Virginia K. Extension No. 2* some work has been done on a fracture-zone or small stockwork about 20 feet in width occurring in tuff. This consists of quartz stringers from ½ to 1 inch in width, fairly well mineralized with pyrite, galena, chalcopyrite, and some sphalerite.

Under the names of *B.L.K., Bryant, Dundee,* and *Virginia K.*, this group was staked in 1929 on discoveries made by D. D. Kimball. Late in the same year the Excelsior Prospecting Syndicate was formed in Stewart, which, it is understood, was capitalized for $150,000, divided into units of $10 par value.

COPPER DEPOSITS.

Alice Arm Area.

Velvet.

This group consists of the *Velvet* and *Velvet No. 1* claims and the *Velvet Fraction* and is owned by D. A. McPhail, Alice Arm. The claims comprise the restaking of the old *Ouray* and *Victoria* claims and *Bertha Fraction.* The property, referred to in the Annual Reports for the years 1916, 1918, and 1926, adjoins the west side of the *Wolf* property, about 1 mile north of Evidsen creek and 1,500 feet west of the Kitsault valley. A good trail extends from the main trunk trail in the Kitsault River valley at elevation 1,300 feet to the cabin at elevation 2,000 feet.

The original workings are on the crest of a small rise in the general slope of the hill. The surface is largely covered with overburden and rock-exposures are scarce. The rocks of the area include tuffaceous sediments and andesitic fragmental and flow rocks of the Kitsault River and Dolly Varden formations (Hazelton group). The mineral deposit consists

of a replacement-zone about 70 feet wide striking north 27 degrees west and dipping 50 degrees north-easterly with the slope of the hill. The hanging-wall of this zone is adjacent to the westerly boundary of *Wolf No. 3* claim and outcrops along the brow of a benched area which slopes towards the Kitsault river. Its projection along the dip would extend into the *Wolf No. 3* claim within a comparatively short distance. Along the brow of this bench are several old open-cuts in which highly oxidized siliceous replacement material containing pyrite, chalcopyrite, sphalerite, and galena is exposed. The new workings consist of a short adit on the hanging-wall side at an elevation of 1,900 feet and about 300 feet south-easterly from the cabin. Several extensive open-cuts have also been excavated on the foot-wall side of the zone on the flat benched area behind the cabin. These expose heavily oxidized material on the surface, and where this has been penetrated the replacement-quartz is well mineralized with pyrite, some chalcopyrite, sphalerite, and galena across widths ranging from 10 to 15 feet. At an elevation of 2,000 feet and 50 feet in a direction south 30 degrees west from the cabin an open-cut on the foot-wall side of the zone exposes a width of 15 feet of replacement-quartz mineralized with pyrite, chalcopyrite, and sphalerite. A sample across 56 inches of the best mineralization in this exposure assayed: Gold, 0.05 oz. per ton; silver, 0.8 oz. per ton; copper, 0.3 per cent.; lead, *nil;* zinc, trace. About 145 feet in direction south 15 degrees east from the cabin an open-cut at an elevation of 1,960 feet exposes a width of 15 feet of oxidized replacement-quartz containing some barite and disseminated pyrite.

About 190 feet south from the cabin an open-cut at an elevation of 2,000 feet exposes an oxidized cross-fracture containing some pyrite and galena. This is again intersected about 65 feet farther south in an open-cut and adit 30 feet long at an elevation of 1,950 feet.

PROGRESS NOTES.

Lode-gold Deposits.

Coast Area.

Surf Inlet Consolidated Gold Mines, Ltd. (formerly Princess Royal Gold Mines, Ltd.).—In January stockholders of Princess Royal Gold Mines, Limited, ratified a change in the company's name to Surf Inlet Consolidated Gold Mines, Limited. Shares were exchanged on the basis of one Surf Inlet Consolidated for three Princess Royal. For general information regarding this operation *see* Annual Report for 1934. In May, 1935, a crew of three was working at the beach camp and twenty-eight at the mine. A small mill, treating about 25 tons per day, had been installed and was operating intermittently as ore-supply allowed. Underground work was continuing in the old *Pugsley* mine on the 1,000-foot level, and the incline shaft from the 900-foot adit-level had been pumped out and exploration carried out mainly by crosscutting west through the "Big" (or east) vein to its hanging-wall and drifting north and south on the hanging-wall side.

The south drift had advanced about 140 feet. A crosscut (No. 3 west) off the south drift projected to intersect the "Small" (or west) vein had passed through the hanging-wall of the "Big" vein.

No. 1 north drift in the central section of the "Big" vein had also been extended south about 40 feet. Side-swiping had been carried out at the face.

Surf Point.—This property is fully described in former Annual Reports covering operations to the end of 1934, together with a detailed report and map of the workings in 1934.

In 1935, operations were continued by the N. A. Timmins Corporation in the workings on the *Trixie* and the *Western Hope* claims.

Redbird.—This claim is owned by J. H. Jones, of Porcher island, and is situated adjacent to the *Edye Pass* group and *Surf Point* on the north. The topography of the area is described in the 1934 Annual Report in connection with the *Surf Point* mine and the geology and character of mineralization is similar to that described for the *Edye Pass* group. Further open-cutting and trenching was done on this vein during 1935, thereby extending the continuity to elevation 215 feet for a total length of about 400 feet. About 250 feet from the eastern extremity of the exposure a cross-vein from 6 to 14 inches in width, striking north 4 degrees east and dipping 70 degrees west, has been uncovered by stripping and open-cutting.

La Porte.—A group of seven claims on the east side of the Ecstall river is owned by P. LaPorte and partner, of Prince Rupert. Surface exploration, consisting of open-cutting and stripping, was continued during the season.

Eagle.—J. Dawson, owner of this claim, adjoining the *Surf Point* on Porcher island, did further open-cutting and stripping.

Cumshewa.—This group, owned by E. C. Stevens, is situated on Cumshewa inlet on the east coast of Moresby island. Open-cutting and stripping was done this year.

Hastings Arm Area.

Mastodon.—This group, owned by Carl Ecklund and associates, of Anyox, is situated on the east side of Hastings arm about 12 miles northerly from Anyox. Open-cutting and stripping showed the siliceous replacement-zone to extend south-easterly above Granite creek (Annual Report, 1934).

Alice Arm Section.

Gold Leaf.—This group, owned by Oscar Flint and associates, of Alice Arm, is situated on the west side of the head of Kitsault River valley. Open-cutting and stripping were continued on this property.

Bear River Area, Portland Canal.

Lucky Date.—J. Hepson, owner of this group at the head of the North fork of Bitter creek, continued work in the adit.

Mayflower.—(*See* Annual Reports of Minister of Mines, 1918, 1922, 1925, 1928, 1930, and Geological Survey of Canada Memoir No. 159.) This group of eight claims, situated on the east side of the Bear river, is reached by a good trail about half a mile long commencing at a point about 6 miles by road from Stewart. In former years open-cuts and adits were excavated on showings in proximity to the cabin. In recent years a new discovery was made in an open-cut at elevation of 800 feet in a creek-draw several hundred feet south of the above work. In the late autumn further exploration of the property was taken over by Clay Porter, of Hyder, and underground operations commenced.

Dunwell Mines, Ltd.—The head office of this company is at 101 Pemberton Building, Victoria, and the property is on the east side of Bear River valley, about 4 miles from Stewart (*see* 1934 Annual Report). The company operated the property during January and February and May and June. Lessees commenced operations in August with a crew of fifteen men. In September the mill was treating 20 tons of *Dunwell* ore per day, and *Ben Ali* ore, about 30 tons. Stoping on the *Dunwell* was done chiefly above No. 3 sub-level. Three men mined the *Ben Ali* claim of the Dunwell Company under contract. Due to contingencies of weather conditions, operations ceased in the late autumn, but at the year-end a deal is reported to have been consummated for continuance of the operation in 1936 by a new group of lessees under the supervision of N. E. Nelson, formerly with the Granby Consolidated Company at Anyox.

Ruth and Francis.—This group of eight claims, owned by James Nesbitt and associates, of Stewart, is located on the north side of Glacier creek, about 4 miles from the *Dunwell* camp on the Bear River road. The main showing outcrops in the steep and bluff-walled bed of the creek and has been explored by two adits. The upper one, at elevation 3,500 feet, is about 60 feet long. In recent years considerable open-cutting and stripping has been carried out on a shear-zone 4 to 10 feet wide occurring about 1,000 feet easterly of the old showings. This zone has been traced between elevations of 3,700 and 4,400 feet along a horizontal distance of about 300 feet by a series of open-cuts and two short adits.

Salmon River Area, Portland Canal.

Premier Gold Mining Co., Ltd.—(*See* former Annual Reports.) Under date of May 23rd, 1935, an agreement was reached between the Premier Gold Mining Company and the Selukwe Company, controlling B.C. Silver and Sebakew Mines adjoining the Premier holdings, wherein a new company, to be known as Silbak Premier Mines, Limited, will operate the properties of the three companies. The authorized capital of the new company is 3,000,000 shares of a par value of $1 each, of which 2,200,000 shares will be issued for properties (1,100,000 shares to Premier) and 300,000 shares will be subscribed in cash at par to provide working capital,

Premier and Selukwe Gold Mining and Finance Company, Limited, each subscribing one-half of this amount. Premier will receive the net proceeds of all ore mined from its present properties during the period ending May 15th, 1937.

In accordance with the terms of the new agreement, the Premier Company commenced development of the B.C. Silver in October, 1935, extending *Premier* mine levels into B.C. Silver ground and diamond-drilling. At the close of the year Premier had completed in this ground 336 feet of drifting and crosscutting and 1,677 feet of diamond-drilling.

Upon completion of the new Diesel power plant to replace the one destroyed by fire, normal milling operations were resumed on March 9th.

Development-work and stoping in the *Premier* mine was largely concentrated during the year on small parallel occurrences on the foot-wall of the main ore-body; 149,672 tons of ore was mined. An average of 303 men were employed.

Big Missouri.—The *Big Missouri* property is owned and operated by the Buena Vista Mining Company, in which the Consolidated Mining and Smelting Company of Canada holds a 60-per-cent. interest. The property is on the east side of the Salmon glacier and distant 18 miles by road from Stewart (*see* Annual Report for 1934). Present operations consist of drifting and crosscutting on the 3,000-foot sub-level, diamond-drilling on the 2,850 (Province) level, and drifting south on the 2,300 (Day) level to the projected position of the raking ore-shoot indicated on the 2,850 and 3,000 levels. Diamond-drilling, raising, and sub-levelling between the Day and Province levels is also being carried out. A crew of forty-five men was employed.

Salmon Gold.—This group is owned by Salmon Gold Mines, Limited, and under option to Consolidated Mining and Smelting Company of Canada, Limited. It is situated on the west side of Summit lake, about 8 miles by trail beyond the *Big Missouri*. Diamond-drilling was continued during the season.

Unuk River Area.

Mackay Syndicate.—The *Unuk* and *Barbara* groups, owned by this syndicate in the Ketchum Creek area, Unuk river, were optioned to Premier Gold Mining Company, Limited, and development-work continued with a crew of twelve men. The work consisted of diamond-drilling, open-cutting, and general prospecting.

Unuk Valley Gold Syndicate.—Premier interests control the *Vera D.*, *Pawn*, and *S.K.* groups adjoining the *Unuk* group on the north. About twenty open-cuts were made during the season.

Taku River Area.

Whitewater.—(*See* Annual Reports for 1929 to 1933, also Bulletin No. 1, 1930; Bulletin No. 2, 1932; and Geological Survey of Canada Summary Report, 1930, Part A.) This group, owned by Art. Hedman, Ray Walker, Ray Rice, and associates, of Juneau, was worked during the year by E. C. Congdon and associates, of Duluth, and 1,000 feet of drifting, crosscutting, and side-swiping was done, mainly from the adit started by the Alaska Juneau Gold Mining Company to investigate the faulting indicated on the surface. During the season eleven men were employed.

PLACER-GOLD DEPOSITS.

Queen Charlotte Islands.

Several individuals worked on the beach black sands on the east coast of Graham island and recovered small quantities of fine gold.

Terry Consolidated.—Testing operations on nine leases owned by this company at Cape Fife were done under the direction of N. Terry. A crew of nine men was employed.

Stikine River Area.

Barrington.—E. J. Brown, under a leasing agreement, worked this drag-line scraper operation. Two men were employed and 219 oz. of gold was recovered.

Little Muddy River Area.

About nineteen individuals, engaged in about ten operations, were active in the Gold Pan Creek-Little Muddy River areas.

Dease Lake Area.

Keystone-drilling was done at the mouth of Dease creek by a San Francisco syndicate. Five individuals also operated on the creek.

Several individuals were "sniping" on Thibert creek and making wages.

Gibson Hydraulic Association.—A crew of seven men carried out work preparatory to the commencement of hydraulicking in 1936.

Atlin Area.

The main operations in the Atlin area are on the O'Donnel river, Bull, Wilson, McKee, Spruce, Pine, Birch, Boulder, Ruby, Cracker, Otter, and Wright creeks. A constructive development on Spruce creek has been the reopening of old drift-workings by individuals working on "lays."

Old McCloskey Drift.—C. Lykkergard and one man were tramming dirt 1,050 feet from a new face behind the old workings. This face was along the edge of the old pay-channel and about 550 feet into the hill from the left bank of Spruce creek. They were drifting nearly parallel to Spruce creek in a direction of south 77 degrees east.

Some sections of remarkably rich ground were encountered in the central section of Spruce creek below its confluence with Dominion creek.

Columbia Development Co.—A feature of this operation in the central section of Spruce creek is the installation of a novel mobile sluicing plant designed by D. Eastman and J. Walsh (*see* illustration). The plant has operated efficiently and a similar one has been completed on additional ground, on the lower section of the creek, acquired during the year. A crew of fifteen men was employed.

Compagnie Francaise des Mines d'or du Canada.—This company ceased operations and lessees took over the operation. Drifting operations have been on the main bed-rock channel and one about 20 feet higher. The bed-rock channel is sinuous and the pay-streaks apparently conform to the straight stretches and the inner sides of the bends.

Tatshenshini River Area.

Squaw Creek.—About forty-five whites and Indians are reported to have worked on Squaw creek during the season. The majority were engaged in individual or small partnership operations.

SILVER-LEAD-ZINC DEPOSITS.

Bear River Area, Portland Canal.

United Empire Gold and Silver Mines, Ltd.—Reports and references to this property are contained in the Minister of Mines' Annual Reports for the years 1924, 1925, 1928, 1929, 1930, 1933, and 1934. The property is also described in Geological Survey of Canada Memoir No. 159, 1929. Subsequent to the work described in the 1934 Annual Report, about 1,235 feet of diamond-drilling was done and some further exploratory drifting, with some crosscutting, in the east and west drifts, which lead from the main crosscut. The west drift-workings driven from the main crosscut adit comprise a total of about 1,071 feet. For a few days previous to the time of examination (September 22nd to 24th) two or three men had been engaged in cleaning out old surface cuts and the underground workings. The surface exposures have been described in former reports.

Palmey.—(*See* Annual Reports of Minister of Mines for 1930 and 1931.) This group consists of twelve claims owned by W. Tooth, of Stewart, and adjoins the *Dalhousie* and *International* groups on the south and south-west and the *M.C.* group on the north. The property is situated on the easterly slope of Mount Bunting of the Bear River ridge, about 7 miles from Stewart, and is reached by a trail from the Bear River road. Recent work consists of further tracing by open-cutting. Exploration was also carried out at higher altitudes.

Ida.—(*See* Annual Reports for 1919, 1922 to 1928, and Geological Survey Memoirs 159 and 175.) This group comprises the *L. and L. Fraction, L. and L. No. 1, Columbia,* and *Sunshine* Crown-granted mineral claims, which were part of the old L. and L. Consolidated Mines, Limited, and were acquired by purchase for taxes by L. H. Davidson, of Stewart. The property is situated at the head of the North fork of Glacier creek. The work in 1935 consisted of stoping in the floor of No. 2 adit, elevation 3,440 feet, for a distance of about 60

feet from the portal. At an elevation of 3,425 feet, about 50 feet northerly from the portal of No. 2 adit, a drift 21 feet long was driven on the vein.

Northwestern Aerial Prospectors, Ltd.—This company owns a group of some fifteen claims on the west side of American creek near its headwaters, about 26 miles from the town of Stewart. The area is reached by trail from the end of the Bear River road at American creek. The main showings on the *Moonlight* claim are described in the Annual Reports for 1930, 1931, and 1932. During 1935 some stripping and open-cutting was done on a quartz stringer on the *Moonlight* claim at an elevation of 3,000 feet on a ridge in the valley of American creek.

Salmon River Area.

Spider.—This group, owned by B.C. Bonanza Mines, Limited, is situated on the east side of Cascade creek, a mile north of Long lake or about 2½ miles northerly from the *Big Missouri.* O. McFadden and partner, lessees, carried out open-cutting and stoping and shipped 3.85 tons of selected ore to Tacoma.

Alice Arm Area.

Esperanza Mines, Ltd. (N.P.L.).—(*See* former Annual Reports and also the Geological Survey of Canada reports covering this area.) During 1935 the "Alice" adit, elevation 1,730 feet, was continued towards the intersection of the "Alice" vein-outcrop. A small-tonnage mill was erected late in the year. A single-line tramway, about 1,200 feet long, was also constructed from the portal of No. 4 adit to the mill. In preparation for mining, the 36–42-horse-power semi-Diesel engine and a 2 by 120 Gardner-Denver compressor were moved from No. 9 adit to the portal of No. 4 adit and housed there.

Dolly Varden.—This property is described in detail in former Annual Reports and also in those of the Geological Survey of Canada on this area. During 1935 the property was leased by T. W. Falconer, Alice Arm, who employed two men on high-grading operations. This work was done in two small open-cuts on the east and west sides of No. 1 glory-hole, on a pay-streak in the hanging-wall side of the vein.

Stikine River Area.

Jackson.—This group is owned by Frank Jackson and associates, of Jackson's Landing, and adjoins the *Lady Jane* group on the east. The geology and mineral deposits are described in the 1929, 1930, and 1931 Annual Reports. During 1935 further open-cutting was done on a cross-vein outcropping down the steep hill-slope at elevation 2,925 feet, about 750 feet above Connover creek and 700 feet north-east from the cabin. About 25 feet west from this cut a cross-vein 18 inches in width is exposed.

Taku River Area.

Banker.—This group of five claims and one fraction is owned by J. L. Hill and associates, of Juneau, and is described in detail in the 1929 and 1930 Annual Reports and in Bulletin No. 1, 1930, "Taku River Area."

On the adjoining *Potlatch* group, owned by Buck Sparling, of Juneau, the owner was engaged in sinking a shaft through overburden at a place about 70 feet north-westerly from the *Banker* showing, with the objective of picking up the extension of this showing.

COPPER DEPOSITS.

Observatory Inlet Area.

Granby C.M.S. & P. Co., Ltd.—The property and operations of this company at Anyox, Observatory inlet, are described in former Annual Reports, and in the Annual Report for 1934 more recent operations are mentioned. Normal operations were continued at Anyox during the first part of the year, but in July preparations for cessation were begun. In September operations ceased completely and the crew, staff, and residents gradually left.

Non-metallic Deposits.

Coast Area.

Sericite.—This group, owned by C. Jedder and P. J. Ray, is situated on Baker inlet. Development-work was continued by two men. Samples of mica sent to the Department of Mines, Ottawa, were favourably reported on regarding character and grade of material. A test shipment of 1.5 tons was made to Vancouver.

Koeye River.

This river flows into the east side of Fitzhugh sound about 7 miles south of Namu cannery. About half a mile from the mouth on the right bank, P. Christensen is operating a limestone-quarry and during 1935 shipped 6,255 tons of crude limestone to the Pacific Pulp and Paper Mills at Ocean Falls.

PART C.

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

BY

DOUGLAS LAY.

SUMMARY.

Active interest in this district has been largely confined to gold properties, both lode and placer, and in these branches of the mining industry important expansion took place during the year.

The producing lode-gold properties in the Cariboo district—namely, Cariboo Gold Quartz Mining Company, Limited, and Island Mountain Mines Company, Limited—increased their respective rates of milling during the year, the rate at the former being now 150 tons daily and at the latter about 100 tons daily. Inauguration of dividend payments at the rate of 10 per cent. per annum commencing January 1st, 1936, was announced on November 19th by Cariboo Gold Quartz Mining Company, Limited. The results secured by these companies may be considered a sound argument for further well-directed development at other points within the Barkerville gold belt.

In the Omineca Mining Division activities took place on the Zymoetz river; in the vicinity of Usk; at several points on Hudson Bay mountain, near Smithers; on Dome and Grouse mountains, near Telkwa; in Whitesail Lake area; and at Aiken lake, where the most northerly lode-mining operation in this district is carried on by the Consolidated Mining and Smelting Company of Canada, Limited.

Individual owners were particularly active developing their properties and making small shipments of ore, the quantity in one case reaching a car-lot (from *Glacier Gulch*, Smithers).

In placer-mining a marked growth of activity, reflected in the output, featured the year and there is every indication of a sustained increase. The two major operations now in progress—namely, those of Consolidated Gold Alluvials of B.C., Limited, and Bullion Placers, Limited—exemplify respectively the largest "deep-lead" and the largest hydraulic enterprise in the Province. Cedar creek witnessed a revival of activity and there seems reason to believe that this deposit, unique in many ways, is not yet exhausted.

While placer activity centred mainly in the Cariboo district, in the Omineca Mining Division the Manson section was busier than for some years past. Other points at which work was carried on were: Two Brothers Lake area; McConnell creek; McDougall river; Lorne, Hankin, and Sauchi creeks. In the Manson section developments on Vital and Slate creeks and on the Germansen river give every promise of continued activity next year.

New discoveries of promise made this and last year in the Cariboo district at points very close to, if not actually on, existing transportation routes emphasize the possibilities such regions still afford to the prospector. In this connection close scrutiny for both lode gold and placer is advised in the strip of country embracing the contact of the Precambrian and Mesozoic rocks extending between Wingdam and Spanish mountain.

It is stated that English interests have acquired the entire holdings of Lowhee Mining Company, Limited, which consist largely of placer properties, although certain lode-mineral holdings are included.

A Placer-mining Training Camp was conducted by the Department of Mines during the summer at Long bar on the Fraser river near Quesnel.

Rumours of an important discovery of tin in the northern part of this Mineral Survey District were in circulation in the Province and in London during the early summer. Close investigation proved, however, that such rumours had no foundation in fact.

Coal-mining was carried on at the Bulkley Valley Colliery; at the Aveling property on the Telkwa river; and on Hudson Bay mountain.

The writer desires to express his cordial thanks for the co-operation and hospitality extended by prospectors and mine operators in the conduct of his work.

Production from this district for the year is as follows: Ore, 74,830 tons; gold, lode, 36,096 oz.; silver, 7,177 oz.; lead, 8,227 lb.; zinc, 1,712 lb.; placer gold, 13,151 oz.

LODE-GOLD DEPOSITS.

Hixon Creek Area.

Quartz veins occur in this area, and in the case of the properties described they are mainly developed in igneous rock at or near the contact of the latter with schistose sediments.

The formation on Hixon creek consists of alternate bands of greenstone and schistose sediments. At some points there is evidence of low gold values in the greenstone in the region of the contact, raising the question as to whether sections of the greenstone can be economically mined. Further investigation is necessary to determine the possibilities of this type of mineralization.

Quesnelle Quartz Mining Co., Ltd.

This company is a reorganization of an old company of the same name incorporated in the seventies. The authorized capital is $600,000, divided into 2,400,000 shares of a par value of 25 cents each. The registered office is 1000 Hall Building, Vancouver, and the president is Newton J. Ker. The property consists of six Crown-granted claims—*Morrison Location, Stewart Location, Washburn Location, Washburn Lateral,* and also Lot 55G and Lot 56G.

The property is situated on Hixon creek, about 4½ miles distant from the Prince George–Quesnel highway, and can now be reached by motor-car. The slopes of Hixon Creek valley are timbered and the rock formations are largely covered by gravel terraces at elevations much above the creek. The creek has cut down to a depth of about 200 feet below the plateau-level and, at about creek-level, rock formation and quartz veins are exposed.

The formation consists of bands of highly altered kaolinized rock interstratified with schistose sediments and phyllites. Within the first mentioned are numerous quartz veins, mineralized with pyrite, varying in size from an inch or less to several feet in width. Quartz veins also follow the contact of the highly altered rock with the sediments. Underground workings show that the deeply oxidized and kaolinized rock gradually passes at depth into greenstone; the zone of oxidation extending to about 100 feet below the creek-level. It is evident that the rock formations were deeply weathered in Tertiary times and that secondary enrichment took place in the quartz veins. Commercial gold values only occur in some of the quartz veins. The greenstone is a highly altered rock, possibly diorite, originally intruded in the form of sills. About 2 miles down-stream a stock of augite syenite outcrops at the falls on the creek, and granodiorite outcrops 2 miles up-stream in the creek-valley.

After incorporation in the seventies the original company carried out a large part of the existing underground work and erected a stamp-mill. Old records show apparently that 239 tons of ore was milled, averaging $20.91, with gold valued at $20.67 per ounce. Operations were suspended in the late eighties, shaft-workings allowed to fill with water, and for nearly fifty years until 1933 they remained in that condition.

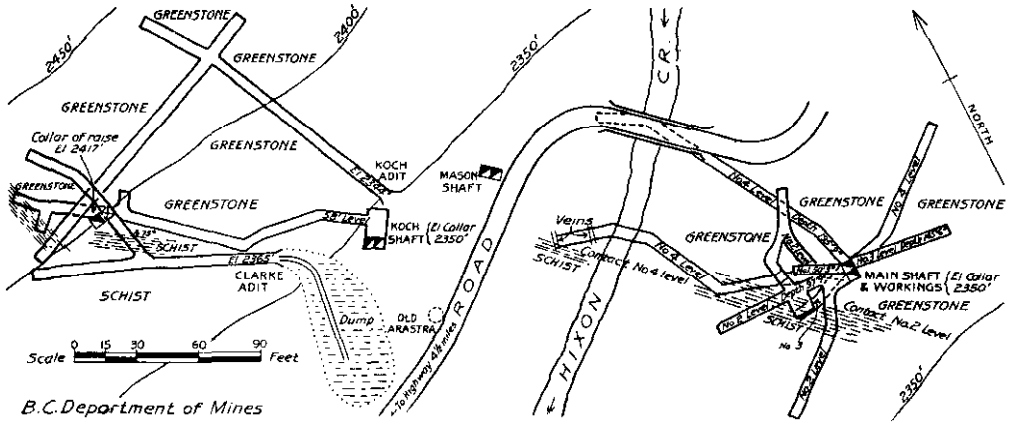
An option on the property was secured in 1918 by Chas. F. Law and later in 1929 by Cariboo Lode Mines, Limited, but on each occasion little was done other than clearing out adits. Interest was revived in 1932 following the discovery by B. Briscoe of some rich quartz stringers, and the property was optioned by R. W. Alward, M.L.A., and J. H. Johnson. Pits were sunk on the quartz stringers to where the ore pinched and 8 tons was shipped, yielding 7 oz. gold and 3 oz. silver. The option was allowed to lapse. In 1933 the present company was organized, plant was installed, comprising a 50-horse-power Diesel-engine-operated air-compressor, 18-horse-power gasoline-engine, hoist and pump, and the main shaft, sunk close to the creek on the left bank to a depth of 207 feet, was unwatered and development commenced. This working shows that the decomposed rock at the surface gradually becomes less oxidized in depth and at 100 feet merges into greenstone, which continues to the bottom. From the main shaft, levels known as Nos. 1 to 4 are driven at depths of 25, 97½, 145½, and 196 feet respectively. Workings are driven on No. 4 level to points respectively 458 feet north-west and 115 feet south-east of the shaft, following the immediate proximity of the contact, although the latter is not exposed at all points.

The schistose sediments strike generally north 40 degrees west. The prevailing dip is north-east at steep angles, but is occasionally south-west. The result of this development was to disclose a large number of fairly closely spaced quartz veins striking almost entirely north-easterly with varying but steep dip. In a few instances quartz veins follow the schist-greenstone contact for a limited distance. The width of the veins varies from a few inches up to 6 feet, and nine of them are from 2 feet to 4 feet in width. In the north-west working twenty-six such veins were cut, and in the south-east working three were cut, of which one near the face is 4 feet in width. Wherever the contact is exposed these veins are seen to terminate abruptly at it. Many of the veins have frozen walls. Only two veins to date have been followed in a direction away from the contact, in one case 52 feet and in another 24 feet. These workings were not sampled, but it is understood that the results were not encouraging. The greenstone *in the immediate vicinity of the contact only* is kaolinized, evidently owing to the percolation of surface waters. A few feet away from the contact the greenstone shows hydrothermal alteration and appears as a well-mineralized green-coloured chloritic rock intersected by quartz veinlets. Quite a diversity of minerals is exemplified in the veins and rock formations immediately adjacent thereto. Those observed at different points are pyrite, chalcopyrite, galena, sphalerite, arsenopyrite, molybdenite, native gold, native silver (in the form of wire silver), and a chocolate-coloured mineral of rare occurrence in the district, which was identified by the Provincial Assayer as silicate of iron. The last two minerals mentioned are obviously secondary, the former being found in a cavity in one of the veins.

The following samples were taken from the veins in the north-west working at the respective distances given from the shaft:—

At 60 feet, across 2.2 feet. Assay: Gold, 0.02 oz. per ton.
At 150 feet, across 6 inches. Assay: Gold, trace.
At 162 feet, across 3.2 feet. Assay: Gold, trace.
At 170 feet, across 4.5 feet. Assay: Gold, trace.
At 250 feet, across 2 feet. Assay: Gold, 0.08 oz. per ton.
At 265 feet, across 6 inches. Assay: Gold, 0.02 oz. per ton.
At 290 feet, across 1.5 feet. Assay: Gold, 0.10 oz. per ton.
At 299 feet, across 2.6 feet. Assay: Gold, 0.02 oz. per ton.
At 324 feet, across 2 feet. Assay: Gold, 0.02 oz. per ton.
At 356 feet, across 2 feet. Assay: Gold, 0.10 oz. per ton.
At 440 feet, across 4 feet. Assay: Gold, 0.20 oz. per ton.

The following sample was taken in the south-east working from a vein 6 inches wide, 90 feet south-east of shaft:—Assay: Gold, 0.30 oz. per ton.



Quesnelle Quartz Mining Co. Plan of Workings as in 1934.

No. 3 level is driven wholly in greenstone. In the east drift from the shaft close to the latter a steeply dipping fairly well-mineralized quartz vein about 6 feet wide is exposed, striking north 38 degrees east and cut diagonally by the working. A sample taken across a width of 4 feet assayed: Gold, 0.04 oz. per ton.

On No. 2 level the greenstone-schist contact was reached 25 feet west of the shaft. At this point a shallow winze and a short raise follow one quartz vein 18 inches in width and two adjoining parallel stringers each about 3 inches in width. These strike north-easterly and their continuation is intercepted by the more easterly of two parallel north branch workings, which also exposes another quartz vein on its east side 6 feet in width striking north-east. A sample taken at this point across 6 feet assayed: Gold, 0.04 oz. per ton. On the west side of the working opposite the last-mentioned vein, a sample was taken across a width of 5 feet, being mainly oxidized greenstone with a little quartz. This sample assayed: Gold, 0.5 oz. per ton.

On No. 1 level, wholly in highly oxidized greenstone, a vein 6 feet in width, striking north-east, is cut 12 feet from the shaft. A sample taken across this width assayed traces of gold only.

The other workings, consisting of the old Koch shaft and Koch adit, and new Clarke adit, are on the right bank of the creek about 230 feet north-westerly from the main shaft.

The westerly working from the Koch adit cuts some well-mineralized quartz veins in oxidized greenstone within the first 90 feet of its length, but samples taken from these veins showed no values. For the last 66 feet this working is in schist which passes into graphitic schist near the face.

The north-westerly working from the Koch shaft is driven entirely in schist, in the immediate vicinity of the contact of the latter with oxidized greenstone. Although lagging prevents thorough inspection, there is evidence of quartz veins on the east side of the working. The face has entered graphitic schist. Near the face a short crosscut west discloses a quartz stringer in the schist, one of the very few examples on this property of the occurrence of a vein in the schist.

The Clarke adit is a recent working chiefly in schist, except where it enters oxidized greenstone in the region immediately below the raise shown on the plan. The purpose of this adit was to explore the region immediately below the bench-ground 60 feet above the adit on which rich stringers were discovered in 1932. Near the top of the raise a quartz vein 4 feet in width is exposed in which free gold was found. These veins did not prove to be continuous.

The veins exposed to date, with quite unimportant exceptions, occur *in the greenstone* at or close to the greenstone-schist contact. Wherever the contact is actually exposed, they are seen to terminate abruptly at it and do not extend into the schist. The strike of the veins is generally north-easterly, and while there is some evidence of quartz several feet in width paralleling the contact for a short distance at some points, there is no evidence of persistence of a contact-vein. The continuity of the veins in a north-easterly direction, that is away from the contact, is yet to be investigated more fully. One of the original workings to the north-west from the main shaft on No. 4 level is driven 50 feet away from the contact and does not show any commercial veins. However, the face has not entered the most promising region as shown by recent work.

Values, although erratic, are good at some points and also appear to occur in places away from the veins in the greenstone.

The comparatively close spacing of the veins at the contact and the values found in that region raise the question as to whether, even if vein-continuity away from the contact is not eventually proven, a considerable width of vein and country-rock in the vicinity of the contact constitutes commercial ore. Such can only be determined by careful and systematic sampling. There is more than one schist-greenstone contact on this property.

There seems but little doubt that the greenstone is younger than the schistose sediments. The former, although slightly schistose near the contact, where there is much evidence of shearing, considered as a whole is not schistose in character. The repetition of alternating bands of schist and greenstone at this and the neighbouring properties suggests that the greenstone was injected in the form of sills. There is much in the nature of these veins to suggest that they have filled cooling fractures formed in the greenstone, and the possibility must be borne in mind that such fissures may only have formed in the vicinity of the contact with the cold sedimentary formations.

Whether this is the case or not, operations to date undoubtedly indicate the schist-greenstone contact as the most promising region.

Cariboo Gold Drop.

This group consists of a number of claims owned by Valentin Witt and associates, of Prince George. It is situated about 12 miles south-east of the property of Quesnelle Quartz Mining Company, between Terry and Canyon creeks, in the broken hilly country typical of the Fraser plateau. The chief showings lie at an elevation of about 3,750 feet in well-timbered, gently sloping ground falling away more sharply on the south.

The property is reached by a trail from Hixon creek, about 12 miles in length, which branches south from the latter about 1 mile above Quesnelle Quartz Mining Company's property, and leads via Pedley lake across the North fork of Terry creek near its junction with the main creek. The trail, over which horses may be taken for a distance of about 8 miles, crosses Terry creek several times. The remaining distance of 4 miles to the property is followed by an indifferent foot-trail. If any work is to be done at this property, about 5 miles of the trail will require relocation. The property is distant in an air-line about 4 miles north-east of Swede mountain, lying north of Canyon creek.

The formation consists of intercalated schistose argillites and quartzites which strike from north 77 degrees west to north 57 degrees west and dip 45 to 60 degrees south-westerly. Conformably overlying this formation is a flow or large sill of pyroxenite in immediate contact with quartzites. Evidence of schistose structure and shearing diminish in the igneous rock away from the contact, and it assumes a more granular texture. The contact coincides very closely with the topographic features, the more resistant sedimentary formation weathering less rapidly than the igneous rock and forming the brow of a hillside, so that the ground falls away more steeply where it is underlain by the igneous rock. The slope of the hillside is about 30 degrees.

Three quartz veins have been exposed to date and some evidence obtained of others. The widths of the veins are respectively 15 inches, 6½ feet, and 35 feet or more. All these veins have free walls and occur close to the contact of the sedimentary formation and igneous rock; the first-mentioned vein is in the sediments and the last two in the igneous rock. The two largest veins show little or no sulphide, but the smallest vein is fairly well mineralized with pyrite. In all cases assays of samples taken failed to disclose any gold values.

The property is believed to have been staked last year by the owners.

At elevation 3,700 feet close to the top of the slope mentioned above, on the *Blue Quartz* claim, a pit is sunk to a depth of 8 feet, following a quartz vein 15 inches in width, with free walls, mineralized with pyrite. This vein coincides in dip and strike with the enclosing argillites, which strike north 42 degrees west and dip 55 degrees south-west. The vein is displaced at the bottom of the pit by a fault, strike north 72 degrees west, with vertical dip. A sample taken from this vein assayed: Gold, *nil.*

About 750 yards from this pit, south 77 degrees east at 3,950 feet elevation, a large quartz vein apparently wholly in sheared and fractured pyroxenite (strike, so far as can be determined from exposures, north 77 degrees west, dip 40 degrees south-west) is exposed by one open-cut and natural agencies for a length of 110 feet. The hanging-wall of the vein is well exposed, but the foot-wall side is obscured by vegetation. The contact between pyroxenite and quartzite occurs 100 feet north of the most westerly exposure. An open-cut 39 feet in length across this vein indicates a quartz-exposure 45 feet in width, as quartz extends beyond the open-cut, but the true vein-width may be less than 45 feet. The vein, showing little oxidation and no sulphides, outcrops strongly 55 feet north-west and the same distance south-east of this open-cut. A sample taken from the open-cut across 45 feet assayed: Gold, *nil.* Distant 123 feet south 62 degrees east from this open-cut, a shear-zone in pyroxenite 6½ feet in width is exposed along the strike by a trench 6 feet deep and 33 feet in length. The filling consists of sheared pyroxenite and seams of quartz, one 2 feet wide on the hanging-wall and another 2½ feet wide on the foot-wall, strike north 58 degrees east, dip 55 degrees south-east. This vein shows much oxidation, but no sulphides were observed. Three samples taken, one of the most oxidized parts of the vein and two others across the full vein-width at different points, yielded negative results in gold.

Whites Landing Area.

Within the area enclosed by the large westerly bend of the Fraser river down-stream from Whites Landing the existence of numerous large quartz veins has been reported, but only the *Cougar* group, situated in the northern part of this region, has been examined to date. This

section is largely covered by dense vegetation and the geology obscured, but the rocks exposed consist of intercalated volcanics and sediments intruded by a large stock about 6 miles east of the mouth of the Blackwater river. The eastern portion of this stock exemplifying various types of batholithic rock is exposed immediately west of Pre-emption Lot 3211.

Cougar. This group comprises eight claims and is owned by a private syndicate, the Cougar Mining Syndicate, of 501 Crown Building, Vancouver. The property adjoins the left bank of the Fraser river, about 6 miles down-stream from Whites Landing. The topography is hilly broken country covered with timber, underbrush, and vegetation, which obscures rock-exposures to such an extent that it is likely that only by chance would a vein-outcrop be discovered in such a region.

The property is reached by following the wagon-road from Strathnaver on the highway to Whites Landing, a distance of about 6 miles. Thereafter a trail, over which horses can be taken, although it is at some points somewhat difficult to follow, leads a further 7 miles to the property.

There are only a few rock-exposures in the immediate vicinity of the showing, which is a large, sparsely mineralized quartz-vein between thickly bedded argillites on the foot-wall and a sheared igneous rock of dioritic type on the hanging-wall. Exposures are insufficient to determine the origin of the dioritic rock. Argillites are also exposed at several points on the left bank of the river.

The vein was discovered, it is stated, by an Indian while hunting, and was subsequently staked by G. C. Colebank, by whom it was optioned to the present owners.

The surface showing is 1,500 feet south-east of and 200 feet above the river, and consists of a large quartz vein exposed mainly down its dip for a distance of 117 feet, chiefly by natural agencies. The vein, strike north 12 degrees west, dip from 20 to 35 degrees south-westerly, varies from 5 to 17 feet in width. It shows evidence of oxidation and is sparingly mineralized, and the walls are free. The minerals observed are pyrite, chalcopyrite, and a little malachite and azurite. A sample taken across a width of 6 inches, including the most heavily mineralized portions of the vein, assayed: Gold, trace; silver, 0.20 oz. per ton; copper, trace. Samples taken at two other points across 16 feet and 5 feet respectively, representing the full vein-width exposed at these points assayed: Gold, trace.

Hansard Area.

There appear to be a number of quartz veins, of varying width up to many feet in one case, on the Bowron river, south-west of Hansard. The fact that on the *Dawn* group low gold values were found seems to justify further prospecting in this region.

Barbara Ellen. This group consists of six claims owned by J. F. Wilson, of Hansard. The property is situated on the left bank of Bowron river, about 4½ miles distant in an air-line south-west of Hansard, and is reached by motor-boat from Hansard via Fraser and Bowron rivers, the distance by water being from 10 to 12 miles. The ground is gently sloping, broken up by numerous small gullies, heavily timbered, and covered by vegetation.

The formation of the region consists of schistose argillites, quartzites, and limestone. The essential feature of the property is a large, partly exposed quartz vein possibly 24 feet wide, with free walls, which, so far as can be ascertained, coincides in strike and dip with the enclosing schistose argillites. The strike of the latter varies from north 65 degrees west to north 47 degrees west and the dip is about 45 degrees north-easterly. At one place the vein shows a bunchy mineralization of pyrite, chalcopyrite, and sphalerite.

The vein is in part sheared and the crushed quartz of the sheared parts has been considered a possible source of silica. Although some samples proved to be very pure, it is apparent that the presence of sulphides in part of the vein would prevent production of any appreciable tonnage of high-grade material.

The surface showings are situated about 400 yards above the mouth of a small creek flowing south-westerly into Bowron river. On the left bank of this creek, at or near creek-level, is an open-cut 51 feet in length on a bearing north 73 degrees east. This open-cut drains part of the underground workings and exposes the foot-wall of the vein. Stripping at the end of this cut on the north side indicates a vein-width of possibly 24 feet. On the opposite side of the creek, distant 52 feet on a bearing north 27 degrees west from the end of the open-

cut, a pit, caved at the time of examination, is stated to have been sunk a few feet and to have disclosed some quartz. A few feet up-stream from this pit stripping shows a small vein.

Most of the underground workings were inaccessible at the time of examination as they are situated at such a low level that they are flooded by the creek at every freshet. It was, however, possible to inspect a working driven close to the foot-wall for a distance of 23 feet.

Dawn. This group, consisting of several claims owned by E. Messmer, of Hansard, and immediately adjoining the *Barbara Ellen* group, is situated on the left bank of the Bowron river and is reached by motor-boat from Hansard. The showings are about 2 miles up-stream from those of the *Barbara Ellen*.

The ground is covered with dense timber and vegetation. The showings are situated a short distance above the mouth and on the banks of a small creek flowing south-westerly into Bowron river. The creek cuts through interbedded schistose limestone and argillites. The rock formations have been stripped for a distance of 70 yards on the left bank and a further 30 yards on the right bank. Numerous small stringers of quartz and siderite with pyrite occurring in the schistose limestone generally follow the bedding-planes, although some cut across them. A sample taken from one such stringer, 3 inches in width, assayed: Gold, 0.04 oz. per ton.

In view of this gold value some further prospecting in the region seems justified in the hope that larger veins of more marked gold content may be discovered.

Usk Area.

The types of lode-gold deposits in this area consist of quartz veins in which copper minerals are not present in pronounced amounts such as those of Omineca Gold Quartz Mines, Limited (*Dardanelle* group), and Columario Consolidated Gold Mines, Limited; and quartz veins in which copper minerals are present to a marked extent such as those of the *Lucky Luke* and *Cordillera* groups.

In the case of the property of Nicholson Creek Mining Corporation, another type of quartz vein is exemplified in which the mineralization consists essentially of pyrite and molybdenite.

Nicholson Creek Mining Corporation. This company, incorporated in the State of Washington, holds sixty-nine claims, covering an area of about 6 square miles between Lowrie and Nicholson creeks, both large creeks flowing south-easterly in a parallel direction into the Skeena river, in the more immediate vicinity of Usk. While there are various mineral-showings at different points in this area, some of which doubtless have not been examined by the Resident Engineer, two sections seem to be of chief interest: (1) The one including the *Diadem* showings (copper-showings containing low precious-metal values, described at length in the 1928 and 1930 Annual Reports); and (2) the other adjacent to Molybdenum creek (northward-flowing tributary of Nicholson creek) and its tributaries, which at present engages the attention of this corporation and is the subject of this report.

The present camp of the corporation is situated on the right bank of Molybdenum creek at an elevation of somewhat over 1,500 feet, and is reached by a motor-road from Usk 2 miles in length, followed by about 4 miles of recently constructed good tractor-road. The country in the vicinity of Molybdenum creek is rugged, precipitous in places, and covered with dense timber and underbrush.

Considering the geology of the area covered by this corporation's property as a whole, it may be described as one underlain by the Lower Jurassic volcanics of the Hazelton series, intruded at various points by stocks of batholithic rock, mainly granodiorite. In one of the latter are situated the surface showings under immediate investigation, and also the adit now being driven to probe the region below these showings. There are some grounds for inferring that the eastern flank of the Coast Range batholith is situated east of this region, in which case the company's property lies in a roof-pendant area.

The type of deposit under investigation consists of shear-zones in much-fractured batholithic rock, mainly granodiorite. The filling consists of well-mineralized quartz veins and sheared granodiorite. The quartz veins vary in width from a few inches up to 4 feet in one case and are well mineralized with pyrite and molybdenite. The sheared batholithic rock is more or less pyritized, and the region of shearing in most cases extends considerably beyond

the walls of the quartz veins. In some places the unsheared batholithic rock is pyritized and in others the pyrite replaces the ferromagnesian silicates only. Heavy gouge is developed on the planes of shearing and the quartz veins exhibit much evidence of post-mineral movement. Commercial possibilities are obviously confined to the quartz veins.

The shear-zones were found to recur over an *observed* horizontal range of about 425 feet and over a vertical range of about 1,800 feet. They vary in strike from a few degrees west of north to north-west and dip at varying angles, but mainly steeply north-east. Lamprophyre dykes intrude the batholithic rock.

The *Diadem* was originally owned by A. Baxendale, who carried out preliminary prospecting and development work in 1923 and prior to that year. Subsequently the ownership passed to Buckley Shannon, who after continued prospecting bonded the property in 1928 to Canadian-American Consolidated Mining Company, Limited, which company did a small amount of hand-mining, and made during that year two trial shipments of ½ ton each, the average assay being: Gold, 0.02 oz. per ton; silver, 1.6 oz. per ton; copper, 5.8 per cent.; as recorded in the Annual Report for 1928.

In 1929 the property was optioned by R. E. Doan, who transferred the option to the American Copper Mines, Limited, in 1930. This company installed an air-compressor plant and erected camp buildings beside the railway about 2 miles east of Usk. Two adits about 4,000 feet apart a short distance above the railway were started and by the end of December had been driven 132 and 930 feet respectively. Work was suspended in 1931.

Activities were commenced by the present company in 1934, and a tractor-trail about 3½ miles in length was constructed to a camp-site on Molybdenum creek where buildings were erected. During 1935 a plant comprising two 36–42-horse-power semi-Diesel Petter engines, each running a Gardner air-compressor of 220 cubic feet of free air per minute capacity, was installed, additions made to camp buildings, and headway made with an adit started in the right bank of Molybdenum creek. (Refer to Annual Reports for the years 1923, 1928, 1930, 1931, and 1934.)

The surface showings examined are situated either in the bed of Molybdenum creek, or on the sides of the creek-valley, or in tributaries of this creek. Molybdenum creek flows north-easterly, almost parallel to the crosscut adit now being run on a bearing south 37 degrees 41 minutes west, in the right bank of the creek. At or about 1,200 feet from the portal of the adit, in the region more immediately above the face, as viewed on August 5th last, four well-mineralized outcrops are exposed, of which three are situated east and one west of Molybdenum creek. The three former veins are named by the management No. 3, No. 4, and No. 5, respectively, the first being nearest to the portal of the adit. The vein on the west side of the creek is considered by the management as being possibly the faulted portion of vein No. 4, and is described in this report as vein No. 4A. No. 2 vein outcrops 160 feet north of No. 3, and No. 1 vein 325 feet north of No. 2. The outcrops of these two latter are markedly weaker than the others. South of the foregoing, farther up-stream, four additional shear-zones are exposed in the bed of the creek within a belt of country a few hundred feet in width, containing outcrops of granodiorite and volcanic roof-rocks. One of the shear-zones is well mineralized, but little has been done to expose them.

Distant possibly 3,500 feet south-west of the portal of the adit at the head of a tributary of Molybdenum creek flowing in on the west, is exposed by natural agencies, by far the largest shear-zone observed. Its full width has not been ascertained, but it may be 20 feet or more. There are several quartz-seams within this shear-zone well mineralized with pyrite and molybdenite.

Distant possibly 750 feet south-west of the last-mentioned shear-zone, on the divide between Nicholson and Lowrie creeks at an elevation of about 1,800 feet above the adit, another shear-zone is exposed, 13 feet in width, wherein quartz-seams are well mineralized with pyrite and molybdenite.

The outcrop of vein No. 3 is uncovered for a few feet in length only on the right bank of Molybdenum creek at an elevation of 300 feet above the adit. This is a strong showing having a width of 4 feet of quartz well mineralized with pyrite and molybdenite, the latter occurring mainly on the hanging-wall, strike north 26 degrees west, dip 70 degrees north-east. The shear-zone apparently continues south-eastwards, but continuity north-westwards is not evident. A sample taken across 4 feet assayed: Gold, 0.02 oz. per ton; molybdenum, 0.08 per cent.

Below the mouth of Mosquito creek, however, the evidence supports the view that in Tertiary times Lightning creek may have occupied an entirely different channel from that of the course of the present creek, which flows north-westerly from this point. Above Wingdam the valley gradually widens to one of subdued relief and great width at Beaver Pass House. Up-stream from the latter point the valley again becomes narrow and steep at and above Stanley.

Apart from the superficial post-Glacial placer concentrations, two distinct types of placer deposits occur on the company's property in immediate proximity to Wingdam: (*a.*) A deposit of possibly inter-Glacial age, underlying the top boulder-clay, and occurring at a depth of 120 feet below the surface. This consists of highly auriferous washed gravels, in which are many large boulders and pieces of slide-rock of purely local origin, while some of the smaller boulders are not local. Up to the present the workings and Keystone-drilling have not revealed a *false bed-rock underlying this deposit*, which is believed to be quite unique in this district. It has been extensively mined, and particulars of sampling carried out by the writer, including further details, are given later in this report. It has proved far more important than there was formerly any reason to suppose. The gold, which is fairly coarse, is flat and well worn. (*b.*) The bed-rock gravels of the pre-Glacial channel which lie buried at a depth of about 165 feet below the creek. These were originally the main objective of this company, upon which vigorous effort has been concentrated for the past two years on the extensive preliminary work necessary for the safe mining of these gravels. No mining has been done and first-hand information as to the values therein has been ascertained only by the large amount of Keystone-drilling. High values are reported by the management and it may be stated that general considerations justify the view that good bed-rock values are quite possible.

At *La Fontaine* mine the pre-Glacial channel of Lightning creek lying at a depth of 125 feet below the creek was extensively mined in the years 1903 to 1907, but values were then found to be too low to yield a profit.

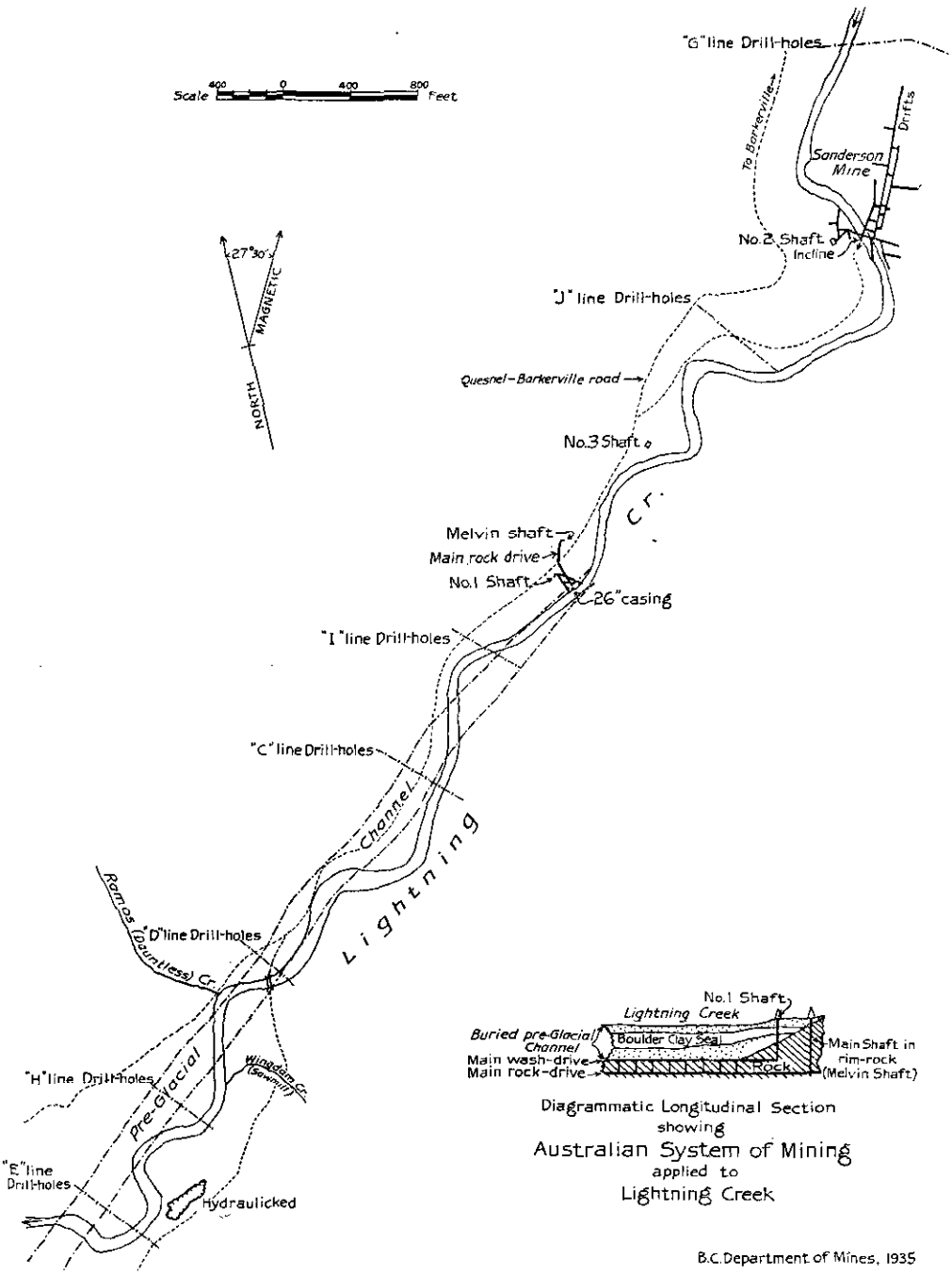
Shortly after incorporation of Lightning Creek Gold Gravels and Drainage Company, Limited (the name of this company was changed to Lightning Creek Gold Mines, Limited, in 1929), mining operations commenced with the driving of a drainage-adit (the site of which is unknown to the writer), which was continued, according to the 1899 Annual Report, a distance of 1,500 feet and subsequently abandoned in favour of shaft-sinking. Four shafts were sunk, and much Keystone-drilling was carried out under the management of C. H. Unverzagt. A branch drive from one of these shafts, now known as No. 1 shaft (depth 195 feet, of which the upper 103 feet are in gravels and the remainder in rim-rock), was run southwards a distance of 115 feet, breaking into the channel-gravels at this point. Unfortunately, at the time of breaking through, water and gravels came in with a rush, causing subsidence of the gravels and suspension of operations in this working at that time. No actual mining of gravels took place until 1933, when, following the completion of the necessary preparations started in 1931, No. 2 shaft (depth 130 feet) was reconditioned and unwatered, and mining of the pay-gravels encountered at a depth of 120 feet was commenced. In the fall of 1933 it was decided to resume the former attempt to mine bed-rock gravels from No. 1 shaft, and with this end in view a method of mining suggested by the N. C. Jannsen Drilling Company, of Seattle, was adopted. This involves sinking, by way of preliminary, a steel casing, 26 inches in diameter, to, and somewhat below, bed-rock in the vicinity of the shaft which it is desired subsequently to sink or from which to mine if the shaft has already been sunk. In this casing (the bottom of which is perforated to permit ready inflow of water) is placed a deep-well pump, which pumps bed-rock waters to surface, likewise such waters in superincumbent deposits as are free to percolate downwards to bed-rock. In the autumn of 1933 a 26-inch casing was put down by the N. C. Jannsen Drilling Company, under contract, close to the creek, 142 feet south of No. 1 shaft, and bedrock was reached at 175 feet 7 inches, and drilling was continued to afford a sump a further 12½ feet in bed-rock. Subsequently, the casing was apparently perforated not only at the bottom, but also, for reasons that are not clear, at a depth of 132 feet. The result was that fine material passed into the pump-well, choking the pump. Following the control of management by English interests in 1934, application of the Australian method of deep-lead placer-mining (subsequently described in this report) was decided upon. Refer to Annual Reports for 1899, 1902, 1904 to 1920 (inclusive), 1922 to 1933 (inclusive), also Geological Survey Summary Report, Part A, 1933.

In 1934 much headway was made with the extensive preliminary development necessary to the application of the mining method mentioned. Meanwhile an extensive campaign of Keystone-drilling to delimit the buried channel was carried out. In addition, a Crossley-Diesel power plant of 560-horse-power capacity was installed and in operation by the end of the year. The above programme was continued during the present year, and mining of the inter-Glacial run from No. 2 shaft produced such favourable results, both as to values and extent, that it became evident that plans might be advisedly made for more active mining of this deposit. All mining operations received a very serious set-back in August of this year, when a disastrous fire almost totally destroyed the power plant. A Diesel engine to serve temporarily was procured from Vancouver and a new power plant was put in operation early in November, when once again former activities were resumed.

Under the Australian system of mining, a main shaft is sunk (as shown in sketch) in solid rim-rock on one side of the valley to such a depth that, allowing for a rock-drive from a crosscut from the bottom of the shaft up-stream and down-stream 1½ miles, the minimum thickness of rock-cover over the drive will be 40 feet. This drive, known as the "main rock-drive," is run approximately below the centre line of the buried channel, and from it raises or drill-holes are put up at frequent intervals to "bleed" or drain the channel-gravels. An interval of time, depending on local conditions, must be allowed for draining. From the shaft a "main wash-drive" is run at the level of the bed-rock of the buried channel, and this main wash-drive is also run up- and down-stream in the drained gravels, and from either side of it lateral gravels are mined much on the "retreating long-wall" system followed in coal-mining. About 400 horse-power should be provided for each main shaft. The average value of wash in Victoria, Australia, is given as a trifle over 1¼ oz. of gold per square fathom, and costs of mining as 64 shillings per square fathom. The square fathom (36 square feet) is used as a unit instead of the cubic yard, which is customary in this Province. In Victoria, Australia, values are apparently confined to a depth of 3 feet of gravels immediately overlying bed-rock, and 1 foot in thickness in the latter. Assuming the workings are one set high—that is approximately 2 yards—in order to clean a square fathom of bed-rock, approximately 8 to 10 cubic yards of ground must be removed. From the cost point of view the system described must show to best advantage when the buried channel is not only long, but wide, because in such cases overhead and indirect charges will be at the minimum. It is obvious that a long stretch of pay-gravel in the buried channel must be proved beforehand by drilling, in order that the cost of the preparatory sinking and drifting for drainage may be distributed over a large yardage of gravel mined subsequently. The presence of a superincumbent water-tight seal (in this country usually afforded by boulder-clay) is necessary so that there is no active percolation of surface waters through the unconsolidated materials overlying bed-rock, so that bed-rock gravels may be effectively drained and quasi-fluid pressure shall not develop therein.

Irrespective of the question of cost, this system of mining is, so far as is known, the only one that can safely be adopted in the case of many buried *creek*-channels where other methods of mining are inapplicable.

In conformity with the adoption of the Australian system of mining, therefore, an instream shaft, known formerly as the "Jones" shaft, sunk many years ago to a depth of 140 feet entirely in rim-rock save for the first 20 feet, has been enlarged and continued to a total depth of 280 feet. This shaft, 15 by 6 feet in the clear, is now known as the "Melvin" shaft and has four compartments. From it a branch drive has been run southerly under the buried channel, and from this point it is to be extended up-stream and down-stream, constituting the "main rock-drive" of the Australian system. Drainage will be established by boring holes up into the gutter at intervals of 100 feet. This drive is 62 feet below another drive run recently south-east from No. 1 shaft, a distance of about 170 feet close to the buried channel, and from a point near its end long holes were drilled into the channel, using an ordinary drifter with specially made long steel. It is understood that some coarse gold was found in the material forced out by the pressure through one of these holes. In view of the known subsidence of gravels previously in this region, it was deemed safest to defer the idea of mining at this point until drainage had been completed through the main rock-drive by pumping from the Melvin shaft. No. 1 shaft is 195 feet in depth, of which the upper 103 feet are in gravels and the remainder in rim-rock. Many years ago a drive was run southerly to the channel-



Consolidated Gold Alluvials of B.C., Ltd. Plan of Workings from Company's Map.
Underground Workings are shown in Heavy Lines.

gravels a distance of about 115 feet at a level 9 feet above and somewhat west of the drive recently run.

Active mining has taken place during the year from No. 2 shaft, depth 130 feet, distant about half a mile up-stream from No. 1 shaft, in the pay-gravels encountered at a depth of 120 feet. These workings are called the Sanderson mine and mining from it has been done almost entirely up-stream. The existence of this deposit has been proved by mining operations over a length of about 1,000 feet and a width of about 400 feet. The average thickness has not yet been determined. The management states that values have been proved by the "J" line of Keystone-drill holes distant about 800 feet down-stream, and, further, that evidence of this deposit was found in the "I" line of Keystone-drill holes distant another 2,400 feet down-stream from the "J" line. The "G" line of drill-holes about 300 feet north of the most northerly underground workings has not been completed, but all evidence points to the fact that this deposit has reached proportions of major importance. It is known to extend *below* the level of the present workings, and during the last examination, on October 26th and 27th, preparations were being made to run an incline down from the Sanderson mine to the "J" line of holes and also to deepen No. 2 shaft to serve the lowest level of this deposit. The incline serves the double purpose of prospecting the ground and of enabling cars from the Sanderson mine to be caged at the same point as those from the lower level.

Nine pan-samples were taken on October 26th and 27th last from the Sanderson mine. One-quarter of a cubic foot was as nearly as possible taken in each case. Three samples, Nos. 2565B, 2569B, and 2571B, were procured from the floor of the workings at different points for the purpose of obtaining some evidence as to continuation of values below the present workings. In all other cases samples were cut up and down the full height of the 6-foot face exposed, and the proportion of the total volume occupied by boulders at each point estimated at an average of 35 per cent. Samples were purposely not panned down very closely, and the total weight of gold in each case was finally arrived at by fire assay. The following results were obtained:—

Sample 2563B, $13.65 per cubic yard; sample 2564B, $6 per cubic yard; sample 2565B, $7.80 per cubic yard; sample 2566B, $9.90 per cubic yard; sample 2567B, 90 cents per cubic yard; sample 2568B, $8.40 per cubic yard; sample 2569B, $12.90 per cubic yard; sample 2570B, $4.50 per cubic yard; sample 2571B, $5.10 per cubic yard.

These samples have the high arithmetic average of $7.68 per cubic yard. Making allowance for volume occupied by boulders of 35 per cent., an average of $4.99 per cubic yard in place is indicated.

In connection with these results it is all-important to bear in mind that a highly critical factor is the average volume occupied by the boulders, and hence the value of the ground per cubic yard *in place*. The latter can *only* be accurately determined by sluicing a considerable yardage and applying gold recovered to the measured volume excavated. It is hardly necessary to say that calculations based on the above pan-samples can only be regarded as approximate, and cannot compare in accuracy with records available to the company. The results do, however, indicate that values are unusually high and have a widespread distribution, and that they extend below the level of the present workings.

Although a certain amount of fine gold is present, the majority is readily recoverable in a well-designed sluice-flume. Its value is $31 per ounce as shown by Mint returns with gold at $35 per ounce. All gravels are carefully washed on a shaking screen in the shaft-house and only minus 1-inch material passes over the sluice-flume, which is in duplicate, 72 feet in length and 2 feet in width, grade 12 inches per 12-foot box. At the end of the flume is an undercurrent 16 feet in length. Clean-ups are made weekly, and are effected by passing all riffle products through a Lorentsen centrifugal gold-recovery machine.

Hydraulic Area.

Bullion Placers, Ltd.

This company is a private one, with R. F. Sharpe as president and manager and registered offices in 501 Vancouver Block, Vancouver. The property, including a number of leases covering the well-known *Bullion* mine, is the largest hydraulic enterprise in the Province. It is situated on the South fork of the Quesnel river and is reached by a branch road, 1½ miles in length, from the Williams Lake–Likely road, the distance being about 60 miles from Williams Lake.

The geology of the region consists of Mesozoic rocks intruded at numerous points by batholithic stocks and tongues. Quartz veins are of frequent occurrence in the region.

The type of deposit is a large buried river-channel, in size 1,000 to 1,500 feet wide at the top, 200 to 300 feet wide at the bottom, and 400 feet deep, immediately adjacent and parallel to the South fork of the Quesnel river. The bed-rock of the channel is 170 feet above the river, so that ideal dump facilities for hydraulicking exist. The direction of flow is the same as that of the South fork and the bed-rock gradient is about 1 per cent. The character of the channel is steep-walled and gorge-like. As seen in the *Bullion* pit, the formation exposed is greenstone intruded by syenite. The filling consists of coarse gravels containing boulders overlying bed-rock. These are overlain by a stratum of boulder-clay on which rests fine gravel, the latter being overlain by another stratum of boulder-clay. The age of the channel, as inferred from fossil evidence, is Pleistocene. The average value from top to bottom, as computed from hydraulicking about 12,000,000 cubic yards in the past, is 10 cents per cubic yard with gold at $20.67 per ounce, or nearly 17 cents per cubic yard with gold at the present price, but the values in the up-stream section of the channel, the length of which is probably very considerable, still remain unproven. From Dancing Bill gulch this channel has been piped out for a length of about half a mile up-stream to within about 800 feet of the South Fork pit—another hydraulic pit opened up many years ago transverse to the direction of flow on Black Jack gulch from the South Fork river. In the South Fork pit bed-rock is not exposed, but the right rim of the channel can be plainly seen, and 1,600 feet farther up Black Jack gulch there is evidence of the left rim, whereas only 800 feet away the face of the *Bullion* pit shows both rims very much closer together; therefore a widening of the channel immediately up-stream from the *Bullion* pit is to be expected. Beyond the South Fork pit the up-stream continuation is not definitely known, but it may be the channel discovered at the *Little Joe* mine, 2 miles farther up-stream. (*See* Annual Report for 1932.) A large yardage of gravels still remains available for hydraulicking from the present *Bullion* pit, the sluice-flume being placed in a tunnel driven from the South Fork valley through the right rim of the older channel, connecting with the pit.

Originally the property was worked for many years by a Chinese company, and in 1892 it was acquired by the late J. B. Hobson and passed into the possession of the Consolidated Cariboo Hydraulic Mining Company, incorporated in 1897. Under the management of the late J. B. Hobson, the property was developed and equipped as an hydraulic one of large proportions. Up to the year 1905, under this management, $1,233,936.51 was recovered from 12,000,000 cubic yards, but the enterprise was not a success financially owing to the insufficient supply of water available from the three mentioned sources of supply. Because of this assigned reason for lack of success, the property was acquired by the Guggenheim Exploration Company in 1906 with the view of developing the fourth water right, Spanish lake. This scheme was, at considerable expense, only partly carried out and in 1907 operations were suddenly suspended. Subsequently, except for very brief periods of resumption in 1914 and 1921, nothing was done until 1926, and in the interim, flumes, ditches, and equipment generally decayed from long disuse. In 1926 and 1927 it was reopened by Messrs. Ross, Holland, and Ulch, who partly repaired the water systems they used and piped off some of the bed-rock gravels left by earlier operations. In 1928 Carinelle Placers, Limited, acquired the property, and under the management of Norman C. Stines connected the sluice-tunnel (previously driven by the late J. B. Hobson in the left bank of the South fork) by upraise with the pit, renovated the water systems, hydraulicked, and subsequently suspended operations in 1929. In 1930 the property was operated by the Quatsino Copper Gold Company; in 1931 by the B.C. Hydraulics, Limited; and in 1932 by Hireen Placers, Limited. In 1933 Bullion Placers, Limited, acquired the property, and in 1934 directive control passed to English interests, who, retaining R. F. Sharpe as manager, initiated the schemes for rendering additional water available, devised by the late Chas. H. Stewart, of the firm of Alexr. Hill and Stewart, consulting engineers. (Refer to Annual Reports, 1900 to 1906 (inclusive), 1910, 1911, 1918, 1921, 1922, 1926 to 1933 (inclusive), also Geological Survey Report, 1932, Part A 1.)

Material changes in the system of hydraulicking were also put into effect in 1934, consisting essentially in the simultaneous employment of two monitors; one at the top of the pit with 5-inch nozzle under a head of 85 feet to commence with, and the other in the floor of the pit with 9-inch nozzle under a head of 380 feet. This arrangement minimized the danger from

caves, but involved much relaying of pipe, construction of two new penstocks, and renewal of 13 miles of ditches. As the result, it was possible to pipe off some 400,000 cubic yards of gravels that year. The arrangement permits sixteen hours of continuous piping each day, the remaining eight hours being devoted to drilling and blasting boulders and general repairs.

In connection with the schemes for rendering additional supplies of water available, the one connecting Polley, Bootjack, and Morehead lakes has been first put into effect. Bootjack Lake outlet has been deepened to 12 feet, with a new control-gate, and Morehead Lake outlet has been deepened, thus permitting withdrawal of greater amounts of water from these lakes than has hitherto been possible. By utilizing 30 per cent. of the total Polley Lake water to develop electric power at a plant situated on Quesnel lake, where a head of 600 feet is obtained, 500 electrical horse-power is generated at this point. This is transmitted to a pumping plant at Polley lake, where 70 per cent. of the total water is pumped over a divide 80 feet in height to flow into Morehead lake, where it is then controlled by the main water system. This renders available an additional 13,000 gallons per minute as the pump has a capacity of 10,000 gallons per minute under a 95-foot head. In connection with the utilization of Spanish Lake water rights amounting to 5,000 cubic feet per minute, the scheme contemplated is to lift Spanish Lake water over a low divide to Summit lake, whence it is to be piped across Poquette pass, reaching the South Fork pit at a much higher elevation for piping than under the scheme contemplated by previous operators. About 2,000 horse-power is required to lift the water over the divide mentioned (a vertical height of 173 feet). Of this amount, some 1,700 horse-power is obtained from the water in its subsequent descent without encroaching upon its value for piping. The net result will be, it is stated, to obtain a piping-head greatly superior to that obtained under the scheme formerly contemplated and the great advantage resulting from a much shorter ditch-line. It is not proposed, however, to put this scheme into immediate effect.

As a result of the additional water rendered available, the management computes the yardage piped during the present year as 696,974 cubic yards, determined from careful surveys of the pit-face before and after the season's operations, which were curtailed by early severe weather. As determined by measurements made by the Water Rights Branch of the Department of Lands, the average amount of water flowing in the company's main supply-ditch this year was 2,600 miners' inches, which was the amount used in hydraulicking. The management estimates that a total of approximately 17,000,000 tons of water was used during the year, which did an estimated hydraulic water-duty of 23.1 tons per cubic yard.

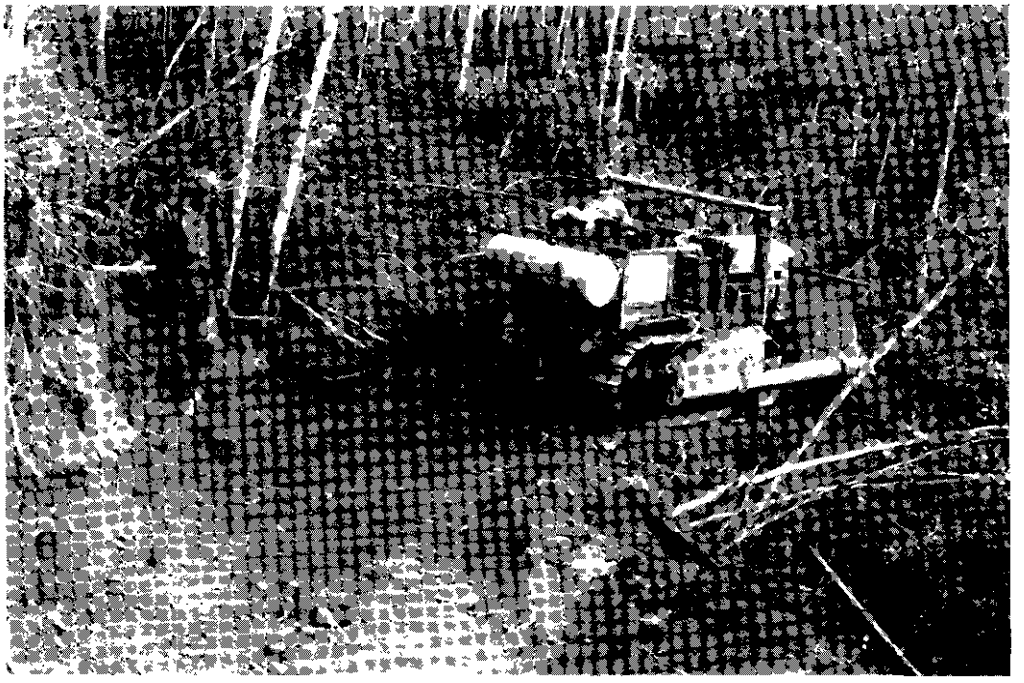
What is believed to be the largest monitor on this Continent was installed this year, having a 10-inch nozzle, under a head of 380 feet, with an intake 18 inches in diameter. The yardage piped with this monitor in the pit, and another with 5-inch nozzle on top of the bank, was about 400 cubic yards per hour. Boulders are entirely disposed of by blasting, one eight-hour shift per day being reserved for that purpose. On an average 243 boulders (about 120 tons) are blasted per day and about one-third of a stick of powder is used per boulder. It is the opinion of the management that such a method is preferable at this property to any mechanical means for removal of boulders. In spite of every precaution large caves occur and cause delays.

The sluice-flume, which is 1,500 feet in length and of cross-sectional dimensions 6 by 4 feet, is contained in a 10- by 10-foot tunnel, electrically lighted, which enters the pit from the South Fork valley. The grade of the lower 900 feet is 5½ per cent. and of the upper part 4 per cent. Riffles used are partly block riffles and partly steel rails. It is proposed to replace block riffles with steel rails finally.

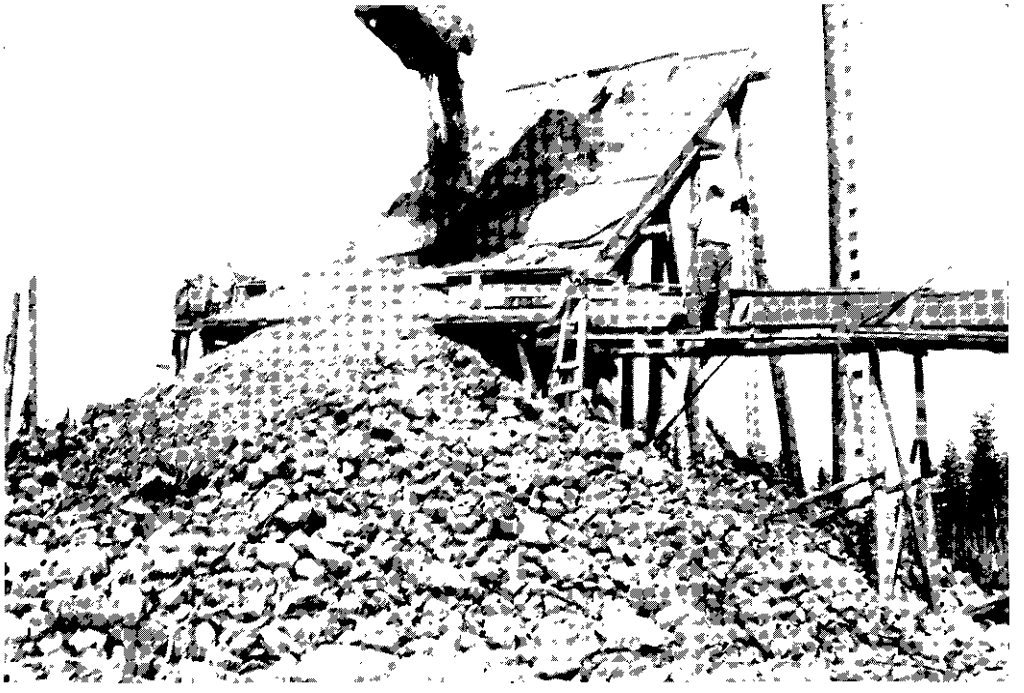
The character of the gold is both coarse and fine.

At the time of examination in October, preparations were being made to drill the South Fork pit to obtain bed-rock contours and some idea of values. It is planned to install two large monitors in this pit as well as the two monitors previously mentioned in the *Bullion* pit. The South Fork monitors will be utilized for piping gravels above the floor of the pit only (the floor of the pit is believed to be about 80 feet above bed-rock). Finally, as the South Fork pit advances, a sluice-tunnel will be run from the river to enable bed-rock gravels to be hydraulicked. Before, however, hydraulicking can be commenced in this pit, renovation of the Morehead ditch and flume and installation of additional pipe-lines is necessary.

To meet the demands for better pit-lighting a new lighting plant was installed.



Road-making by Consolidated Mining and Smelting Co. of Canada, Slate Creek, Manson Area.



Cedar Creek Hydraulic Mines, Ltd. Drag-line Scraper dumping on to Screen at Head of Sluice-boxes.

Drag-line Operation of Consolidated Mining and Smelting Co. of Canada, Slate Creek, Manson Area.

Placer Training Camp on Fraser River North of Quesnel. Trainees panning on River-bank.

It is anticipated by the management that next year it will be possible to hydraulic close to 1,000,000 cubic yards.

Hixon Creek Area.

The feature of this area is the remarkable extent to which the deep Tertiary weathering has been preserved, and hence the proved absence of ice-erosion. Terry creek at one point flows over a kaolinized mass of granitic and schistose rock-detritus, which is an uncommon feature.

The placer deposits on the low-lying benches in this area worked by the early miners may have been rock-bench deposits of Tertiary age, but criteria are now entirely obscured. The discovery made some years ago by E. Hann and J. Strbac on lease No. 2118, now being investigated, is probably of this type.

The types of deposit exemplified on the property described below are post-Glacial concentrations and buried pre-Glacial channel-segments.

Hixon Creek (Cariboo) Gold, Ltd.

This company was incorporated in 1934, with an authorized capital of 50,000 preference shares of a par value of $1 each and 1,900,000 ordinary shares of a par value of 50 cents each. The president is General J. Duff Stuart and the registered office of the company is Stock Exchange Building, Vancouver.

The property consists of thirteen placer-mining leases situated on Hixon creek, covering upwards of 4½ miles of the bed of the creek and extensive bench-ground on the right bank. The property is reached by a branch road 4½ miles in length, which leaves the highway at a point 41 miles south of Prince George and, reaching Hixon creek in 2 miles, follows the creek throughout the property.

Hixon creek, flowing westerly, has cut a wide and somewhat deep valley in the Fraser plateau in the region under description. In the central part the depth of the valley is 200 feet, with an increase down- and decrease up-stream. The creek-gradient in this part is 2 per cent. In places the creek flows over bed-rock and at other points over gravel, and there are falls 90 feet in height at the lower end of the property. The ground is densely timbered and rock-exposures are not numerous away from the creek. On the right bank are extensive gravel benches. About 3 miles above the falls a tributary known as Little Hixon creek, or the North fork, flows in from the north.

Low-lying benches flank both banks of the creek and were extensively worked by the old-time miners, but these early operators apparently were solely occupied with superficial placer deposits and none of the pre-Glacial channel-remnants indicated as lying buried at various points have been mined.

The rock exposed at the falls is an augite syenite, but up-stream from this point, as determined by examination of outcrops and the underground workings of lode-mineral properties on the creek, the formation consists of alternating bands of schists and greenstone. The latter appears on the surface as a deeply oxidized pink-coloured or red rock, which has in places weathered to residual clay. In it are numerous quartz veins which are indicated as being the source of placer deposits overlying bed-rock or rock benches. It is known from underground workings that the greenstone has been weathered to a depth of at least 100 feet below creek-level. It is apparent that this weathering must have taken place in Tertiary time.

In the upper part of the property the valley is constricted by a large moraine which extends outwards from the plateau on the north side of the valley; above and below this moraine the valley again widens. The creek flows over bed-rock on the south side of the valley at the edge of the moraine, which indicates, therefore, that a pre-Glacial channel lies buried on the north side of the creek in this region and continues on this side for some distance. In the absence of Keystone-drilling no opinion can be formed as to the depth at which the bed-rock of the pre-Glacial channel lies, beyond the fact that it has been proved by hydraulicking that it is below creek-level. About 1 mile down-stream on the Crown-granted mineral claim Lot 52, owned by Quesnelle Quartz Mining Company, Limited, 75 feet above the creek, a rock bench of oxidized greenstone, evidently of considerable extent, dips into the valley-rim and is overlain by gravel banks 125 feet in height. The indications here are that this is the left rim of a pre-Glacial channel-remnant. Whether this is of the same age as that just mentioned cannot be determined from existing exposures. This is the point where B. Briscoe did a considerable amount of testing in 1932 (*see* 1932 Annual Report) and at which hydraulic

operations are now being carried on. The falls are undoubtedly post-Glacial, and there is every indication that a channel lies buried on the south side of the creek in this region. The identity of this channel is entirely a matter of conjecture, inasmuch as there are some grounds for inferring that a large Tertiary river-channel crossed the present Hixon Creek valley immediately up-stream from the falls, and if so Hixon creek must have been tributary to such. If that hypothesis is incorrect, then the channel indicated as lying buried on the south side of the creek in this region must be a pre-Glacial channel of Hixon creek.

On the right bank and 200 feet above the creek, on Lot 52, an extensive flat extends both up- and down-stream immediately north of the Quesnelle Quartz Mining Company's workings and marks the action of the post-Glacial waters of the creek as they cut down to their present level. Superficial post-Glacial placer deposits may be expected to occur at various points on this flat. Nothing is known as to bed-rock values in any of the deeply buried pre-Glacial channel-segments on Hixon creek, but in view of the bed-rock geology there is justification for anticipating that such may prove good.

The low-lying benches flanking both banks of the creek were extensively worked by the early placer-miners.

The property was acquired in 1927 by B. Briscoe, who carried out much preliminary investigation, including the erection of a sawmill and sinking some shallow shafts. In 1930 and 1931 the property was acquired under option successively by Golden Reward Placers, Limited, and by Golden Eagle Mines, Limited, but these companies only operated in a desultory manner, and in 1932 B. Briscoe started hand-mining operations on Lot 52. In 1934 the property was acquired by the present company, which, during that year, commenced building a dam on the creek at the upper end of the property and made good headway with flume and ditch construction for conveyance of water to down-stream points preparatory to hydraulic operations. (Refer to Annual Reports for 1927, 1930, 1931, 1932, and 1933.)

The dam is 116 feet long, 7 feet wide at the crest, and 17 feet wide at the base. The height is 20 feet 5 inches to spillway and 22 feet to crest. It is a rock-filled log crib, back-filled with earth and rock. The flume is partly constructed of wood and partly Dutcher metal flume. The dimensions of the former are 4 feet wide by 2 feet 3 inches high, and of the latter 3 feet 9 inches wide and 2 feet 4 inches deep. The ditch is 5 feet wide in the bottom by 2 feet 6 inches deep, with 1–1 side-slopes. Trestling was necessary at several points to carry the flume over the various gullies.

At the time of examination on October 6th the flume had been completed to and beyond Crown-granted Lot 52. At this point it passes along on top of the plateau on a large flat 200 feet above the creek. A penstock has been constructed on this flat, and pipe-line laid therefrom to a monitor with 6-inch nozzle set up on the rock bench previously mentioned, and hydraulicking had just commenced on the date mentioned. Conditions for hydraulicking at this point are more favourable than at any other point on the company's property. The head available is 125 feet and dumping facilities excellent, as this rock bench is 75 feet above the creek. Immediately west of this point a deep draw trends south down the valley-slope, and a short sluice-flume serves to discharge tailings into this draw, thence to the creek. The continuation of hydraulicking at this point will undoubtedly throw much light on certain conjectured data concerning the bed-rock contour of the channel indicated as lying buried in the valley-rim at this point; for example, the depth to bed-rock. Should it transpire that the latter is below the creek, bed-rock gravels will not of course be available for hydraulicking. To date there is a flat rock bench at this point, dipping very gradually into the valley-slope and down-stream.

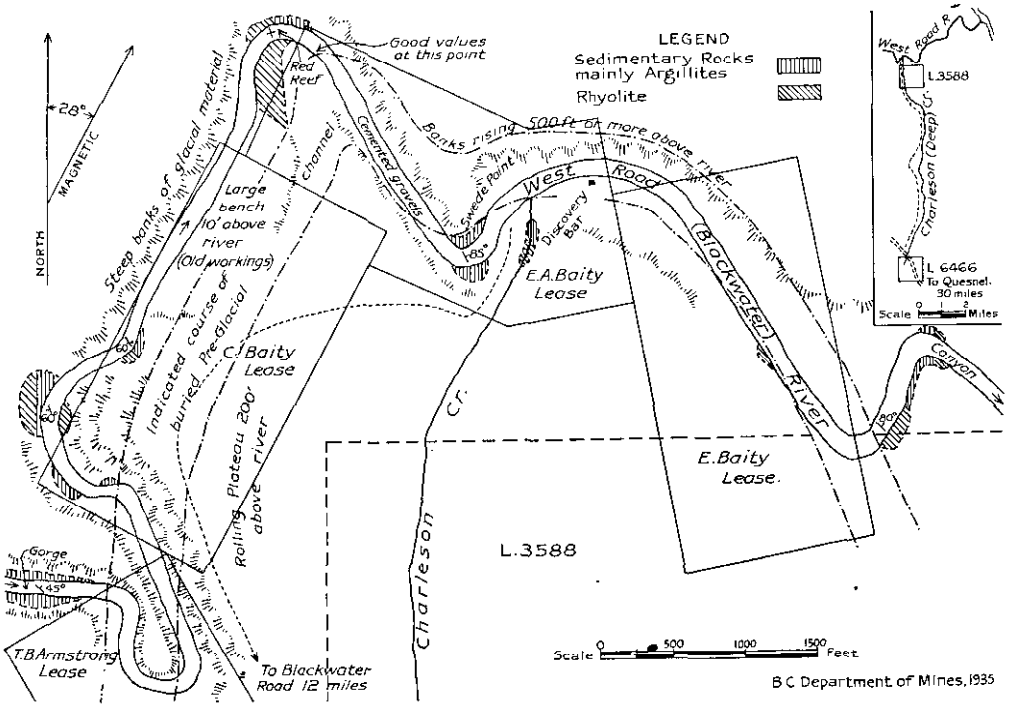
Before commencing piping at the last point mentioned, in the course of flume-construction, a certain amount of piping was carried out last year where three prospect-shafts were formerly sunk by B. Briscoe on the north side of the creek and where a pre-Glacial channel-segment is indicated as lying buried, and also on a low-lying rock bench up-stream from this point. It was established that the bed-rock of the buried channel in this region is below creek-level. This year an option was acquired on leases on Little Hixon creek (where a discovery of coarse placer was made in 1932 by A. Nani, described on page 94 of the Annual Report for 1932), held by the Edmonton and British Columbia Mining Syndicate, and some hydraulicking was carried on, but discontinued in view of the more favourable piping conditions obtaining at the point finally selected.

Leases of E. A. Baity.

Three leases, owned by E. A. Baity and his sons, of Quesnel, are situated on the West Road (Blackwater) river contiguous to the mouth of Charleson (Deep) creek. The property is reached by following the Blackwater motor-road from Quesnel to Kirkendale's ranch on Pre-emption Lot 6466, a distance of 30 miles; thence by wagon-road, rough in places, a further distance of 12 miles to the property.

In this region the West Road (Blackwater) river follows an extremely tortuous course (as will be seen by reference to sketch-map) and has cut to depths of about 600 feet in the Fraser plateau more immediately adjoining the river. The region is heavily overlain with glacial debris, but rock formations are well exposed at several points on the river-bank and in Charleson creek, which is contained in a steep gorge, the walls of which are about 125 feet in height. It is also to be noted that immediately above the region under description the West Road river is contained in a steep-walled rocky gorge, and below E. Baity's lease it enters a canyon some miles in length.

The rocks consist chiefly of an assemblage of intercalated schistose sediments, which strike north-west and dip both north-east and south-west. Alternating bands of argillites



Leases of E. A. Baity, West Road (Blackwater) River. Pace and Compass Survey.

and rhyolite predominate. No evidence of mineralization was observed in these rocks, but it may be noted that the known buried channel-remnants in Palæozoic rocks, adjacent to the Fraser river, invariably contain placer gold.

Exposed in the bed and banks of the river at two points are well-cemented glacial gravels known locally as "conglomerate." The constituent fragmental material is wholly angular or subangular, showing no evidence of sorting action by water, and is cemented by lime. It is probable that the "conglomerate" is not of pre-Glacial age. It may, however, mark the course of an underlying buried pre-Glacial channel.

The discovery of E. A. Baity was made on a low-lying bench or bar of considerable extent situated immediately down-stream from Charleson creek, and consisted of coarse nuggety gold, mainly well worn, some nuggets showing adhering quartz and also fine gold. The coarsest nugget weighed about 1 dwt. The gold accompanied by small pyrite pebbles was found on a false bed-rock of partly cemented sand. Good values extend right into the bed of the river at

this point, but it is only at low stages of water that this bar can be worked by hand-mining methods.

Other points up-stream on the river at which gold was discovered were: (*a.*) At the lower end of a small bar at the upper end of a rock point known as "Swede Point," above which the river flows over cemented glacial gravels for a distance of about 500 feet, the conglomerate being also exposed on the right bank of the river at this point. (*b.*) On a low-lying bench or bar immediately below "Red Reef," so named because the river at this point flows over iron-stained rhyolites. (*c.*) By very early superficial diggings on the large, low-lying bench which flanks the right bank of the river for a distance of about 1,100 feet on the C. Baity lease. (*d.*) On the lease of T. B. Armstrong on the right bank of the river immediately below its emergence from a deep rocky gorge to make a remarkable hair-pin bend around a bank of glacial debris.

Owing to high water prevailing at the time of examination, E. A. Baity was only working at point (*b*) mentioned above. The concentration at this point was decidedly good, warranting further investigation, but it is understood that the point of original discovery offers greater promise.

The nature of the gold, coupled with the fact that it occurs at certain points only at or near river-level, suggests that the placer is due to reconcentration effected by the post-Glacial waters of the river as they cut through a former channel at such points, and from the nature of the reconcentrated gold, and other features, the age of the former channel is indicated as being pre-Glacial. A study of the region indicates that the course of the channel was probably as shown on the accompanying sketch-map. It might be added that the up-stream and down-stream continuation of the channel beyond the points shown is rendered obscure by the very heavy covering of glacial drift. There is no evidence as to the depth at which bed-rock lies, nor can any opinion be formed as to the values overlying bed-rock, inasmuch as recent discoveries are obviously reconcentrations. This ancient channel is, moreover, very deeply buried except on the C. Baity lease, where it can be most easily reached.

Interest centres mainly in the region of the original discovery by E. A. Baity immediately down-stream from Charleson creek, where considerable investigation is warranted, and also immediately below "Red Reef."

Willow River Area.

The types of deposits exemplified down-stream from George creek, on the properties described, consist of remnants of former channels of the river of considerable length, lying buried instream; rock-bench deposits; and deposits in the bed of the river. The two last-mentioned types are indicated as being of post-Glacial age.

It is noteworthy that the early placer-miners rightly regarded this river as approximately delimiting the easterly limit of important placer deposits.

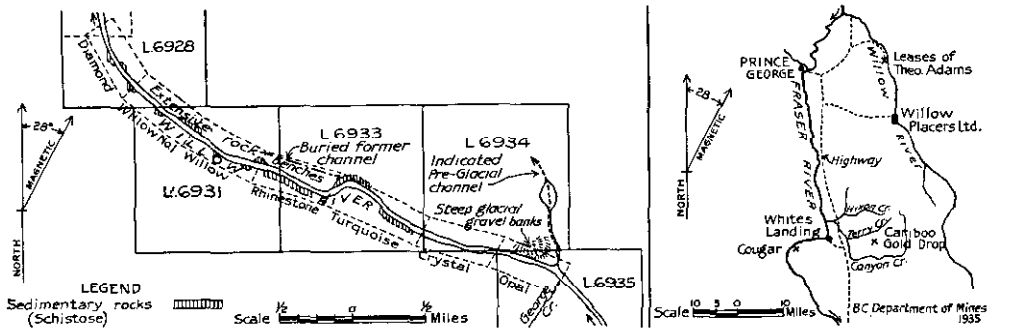
Willow Placers, Ltd. This private company was incorporated for the purpose of operating certain leases on the Willow river, comprising four dredging and six placer-mining leases, covering about 20 miles of the river up-stream from Pre-emption Lot 6925, except 1 mile of the river on Pre-emption Lots 6928 and 6931, which is held by others.

The property is reached by a branch road and trail about 21 miles in length, which leaves the highway immediately south of Tabor creek, 13 miles south of Prince George. A car can be taken for a distance of about 7 miles from the highway; thereafter a rough road, constructed this year by the company for the purpose of taking a power-shovel to the property, leads to the Willow river, at elevation 2,520 feet, via Buckhorn lake, elevation 2,270 feet.

It was only possible to examine that part of the ground lying between Pre-emption Lots 6935 and 6925, as it was on this section that operations were planned.

In the stretch of 5 miles of the river examined, the rocks exposed at various points were seen to consist entirely of schistose sediments, argillites, and quartzites, presumably of Palæozoic age, intruded at several points on Pre-emption Lots 6925 and 6931 by stocks of granodiorite. Beyond oxidation in the sedimentaries in the vicinity of such intrusives, and a few quartz stringers, no further mineralization was observed, although such may quite possibly be obscured by timber or vegetation.

The river runs either on or close to bed-rock and the greatest depth of gravels overlying bed-rock is probably not over 20 feet. Flanking the right bank of the river in this region are low- and higher-lying gravel-covered benches, on which rock outcrops at various points. These gravel-covered benches extend instream for many hundreds of feet, to a maximum height of 125 feet above river, and there is every indication that they are underlain by rock at no great depth. On the left bank the valley rises more abruptly from the river, although there are a few mainly low-lying benches on this side. Generally the ground is well timbered and covered with vegetation.



Willow Placers, Ltd.

It is indicated by the topography that in this region down-stream from the mouth of George creek, the Willow river in pre-Glacial times occupied a channel considerably east of its present position, a mile or more instream from the latter. The blocking of its former channel by glacial drift (the moraine of George Creek glacier appears to have been an important factor in this connection) caused the river to follow different courses successively west of its former channel until it finally cut the one it now occupies. The pre-Glacial channel lies mainly east of the area under description, but the rock benches mentioned exemplify the successive channels occupied by the river formerly.

Extending throughout the *Rhinestone* lease it is probable that a channel-remnant, both rims of which are preserved, lies buried in the right bank of the river.

Investigation by the company had, at the time of examination, been confined to the gravels of the present river, and to benches immediately contiguous thereto. It is stated by the company that last year a stretch of about 2 miles of the river from the *Opal* lease down-stream was tested by 1,500 or more pan tests, and about eight yardage tests, comprising sluicing and treatment in a centrifugal machine, of quantities varying from 1 cubic yard to 27 cubic yards. Such tests were made on low-lying benches, on river-bars, and in the bed of the river, and it is stated that the average values indicated "pay." The values were stated to occur in the gravels immediately overlying bed-rock, and in the cracks and crevices of the latter, except on the *Opal*, where values were found overlying a false bed-rock in the river.

Owing to the high water prevailing at the time of examination, no pan-testing was possible, but it is known that H. Robinson, owner of the *Willow* lease, has worked on his property by hand for some years with, it is understood, encouraging results.

It is apparent that the mode of placer occurrence exemplified in the ground tested is of post-Glacial age, and that the origin of the gold is glacial material, through which the post-Glacial waters have swept in cutting the successive channels mentioned above. It is also a justifiable anticipation that values may be contained in the gravels overlying the extensive rock benches described as flanking the right bank of the river, in the channel-remnant preserved on the *Rhinestone* lease, and such merit further investigation. The ground appears to be reasonably free from large boulders.

At the time of examination the company was transporting to its property a Ruston power-shovel (operated by gasoline-engine) equipped with caterpillar traction, with bucket of ½- to ⅝-cubic-yard capacity. The intention was to work low-lying benches until the river fell sufficiently to work in the bed of the river. It is understood that the shovel reached its destination during the summer, but it is not known what subsequently transpired.

A detailed description of individual leases follows: The *Opal* is the farthest up-stream and extends down-stream from the mouth of George creek, and the others are described as they occur in order down-stream.

On the *Opal* lease a bank of glacial gravels 200 feet in height above the river occurs in the lower central part on the right bank of the river. Up-stream from this a depression in the topography, occupied by a morainal lake, trending north and north-west instream, in all probability indicates the position of the pre-Glacial channel of the Willow river in this region. It is stated that at the lower end of this lease a good concentration of placer occurs in the bed of the river on a false bed-rock. This evidently results from the modern river cutting through the glacial debris at this point.

On the *Crystal* lease the right bank of the river is flanked by extensive benches, 5 to 15 feet above the river, which extend instream for a distance of 500 feet. At the back of these rise morainal hills to a height of about 100 feet above the river. The benches mentioned extend down-stream on the *Turquoise* lease and warrant testing. No rim-rock shows on the river-banks throughout this lease.

On the *Turquoise* lease the benches noted on the *Crystal* continue on the right bank of the river in the upper part of the lease, but are terminated in the lower part by the rock-rim of the river, which rises sharply to a height of 60 or 70 feet above the river and continues to the end of this lease. Above the steep rock-rim an extensive bench, rising gradually to a height of 100 feet above the river, extends down-stream through the adjoining *Rhinestone* lease. Rock is exposed at several points, and the topography markedly suggests that a former channel of the river lies buried in this region. The length of the buried remnant is at least half a mile. On the left bank of the river the rock-rim is continuous in the upper part of the lease save for a gap of about 150 feet. Values are stated to have been obtained in the river-gravels at this point.

On the *Rhinestone* lease the chief feature is the channel-remnant referred to above, which is indicated as lying buried on the right bank of the river, about 300 yards instream. This appears to merit testing, likewise the low-lying bench-ground, which forms the immediate river-frontage. On the left bank of the river the rock-rim is exposed throughout the greater part of this lease and on the right bank the rock-rim rises abruptly to a height of 50 feet, about 100 yards from the down-stream end of the lease.

The *Willow* lease is owned by H. Robinson, who has carried on hand-mining operations for some years past. Gravel-covered rock benches extend from the river's edge instream for many hundreds of feet on the right bank of the river. These benches merge at the down-stream end of the lease in rock ridges, which extend to the river at this point. The schistose sedimentary rocks are iron-stained at this point where they are intruded by small stocks of granodiorite. Judging from the workings, the owner in past years appears to have found the most productive ground immediately adjacent to the river, but extensive testing of bench-ground in cases like this, where there is no water-supply available under gravity, can hardly be carried out by the individual operator.

The *Willow No. 1* lease is owned by Martin Framstad, and comprises, to a great extent apparently, untested bench-ground at a height of about 25 feet above the river.

Leases of Theo. Adams.

Two leases held by Theo. Adams, of Prince George, are situated on the left bank of the Willow river at the outlet of the canyon, the upper end of which is situated on Pre-emption Lot 2800. The property is reached by following the Willow River road from Prince George to Six-mile mountain, from which point an indifferent branch road leads to a ranch by the Willow river, a total distance of 19¾ miles from Prince George. In suitable weather a car can be taken this distance. A rough road and trail leads a further 7 miles to the property.

The rock formations consist of argillites and limestone intruded by quartz-feldspar tongues. Just below the canyon a former buried channel is plainly discernible on the right bank of the river lying instream from the latter. The Willow river cuts diagonally across its former channel, which at this point has a bearing of north 30 degrees west. The argillites here contain a large number of quartz veins. It was not possible to cross the river, but from the left bank two old drifts are visible on the other side comparatively close together and situated a short distance above the water, which were possibly run on bed-rock, although this fact cannot be determined without access to them. However, this matter should be investi-

gated, for the question as to whether the bed-rock of the old channel is above or below the present river is important. A small amount of testing on the left bank of the river has been done, and it is stated that a certain amount of encouragement has been secured, but the topography on this side renders the channel less clearly discernible than that on the opposite bank, which merits investigation.

Cottonwood River Area.

The properties described exemplify post-Glacial placer concentrations on false bed-rock and a deeply buried pre-Glacial river-channel.

Claims of F. Norn and Associates.

These claims, originally nine in number, are owned by F. Norn and associates, of Quesnel, and are situated on the left bank of the Cottonwood river, immediately adjacent to and west of the Pacific Great Eastern Railway grade, near the eastern boundary of Pre-emption Lots 8593 and 8594 and about 17 miles from Quesnel. The ground after discovery in 1934 was acquired by C. W. Moore, R. Sutton, and E. Sutton, and was, it is understood, restaked that year in the form of three leases with the consent of previous owners. In dry weather a car can be driven over the Pacific Great Eastern Railway grade to within 1½ miles of the claims.

The property covers a terraced bench on the left bank of the river, roughly semicircular in shape, having a river-frontage of about 1,500 feet and extending back from the river to a maximum distance of about 1,500 feet. The lowest bench is about 25 feet above and fronting the river, and as no convenient gravity water-supply lies immediately adjacent, F. Norn and associates had merely seepage-water for their hand-mining operations, which were impeded by this indifferent supply.

The ground is remarkable for the richness of the superficial gravels, which at some points are immediately below the grass-roots and at others are covered with 3 or 4 feet of barren sand. The gold is quite fine, although individual pieces up to 25 cents in value are reported.

The deposits are a false bed-rock type and exemplify post-Glacial concentrations, resulting from the post-Glacial waters cutting through the immense quantity of glacial debris (much of which still remains on the banks of the river) left in this region on the final retreat of ice, the gold being reconcentrated on any false bed-rock material contained in the glacial debris. This class of deposit cannot ordinarily be expected to be other than superficial, except *in so far as there may be concentration on one or more false bed-rocks below the uppermost* —a fact which seems well worth bearing in mind in the investigation of this property. In this particular case, however, there is every indication that a large pre-Glacial river-channel underlies this ground, quite possibly, it is believed, the down-stream continuation of the buried Tertiary Horsefly river. The right rim of the channel is apparently exposed in the eastern part of the ground under description, but bed-rock probably lies at great depth. An examination of the ground adjoining that under description, staked by J. W. Jones, strongly suggests that this buried ancient river-channel originally flowed north through Ten Mile lake, its course being immediately west of the Pacific Great Eastern Railway grade in this region.

Leases of J. W. Jones and Associates.

These leases Nos. 28518 to 28523, inclusive, are situated on an unnamed small creek, which rises near the north end of Ten Mile lake and flows northerly into the Cottonwood river on Pre-emption Lot 8594. The property adjoins on the south and west that immediately above described and is reached by the same road. This creek cuts deeply into glacial sands, gravels, and silts. This fact, coupled with the topography, strongly indicates that it follows very closely the course of a definite channel which is believed to be the northward continuation of the buried Tertiary Horsefly river, which quite possibly originally flowed, via Ten Mile lake, to this point. The extensive deposits of stratified silt (slum), the lower beds of which are partly lithified, exposed in the deep valley of this little creek and on the Cottonwood river in this region, indicate extensive damming during retreat of ice and the formation of temporary glacial lakes in which these deposits were laid down. It is quite impossible to form an opinion as to the depth at which the bed-rock of this channel lies, but it is probably very deep and its gradient low.

So far as is known, no noteworthy superficial concentrations of placer have been found on this ground. Pieces of the stratified-silt beds mentioned, rolling down into the creek, become fashioned by the waters of the latter into fantastic shapes, erroneously thought by some to be fossils. These curious objects were the means of originally drawing attention to the property.

Harrison Creek (Manson Section).

Harrison creek flows south-easterly into Kenny creek between Humphrey and Tom lakes, opposite Tom creek.

Leases of W. and E. T. Gibbon.

These leases are situated on Harrison creek, about three-quarters of a mile above the mouth. The property is reached by a branch trail about 2 miles in length from the main Tom Creek–Old Hogem wagon-road, the total distance from Takla Landing being about 22 miles. The region is the steep, densely timbered southern slopes of Vital mountains.

The rocks of the region are intercalated schistose sediments and volcanics of Carboniferous age intruded by numerous stocks of acid batholithic rock. The former contain a multiplicity of quartz veinlets and numerous quartz veins.

The mode of placer occurrence exemplified is a buried pre-Glacial channel-remnant about 1 mile in length, which is plainly indicated topographically as lying buried in the right bank of the creek, and which is being investigated by an adit at the lower end.

The existence of this channel was apparently previously perceived, and many years ago a man named Bodine constructed a dam across the creek and drove an adit into the right bank in this region, but this working is inaccessible. Somewhat down-stream from the old workings, the present owners drove an adit 144 feet in length in the right bank of the creek in the autumn of 1934 in the glacial debris overlying the channel. Although this proved to be above bed-rock, a winze sunk to a depth of 8½ feet at the face of this adit struck the gently sloping left rim of the channel at a depth of 6 feet only. The glacial material overlying the rim contained, it is stated, encouraging values in coarse gold, and a nugget of arquerite weighing about 1½ oz. was also found.

In the part of the valley under investigation the creek is contained in a canyon about half a mile in length, and the adit now being driven is situated below the lower end of the latter. The east wall of the canyon forms the main rock-rim of the valley, rising steeply above the creek for many hundreds of feet. On the west side of the canyon are extensive flats at 25 to 75 feet above the creek in the up-stream part. At the level of the flats the width of the valley from rim to rim is about 850 feet. Down-stream from this point the topography is more broken. The flats terminate abruptly at the head of the canyon, where the creek makes a sharp bend, and above this point the valley widens. Below the adit mentioned the creek enters another shorter canyon. The gradient of the creek in this part as determined by aneroid is 7 per cent.

The adit on the right bank of the creek for the first 50 feet is run on a bearing north 70 degrees west and for the remaining 94 feet on a bearing north 84 degrees west. The bed-rock rim struck in the winze was followed up-stream for a distance of 12 feet and down-stream for 18 feet. The character of the filling is very similar to that on Vital creek, which rises in the same mountain range, flowing north-easterly.

In the buried channel of Vital creek the gravels on bed-rock are free from large boulders and deep enough to permit drifting beneath the glacial debris in which large boulders are found. In the upper part of the glacial debris is a very tight boulder-clay which acts as a seal, preventing the downward circulation of surface waters.

The present workings below the adit cannot be continued without pumping. It seems reasonable to anticipate that the buried channel-gradient will not be less than 4 per cent., and the gentle slope of the rim suggests that bed-rock may not be more than a few feet below the bottom of the winze, so that the present adit, if continued, might reach the bed-rock within 300 feet. Without some predetermined evidence of the exact depth at which bed-rock lies, however, the extension of the adit is wrought with uncertainty. On the other hand, the length of the buried channel-remnant is such that some further attempt to ascertain the depth to bed-rock and values thereon is clearly justified. More especially so, as the channel-filling

contains a considerable amount of clayey material and stands up well, contributing to cheap mining.

Doubtless this channel could be hydraulicked because Harrison creek is a fair-sized stream, and possibilities in this direction should also be investigated.

JIMMAY CREEK, OSILINKA RIVER.

Jimmay creek, as shown on Map No. 1A, published by the Department of Lands, is a tributary of a large unnamed creek flowing into the Osilinka river about 7 miles below Usilka lake. The region is densely timbered and mountainous, but the summits are generally rounded, and the creeks have carved wide valleys terraced with much glacial debris. It is reached by a pack-trail about 51 miles in length from Old Hogem, which is about 40 miles by rough wagon-road from Takla Landing. The Omineca river must be forded at Old Hogem and the Osilinka river about 3 miles above Usilka lake. From Old Hogem northwards the trail follows on the west side of Duck creek, for 16 miles on the eastern flank of the Eastern batholith, which outcrops prominently in this region for many miles in a north-westerly direction. Crossing Duck creek at this point, the trail subsequently follows a north-easterly direction, as shown on Map No. 1A.

Placer was first discovered nearly forty years ago on this creek by Jim May, a pioneer prospector in this region. Map 207A, published by the Geological Survey, furnishes the closely adjacent geology. The rocks exposed along the creek are silicified quartz-muscovite schists, quartz-biotite schists, and quartz-schists, and are presumed to be part of the Pre-cambrian belt which trends north-westerly across the Osilinka and Mesilinka rivers as shown by Map 207A. They are intruded by a granitic dyke and quartz veins are developed in the intruded rocks at a few points. No occurrence of placer, other than in the form of river-bars, is known to occur in regions underlain by these rocks.

Leases of Frank Martin

Three leases have been staked on Jimmay creek by Frank Martin, of Hazelton, who for some three years past has worked at his property each year. The means of access is given above. In the region covered by the property, Jimmay creek flows on an average south 45 degrees west and occupies a comparatively narrow valley about 175 feet in depth. Although the valley-slopes are largely covered with glacial debris or dense vegetation and timber, silicified schists are exposed at several points at the upper end of the property, where they are intruded by a granitic tongue. At the central part, in the vicinity of the workings, the creek is contained in a gorge, and on the right bank in this region rocks are exposed for a distance of several hundred feet, and are seen to be silicified quartz-muscovite schist, quartz-biotite schist, and quartz-schist in which some quartz veins occur mainly narrow, but one of which is 2½ feet in width. They conform with the schistosity of the enclosing rocks which strike north 10 degrees west and dip south-westerly at an angle of about 65 degrees. The gradient of the creek as determined by aneroid is 5½ per cent. A few low-lying, not very extensive benches flank both banks, some of which are rock.

Placer was first found in the creek-bed at the lower end of the gorge mentioned, but attention is at present directed to a bank of well-washed glacial gravels about 20 feet in height which overlies a low-lying rock bench on the right bank of the creek. Gravels are washed in a sluice-flume set up in the creek, and values are said to be distributed throughout the gravels and are no better on bed-rock than at higher points The character of the gold is said to be fairly coarse. Pan-samples taken proved rather disappointing, but it is said that bulk samples invariably yield better results. A pit has been dug by shovelling at this point, about 90 by 40 by 20 feet in height. Opposite on the left bank of the creek a low-lying, crescent-shaped bench occurs which extends instream a maximum distance of about 200 feet over a length of about 850 feet. A shallow shaft, now caved, was originally sunk on this bench and a cut 200 feet in length was started from creek-level to apparently drain it, but has not been completed. Behind the bench a depression in the glacial drift 125 feet above the creek probably indicates the course of the underlying pre-Glacial channel in this region.

The occurrence of placer clearly originates from glacial materials through which the post-Glacial waters have carved their present channel. The glacial drift consists largely of local rocks with a certain amount of boulders of batholithic rock.

TUNGSTEN DEPOSITS.

North Point of Fraser River.

In this region the formation consists of silicified schists, mainly quartz-muscovite schist, quartz-biotite schist, and quartz-sericite schist, in which occur a number of quartz veins. These veins are in most cases sparingly mineralized with pyrite and some contain in addition galena and sphalerite. They vary in width from a few inches up to several feet and have free walls. On the *Ada* claim, owned by the estate of the late Oscar Eden and developed by an adit and drift therefrom, one vein contains a noteworthy amount of scheelite. This mineral has also been found, although not to the same extent, in a vein on the *Silver* group occurring in similar formation, situated about 1 mile to the west on Averil creek.

Most of the veins exhibit evidence of post-mineral movement, and the two veins in which scheelite occurs also contain considerable amounts of graphite. In no other vein was graphite observed.

Good water transportation is available for quite large craft between the Canadian National Railway at "Hudson's Bay Spur," about 2 miles west of Hansard, and this property, a distance of about 24 miles. In view of this fact and because of the comparatively small expense involved, some additional development on the vein mentioned on the *Ada* seems justified to further test tungsten possibilities.

No commercial possibilities are apparent in so far as gold, silver, or lead contents are concerned.

Although these properties have been previously examined and an account appears in the 1928 Annual Report on pages 191 and 192, they were re-examined this year, in view of the interest evinced at the present time in tungsten properties, and also because additional work had been done in the interim on the *Silver* group.

Ada. This mineral claim, owned by the estate of the late Oscar Eden, is situated contiguous to the eastern boundary of Pre-emption Lot 9606, at the most northerly point and on the right bank of the Fraser river. Low-lying meadow-land flanks the right bank of the Fraser river, extending back for a distance of about 1,500 feet. From this point the valley-rim, covered with dense vegetation and heavily timbered, rises abruptly at an angle of about 40 degrees. The property is readily reached by motor-boat from Hansard, from which it is distant about 25 miles.

The formation consists of silicified quartz-muscovite schist which strikes north 57 degrees west and dips about 60 degrees south-west. Within this host-rock two quartz veins are exposed in the adit on the property. These conform in strike and dip with the planes of schistosity of the enclosing rocks and are from 3½ to 4 feet in width. Mineralization consists of pyrite, galena, and scheelite. The last-mentioned mineral is exposed, as far as is known, in one vein and only in the underground workings.

The veins show evidence of intense post-mineral movement and in one case the amount of graphite present is noteworthy. The schist formation gradually passes into an acid rock of granitic texture towards the face of the underground workings.

The property was originally staked or acquired by the late Oscar Eden, and in 1922 the North Point Mining Company, Limited, was incorporated for its development. This company carried out the underground development described below, and subsequently another company, called the Granite Mining Company, was incorporated for the purpose of operation. No work has, however, been done at this property for more than ten years. It seems evident that the gold-silver-lead possibilities were originally deemed worth investigating as tungsten was not exposed on the surface, nor its extent investigated when found underground.

Surface workings have now entirely caved, but consisted originally of a shallow shaft 15 feet in depth and a drift 30 feet in length. These workings were driven in a vein 5 feet in width composed of quartz, with pyrite and galena. In the 1922 Annual Report it is stated that this drift "shows the vein to be only slightly mineralized." A sample taken in 1928 from a small dump of the most heavily mineralized pieces assayed: Gold, 0.04 oz. per ton; silver, 4.2 per ton; lead, 10 per cent.

As determined by aneroid this year the elevation of the shaft is 310 feet above the river.

To explore the region below the above-mentioned vein an adit has been driven a total distance of 675 feet on a bearing north 48 degrees east at a depth of 210 feet below the collar

of the shaft. Two veins were cut by the adit—one at 372 feet from the portal and the other at the face. Both veins conform in strike and dip with the enclosing quartz-muscovite schist, striking north 57 degrees west and dipping at about 60 degrees south-west. The former is quartz-filled, sparingly mineralized with pyrite, and 3½ to 4 feet wide. To intercept its north-westward continuation a branch crosscut was run a distance of 65 feet on a bearing north 8 degrees east at a point 340 feet from the portal of the main adit, without results. The vein cut at the face of the main adit was followed by a drift for a distance of 33 feet south-east, and the width showing in the drift-face is 4½ feet. The filling consists of intensely sheared material, quartz, scheelite, and graphite. A sample taken across a width of 2 feet at this point assayed: Gold, trace; silver, trace; tungsten, 4.05 per cent. It is evident from a small dump in a shed at the portal of the adit that the small amount of drifting yielded a very encouraging quantity of scheelite. The latter occurs in the form of graphite-coated nodular lumps, due to post-mineral movement, and lends itself readily to sorting by hand. Presumably at the time this mineral was struck the operators were interested only in gold-silver-lead possibilities and did not deem it worth further investigation. This showing appears to merit some further investigation which could be carried out at relatively low cost by hand-mining, because men and material can be transported by motor-boat from Hansard very readily and inexpensively. The advisability of continuing the drift started on the vein in both directions is indicated. A small amount of raising and sinking also seems advisable.

Silver. This group consists of seven claims owned by Fred Peterson, of Prince George. The property is situated on and about 1 mile above the mouth of Averil creek, which flows into the Fraser river on the right bank of the latter about 1 mile east of the eastern boundary of Pre-emption Lot 9606. It is readily reached by motor-boat 24 miles from Hansard. The valley is somewhat deeply incised, affording numerous rock-exposures on the rims near the creek. A short distance from the creek, however, the ground is covered with a thick growth of timber and dense vegetation.

The formation, consisting of silicified quartz-sericite schist and quartz-biotite schist striking from north 77 degrees west to north 52 degrees west and dipping steeply south-west, contains several conforming quartz-filled shear-zones. Of these, only one of possible commercial significance reaches a maximum observed width of 10½ feet and is exposed by surface and underground workings for a distance of 335 feet along its strike. It is filled with quartz-lenses and sheared rock and in the parting seams there is a heavy development of graphite. The quartz is sparingly mineralized chiefly with pyrite, galena, and sphalerite, except in one place where heavy pyrite mineralization occurs. Scheelite was observed at one point in the outcrop, but this mineral has not at present been found in the underground workings.

The shear-zone is cut diagonally by Averil creek at two points, 135 feet apart, and the surface exposures occur at these points immediately above the creek, also at a third point about 100 feet farther south-east on the line of strike. A 9-foot sample of quartz slightly mineralized with pyrite from the 10½-foot shear-zone assayed: Gold, *nil;* silver, *nil;* tungsten, *nil.* Distant 135 feet on a bearing south 70 degrees east, the second outcrop occurs, on which the adit described below has been driven. The third outcrop is about 75 feet above the adit on the steep bank of the creek. While this outcrop is now rather obscured by sloughing, pieces of solid pyrite were observed at this point and also a little scheelite.

The adit, 203.5 feet long, is situated a few feet above creek-level, and for the first 126 feet follows a bearing south 77 degrees east, and for the remaining 77.5 feet a bearing south 72 degrees east. At the face on the north side a crosscut is driven a few feet towards the foot-wall.

The adit follows the hanging-wall of the shear-zone apparently throughout, the succession of mineralized quartz-lenses occurring on that side. These are to a great extent sparingly mineralized with pyrite and sphalerite. The first quartz-lens, 10 feet long, is 30 feet from the portal. Quartz appears at 65 feet from the portal and again at 120 feet, but is not continuous between these points, although it may exist in the foot-wall. The quartz-lens is continuous in the back of the adit between points 120 and 150 feet from the portal. At 160 feet another quartz-lens appears and continues for a length of 35 feet. The widest quartz-lens observed was 3 feet. The face exposes a width of 7 feet on the hanging-wall consisting of pyritized silicified quartz-sericite schist and brecciated material, in which are fragments of quartz

mineralized with pyrite. The average dip of the hanging-wall in the adit is 76 degrees south-west. At the face the foot-wall of the shear-zone is not exposed.

Scheelite, so far as is known, has not been discovered in the adit, although it was observed in the outcrop. As mentioned, the latter is also heavily mineralized with pyrite at one point, but a sample of this assayed: Gold, trace; silver, 0.04 oz. per ton. A sample taken from a quartz-lens at 126 feet from the portal assayed: Gold, *nil;* silver, *nil.* The average amount of galena and sphalerite in the quartz-lenses is obviously low. A sample taken of selected mineral only assayed: Gold, trace; silver, 10 oz. per ton; lead, 11 per cent.

It is suggested that, inasmuch as the general character of this vein is very similar to that on the *Ada* claim described above, and as scheelite has been found at one point, some prospecting might be undertaken along the outcrop of the shear-zone at points farther south-east of the adit, in the hope that this mineral may be found.

NICKEL DEPOSITS.

Williams Lake Area.

Williams Group.

This property consists of twelve claims owned by A. W. Haddock and associates, of Williams Lake, and is understood to be under option to J. O. Williams. The local name is "Cariboo Nickel." It is situated in immediate proximity to and just north of the road connecting Williams Lake with the Cariboo highway, about 4 miles east of the town of Williams Lake. A car can be driven over a short branch road from the main road to within a few yards of the lowest showing at elevation 2,075 feet (elevation of Williams Lake 1,925 feet). The outcrops are situated on the sparsely timbered range of hills which rises sharply from the main road.

The geology is largely obscured by overburden, and rock-exposures are few, save those in which the mineralization under investigation occurs.

A green-coloured mineral of low nickel content occurs in a rusty, carbonated outcrop. Other minerals present are ankerite, calcite, and pyrite. In addition, pyrrohotite was detected in one sample by the Provincial Mineralogist. The full width of the outcrop is exposed at one point only, but the average width may be considerable. The outcrops can be traced on the surface for a mile or more extending in a north-easterly direction up and across the hillside from the point of lowest exposure. The strike varies from north-east to north 80 degrees east and the dip is north-westerly into the hill. The hanging-wall rock, which is serpentine, is exposed at the south-west end of the property *only.* At this end several open-cuts expose the foot-wall, which is a dark-coloured, silicified, and somewhat pyritized rock of dolomitic appearance. At the north-east end of the property, while the hanging-wall is not apparent, the foot-wall is limestone with serpentine exposed below. These facts therefore indicate that limestone, the thickness of which is indeterminate from present exposures, is overlain and underlain by serpentine. Fracturing and shearing, subsequently followed by mineralization, has taken place at the contact of the limestone with the *overlying* serpentine, the zone of fracturing extending into both rocks and trending in a north-easterly direction, and it is this zone that engages attention at the present time. At the south-west end of the property the foot-wall rock has been fractured in a *north-westerly* direction and intensely silicified, the fractures being filled with quartz, and now appearing as sparsely mineralized quartz gash-veins, some of which are of large size. The nearest known intrusive rock is a stock of sheared and serpentinized granodiorite exposed in the Pacific Great Eastern Railway cut immediately east of Williams Lake.

Investigation disclosed the interesting fact that samples of both the overlying and underlying serpentine, taken some distance away from the mineral-zone, contained higher values in nickel than are present in the mineral-zone itself.

A sample of the overlying serpentine, taken at the south-west end of the property, 50 feet from the mineral-zone, assayed: Gold, trace; silver, trace; nickel, 0.23 per cent.; platinum, *nil.*

A sample of the underlying serpentine, taken about 300 feet from the mineral-zone, at the north-east end of the property, assayed: Gold, trace; silver, trace; nickel, 0.2 per cent.; platinum, *nil.* These two samples were taken from points not less than 1 mile apart.

After discovery of the fact that the serpentine was nickeliferous, the Provincial Mineralogist had serpentines from other parts of British Columbia analysed. It was ascertained

that in two or three instances nickel was present to the extent of about 0.2 per cent. The Provincial Mineralogist therefore suggests that serpentines derived from dunites may normally contain a small amount of nickel. Such, therefore, may be the explanation of the presence of nickel in the serpentine at this property, which exists in the form of large sills.

Exposures are at present so meagre that further open-cutting must be carried out before this and other points can be clarified. The average nickel values present in the serpentine cannot be ascertained until the work mentioned has been done.

The property was staked some years ago by A. W. Haddock, whose attention was originally attracted by the large quartz gash-veins mentioned above. Subsequently and recently the attention of the owners was arrested by the green-coloured mineral present in the north-easterly-striking rusty outcrop, which was found to contain nickel.

The surface workings are situated at the south-west end of the property and consist of a number of open-cuts extending north-easterly up the hillside from the lowest exposure at elevation of 2,075 feet. These open-cuts cover a horizontal range of about 1,200 feet and a vertical range of about 300 feet. The overlying serpentine is exposed only at the lowest point, where an open-cut 18 feet in length is run north 45 degrees east following the mineralization, which dips north-west at 53 degrees at this point. This cut also exposes the dark-coloured foot-wall silicified rock which is presumably a silicified limestone. Overlying this is a width of 3 feet of slightly pyritized siliceous material containing a certain amount of transparent green-coloured mineral. Samples across this width of 3 feet assayed: Gold, trace; silver, trace; nickel, 0.15 per cent. This is immediately overlain by a width of 4½ feet of fractured serpentine containing an opaque dull-green material. A sample across this assayed: Gold, trace; silver, trace; nickel, 0.17 per cent. Further open-cutting discloses serpentine on the hanging-wall for 50 feet. The silicified dark-coloured foot-wall rock is well exposed by some open-cuts, and others are in the mineral-zone only.

About 100 feet north-east and 45 feet above this open-cut, another open-cut is run a distance of 15 feet in a direction north 78 degrees east in the foot-wall rock, exposing on the foot-wall a mineralized width of 10 feet. A sample across this width assayed: Gold, trace; silver, 0.4 oz. per ton; nickel, 0.06 per cent. At elevation 2,195 feet, an open-cut, 30 feet in length and 16 feet in height at the face, is run north 48 degrees west in the pyritized silicified foot-wall rock, which contains small quartz veinlets at this point. The face exposes the foot-wall of the mineral-zone containing the green-coloured mineral; also a mineralized width of at least 10 feet at this point. Although the full width could not be sampled owing to its inaccessibility, a sample across 2.5 feet assayed: Gold, trace; silver, trace; nickel, 0.13 per cent. The remaining open-cuts are comparatively small. A sample from the uppermost open-cut in the mineral-zone only, across 3 feet, assayed: Gold, trace; silver, 0.2 oz. per ton; nickel, 0.10 per cent. A sample from an open-cut 750 feet north-east of the lowest working, across 5 feet, assayed: Gold, trace; silver, 0.2 oz. per ton; nickel, 0.17 per cent. A sample taken across 6 feet from outcrop on trail, south-west of the last-mentioned sample, assayed: Gold, trace; silver, trace; nickel, 0.17 per cent. A sample taken across 1.5 feet from a small open-cut 25 feet below the open-cut, 30 feet in length, assayed: Gold, trace; silver, trace; nickel, trace. A sample taken across 12 inches from the open-cut 25 feet above the 30-foot open-cut assayed: Gold, trace; silver, 0.4 oz. per ton; nickel, 0.23 per cent.

The foot-wall rock between points 750 to 1,200 feet north-east of the lowest open-cut shows a development of numerous large quartz gash-veins, one of which reaches a width of 20 feet at one point. These gash-veins are very sparsely mineralized and one shows a little copper-stain and chalcopyrite. The dark-coloured foot-wall rock is exposed by a short open-cut at a point 85 feet vertically below the uppermost cut in the mineral-zone.

The facts indicate that the fracturing at the contact of the overlying serpentine and limestone, while extending into the former, was probably largely confined to the latter. The fractured zone was subsequently mineralized with highly siliceous solutions bearing a certain amount of sulphides, mainly pyrite. The mineralization is chiefly a replacement in limestone. The limestone, which occurs as the foot-wall of the mineral-zone now undergoing investigation, was itself intensely silicified below the foot-wall mentioned at the south-west end of the property, and irregular fractures were developed approximately at right angles to the main mineral-zone. These fractures were filled with quartz very sparsely mineralized, and now appear as gash-veins varying in width from less than an inch to many feet.

The full width of this mineral-zone is exposed at one point only—that is, by the lowest open-cut at the south-west end of the property. Its width is seen to be 7½ feet, including 4½ feet of mineralized and fractured serpentine. At all points north-east of this it is obviously very much wider and may reach an average width of 50 feet or more, but this is not disclosed by surface workings.

It has been determined by analysis that the greenish-coloured mineral contains only a small percentage of nickel and is not garnierite, although a small amount may be present. Chromium was found, which might account for the green colour.

It is not a digression to state that green-coloured minerals, other than malachite, similar in appearance to that found at this property are of quite widespread distribution and have been the subject of considerable attention by this Department. Investigation has shown that in most cases they are chlorite containing no nickel; in others a small amount of nickel is present; more rarely the mineral is mariposite, a mica containing chromium. The green colour of the last mentioned is considered by authorities to be due to chromium.

NON-METALLIC DEPOSITS.

Lime Deposit.

Ritchie Area.

A deposit of essentially calcium carbonate, in pulverulent form, containing about 95 per cent. calcium carbonate, which has been found very useful locally as a dressing for agricultural land, occurs about 1½ miles by road from Ritchie, a flag-station on the Canadian National Railway between Cedarvale and Dorreen.

The entire absence of any admixture of clayey material renders the deposit particularly amenable to handling by any mechanical method of excavation. While no exact calculations of total tonnage can be made owing to lack of development-work, it is probable that some thousands of tons are immediately available for shipment. A motor-road has been constructed to the deposit from Ritchie to meet the local demand for the material and in the hope that a wider market may be created.

Buccaneer of the North.

This mineral claim has been staked by August Johnson and A. J. Hillyard, of Dorreen, covering the above-mentioned lime deposit, situated about three-quarters of a mile in a direct line south-west of Ritchie. The property is located in a depression in a timbered flat known as " Porcupine Flats," which parallels the Skeena river in this region about 80 feet above the latter. The depression mentioned is bordered on the east by morainal slopes which rise to another flat above Porcupine Flats to the foot of a rocky ridge situated immediately west of the Skeena river. On the west the depression is bordered by morainal hills which rise to the rocky ridge forming the left bank of Lorne creek.

Except for a small circular meadow about 475 feet in diameter occupying the depression, the ground is covered with dense vegetation and timber.

The deposit was first found immediately underlying surface vegetation in the meadow and subsequently in a similar position in regard to the gently rising ground adjoining the meadow on the east and south. A creek of considerable size cuts through the sediments of the Hazelton series, which form an extensive range of hills immediately west of the meadow. Shortly after emerging from the range of hills the creek disappears into the glacial debris which flanks the range and evidently flows under the meadow and, seasonally each year, in the spring and autumn, completely floods the meadow to a depth of several feet. It is evident, therefore, that the depression occupied by the meadow in the glacial debris and immediately adjoining area to the south-east acts as a catchment-basin for water containing calcium carbonate, and, further, that by very slow evaporation the waters become super-saturated with the mineral, so that the deposition of calcium carbonate in pulverulent form takes place within the body of water. The deposit bears none of the characteristics of calcareous tufa. It was noted that the creek mentioned cuts through calcareous argillites immediately before disappearing into glacial debris, so that a local source of the lime is afforded.

Exploration of this property, staked in 1931 by the present owners, consists of several small and shallow pits at various points on the meadow and within an area 300 by 500 feet lying south-easterly. In addition to these, there is one trench of a maximum length of 205

feet, a maximum width of 10 feet, and from 3 to 5 feet deep. The pits indicate the probability that the meadow and area described is underlain by the deposit of lime. The trench affords a very good exposure of the white or cream-coloured deposit, and shows that at this point the latter is immediately overlain by moss and timber, with very little overlying soil. It will be noted that the area lying to the south-east of the meadow lies above water-level and is not overlain by any glacial debris, so that shipments can be made at any time from this region after it has been cleared of timber and vegetation. Development to date affords but little evidence as to the average depth of the deposit; obviously, therefore, no exact calculations as to quantity can be made, but assuming that an area 300 by 300 feet on the south-east side of the meadow is underlain by a wedge-shaped body of the deposit, 30 feet deep at its eastern extremity, and that the material in place occupies 18 cubic feet per ton, then 70,000 to 75,000 tons are indicated as lying above water-level and immediately available.

PROGRESS NOTES.

Lode-gold Deposits.

Wells Area.

Cariboo Gold Quartz Mining Co., Ltd.—The rate of milling was increased to 150 tons daily on September 4th. A comprehensive development scheme was also carried forward, including the sinking of two vertical winzes on the 1,500 level, one in the *Rainbow* vein system (formerly "Nos. 5, 6, and 7 vein area") and the other in the *Sanders* vein system (formerly "Rainbow or Sanders" vein area). Both these had reached a depth of 250 feet on October 11th. (Refer to Annual Report for 1934, also to Memoir No. 181, Geological Survey of Canada, 1935.)

Island Mountain Mines Co., Ltd.—During the year the rate of milling was increased to about 100 tons daily and development and diamond-drilling to about 800 feet monthly. Tonnage milled consists of about 60 per cent. from quartz veins and 40 per cent. from the replacement deposit. (Refer to Annual Report for 1934, also to Memoir No. 181, Geological Survey of Canada, 1935.)

Barkerville Area.

Richfield Cariboo Gold Mines, Ltd.—During the year the main adit was advanced about 1,000 feet farther and has now reached a total length of approximately 2,600 feet. Near the face of the main adit some small sulphide-bearing quartz veins were cut. (Refer to Annual Report for 1934, and Memoir No. 181, Geological Survey of Canada, 1935.)

Stanley Area.

Cariboo Gold Syndicate.—This syndicate holds forty-eight mineral claims on Van Winkle mountain, 6 miles from Stanley. A number of "B" veins and one "A" vein are exposed on the flat-topped mountain summit in schistose sediments of the Cariboo series. An adit, the estimated length of which is 1,092 feet, has been started and on October 9th had advanced 25 feet towards its objective, 340 feet below the vein-outcrops.

Usk Area.

Omineca Gold Quartz Mines, Ltd.—This company was incorporated during the year for the purpose of operating the *Dardanelle* group on the Zymoetz river. (Refer to Annual Report for 1927.) A force of upwards of forty men was employed in constructing a tractor-trail, an essential preliminary to development, following the north bank of the river from the Terrace–Usk highway to the property, a distance of 12 miles.

Columario Consolidated Gold Mines, Ltd.—This company suspended mining and milling operations in the early summer, which were not subsequently resumed.

Smithers Area.

Glacier Gulch.—Operations were resumed at this property during the year by the owners, who shipped approximately 30 tons of ore. (Refer to Annual Report for 1934.)

Mamie.—The optionees, W. R. Wilson & Sons, continued No. 1 adit, the face of which at 218 feet from the portal showed a vein-width of 3 feet. A sample across 3 feet at this point assayed: Gold, 1 oz. per ton; silver, 4 oz. per ton. (Refer to Annual Report for 1934.)

Placer Deposits.

Barkerville Area.

Lowhee Mining Co., Ltd.—This company continued hydraulic operations on Lowhee creek, where the face of the pit has reached a point just beyond Watson's gulch. The channel near bed-rock is narrow and V-shaped. Among nuggets recovered during the year was one of galena containing a large amount of gold. It is stated that the entire holdings of this company have been acquired by English interests.

French Creek Hydraulic Placers, Ltd.—This company last year rendered its water rights on Williams creek available to its property on French creek and continued active hydraulic operations throughout the season.

Antler Gold Mines, Ltd.—This company holds a large number of leases on Antler creek, extending down-stream for about 12 miles below Grouse creek. During the year a road from the Barkerville–Bear Lake road to the lower end of the property was built. At this point on a low-lying rock bench a boom-drag-line Diesel shovel, with bucket of 1¾-cubic-yard capacity, was installed, together with screening and washing plant.

Walker Gulch.—This creek immediately before entering Williams Creek valley is contained in a rocky gorge above which its valley widens. The topographic indications suggest that a buried pre-Glacial channel-remnant lies in the right bank of the creek on the south side of the gorge. The depth of the pre-Glacial channel-remnant is unknown. The property covering the above region is owned by E. T. Fitzsimmons, who has installed an hydraulic plant.

Antler Placer Mines, Ltd.—This private company holds leases on upper Antler creek in the vicinity of Sawmill Flat creek, where there is an indication that a former channel of Antler creek lies buried in its left bank. An hydraulic plant was installed last year and operated this year under the direction of Alfred Brown.

Leases of H. Brown and Associates, Nugget Gulch.—A description of this property, on which an option was taken during the year by Consolidated Mining and Smelting Company of Canada, Limited, will be found in the 1933 Annual Report under "Nugget Gulch."

Wells Area.

Queen City Mining Co., Ltd.—This company holds an option on placer-mining leases 608, 2786, and 2787, situated on Eight Mile lake at and near the old *Thistle* pit. A Bucyrus power-shovel with a bucket of ¾-cubic-yard capacity was installed at the property during the year and working in the face of the pit.

Eastman Red Gulch Placers, Ltd.—This is a private company incorporated in 1934 for the purpose of hydraulicking the buried pre-Glacial channel of Red Gulch. The *Oliver, Never Sweat, Alabama,* and *Pay* placer-mining leases, owned by the Lowhee Mining Company, are operated on a royalty basis.

Guyet Placers, Ltd.—Hydraulic operations continued by this private company during the year at its property on Antler creek, an account of which is given in the Annual Reports for 1932 and 1933. Time did not permit of examination this year.

Stanley Area.

Among the hydraulic properties in operation during the year may be mentioned that of L. Ford and R. McDougall on Dragon creek; those of Chinese interests on Slough creek; that of Julius Powell on Coulter creek; the *Cariboo Eagle* on Houseman creek; the *Last Chance* on Last Chance creek; the *Ketch* at the mouth of Devil's canyon; and the property of Magnus Sundberg on Donovan creek.

Beaver Pass Area.

Considerable activity was manifested by individual operators in Beaver Pass, among whom may be mentioned K. K. Langford and H. C. Cameron. Time did not permit of examination of this area this year.

Wingdam Area.

Slade-Cariboo Gold Placers, Ltd.—Hydraulic operations were continued by this company throughout the season and a large yardage piped off. The pit is now about 600 feet in length

and 180 feet in width and trends in a south-easterly direction from Lightning creek. (Refer to *Annual Report for 1932.*)

Cottonwood House Area.

Leases of J. W. and W. D. Jones and W. H. Stricker.—This property, through which the Quesnel–Barkerville road passes, is distant 2 miles from Cottonwood House. In October a drag-line plant, with bucket of ½-cubic-yard capacity, was installed, together with screening and washing plant, on the right bank of the Cottonwood river.

Prince George Area.

Nechako Golds, Ltd.—This private company installed a caterpillar boom-drag-line shovel, with bucket of 1½-cubic-yard capacity, together with screening and washing plant, at its property on the Nechako river at Miworth, 9 miles west of Prince George.

A considerable yardage was treated on the left bank of the river, but operations were subsequently suspended for reasons unknown.

West Road (Blackwater) River.

Lease of T. B. Armstrong and Associates.—Investigation on T. B. Armstrong's lease had only just commenced at the time of examination, but appeared to merit continuation as evidence had been found of placer concentrations on the right bank of the river at the assumed point of intersection with the buried channel.

Hixon Creek Area.

Lease 2118.—Acting for Hixon Mother Lode, Limited, Richard Langdon installed a pump-hydraulic plant on this property during the year. A small drag-line plant was utilized for stacking oversize tailings and the minus 6-inch tailings were disposed of with a dredge-pump.

Hansard Area.

W. H. O'Dell's Dredge.—W. H. and W. C. O'Dell designed and built at Hansard a small dredge 50 feet long by 16 feet wide, equipped with a bucket of " orange-peel " type and operated by a 25-horse-power donkey-engine. This was subsequently towed to a large low-lying bench on the right bank of the McGregor river, about 7½ miles above its mouth, and operations commenced at this point.

Likely Area.

Cedar Creek Hydraulic Mines, Ltd.—This company was incorporated during the year to operate the leases originally owned by the Cedar Creek Mining Company, Limited. (Refer to Annual Report for 1934.) Drag-line operations were continued in the north-western part of the property and systematic prospecting was undertaken in this region with, it is stated, encouraging results.

Moose Syndicate.—It is understood that encouraging results were secured by this syndicate. (Refer to the Annual Report for 1932.)

Quesnel Forks Area.

Property of C. S. Wing.—This property is situated on the left bank of the Quesnel river, 4 miles below Quesnel Forks, and was discovered last year by a Chinaman. A small creek cutting through the mass of glacial debris, which forms a large part of the valley-fill at this point, has effected a rich concentration of fine gold on slum. Two pans taken here by the Resident Engineer yielded gold of a total value of 78 cents. A small hydraulic plant has been installed.

Leases of J. Shaw.—These leases are situated on the South fork of the Quesnel river above Quesnel Forks. Particular interest is attached to this part of the river because of the probable enrichment caused by the post-Glacial waters of the river cutting through the *Bullion* channel.

Half Mile Creek.—This creek flows into the South fork about half a mile above Quesnel Forks on the north side of the river. Topographic indications strongly suggest that a pre-Glacial channel-remnant of considerable length lies buried in the left bank of this creek. Lease-owners handicapped by the indifferent water-supply are meeting with encouraging results on a rock bench indicated as being the right rim of this buried channel.

Keithley Area.

Placer Engineers, Ltd.—An account of this property will be found in the Annual Report for 1933. Hydraulic operations continued during the year in *China* pit, resulting in the exposure of bed-rock of two channels. One is presumably the pre-Glacial channel of Four Mile creek and the other that of Keithley creek.

Upper Pine Creek.—A new discovery of placer on this creek by G. Baker and A. Peeling is reported.

Pine Creek Mining Co.—Hydraulic operations continued during the year by this company under the direction of B. Boe and a considerable yardage was piped off. The right or west rim of the buried channel is well exposed, but there is as yet no evidence of the left rim, although such may not be very prominent. (Refer to the Annual Report for 1933.)

Harvey Creek.—A general account of this creek and B. Boe's earlier operations will be found in the Annual Reports for 1932 and 1933. During the year it is understood that hydraulic operations commenced above the falls.

McLeod River Area.

Northern Reef Gold Mines, Ltd.—The secretary of this company reports that during the year much further testing of both placer and lode-gold deposits was carried out, and that preparations have been completed for continuous hydraulicking throughout next season. (Refer to Annual Report for 1934.)

Manson Section.

This section comprises the area immediately south of the Omineca river and includes the drainage areas of Silver and Quartz creeks at the west end, and those of the Germansen and Manson rivers at the east end.

Northern Ventures, Ltd.—This company was incorporated during the year. The secretary is T. W. Brown, P.O. Box 1585, Prince Rupert. The property owned consists of five claims and twelve leases situated on Vital creek, and covers the entire section of this creek worked to date. Deciding to abandon drift-mining in favour of hydraulicking, the company commenced active preparations in September with this end in view. (Refer to Annual Report for 1933.)

Yukon Border Placer Golds, Ltd.—This company, under the direction of R. D. Adams, carried out a considerable amount of drilling on Tom and Silver creeks with a tractor 6-inch Keystone drill. After boring fifteen holes on the former creek and eight holes on the latter, the drill was subsequently moved to Old Hogem and transported by scow to Germansen Landing for the purpose of drilling property acquired in the eastern part of the Manson section.

Consolidated Mining and Smelting Co. of Canada, Ltd.—Drag-line operations on this company's property on Slate creek have been impeded by the tightly packed glacial gravels overlying bed-rock, and it was found necessary to drain the pit. A bed-rock drain from a down-stream point approached completion early in September, and the management then anticipated that it would shortly be possible to clean a considerable area of bed-rock. (Refer to Annual Report for 1933.)

Germansen Mines, Ltd.—This company was incorporated in 1934 and acquired the property on the Germansen river formerly owned by Germansen Placers, Limited. Hydraulic operations have proved the down-stream continuation on the right bank of the channel, 50 feet above the river previously hydraulicked and immediately up-stream on the left bank. Farther down-stream a continuation, which may prove extensive, is indicated. Satisfactory values in coarse gold are reported.

Operations of B. McDonald.—B. McDonald was engaged during the year in transporting a caterpillar power-shovel, with a ⅞-cubic-yard bucket, from Vanderhoof to his property situated on the Manson river. At the end of the season the shovel had reached a point about 20 miles north of the Nation river.

Leases of S. Young and W. B. Cowan.—These leases are situated on Kenny creek, about 2½ miles below Silver lake, distant 28 miles from Takla Landing. Concentrations of placer were previously worked by earlier operators in shallow gravels overlying rock benches in immediate proximity to the canyon. Encouraging values were found by the present operators

in the bed of the creek at the lower end of the canyon about three-eighths of a mile above Silver creek.

Leases of E. Jones and Associates.—This property, consisting of five leases situated at the lower end of Quartz creek, is 38 miles by trail from Takla Landing. The topography indicates that the pre-Glacial channel of the creek is buried in the right bank, and the investigation of this is proposed. Present operations consist of washing bench-gravels at the mouth of the creek.

Lease of E. Martin.—The placer deposits on this lease, situated about half a mile above the mouth of Quartz creek, consist of post-Glacial concentrations on rock benches above creek-level and in the shallow gravels immediately overlying bed-rock in the creek. Quite coarse gold is found on bed-rock in this region, where the creek is wholly contained in a canyon.

Lease of E. Woods and T. Harrison.—This lease is situated on the Fall river, about half a mile down-stream from Quartz creek. At this point the river makes a turn before entering a rocky gorge and a good concentration is found in the bed of the river.

Leases of Alex. Clark and G. R. Moore.—These leases are situated on Quartz creek and extend within a canyon up-stream from a point about 1½ miles above the mouth of the creek. Work to date chiefly consists of driving an adit and branch therefrom whilst investigating above the mouth of the creek the buried pre-Glacial channel of the creek, which is indicated as lying instream in the right bank.

Leases of H. A. Hagberg.—These leases are situated on Germansen river, 4 miles down-stream from Germansen Mines, Limited. A rock bench, 20 feet above the river on the left bank, overlain by a height of about 75 feet of glacial gravels, exemplifies a former river-channel. A small hydraulic plant is installed. At the lower end of this ground there is evidence of another channel below the present river-level.

Lease of A. L. Ward and J. Bauer.—This lease is situated on the south side of Plug Hat mountain. An hydraulic plant has been installed on bed-rock in what appears to be a former channel of the river immediately instream from the canyon, and considerable headway has been made with the advancement of the pit northwards.

In the eastern part of the Manson section other operators were: E. Dunsmore and associates on Lost creek; E. A. Floyd on Boulder creek; S. Rosetti, A. Hyndman, and E. Moore at different points on the right bank of the Manson river; and Luke Fowler on Blackjack gulch.

Gold-Silver-Lead-Zinc Deposits.

Smithers Area.

Hyland Basin.—A shipment of ore was made to Trail by the owners of this property. (Refer to Annual Report for 1926 and Geological Survey Summary Report, 1924, Part A.)

Topley Area.

Topley and Richfield.—These groups are a restaking of ground formerly held by Topley-Richfield Mining Company, Limited, by the owners, L. B. Warner and A. Chisholm, of Smithers, and R. W. Innes, of Topley. A new discovery was recently made east of the region formerly under development, consisting of a shear-zone several feet in width, in which a well-mineralized quartz vein 2 feet in width contains gold values.

Gold.—A considerable amount of development was carried out by the owners of this property with gratifying results. Gold values were encountered at two points about 300 feet apart in the flat-dipping vein under development, justifying further work. (Refer to Annual Report for 1934.)

Silver-Lead-Zinc Deposits.

Smithers Area.

Silver Creek.—Further development of this property, attended by encouraging results, was carried out by the optionees, W. R. Wilson & Sons, in No. 3 adit in the pyrrhotite-sphalerite ore struck in 1926 by British Canadian Silver Corporation. (*See* Annual Report for 1926, with map, under "Schufer.")

Silver-Copper Deposits.

Grouse Mountain Area.

Last Chance.—A new discovery was made on this property this year by one of the owners, J. Oakes, of Telkwa, consisting of a quartz vein varying in width from a stringer to 19 inches, well mineralized with grey copper, chalcopyrite, pyrite, malachite, and azurite, and carrying high silver values. It was the intention of the owners to endeavour to make a shipment this winter.

Tungsten Deposits.

Wells Area.

Hardscrabble.—A small-scale development programme was undertaken on this property by the Columbia Tungsten Company, Limited; office, 61 Broadway, New York, U.S.A. A description of this group will be found in the Annual Report for 1918.

PART D.

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

BY

A. M. RICHMOND.

SUMMARY.

Briefly summarizing mining activity in the seven mining divisions comprising the Southern and Central Mineral Survey Districts, it is pleasing to record progress in prospecting, development, and production during 1935.

Major interest was centred in the search for gold properties, and, stimulated by favourable mining developments in the Hedley camp, much old and new ground was re-examined and prospected in that camp during 1935. The result was the re-establishment of Hedley as a gold-mining camp of importance, with one property (reopened) producing at the rate of 210 tons or more per day; another property being equipped with mining and milling equipment of modern design to treat 150 tons per day (which it is expected will be in operation by April, 1936); and the announcement that one and possibly two new milling plants will be built and placed in operation during 1936.

Similar prospecting, but on a reduced scale, was done in the Osoyoos, Oliver-Fairview, Lightning Peak, Monashee, Vernon, Greenwood, Grand Forks, Summerland-Peachland, Nicola, and Windpass areas, and some encouraging gold discoveries were reported. Revival of interest in silver properties resulted in Beaverdell receiving more attention than for several years past, and as more knowledge is gained about the intricate faulted nature of the ore deposits in this camp it is confidently expected that production, already substantial in the aggregate, will be materially increased.

Placer-prospecting and small-scale individual placer-mining operations were about the same as in previous years. The larger operations on Rock creek, Midway creek, and the Similkameen-Tulameen areas did not report a particularly successful year. Renewed interest has been taken in the old high-bench channels on Scotch creek and Woods Lake benches, where more extensive testing has recently been started.

It is worthy of note that while the Nos. 3 and 4 Mineral Survey Districts, situated conveniently as they are with respect to road and rail transportation, have always been thought of as thoroughly prospected, there still remain many areas of potential promise. Some of these, now coming into prominence, were prospected many years ago, but changed economic conditions have caused a renewal of interest by those interested in mining. Generally speaking, it is the prevailing opinion that the old mining camps of the southern part of the No. 3 and particularly No. 4 Mineral Survey Districts have been thoroughly gone over in recent years, but this is quite to the contrary. Particular reference to the Greenwood-Phoenix, Franklin, South Okanagan, and Camp McKinney areas may be made where a number of old producers and possible potential prospects exist.

In the more isolated parts of the district there are also several promising areas for prospecting: The area to the south of the Tulameen and Similkameen rivers; the country lying between the Okanagan lake and Nicola; the area near the headwaters of the Kettle river; and some areas on both sides of the North Thompson river. In all instances mentioned attractive samples of mineral have been brought out from time to time by the few prospectors working in these areas.

PRODUCTION.

No. 3 District.—Ore, 27,444 tons; gold, lode, 7,576 oz.; silver, 44,069 oz.; copper, 38,448 lb.; lead, 269,652 lb.; zinc, 89,926 lb.; placer gold, 261 oz.; miscellaneous metals, minerals, and structural materials produced had a value of $138,620. Coal production for this district was 25,617 tons.

No. 4 District.—Ore, 184,471 tons; gold, lode, 33,795 oz.; silver, 801,812 oz.; copper, 2,334 lb.; lead, 706,066 lb.; zinc, 638,557 lb.; placer gold, 461 oz.; miscellaneous metals,

minerals, and structural materials produced had a value of $51,280. Coal production for this district was 121,118 tons.

ACKNOWLEDGMENTS.

The writer desires to acknowledge the help and many courtesies extended to him by the prospectors, mining operators, engineers, and the general public with whom he came in contact during the field season.

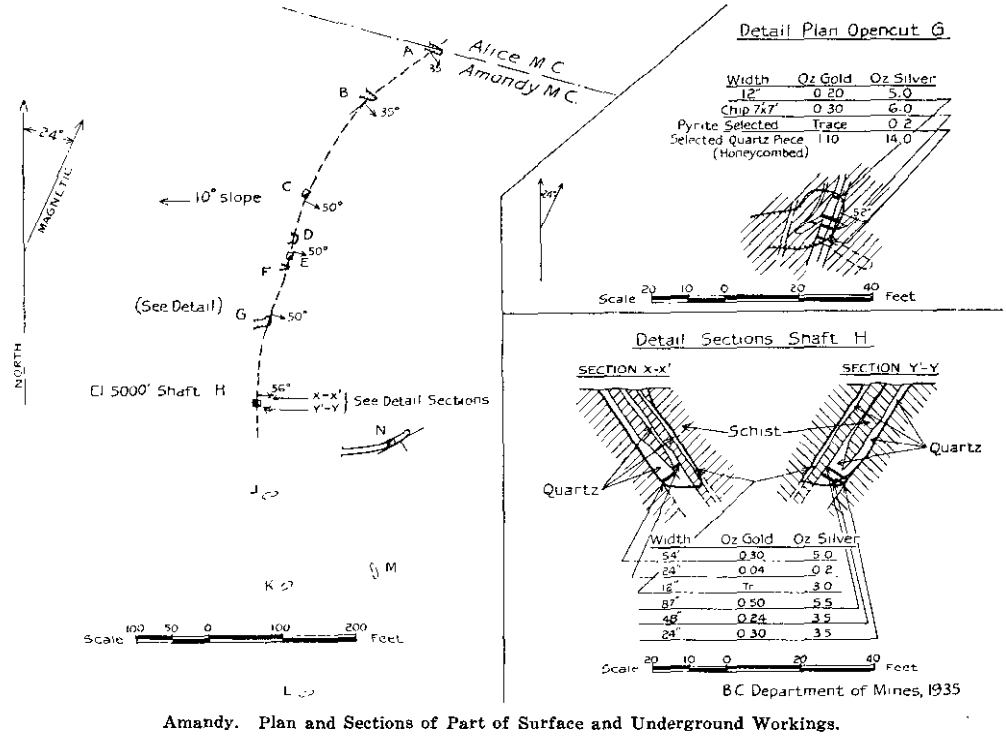
LODE-GOLD DEPOSITS.

GREENWOOD-PHOENIX AREA.

For details concerning the past history the reader is referred to the Annual Reports for 1896 to 1934 and also to the Geological Survey of Canada publications, Memoirs 19 and 21, on the Deadwood and Phoenix camp. The geological map No. 828, "Boundary Creek Mining District," presents an excellent guide to the general geology and its relation to the mining occurrences of the camp.

JEWEL LAKE CAMP.

Amandy. (*See* Annual Reports under *Amanda* for 1897 and *Amandy* in 1903 and 1934.) This group, consisting of the *Amandy* Crown-granted Lot 2795 and six other claims held by location, is owned by E. C. Henniger and associates, of Grand Forks. Under the name of *Amanda* in the Annual Report for 1897 the property is briefly



Amandy. Plan and Sections of Part of Surface and Underground Workings.

mentioned as being owned by Chas. Collier *et al.*, and that some exploration was done on two quartz-outcrops—one, 15 to 18 inches wide, mineralized with galena, sphalerite, and pyrite, and the other at the north end of the claim, 4 feet wide, of barren-looking quartz. In 1903 the same claim, under the name of *Amandy*, Lot 2795, is recorded as having been Crown-granted by James Hunter. No further reference of note appears in official records until 1934. A short time prior to this the *Amandy* was leased from the Government by E. C. Henniger *et al.* and six other adjoining claims staked. In November, 1934, after back taxes were paid, the claim was re-Crown-granted in Henniger's name.

The *Amandy*, upon which most of the exploration has been done, lies at an elevation of approximately 5,000 feet, generally on the southern slopes of Rhoderic Dhu mountain, which lies north-west of Jewel lake. On the upper part of the group the ground slopes gradually to the south and west, but becomes more precipitous to the south before reaching Jewel lake, about 1,300 feet lower and 3,500 feet distant. A sufficiently abundant growth of fir timber for mining purposes can be obtained on the claims. Water is scarce in the immediate vicinity, but plenty is available in Jewel lake. A branch from the West Kootenay Electric Power Company line supplies the Dentonia mine across Jewel lake, about 2 miles distant south, with power. Transportation consists of a road about 8 miles long from Greenwood, on the Canadian Pacific Railway, to Jewel lake, and from thence a newly constructed road uphill for a distance about 2 miles to within a few hundred yards of the camp at 5,000 feet elevation.

The formations in the immediate vicinity of the *Amandy* claim consist of quartzitic schists, strike northerly, dip from 30 to 60 degrees easterly. A short distance south of shaft " H " a porphyritic granite tongue strikes across the schist-beds in a north-westerly direction. Beyond this to the south the schists continue to outcrop. The attitude and width of this intrusive rock is uncertain and obscured by hidden contacts and apparently large inclusions of schist, but at most the surface exposure is not more than 100 feet across. For the same reason, the relation of this intrusive, if any, to the granite batholith, known to underlie the Jewel Lake area, could not be definitely ascertained. The schists have been fractured, sheared, and generally quartz-filled along the bedding-planes in a wide semicircle trending gradually east towards the north boundary of the *Amandy*, and to east of south in the opposite direction. Two other less prominent fractures occur, one outcropping a short distance east of shaft " H " and the other about 125 feet north-east of cut " C." Similar outcrops to the west and south-west of the main fracture expose other shear-zones less well defined, striking in variable directions and without apparent continuity for more than a few feet.

Mineralization in the main fracture, which has free walls, consists of pyrite oxidized near the surface and lesser amounts of galena, sphalerite, and occasionally a bright silvery-coloured mineral undetermined, but probably telluride in a gangue of quartz alternately banded with schist. The width of quartz in the main fracture varies from a few inches to 10 feet in comparatively short distances on the strike and dip. In the other fracture similar minerals are found in widths from ½ to 18 inches.

Exploration consists of open-cuts, pits, and shafts portrayed on the map. In addition to these, a shallow shaft and open-cuts have been excavated on some of the various outcrops mentioned above.

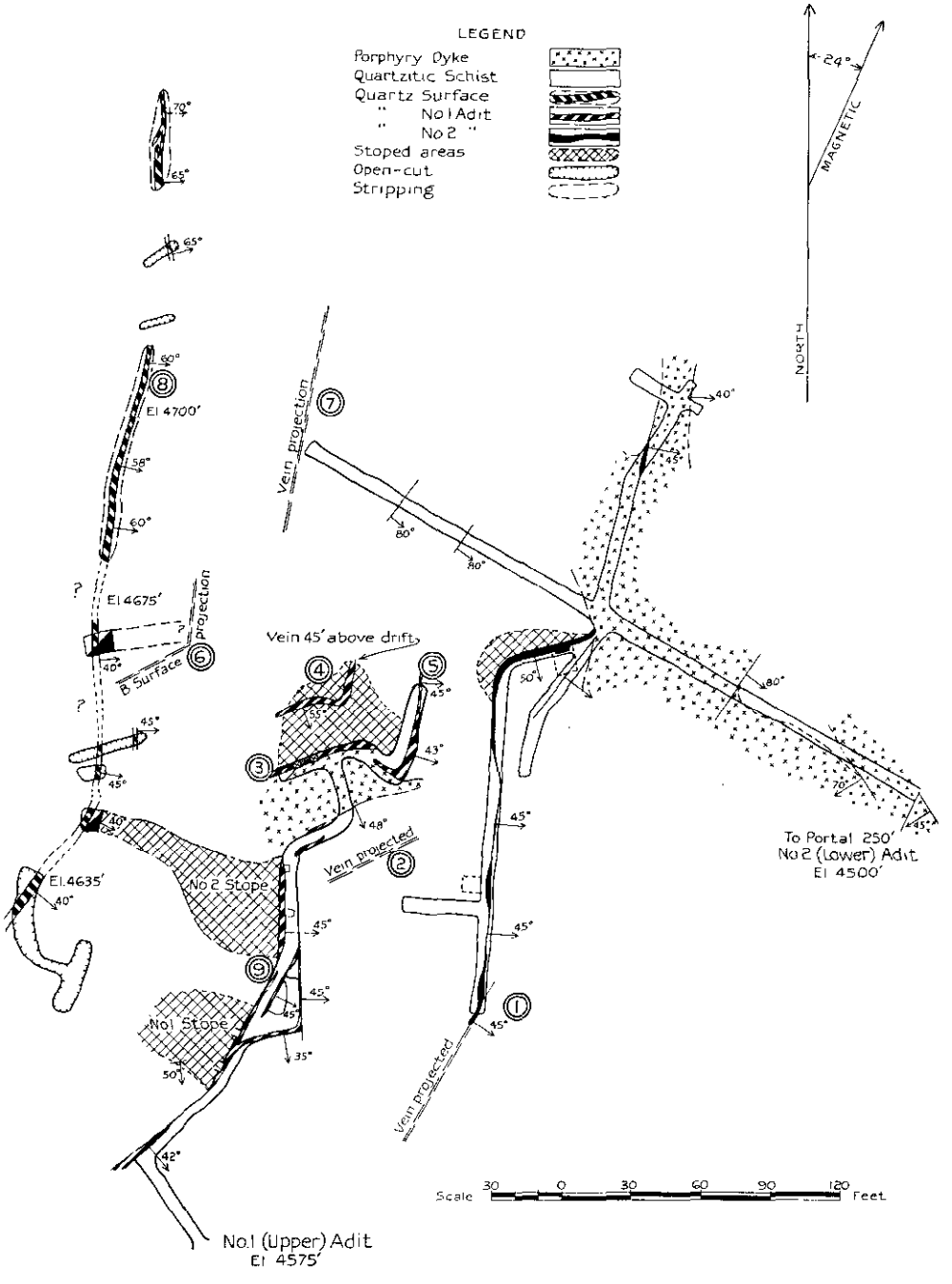
Summing up the possibilities of these showings, it may be said that the main fracture is typical of others found in the schists in the Jewel Lake area, where structural conditions play an all-important part in the deposition of minerals. The different attitudes of the schist-beds both on the strike and dip have often been a controlling factor, permitting easy access or otherwise of the ore-bearing solutions. Rakes of ore-bodies in different directions within the shear-zones is also of common occurrence. The improvement in the quantity of quartz, minerals, and values in depth in shaft " H " is an encouraging feature and warrants continued exploration. Most of the work has been done recently by four men in cut " C " and shaft " H," where a higher ratio of minerals in greater widths of quartz have been found as depth is attained.

Superior Mines, Ltd.

(*See* Annual Reports, 1897 and 1931 to 1934, under *North Star*.) This company, with headquarters at 6 Cameron Building, Calgary, Alberta, and reported as owning a controlling interest in the Askalta Oil Company, has bonded the *North Star* group of claims, consisting of the following: *North Star* (Lot 1165), *Cairn Gorn Fraction* (Lot 2853), *Old Bird* (Lot 1324), *Golden Eagle Fraction*, and *Eastern Star Fraction*, situated to the north-west and adjoining the Dentonia mine, and also the old *Providence* mine located about 1 mile north of Greenwood.

The *North Star* group, elevation 4,700 feet, lies on the rolling summit and eastern slope of the range of mountains skirting the east side of Jewel lake, and can be reached by a branch road from the Dentonia mine. Timber is plentiful, but water is scarce, except in Jewel lake.

The vein upon which most of the work has been done occurs in schistose quartzite, conforms to the strike of the formation in a northerly direction, dips variably to the east, and is often



B C Department of Mines, 1935

Superior Gold Mines, Ltd. Plan showing North Star Workings.

frozen to the walls. Mineralization consists of pyrite, galena, sphalerite, and gold telluride in a gangue of quartz. The mineral-zones, which reach a maximum width of 3 feet, but average about 8 inches, lie in isolated shoots, with low-grade quartz between.

The *North Star* and *Cairn Gorn* were first bonded by Leslie Hill in 1897 and two shafts sunk, 50 and 60 feet respectively, on the vein. At a later date (not known) a crosscut 45 feet long was driven to intersect the vein below the shafts and a drift driven 125 feet on the vein. At a point about 45 feet along the vein some stoping was done and a shipment of ore made to the smelter. In 1932 R. L. Clothier and associates, of Penticton, leased the *North Star* and shipped three car-loads of ore to Trail. In 1933 W. E. McArthur, of Greenwood, shipped a car-load of ore from the same stope and drove the main adit ahead, as well as a semicircular side-drift on a branch vein. In 1934 the Superior Mines extended the main drift in a northerly direction through a porphyry dyke.

Development on the surface consists of two shafts 50 and 60 feet deep, as well as numerous open-cuts over a length of about 500 feet. Underground, a considerable amount of drifting and crosscutting has been done and a small area stoped. From the point where the crosscut intersects the vein for 42 feet along the north drift the vein is split, having a maximum width of 14 inches, averaging about 4 inches on each strand. For the next 83 feet much of the ore has been stoped above the level; then for 27 feet the vein is narrow and displaced. From this point for some distance only occasional displaced remnants of quartz occur. In the semi-circular side-drift, about 40 feet long, driven easterly from a point about 120 feet along the drift, the vein is much disturbed and narrow, but generally well mineralized.

From a study of the plan it is apparent that the north drift (5) on the No. 1 adit-level stopped at an interesting place and it should be continued to the north through the intrusive porphyry tongue and turned to the north-west to determine what values exist in the vein projection at point (7). Similarly, the south drift on No. 2 level should be continued south-west from (1) to get under the area stoped on No. 1 adit-level. A short crosscut should also be driven north-west to intersect the downward continuation of the (3-4) stope at point (2).

A limited amount of surface-trenching at (6) would throw considerable light on what happens to the dyke found cutting both adits underground. It is quite possible the intrusive does not reach the surface and that the flat dip of the vein south of (6) is due to this part of the country being subjected to a regional uplift by the underlying intrusive.

Stoping was started on a small shoot of ore on the No. 2 adit south crosscut, and the ore so mined, together with that roughly sorted from the rest of the development in this crosscut, was piled separately on the dump. Three large samples of the 400-ton dump were taken and the assays were:—(1.) Top edge of dump: Gold, 0.16 oz. per ton; silver, 0.8 oz. per ton; *nil* in lead and zinc. (2.) Toe of dump 6 feet below (1): Gold, 0.16 oz. per ton; silver, 0.8 oz. per ton; *nil* in lead and zinc. (3.) Surface of dump: Gold, 0.19 oz. per ton; silver, 0.4 oz. per ton; *nil* in lead and zinc. An assay of an 8- to 10-inch stringer of heavy sulphides from the winze on No. 2 adit-level assayed: Gold, 2.06 oz. per ton; silver, 10.4 oz. per ton; copper, 2 per cent.; lead, 6 per cent.; zinc, 2 per cent.

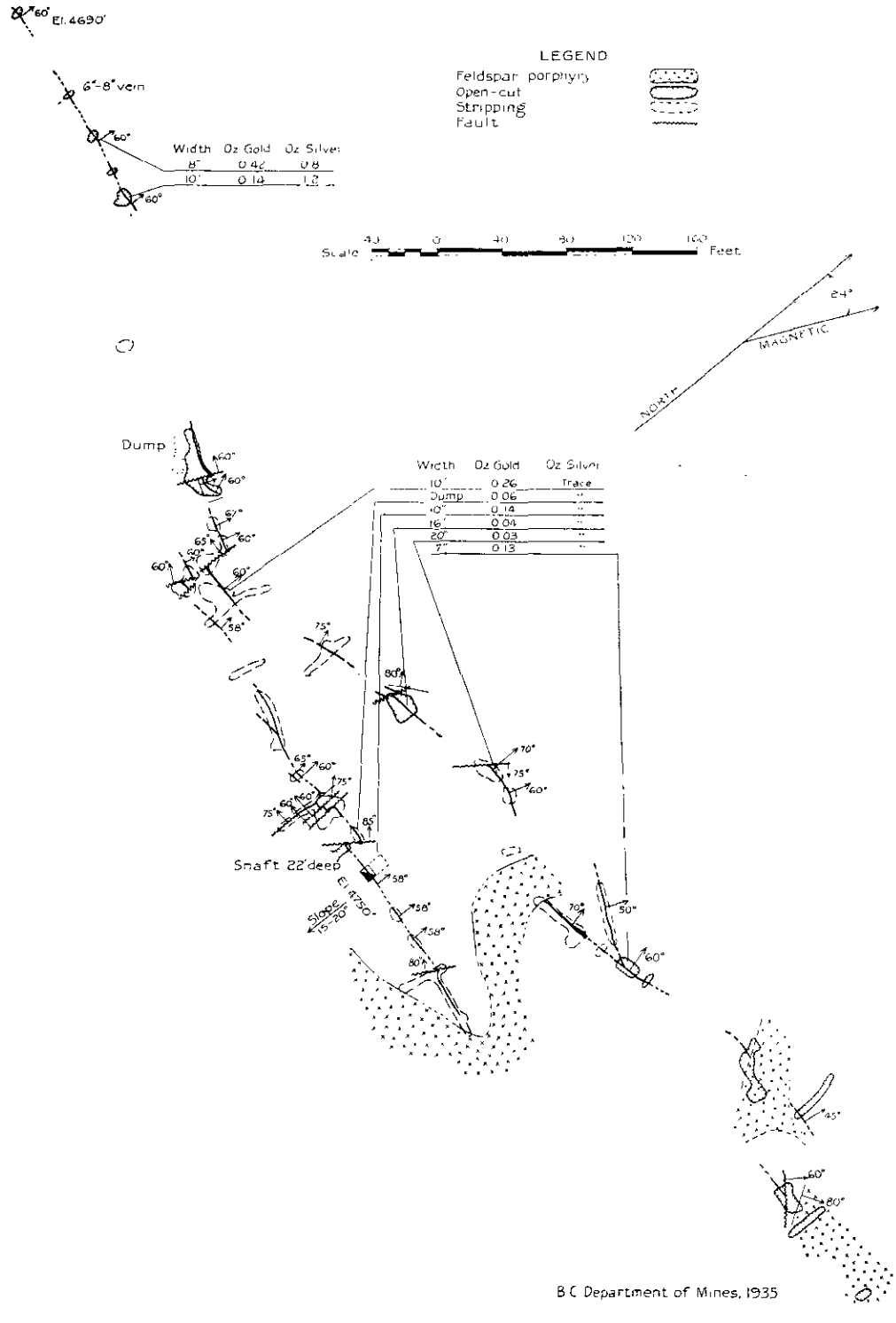
Recently W. E. McArthur, of Greenwood, took over the property and has had six men working. They have shipped 150 tons of ore from the property.

The *Providence* property was kept pumped out, but remained inactive after the first few months of 1935, when an attempt was made to mill ore from the *Providence* mine dump in the 50-ton mill newly constructed for this purpose a short distance to the south of the mine.

The 1934 suggested flow-sheet was as follows: 10-ton coarse-ore bin; ½-inch grizzly; 9- by 16-inch Forano jaw-crusher; 75-ton fine-ore bin; 6-foot by 22-inch Hardinge conical ball-mill; Dorr simplex classifier; 6-cell gravity-flow flotation unit; 10 by 4 feet 5 inches by 4 feet deep settling-tanks. Milling operations commenced on October 25th, 1934. The ore was transported from the dump to the mill by a 5-ton truck.

North Copper Camp.

Mabel-Jenny. This group of eleven claims held by location, owned by D. Spooner and associates, of Holberg, is situated to the east of the *Princess Louise* Crown-granted group of claims at the headwaters of Nicholson creek. The claims may be reached by a 10-mile road and 2 miles of trail up Nicholson creek from Kettle Valley Station on the Kettle Valley Railway, or by 7 miles of road and 3 miles of trail from Greenwood



Mabel-Jenny Group. Plan showing Surface Workings.

via *Deadwood* and the *Copper Mine* property at the head of Deadwood creek. The principal showings are located on sparsely timbered uplands of moderate relief at an elevation of 4,750 feet. There is, however, ample timber on the claims for all mining purposes.

The rocks in the vicinity of the showings, illustrated on the accompanying sketch-plan, are mainly granodiorite to diorite. To the east end of the area the diorite is cut by irregular feldspar "bird's-eye" porphyry dykes, while open-cuts just off the south-west edge of the plan disclose highly altered argillaceous remnants and volcanic flow-rocks overlying the diorite. A general east-west system of narrow quartz veins 4 to 20 inches in width are found in badly faulted fissures in the diorite, and the occurrence of good gold values in association with the arsenopyrite, pyrite, quartz veins has been the reason for the extensive surface prospecting the claims have received on both sides of the old 22-foot shaft which was apparently sunk many years ago. The trenching indicates vein systems extending for almost 900 feet along the general east-west strike. Two vein systems are apparent, as illustrated, both being of similar age and character.

While in general the values from such channel samples as were taken were comparatively low in gold content for narrow vein-widths uncovered so far, further prospecting is warranted by the extent of the mineralization and the comparative ease by which it may be accomplished.

Approximately 1,000 feet north-east of the shaft and at 4,875 feet elevation a shear-zone averaging 9 feet wide of heavy pyrite-pyrrhotite mineralization, and occasionally arsenopyrite, has been uncovered by two trenches 250 feet apart on the east-west strike of the shear. A sample of the best-looking sulphides containing pyrite, pyrrhotite, and arsenopyrite assayed: Gold, 0.01 oz. per ton; silver, 0.2 oz. per ton; copper, *nil.*

Several of the samples taken from the vein system near the shaft were assayed for arsenic content, and found to contain from 2.3 to 6.4 per cent. arsenic.

North Thompson River Area.

Birk Creek.

North Star. (*See* Annual Report, 1927.) This group of eight claims, owned by Nick Fosberg and associates, of Barriere, is situated on the south side of Birk creek, an easterly-flowing stream which enters the Barriere river 1 mile south of its source at North Barriere lake. The claims, at an altitude of 4,000 to 5,500 feet above sea-level, are 8 miles by trail from the end of the road to C. Johnson's ranch at North Barriere lake, connected with the North Thompson highway. The topography is of moderate relief, except in the immediate vicinity of Birk creek and its tributary streams, where erosion has been more pronounced, leaving precipitous bluffs and rocky talus-slopes. There is a plentiful supply of good timber and water on the claims.

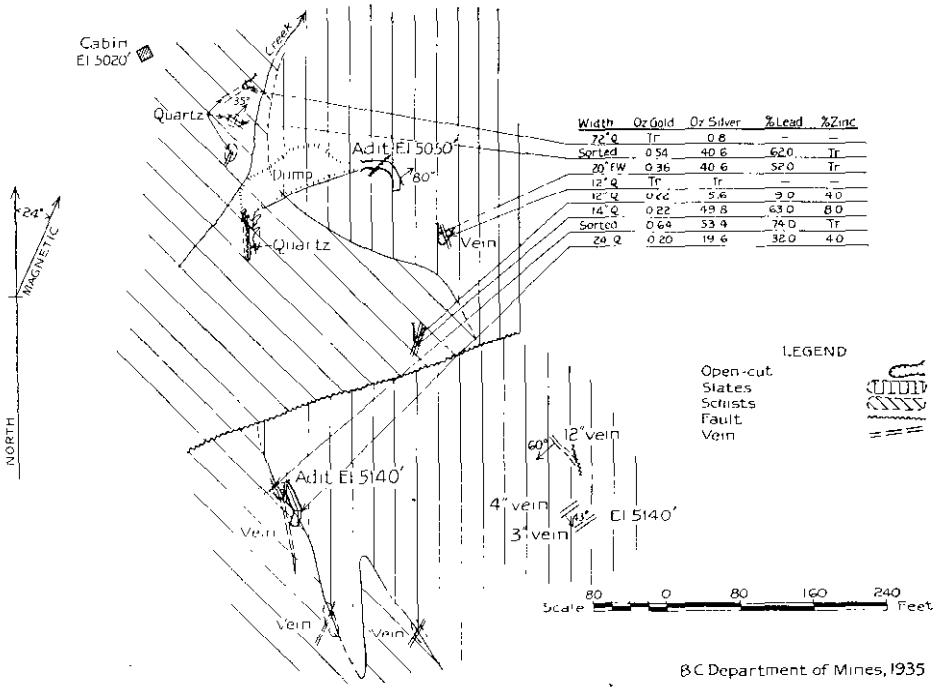
The rocks of the general area are light-coloured sericitic schists, slates, and intercalated limestone and dolomite beds, which are intruded in places by narrow andesite and diabase dykes. No igneous rocks were seen in the immediate vicinity of the workings, but reports state that a few thousand feet south a stock of diorite or granodiorite outcrops and 2 or 3 miles to the north granodiorite and granite of the Baldie batholith invades the area.

Two main groups of mineral-showings have been developed, the first on the banks of Birk creek at 4,575 feet elevation, three-quarters of a mile north of the camp, and the second to the south and east of the camp at 5,000 to 5,200 feet elevation. The first showing is of interest because it uncovers several small non-commercial replacements in limestone mineralized with pyrite and galena, which should encourage prospecting for larger sulphide deposits in favourable limestone-beds of the vicinity.

The second group of showings is shown in detail on the accompanying plan. Here quartz veins generally from 18 to 72 inches in width occur on both sides of the schist-slate contact, in irregular distribution over an area 600 by 400 feet. The schist-slate contact strikes generally north-west and one major fault is indicated between the upper and lower creek showings. The quartz is massive and milky white, slightly oxidized at the surface and mineralized with irregular patches and segregations of galena, pyrite, and sphalerite, and associated gold and silver values. Continuity has not been definitely established for any

appreciable length in any of the quartz-sulphide exposures, due to the presence of heavy overburden.

A study of the sampling and the assay results indicates better than ordinary gold values with the silver-bearing galena-sphalerite mineralization, and sufficient ore might be sorted from the various open-cuts and adits to make small shipments which would enable the owners to secure further funds with which to do more prospecting and development.



North Star Group, Birk Creek. Plan showing South Workings.

The trail to the property was reconstructed by the owners during 1935 and four substantial bridges built en route from the road to the camp.

COPPER-GOLD DEPOSITS.

Kamloops Area.

Gold Crest. (*See* Annual Reports, 1924 and 1930, under *Copper King.*) This property, comprising nine Crown-granted claims owned by Baroness Sartorio and under option to George F. Mobley, of Kamloops, is situated to the north of and a few hundred feet above the Kamloops–Vancouver highway, 16 miles west of Kamloops. A short side-road leads to the mine buildings and the ore-bins, located at the lower end of a short inclined tramway which connects the bins with the lower adit at 2,200 feet elevation. The property is approximately 1 mile south of the main line of the Canadian Pacific Railway, but the nearest station, Cherry Creek, is 2½ miles west by the road. The country is moderately hilly and practically barren of timber.

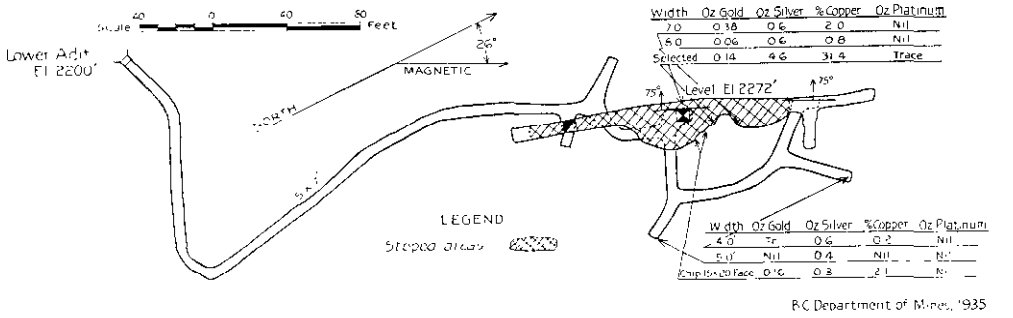
The mineralization, consisting of chalcopyrite, pyrrhotite, bornite, some magnetite, and associated gold and silver values, occurs along a fracture-zone in diorite. Platinum and palladium assays have been reported from samples from this property, but those taken by the writer did not contain these minerals.

The claims were first staked in 1897 by J. H. Hill, when the shaft was sunk to a depth of 25 feet and 3 tons of ore was sorted for shipment. In 1899 about 470 feet of open-cuts and underground work was done. Small amounts of underground work were completed in subsequent years until about 1906, when A. N. Gray purchased the property and shipped between 900 and 1,000 tons of ore stated to average 0.3 oz. gold per ton and 4.4 per cent. copper

from the stope above the upper level. The claims were acquired by Mr. Beckman in 1908 and when he died title passed to the present owner. Four car-loads of ore was shipped to Trail smelter in 1929, this being the first work done on the ground for many years. More recently the workings have been cleaned out and a limited amount of underground drifting done.

The plan accompanying this report shows the underground workings as at June, 1935. Several open-cuts and shallow shafts have been excavated to the north-west of the main workings, and all show minor amounts of sulphide mineralization occurring along fractures and joint-planes in diorite. The fractures have a general north to north-east trend and where they are most numerous mineralization appears to be most intense.

The underground work has been done on two levels. The upper level (connected with the surface by a shaft and with the lower adit by a winze) exposes the best mineralization, consisting of chalcopyrite, bornite, pyrrhotite, and magnetite at its south-western end. The mineralization extends along the east side of the main fracture-zone for a length of



Gold Crest (Copper King Group). Plan showing Underground Workings.

75 to 80 feet and averages about 15 feet in width. The main fracture-zone strikes north 30 to 35 degrees east and dips almost vertically. Four samples from this level taken by the writer showed low gold and silver values with comparatively low copper values. One sample picked by the optionee as being representative of mineral in which he had obtained platinum and palladium values carried only traces of these minerals. The sample results are shown in detail on the plan.

The lower adit, 72 feet below the upper level, comprises over 700 feet of crosscutting and drifting. This work was done in an attempt to pick up the downward extension of the ore found and shipped from the south end of the level above. The main fissure-zone does extend down to this level, but the mineralization is very sparse with almost negligible values.

Several tons of ore at the adit-portal was sampled with the following results: Gold, 0.2 oz. per ton; silver, 0.8 oz. per ton; copper, 2.1 per cent.; platinum and palladium, *nil.*

PROGRESS NOTES.

Jamieson Creek Area.

Several days were spent by the writer in the Jamieson Creek area examining such prospects as were accessible. The occurrence of gold in quartz veins on this creek has long been known, the earliest reference being made to the *Homestake* property by G. M. Dawson in 1888. Many other quartz veins are found both in the prevailing argillaceous sediments and altered greenstone volcanics, as well as within the granite-granodiorite stock to the north of Jamieson creek, on the west side of the North Thompson river. Development-work to date has been spasmodic and only brief notes are available as to the past work at the *Homestake* (*see* Annual Reports, 1899, 1901, 1904, 1913, 1930, and 1931; also Geological Survey of Canada Summary Report, 1921, Part A, and Geological Survey of Canada Annual Report, 1896, Part B, Vol. 7); the *Molly Gibson* (*see* Annual Reports, 1899, 1901, 1904, and 1913); and the *Polestar* (*see* Annual Report, 1913). For information concerning these three properties the 1913 and 1930 Annual Reports summarize present conditions, except in the case of the *Polestar*, where a limited amount of surface-stripping has been done west and north of the old shaft, now

partially caved and inaccessible below 20 feet down from the collar. Recent work has been done on the *Mackay* claims; *Bearcat, Shufly, Lakeview,* and *Royal Inland* groups.

Jamieson creek is a south-easterly-flowing tributary of the North Thompson river which has its headwaters on the Tranquille plateau (5,000 feet elevation) and enters the main river 15 miles north of Kamloops. The general topography is of moderate relief, except in the immediate vicinity of the creek and its short tributaries, which flow through deep and narrow steep-walled valleys. Timber is plentiful and water, though inadequate for power-development, is sufficient for general mining requirements. Water for irrigation of the benches along the west side of the North Thompson as far south as Tranquille is obtained from Jamieson creek, the dam and flume intake being situated 1½ miles up-stream from the outlet.

The area is well located with reference to transportation. A branch road 3 miles long has been built up Jamieson Creek valley from the North Thompson West road. Another road west from the highway starting 1 mile south of Jamieson creek gives access to the upper valley-slopes south of the main creek-valley, while a third road to Inskip's ranch serves the Macaulay Creek area. Several trails have been built through the park-like uplands and almost all properties visited were easily reached by comparatively short and well-constructed pack-horse trails.

The prevailing rocks, as previously mentioned, are light green to dark-coloured schistose sediments and dark greenstone volcanic flow-rocks. The sediments on the lower section of Jamieson creek are argillites and black thin-bedded shales and slates. The granite rocks of the area outcrop in an oval-shaped mass, 1 mile wide by 1½ miles long, across the lower valley of Jamieson creek about 1 mile up-stream from the North Thompson river. Several acid dykes of quartz porphyry cut the sediments close to their contact with the granite.

Summing up conditions on the creek, it may be said that most of the properties examined have had but little work done on them. On the few properties which have received more than the average attention values have been found to be erratic in distribution and of low value. The quartz veins are found at many points in the sediments as well as in the granite, and so far the best values seem to occur in those in the granitic rocks. The veins in the sediments are generally narrow, from a few inches to 2 or 3 feet, and occasionally reach a maximum width of 7 or 8 feet, but no continuity has been exposed at present for any appreciable distance. The veins in the granite are generaly of better width and of more uniform value, and where work has been done on the surface they have been followed for appreciable lengths.

Lode-gold Deposits.

Greenwood, Phoenix, and Vicinity.

Dentonia Mines, Ltd.—(*See* Annual Reports, 1933 and 1934.) Underground development for 1935 consists of crosscutting and drifting 2,265 feet and raising 730 feet. This work was done on and above the 300-foot level north into the *Anchor* claim and on and above the 500-foot level north and south. Diamond-drilling 150 feet to the south of the *Enterprise* encountered the vein 250 feet below the surface. The mill was operated on about a 100-ton basis during the year. About sixty men were employed.

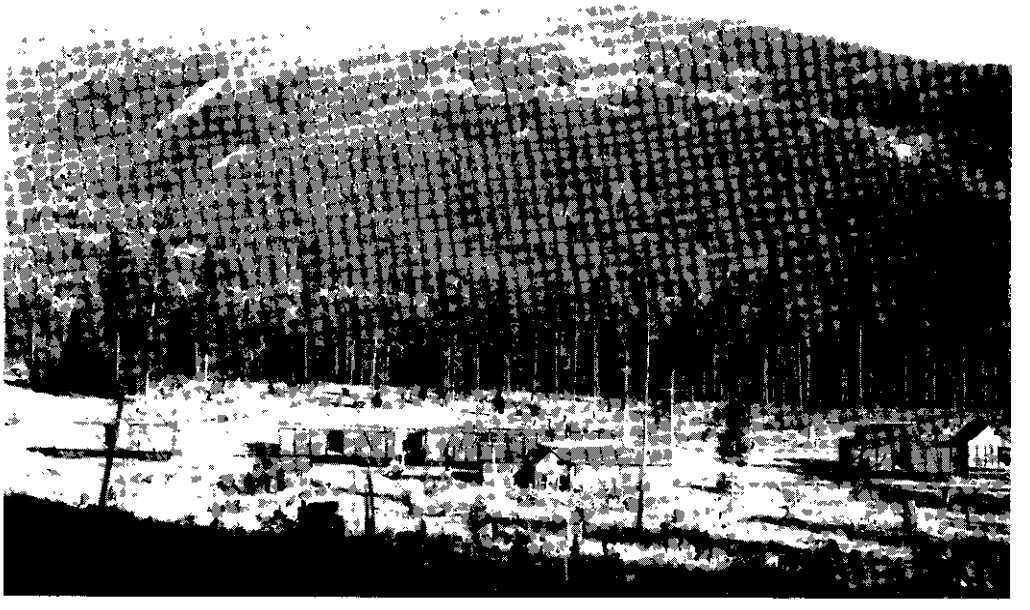
Athelstan Jackpot.—(*See* Annual Reports, 1904, 1910, 1911, and 1912.) This group of thirteen claims, situated in the Wellington camp, 3 miles south-east of Phoenix, is owned by W. E. McArthur and associates, of Greenwood. Shipments of ore were made this year to the smelter from the old workings.

Crescent.—This property, situated a short distance west of the Greenwood–Phoenix road and 3 miles by road from Greenwood, was leased in the fall of 1935 by J. McDonnell & Son, of Greenwood. The lessees were constructing suitable equipment preparatory to cleaning out the main shaft on the claim and planned to explore the quartz vein below the stoped area, from which a small tonnage of ore was mined in the past.

Bay.—(*See* Annual Reports, 1905, 1906, 1913, 1922, and 1934.) This group of two claims, the *Astoria* and *Bay,* was again under lease to W. E. McArthur, of Greenwood. Five men were employed and some shipments of gold-bearing quartz made from the foot-wall section of the mine to the south of the main inclined shaft.

Winner.—(*See* Annual Reports, 1932 and 1933.) This group of claims, owned by George Walters and associates, of Greenwood, includes the *Winner, Legal Tender, Wren,* and *Good*

Grand Forks and Valley of Kettle River.



Wallace Mountain Mining Camp. Beaverdell Railway-station in Foreground.

South Thompson River Valley East of Kamloops.

Windpass Mining Co.'s Mill, North Thompson River Area.

Luck Fraction, situated a short distance south-east of Hartford Junction and Phoenix, close to the old Anaconda–Phoenix road. During 1935 the Reigel Bros., of Spokane, Washington, optioned the group and several diamond-drill holes were bored. The results of this work are not to hand. The option was dropped.

Jubilee.—This group of four claims, *Jubilee* and *Jubilee Nos. 1, 2,* and *3*, owned by R. Gilbert and R. E. Leask, of Greenwood, is situated on the south slopes of Atwood mountain, between 5,000 and 5,500 feet, and about 4 miles in a direct line south-east of Greenwood. A considerable amount of old and new work has been done, represented by open-cuts, stripping, and one or two adits and shallow shafts.

Central Camp.

No. 7 Mine.—(*See* Annual Reports, 1896, 1897, 1900, 1901, 1903, 1909, 1912, and 1934.) This group of claims, situated about 8 miles by road south-east of Greenwood, is owned by the Consolidated Mining and Smelting Company and is at present being worked on lease by W. E. McArthur, of Greenwood. Shipments early in the summer were approximately 600 tons per month of siliceous ore containing galena, pyrite, gold, and silver from the upper levels of this old property. In August shipments were curtailed to 100 tons per month owing to the inability of the smelter to take more than this amount of ore monthly.

Grand Forks Area.

Yankee Boy.—(*See* Annual Reports, 1900, 1901, 1905, 1919, 1920, 1923 to 1925, 1930, 1931, and 1934.) Shipments were made from this property to the smelter at Trail during 1935. Underground development of the vein on the No. 1 adit-level and two intermediate levels below it was continued westerly to the fault and stoping operations were continued on both the intermediate levels. The No. 2 adit was extended westerly to the fault. A crew of twelve to twenty men is employed, with D. M. (Mickey) MacKay as superintendent for the Reigel Bros. and the Royal Development Company, of Spokane.

Franklin Camp.

Union.—(*See* Annual Reports, 1913 to 1922, 1925 to 1934; also Memoir No. 56, Geological Survey of Canada.) At this property in the Franklin camp underground work consisted of further limited exploration and the removal of small unstoped ore-remnants. The mill was operated on such ore as could be found underground and for the balance of the season in the retreatment by cyanidation of the mill tailings of former years' work. Operations were discontinued late in the year.

Hedley Camp.

Kelowna Exploration Co.—(*See* Annual Reports, 1933, 1934, and under Hedley Gold Mining Company for 1917 to 1919, 1923, 1927, 1929, and 1930; also Geological Survey Memoir No. 2, 1910, and Summary Report, 1929, Part A.) Full operations were resumed at the *Nickel Plate* mine of this company in the spring of 1935 at a capacity of 210 tons daily. Approximately 1,910 feet of underground development and 12,200 feet of diamond-drilling was done during the year, and a crew of 183 men was employed at the mine and mill as at December 31st, 1935. Paul Billingsley was consulting geologist and W. C. Douglass general manager. Many replacements and plant improvements were effected during 1935, both at the mine, in the ore-transportation system, and at the mill.

Hedley Mascot Gold Mines, Ltd.—(*See* Annual Reports, 1931 and 1934.) Work at this company's property at Hedley during 1935 consisted of driving the main adit-crosscut 1,916 feet, out of a total of 2,616 feet required to reach the *Mascot Fractional* ore-bodies. By the end of the year a modern 150-ton flotation-mill building was constructed and the primary and secondary crushing machinery installed. Milling equipment had been received and will probably be ready for operation in May, 1936, when production is scheduled to commence. The aerial tramway with power and phone lines connecting the mill and mine adit was practically completed by December 31st. W. R. Lindsay is manager for the company at Hedley and W. C. S. Tremaine is chief engineer.

Shamrock.—(*See* Annual Report, 1934.) Exploration done upon this property since 1934 consists of driving a 50-foot adit at an elevation of 1,870 feet on the east or No. 1 porphyry

dyke. About 350 feet west and striking between south 25 and 30 degrees west, what appears to be a branch of No. 1 dyke has been prospected by open-cuts.

Gold Mountain Mines, Ltd.—(*See* Annual Reports, 1933 and 1934, and under *Pollock*, 1909, 1910, and 1913.) During 1935 this property was bonded by the Consolidated Mining and Smelting Company and 750 feet of diamond-drilling was done from the inner end of the lower crosscut adit in search of the downward continuation of the mineralization developed on the No. 1 adit of the *Maple Leaf*. The option was dropped late in 1935 and the owning company is deepening the winze in the *Maple Leaf* adit. A crew of ten men was working under Frank Dollemore.

Hedley Consolidated Gold Mines, Ltd.—This company was formed during 1935 to explore a group of claims adjoining the Hedley Amalgamated Gold Mines holdings on Stemwinder mountain, 2 miles north-west of Hedley. A crew of three men was employed stripping and open-cutting different mineral-zones in replaced limestone and other sediments close to the diorite-contact.

Hedley Sterling Gold Mines, Ltd.—(*See* Annual Reports, 1933 and 1934, and under *Patsy*, 1927, 1928, and 1931.) Since the above reports were written this company continued underground diamond-drilling and drifting on the "O" adit on its property on Sterling creek until about the middle of July, when operations were suspended pending further financing. Work done from No. "O" adit is as follows: No. 1 drift at 75 feet from the portal was extended 40 feet north; No. 2 at 152 feet in was driven 50 feet north; No. 3 drift at 190 feet in was driven 56 feet north; No. 4 drift at 227 feet in was driven 30 feet north; No. 5 drift at 410 feet in was driven 259 feet north on the foot-wall of a dyke. In addition to this work four diamond-drill holes were bored east at 350, 455, and 650 feet respectively in from the No. "O" portal.

Fairview-Osoyoos Camp.

Brief visits were paid to a few of the operations in this camp and the notes which follow summarize conditions at several of the better-known properties. Many prospectors were in the hills according to reports and some discoveries are indicated.

Osoyoos Mines, Ltd.—(*See* Annual Reports, 1913, 1927, 1928, and 1930 to 1933, under *Dividend-Lakeview*, and 1934.) This company continued exploration and development upon the *Dividend-Lakeview* group of claims at Osoyoos during 1935. Underground work on the *Dividend* included continuation of drifting on the No. 1 adit to the west and south and drilling to test ore possibilities. A raise from No. 2 level to No. 1 adit was put through and No. 3 adit was continued to the south-east and diamond-drilling done below this level. On the *Lakeview* and the *Manx* claims development was continued and the workings were thoroughly examined and sampled.

The old 10-stamp mill at the property was rebuilt and run as a pilot plant for a short period in the summer, after which about 2,300 tons of ore from the *Dividend* stopes above No. 1 adit-level was milled on a custom basis at the mill of the Morning Star (Fairview) Gold Mines, Limited. Shipments were stopped early in November and the 10-stamp mill is being remodelled by the addition of a ball-mill, classifier, and flotation-machines to handle 50 tons of ore per day. A crew of twenty to forty men has been employed.

Morning Star (Fairview) Gold Mines, Ltd.—(*See* Annual Reports, 1920, 1923, 1924, 1927, 1928, and 1930 to 1934.) The 50-ton mill constructed at this property was completed in August and was operated at a 40-ton-per-day rating on ore obtained from the accumulated dump of low-grade ore and from the 100-foot level and sub-level stopes below the 100-foot level. Underground work at that time was confined to the driving of crosscuts from the west end of the 100-foot level and stoping on the sub-level stopes on the east end of this level. At the end of 1935 the operation was in charge of J. B. Cowell, of Vancouver; several changes in staff being made shortly before the end of the year.

Fairview Amalgamated Gold Mines.—(*See* Annual Reports, 1933 and 1934; and under *Flora*, 1899 to 1901.) This company continued underground development in the form of drifting, crosscutting, and raising on the No. 1 (upper) adit and No. 2 adit with a small crew of men. The property was not visited during 1935.

Susie.—(*See* Annual Reports, 1913, 1915, 1922, 1923, 1932, and 1934.) During 1935 approximately 2,800 feet of crosscutting, drifting, and raising was done on and from the new

low-level adit on the *Susie* claim, in addition to cleaning out and sampling the old adits on the *Wide West* and *Black Bear* claims. The work was done by contract under the supervision of R. Austin for the owners, the Federal Mining and Smelting Company. The property was not visited during 1935.

Mak Siccar Gold Mines, Ltd.—(*See* Annual Reports, 1933 and 1934; and under *Tiger*, 1928, 1930, and 1931.) This company operated its property on the headwaters of Manery creek, below Similkameen Station on the Great Northern Railway, throughout the year with a crew of five to twelve men under the supervision of A. T. Miller. Underground work consisted of drifting on the 3,750 level and 3,700 sub-level; driving a raise from the 3,750 level up 112 feet towards the 4,100-foot level; and sinking a winze below the 3,750-foot level to the 3,700-foot level. This property was not visited during 1935.

Grandoro Mines, Ltd.—(*See* Annual Reports, 1932 to 1934; and under *Oro Fino* and *Independence*, 1896, 1898, 1920, 1922, 1923, 1930, and 1931.) The ore indicated in the 1934 Annual Report, about 10,000 tons averaging 0.5 oz. gold per ton, was mined and trucked to the Twin Lakes milling plant, three-quarters of a mile distant, during 1935 and operations were suspended indefinitely in December, 1935. The crew has been dismissed and part of the mining plant has been dismantled and sold. J. McLeod was superintendent in charge of the property during the recent mining-work.

Twin Lakes Gold Mining Co., Ltd.—(*See* Annual Reports, 1933 and 1934; also under *Huntsman* and *Juniper*, 1924 and 1933; *B.E. Mining Company*, 1929 to 1931; *Parvenue Mines*, 1932.) This mine remained idle throughout most of the year, except for a small amount of underground development done during the months of June and July. The milling plant was operated on ore from the *Grandoro* mine.

Osoyoos-Hecla.—This group of claims, owned by D. P. Simpson, of Osoyoos, and situated to the south of and adjoining the property of the Osoyoos Mines, Limited, was further prospected during 1935 by diamond-drilling, done under the direction of the Osoyoos Mines, Limited, to whom the claims were bonded for a short period. A magnetometer survey of the *Osoyoos-Hecla* claim of the group was made by E. E. Bergman in April.

Okanagan Lake Area.

Kalamalka Mines.—(*See* Annual Report, 1934.) This group, consisting of twenty-four claims owned by W. V. Somerville and associates, is situated 1¾ miles by road south of Lavington, on the Canadian National Railway, and 11¾ miles by road from Vernon. Further development was done by trenching, adits, and a winze on a series of quartz-filled shear-zones and fissures in diorite and argillaceous rocks. A shipment of gold ore was made to the smelter from these workings during the year.

Pre Cambrian Gold Mines, Ltd.—(*See* Annual Reports, 1929 to 1934; also under *White Elephant*, 1921 to 1924, 1927 to 1929, and 1931 to 1933.) Operations were suspended at this property during the summer of 1935. It was reported in the autumn that diamond-drilling exploration was to be started, but no recent reports indicate that this work has been done.

Bluehawk.—(*See* Annual Report, 1933.) This property, owned and operated by the Bluehawk Syndicate, of Kelowna, is situated 2 miles south-west of Wilson's Landing on Okanagan Lake. Development-work consists of an open-cut as well as deepening a shaft and driving an adit a short distance to the north-east from the bottom of the shaft. A 5-ton shipment of ore was made from this working.

Monashee Camp.

Monashee Mines Syndicate, Ltd.—(*See* Annual Reports, 1933 and 1934.) A crew of thirty-eight men, under the supervision of G. F. Dickson and H. A. Rose, was employed at this property until August, when operations were suspended indefinitely pending financing of further development and mill-construction. Drifting was continued on the 4150-, 3950-, and 3,900-foot adits in addition to raising and crosscutting.

Stump Lake, Nicola.

Nicola Mines and Metals, Ltd.—(*See* Annual Reports, 1916, 1920, 1927 to 1931, 1933 with map, and 1934.) This property was reopened on July 10th by the same company under new direction and management after having been closed down for several months. When a limited

amount of development-work had been done and the mill and buildings reconditioned, production commenced at the rate of 65 tons per day on August 1st. At the time of the writer's visit the 440-foot level from the *Enterprise* shaft had been advanced 140 feet south and ore was being stoped between this and the 320-foot level. Further drifting was also done on the 190-foot level south.

Sheffield Gold and Silver Mines, Ltd.—(*See* Annual Reports, under *Alameda, Thelma*, and *Corona*, 1924 to 1930 and 1934.) This property remained idle during 1935, following the fire which destroyed the head-frame and buildings at the main *Thelma* shaft.

North Thompson Area.

Windpass Gold Mining Co., Ltd.—(*See* Annual Reports, 1917, 1921 to 1927, 1930, 1933, and 1934; also Geological Survey Summary Report, 1921, Part A.) On this company's property, situated approximately 5 miles due east of Boulder Station on the Canadian National Railway, mining and milling operations were continuous throughout the year. Milling capacity was increased from 50 tons to 75 tons daily towards the close of the year; additional power equipment was installed in the mill; a loading-tower was constructed on the main *Windpass* aerial tram at which to load ore from the *Sweet Home* claim; and shipments to the mill were commenced from this part of the company's holdings late in the autumn.

Royal Inland.—This group of four claims held on location by Joseph Reid, who lives at the mouth of Lanes (Macaulay) creek, is situated at the upper end of the South fork of the creek of the same name and about 7 miles by trail from Inskip's ranch (the end of the road), and approximately 21 miles by road and trail from Kamloops. The principal showing, an open-cut and shallow shaft, is at 4,700 feet elevation on the left or north-east bank of the creek. An open-cut 25 feet long by 7 feet wide by 6 feet deep has been driven along the schist and porphyry-dyke contact, which strikes north 45 degrees east and dips 20 to 30 degrees north-west. At the inner end of the cut an 8-foot shaft has been sunk.

SILVER-LEAD-ZINC DEPOSITS.

Wallace Mountain Section.

Development, exploration, and production from the several mines on Wallace mountain, Beaverdell, was increased during 1935 and the season 1936 promises to witness more interest in this camp than has been given to it for several years. The most important single strike in the camp during 1935 was made at the *Wellington*, where a high-grade silver-bearing galena-sphalerite ore-shoot, 8 to 18 inches wide and 170 feet long, was opened up by a drift from the bottom of the 80-foot winze below No. 5 adit-level at the south-east corner of the property. Approximately 510 tons of ore was shipped during the year. A crew of eighteen men is employed under the supervision of A. J. Morrison.

The *Highland Lass* and *Bell* properties continued steady development and production during the year with a crew of thirty to thirty-two men under the management of R. B. Staples. Approximately seven cars of ore was shipped monthly from these two properties.

The Sally Mines, Limited, continued active development during 1935 with a small crew of men under the supervision of J. Hanna and R. H. Stewart. Several shipments of ore were made from that section of the property adjoining the *Wellington* claim.

The *Beaver* and *Bounty* properties received further development-work during the year. Further development-work was also done at the *B.A.* group (*Buster* and *Alaska* claims) by Penticton people represented by L. Smith; at the *Rambler* and *Standard Fraction* claims by an American syndicate headed by Mrs. H. E. Growdon, of Beaverdell; at the *Balaclava* and *Hidden Treasure* claims by the Crater Lake Mining Company, headed by M. L. Sorber; and at the *Nepanee*, owned by E. G. Cummings, of Beaverdell.

To the north and west of Beaverdell the *Inyo-Ackworth* property was further developed and prospected; while at Carmi, the Carmi Gold Mines, Limited, property remained idle for most of the year.

Raven Mountain Area.

Raven Mountain.—(*See* Annual Report, 1934.) This group of claims, including the *Golden Fleece*, owned by W. B. Hall and associates, of Princeton, is situated on Raven mountain at the head of Stevens creek, about 3½ miles by steep trail from Bromley, on the Hedley–

Princeton highway. At an elevation of about 5,300 feet numerous shafts and open-cuts have been excavated in replacements of the sedimentary rocks.

Hayward.—This group of four claims, the *Raven, Sunshine No. 1, Creek Side*, and *Lion*, is owned by C. Hayward and associates, of Princeton, and is situated about 4 miles by steep trail from Bromley, on the Hedley–Princeton highway. Several exploratory open-cuts, a 20-foot shaft, and 12-foot adit have been driven by the owner during the past few years on numerous quartz-filled fissures in the sedimentary rocks close to wide tongues of granite.

Lightning Peak Area.

The writer paid a brief visit to this area in September, when it was found that only a limited amount of development and prospecting was in progress. The reader is referred to Annual Reports for 1920 to 1934 and to Geological Survey of Canada, 1930, Summary Report, Part A, for detailed information about the camp, its geology and mineral possibilities.

Waterloo Consolidated Mines, Ltd.—(*See* Annual Reports, 1918 to 1922, 1925, 1927, and 1929 to 1934; also Geological Survey of Canada Summary Report, 1930, Part A.) This property remained idle throughout 1935, following cessation of mining development on December 3rd, 1934.

Lightning Peak Camp.

Lightning Peak.—(*See* Annual Reports, 1904, 1918 to 1921, 1924, 1925, 1927, 1933, and 1934; also Geological Survey of Canada Summary Report, 1930, Part A.) Further development-work was done on No. 4 adit-level during 1935 by W. A. Calder, F. and R. Jordan, and B. F. Lundy, the optionees. This drift was advanced through a faulted area, and what appears to be the vein, though narrow in width, has been picked up on the south side of the fault.

Potosi-Spokane.—(*See* Annual Reports, 1921, 1922, 1927, 1930, 1931, and 1933; also Geological Survey of Canada Summary Report, 1930, Part A.) Further surface-stripping was done on this group of claims, owned by V. Locke, of Kelowna, and associates. The claims are situated a short distance north-west of the *Waterloo* and accessible therefrom by a good trail.

Pay Cheque (formerly Pay Day).—(*See* Annual Reports, 1929 to 1934; also Geological Survey of Canada Summary Report, 1930, Part A.) During 1935 the owners of this group of claims, A. Williams and W. B. Johnstone, of Edgewood, continued prospecting and development on the *Pay Cheque* claim, located 1,000 to 1,500 feet east of the *Pay Day* claim.

Killarney.—(*See* Annual Reports, 1919, 1922 to 1925, 1927, 1929 to 1932, and 1934; also Geological Survey of Canada Summary Report, 1930, Part A.) The owner of this group of claims, W. J. Banting, of Edgewood, continued development-work on his property during 1935.

Winfield Area.

Winfield (Woods Lake) Placers.—Development and testing of the Winfield placer area was undertaken in the fall of 1935 by the West Canadian Collieries, of Blairmore, Alberta, under the management of J. A. Brusset and local supervision of D. J. McNeil, geologist. A crew of ten to twelve men has been employed and the working-adit on the Hall and Eley lease is being driven easterly to determine the width of the old channel and the gold values therein. A Denver mechanical gold-panning machine is being used to wash the gravels taken from the adit.

Further placer-work was also carried out by individuals and small syndicates on Mission, Cherry, Siwash, Troup, and Deep creeks.

Rock Creek Area.

The Porter and Condit placer operation on Rock creek was discontinued early in the autumn of 1935, due partly to lack of water and partly to insufficient values in the gravels.

Several individuals and small placer syndicates were reported to be working on the upper sections of Rock and Jolly creeks.

Boundary Creek.

The Boundary Creek Mining Company, Limited, continued operations on the B. Lang leases on Boundary creek, a few miles above Midway, throughout part of the summer months and operations were discontinued in October.

Royal Creek and Camp McKinney.

For detailed information respecting this camp the reader is referred to the recently published Memoir 179 of the Geological Survey of Canada, by W. E. Cockfield, as well as to the past Annual Reports of the Department, particularly 1931 to 1933. During 1935 further geological work was done in this camp by N. F. G. Davis and H. V. Warren for the Geological Survey of Canada. Some exploration was done on the J. Carmichael property to the north-west of the *Cariboo-Amelia* claims. Interest was aroused in the *Ecuador* group of claims, owned by C. Nelson and associates, of Penticton, by the reported discoveries of tin from the development-work being done in the vicinity of the old *Ecuador* shaft. G. Partridge & Sons are reported to have continued development-work at the *Morning Glory No. 2*, and several groups of prospectors were said to be working in the area surrounding Baldy mountain, but with what results it is not known.

NON-METALLICS.

Kamloops Area.

B.C. Sodium Syndicate.—This syndicate, with headquarters at Cherry creek, 12 miles west of Kamloops, continued the operation of its sodium-carbonate plant at a small lake 2 miles north-east of the Kamloops–Ashcroft highway, and several car-loads of sodium-carbonate crystal was shipped to the Calgary and Vancouver soap-factories during 1935.

Vernon Area.

Gypsum, Lime, and Alabastine, Canada, Ltd.—This company, owning gypsum deposits at Falkland, 26 miles north-west of Vernon, on the Vernon–Kamloops highway, continued quarrying operations in 1935 and shipped the product to its plant at Port Mann, where it is manufactured into plaster of Paris, plaster boarding, wall-board, gypsum insulating-powder, insulation-blocks, and hard wall-plasters, etc.

PART E.

EASTERN MINERAL SURVEY DISTRICT (No. 5).

BY

H. SARGENT.

INTRODUCTION.

The year 1935 witnessed a material increase over 1934 in tonnage of ore mined in the Eastern Mineral Survey District. An increase in the Fort Steele Mining Division and a substantial increase in the Slocan camp more than made up for the reduced production of silver-lead-zinc ores in the Golden area. The tonnage of lode-gold ore mined showed a marked increase over the 1934 output, large increases in the Nelson Mining Division and in the Lardeau Mining Division more than making up for some reduction in the Rossland camp. Crude ore shipped to custom smelters decreased to about one-fourth the quantity shipped in 1934, while gold concentrates shipped increased about four to one. There was also a material increase in direct recovery of bullion from milling of gold ores.

The Slocan camp, embracing the active areas of three mining divisions, experienced a great revival, much of which was due to a larger number of properties being worked by lessees. Increased output was due also to three mining companies and the operation of their mills. The improvement in the prices of silver, lead, and zinc, which obtained until autumn, renewed optimism. Unfortunately the year closed with silver in a precarious position, and although the prices for lead and zinc were better than a year earlier the outlook for 1936 was quite uncertain.

A feature of the year was the appearance of buyers seeking ore and concentrates for export to foreign smelters. During the autumn, when prices for lead and zinc were at their peaks for the year, buyers were active particularly in the Slocan district. As a result, considerable shipments of concentrates and crude oil were made to European smelters. The output of the *Monarch* mine was exported to Europe as in the previous year. Shipments were also made to the smelter at Tacoma.

Placer-mining, although it did not contribute greatly to the output of the district, is a matter of widespread interest. The production of 1,101 oz. is largely the recovery made by individual miners or partnerships and in most cases represents hard-earned wages. The notes on placer-mining are, in all cases, based on information kindly supplied by Gold Commissioners and Mining Recorders.

The Geological Survey of Canada published Memoir 173, "Slocan Mining Camp, B.C.," in 1934, and Memoir 184, "Description of Properties, Slocan Mining Camp, B.C.," in 1935, both written by C. E. Cairnes. In addition to geological maps of the area, the publications contain invaluable information on the geology and mining history of the area and of the mines and prospects there.

Geological information concerning various areas in the No. 5 Mineral Survey District and, in many cases, descriptions and historical data concerning mining properties in the area are available in publications of the Geological Survey of Canada. The Annual Reports of the Minister of Mines for past years contain information on nearly every property in the district.

The writer gratefully acknowledges his indebtedness to prospectors, mine officials, and Government officials throughout for uniform courtesy and assistance both in connection with field-work and in supplying information used in this report.

LODE-GOLD DEPOSITS.

HALL CREEK, NELSON MINING DIVISION.

Allan. Four claims, *Allan*, *Allan No. 1*, *Allan No. 2*, and *Contact No. 1*, were staked in 1934 by H. Erickson and C. Peterson, of Hall. The three *Allan* claims, extending across the valley of Hall creek, while the *Contact* adjoins them south of the creek and up-stream from the rest, are situated about 5½ miles by trail from Hall Siding. The ground is moderately steep and south of Hall creek is still fairly well

timbered. There is a good road as far as the *Fern* mine, then 2½ miles of pack-trail obstructed by fallen timber. A substantial cabin has been built on the north side of the creek.

The rock formations consist of more or less schistose greenstone intruded by andesitic and some porphyritic dykes. Widely spaced workings have exposed shearing with variable amounts of quartz and pyrite mineralization paralleling or close to narrow andesitic dykes, strike about north 10 degrees east, extending from a point approximately 1,500 feet north of Hall creek and 300 feet above it to half a mile south of the creek and 800 feet above it. At a point 1,400 feet north of the creek and 230 feet above it an adit has been driven for 28 feet, the first 24 feet of which is timbered. The face shows 3 feet of rusty, sheared greenstone; the shearing strikes north 70 degrees west and dips 70 degrees to the east. Included in this on the hanging-wall side is 6 inches of vuggy quartz, which assayed: Gold, 0.02 oz. per ton; silver, trace. The remaining 2½ feet of rusty, sheared greenstone assayed a trace in gold and silver. There are several trenches to the north of the adit; one, 125 feet distant, exposes 15 inches of shearing with 6 inches of quartz. In this vicinity there is a good deal of porphyritic granite float. On the north bank of Hall creek there are two cuts about 70 feet apart. The one up-stream, under an andesitic sill, exposes some narrow fissures in greenstone, filled with bluish quartz frozen to the walls. A sample across 15 inches of greenstone and quartz containing some pyrite assayed: Gold, trace; silver, trace. The down-stream cut exposes a 15-inch andesitic dyke dipping steeply to the east; both dyke and walls are somewhat limy. Half a mile south of the creek and 800 feet above it a 12-foot-wide cut exposes a 3-foot andesitic dyke, strike south 10 degrees east, dip 70 degrees east, cutting a fine-grained greenstone. To the east of the dyke the greenstone is silicified and rusty, and for 6 feet to the west the greenstone is sheared and a good deal of quartz has been deposited. The quartz appears to be completely barren, but the 15 inches of sheared greenstone next to the dyke contains a little quartz and is mineralized with some pyrite and a little fine-grained galena. A sample of this material assayed: Gold, *nil;* silver, *nil.*

Erie Creek, Nelson Mining Division.

Mjolner Gold Mines.

This property, owned by Andrew Sostad, of Vancouver, consists of the Crown-granted claims *Houlton* and *Princess* and six claims held by location. It is situated on Keystone mountain, 1 mile easterly from the Northern Cedar camp at the end of the Rest Creek road. The country immediately surrounding the property is rather flat, with low hills and ridges. A good cabin has been built some 1,400 feet westerly from the workings, which are located on a ridge trending northerly. There are two open-cuts on the ridge about 200 feet apart, the more southerly cut exposing aplite traceable on the surface for about 120 feet. This dyke or sill appears to follow the bedding of the enclosing impure tuffs, strike about north 15 degrees east, dip 45 degrees easterly. There is a width of about 10 feet of aplite which is fractured and healed with quartz, some pyrite and galena being developed in the aplite near quartz veinlets. On the hanging-wall is 1 foot of sheared tuff and east of that a mica dyke is exposed.

The northern cut, about 200 feet at north 10 degrees west from the other, opens about 24 feet of blocky argillaceous tuff, cut by aplite dykes, which in turn are cut by irregular quartz veinlets. The eastern end of the cut exposes brecciated aplite cemented with quartz. Three feet of this material on the south side was sampled, as was also 1½ feet on the northern side of the cut. These samples yielded no values in gold or silver. The portal of the adit at 70 feet lower elevation is 120 feet at north 60 degrees west from the cut. It is a crosscut being driven south 85 degrees east to intersect the material exposed in the cut and was in 125 feet in August. There would probably be 70 feet to drive in order to get through the aplite.

Copper King.

This group, consisting of six claims staked in October, 1934, held in the name of O. A. Haglund, of Erie, is located about 11 miles from Erie, east of the Erie Creek road on a moderately sloping hillside recently burned over. Late in 1934 a discovery was made at a point about three-quarters of a mile from the road at an elevation of 4,650 feet above sea-level. Some stripping was done partly exposing irregular quartz mineralization over a length of 35 feet, striking along the contour about north 15 degrees west and dip 35 degrees to the east. The prevailing rock is greenstone intruded by aplite dykes. There appears to be up to 3 feet of vuggy quartz containing some greenstone inclusions, a little pyrite and arsenopyrite, and some dark manganese-stain. A sample of selected pieces of

quartz better mineralized than the average assayed: Gold, *nil;* silver, *nil;* copper, *nil.* A sample across a 10-inch quartz offshoot assayed: Gold, *nil.* A crosscut adit driven 40 feet into the hill 35 feet below the outcrop would have to be advanced 40 to 50 feet to cut the downward extension of the quartz if it maintains the dip observed at the surface. A little free gold was noted on a manganese-stained fragment from an aplite dyke which outcrops 100 feet south-east from the cut. A cabin has been built about 600 feet north-westerly from the adit at an elevation of about 4,300 feet.

Approximately half a mile southerly from the adit on the southerly side of a small creek, at 3,825 feet elevation, a cut exposes an aplite dyke 2 to 2½ feet wide which has been fractured and filled with quartz, some pyrite, galena, and arsenopyrite. The dyke strikes south 35 degrees west and dips 35 degrees to the south-east. The hanging-wall is argillite or argillaceous tuff. Twenty feet to the west is a dyke of aplitic granite about 12 feet wide. In the cut a sample across 3 inches at the hanging-wall, consisting of quartz, argillite, and a little sulphide, assayed: Gold, *nil;* silver, *nil.* A 15-inch width on the foot-wall, consisting of aplite containing quartz stringers with some sulphides, assayed: Gold, *nil;* silver, *nil.*

About 450 feet south-easterly of this cut on the north side of a small creek an outcrop of granite lies in contact with greenstone. A shear cutting the granite is seen on the southerly side of the creek. At elevation 3,700 feet an old adit has been driven for 225 feet in a general northerly direction. For the first 90 feet from the portal this adit follows the shear to its contact with the granite on the east and greenstone on the west, and then along the contact for 65 feet and narrow joints in the greenstone for 70 feet to the face. At the portal there is a little quartz, but farther in there is practically no quartz nor other vein-mineralization. Some mineralized greenstone and quartz was seen on the dump, though none could be found underground.

Slocan Area.

Little Daisy.* The *Little Daisy* group consists of four Crown-granted claims—namely, *Little Daisy, Golden, Golden Fraction,* and *Idler*—owned by Mrs. McNaught, of Silverton, but under lease to R. A. Grimes, of Nelson, and under sub-lease to A. Erickson, of Silverton. The workings and cabin are on the north-east side of Aylwin creek at elevations between 3,900 and 4,000 feet. The property may be reached from Silverton via automobile-road for 5½ miles and then via 1 mile of pack-horse trail up the north-east side of Aylwin creek. It is situated on a steep side-hill rising from the valley of the creek and the workings are between 300 and 420 feet above the creek. In the narrow valley-bottom there is considerable red cedar that is suitable for shakes, but farther up the hillside in the vicinity of the adits and above, where the slopes are steep and rock bluffs numerous, the timber is chiefly small fir and spruce.

The rock in the immediate vicinity of the workings is fine-grained granite. It occurs in the form of a " Y "-shaped mass 2 miles long and about a quarter of a mile wide (*see* Geological Survey of Canada Slocan Sheet). This granite is much finer in grain than the typical granite of the Nelson batholith and Cairnes believes it is younger. In places the granite is finely porphyritic and in other places where fractured and slightly oxidized it has a brownish colour.

The main feature of the property is a tight fissure-vein of quartz in the granite. By means of three adits this vein has been explored for an aggregate length of 230 feet along its strike. The width of the vein varies from 2 to 6 inches, but it frequently splits into two or three branches, which individually vary in width from 1 to 2 inches. The vein-filling is quartz containing minor amounts of pyrite, with occasional grains of chalcopyrite and pyrrhotite.

There are several small faults. These are chiefly cross-faults, most of which displace the vein only slightly; the maximum measured displacement is 18 inches. However, a major fault in No. 2 adit displaces the vein an unknown amount greater than this. The evidence indicates that the movement has been at least 12 feet in the plane of the fault. Gouge and crushed rock are present in varying amounts adjacent to the fault-planes.

The mine-workings comprise three adits on the *Little Daisy* claim. The upper (or No. 1) adit is 100 feet long and has been driven at north 60 degrees east on the vein for the full length. The vein is tight and varies in width from 2 to 6 inches, the average being 3 inches. A sample taken across 6 inches of quartz in the face assayed: Gold, 0.02 oz. per ton; silver, trace.

* Report by J. S. Stevenson.

The middle (or No. 2) adit is 70 feet below No. 1 and is distant 100 feet horizontally in a direction of south 50 degrees west. The adit follows the vein for 75 feet from the portal to a point where cross-faulting has developed considerable gouge and crushed rock, so that the back of the adit is badly caved and examination impossible. Thirty-five feet from the portal a winze has been sunk at 72 degrees from the horizontal on the vein for 31 feet. There is some 20 feet of lateral stoping on the vein from the winze for 15 feet from the floor of the adit. A sample taken along the vein from 37 feet to the caved part, a distance of 46 feet, assayed: Gold, 0.50 oz. per ton; silver, 0.1 oz. per ton; the width of the vein varying from 3 to 6 inches. Three samples were taken at the bottom of the winze (as of July 8th, 1935). Here the vein is 4 inches wide and contains a small amount of pyrite; the wall-rock, however, carries considerable pyrite, disseminated and in small seams. A 4-inch sample across the quartz vein assayed: Gold, trace; silver, trace. A 3-inch sample of the foot-wall rock, immediately adjacent to the veins, assayed: Gold, 0.54 oz. per ton; silver, 0.1 oz. per ton; this material containing much disseminated pyrite. A sample along a ½-inch pyrite-streak contained in a 1-inch quartz veinlet assayed: Gold, 1.20 oz. per ton; silver, 0.10 oz. per ton. Fifteen feet down the winze in the bottom of a small, underhand stope a sample across the quartz vein, which was here 2 inches wide and contained a small amount of pyrite, assayed: Gold, 0.04 oz. per ton; silver, trace.

No. 3 adit is 50 feet below No. 2 adit and 90 feet horizontally in a direction of south 60 degrees west from it. It has been driven east for 55 feet and then at north 60 degrees east for 60 feet, after which a short crosscut was driven at south 45 degrees east for 20 feet to the face. The face is about 20 feet in the direction of the strike of the vein beyond the portal of No. 2 adit. The drift is along the vein from 55 to 115 feet from the portal. In this section it consists of one and sometimes three tight stringers of quartz which vary from 1 to 3 inches in width.

The wall-rocks in all the adits are variations of the fine-grained granite as described previously.

At the time of examination A. Erickson and his son were hand-mining in the lower adits.

Rossland Camp.*

O.K. Mountain Area.

The properties on O.K. mountain are about 2½ miles south-west from Rossland on the easterly slope of the mountain, and they extend up the hillside from the valley of Little Sheep creek at an altitude of 3,040 feet to the highest adit at an altitude of 3,610 feet. A good motor-road branches south-westward from the Cascade highway about 1 mile west of the city of Rossland and leads directly to the properties. In the vicinity of the various adits the slopes are covered by a heavy growth of underbrush and a scattering of evergreens, the densest growth being in the valley-bottom.

The writer examined only those properties on which most work has been done and which were being operated by lessees at the time. These included the *I.X.L.*, *O.K.*, and *Midnight* properties. Lessees had just commenced work on the *Golden Drip* at the time and were busy dewatering the workings; only a brief examination of this property was made.

From the time the claims were located in the early nineties most of the work on these properties has been done by lessees, who have followed the faulted sections of the veins and stoped the high-grade lenses of gold-quartz ore.

Milling on the properties has been attempted twice. In 1894 a 5-stamp mill was erected on the *O.K.*, but it did not operate for long; recently, in 1932, a mill to treat 8 tons in twenty-four hours was installed on the *Midnight* property; however, tests were not satisfactory and the mill is at present temporarily in disuse.

Work on these properties has been fairly active since 1920, and recent descriptions of the operations may be found in most of the Annual Reports since then, the more recent description being in the Annual Report for 1932. Memoir No. 77, "Geology and Ore Deposits of Rossland," 1915, by C. W. Drysdale, of the Geological Survey of Canada, includes a short description of the *I.X.L.* and *O.K.* properties.

* Report on this area by J. S. Stevenson.

In the workings of the properties examined the rocks are all of igneous origin. They include highly altered andesite that is perhaps more safely termed greenstone, serpentine, monzonite, and basic dykes, the greater number of which are mica lamprophyres.

The andesite is a very fine-grained to dense, massive rock of dark-green to brownish hue. The original texture and composition have been largely destroyed, both by the development in varying amounts of chlorite and of fibrous amphibole and by local silicification and serpentinization. The andesite varies from a uniformly dark-green phase that is highly altered, but contains only small amounts of serpentine and magnetite, to a similar dense, dark-green phase that is mottled by small brown 1-inch areas containing abundant serpentine and magnetite, and finally to a dense, uniform brownish phase that, in addition to other alteration products, carries a uniform abundance of serpentine and magnetite.

The present investigation did not disclose any systematic distribution of these variations in the altered andesite. It is thought that the development of varying amounts of serpentine and magnetite is related to the main area of black serpentine that occurs south of the andesite in the lower *O.K.* adits and extends both across and down the valley of Little Sheep creek.

The typical massive serpentine is a very dense black rock. Cross-fibre asbestos has filled in many of the joints as 1/16- to 1/4-inch veinlets and light-green talc has developed in the immediate vicinity of faults. A contact-zone intervenes between the black serpentine and the andesite; it is best seen in the second and third crosscuts to the north from the main fault-drift in the lower *O.K.* adit. The zone strikes roughly east and varies from 20 to 30 feet in width. Over this width irregular areas of hard, chocolate-coloured andesite are interspersed with irregular areas of serpentine. It is reported that the quartz veins on the *O.K.* occur only in the andesite to the north; the Baker lead, where examined by the writer, is in andesite. It is suggested that, although there are faults in the serpentine, those faults which tapped quartz and precious-metal-bearing solutions did not continue from the andesite into the serpentine.

A small intrusion of biotite monzonite is intersected by the lower *O.K.* adit and by Nos. 350 and 4 *I.X.L.* adits. This rock varies considerably, but the most characteristic features are its hard, fresh appearance and medium-grained granitic texture. Biotite is so abundant in the marginal facies of the monzonite that the rock is very dark and lamprophyric in appearance. However, in areas at a short distance from the contact, the feldspars are more abundant and the rock becomes dioritic in appearance. The relative amounts of orthoclase and plagioclase feldspar vary; in some phases of the rock they are equal, and in others orthoclase is by far the most abundant. Other than the fact that in the lower *O.K.* adit the monzonite is traversed by fault-seams, no data relating to the age relationships between the monzonite and the lamprophyre dykes or the veins were obtained. It is, however, definitely later than the andesite.

Lamprophyre dykes are numerous and widely distributed; they occur in most of the workings. These dykes contain abundant biotite, are medium to coarse-grained, and usually decompose to crumbly masses very shortly after being exposed to the air. In addition to the mica lamprophyres, there are a few narrow, very fine-grained dark dykes in which the former presence of either biotite, amphibole, or pyroxene is indicated by a ground-mass of chlorite; orthoclase and plagioclase feldspar occur as phenocrysts and as part of the ground-mass. The lamprophyre dykes occupy faults which cut, and in some places have slightly displaced, the quartz veins.

The veins in the properties on O.K. mountain are quartz-filled fissures in the highly altered but brittle volcanics. In sections undisturbed by faulting, the average strike of the veins is north 80 degrees east, but the dips vary from 35 to 75 degrees south. However, one vein on the *Midnight* strikes north and dips westward.

Although occasional concentrations do occur, sulphides are not common in the quartz veins. These sulphides include pyrite, chalcopyrite, and galena. Pyrite is also quite widely disseminated in small amounts throughout the wall-rock. The only other gangue-mineral in addition to quartz is ankeritic carbonate, which occurs in irregular areas in the vein and occasionally as veinlets in the surrounding rocks. The veins contain free gold, often in particles visible to the naked eye. Minable amounts of gold occur in pockets that are very erratically distributed in the veins. These pockets, however, contain very high-grade gold quartz, so that work along barren sections of the vein is amply rewarded by the discovery of a high-grade lens of ore. A conception of the occasional very high concentration of gold may

be formed from the statement made by Drysdale in Memoir No. 77 of the Geological Survey of Canada, page 151: "Mr. W. F. Ferrier found 2½ oz. of gold in 6 square inches of ore."

The many faults on O.K. mountain are very diverse both as to time of formation and as to attitude of fault-planes. An early period of faulting has produced fissures, some of which were filled by the gold-quartz veins, others remaining barren. An intermediate period produced fissures, some of which were filled by lamprophyre dykes. A later period has produced fissures that at present contain only gouge and crushed country-rock. The intersection of fissures of the first period of faulting are of economic importance.

A high-grade shoot of ore was stoped between No. 1A and No. 2 adits of the *I.X.L.* from the intersection of the "A" vein-fissure and a cross-fissure. It is evident that the increased deposition of gold at this intersection indicates that the cross-fissure antedated the mineralizing solutions. Post-mineral faults that have displaced the veins are common; in most cases, however, it has been possible to find the faulted portion of the vein beyond the fault. Although discontinuous fissures do exist in the serpentine, present knowledge indicates that the vein-bearing fissures do not continue from the andesite into the black serpentine. The fissures in the serpentine probably represent those of the later period as indicated by the presence of crushed lamprophyre dykes in the immediate vicinity of faults in the serpentine.

I.X.L.

The *I.X.L.* claim was located in 1891 and Crown-granted in 1895. There are seven adits on the property—namely, Nos. 1, 1A, 2, 3, 3A, 350, and 4. These adits have, with the exception of No. 3A, encountered quartz veins, three in number, which are locally known as the "A," "B," and "C" veins. The rock enclosing the veins is dense, highly altered andesite which has been cut by biotite monzonite and lamprophyre dykes. Black serpentine such as in the *O.K.* does not occur in the *I.X.L.* adits.

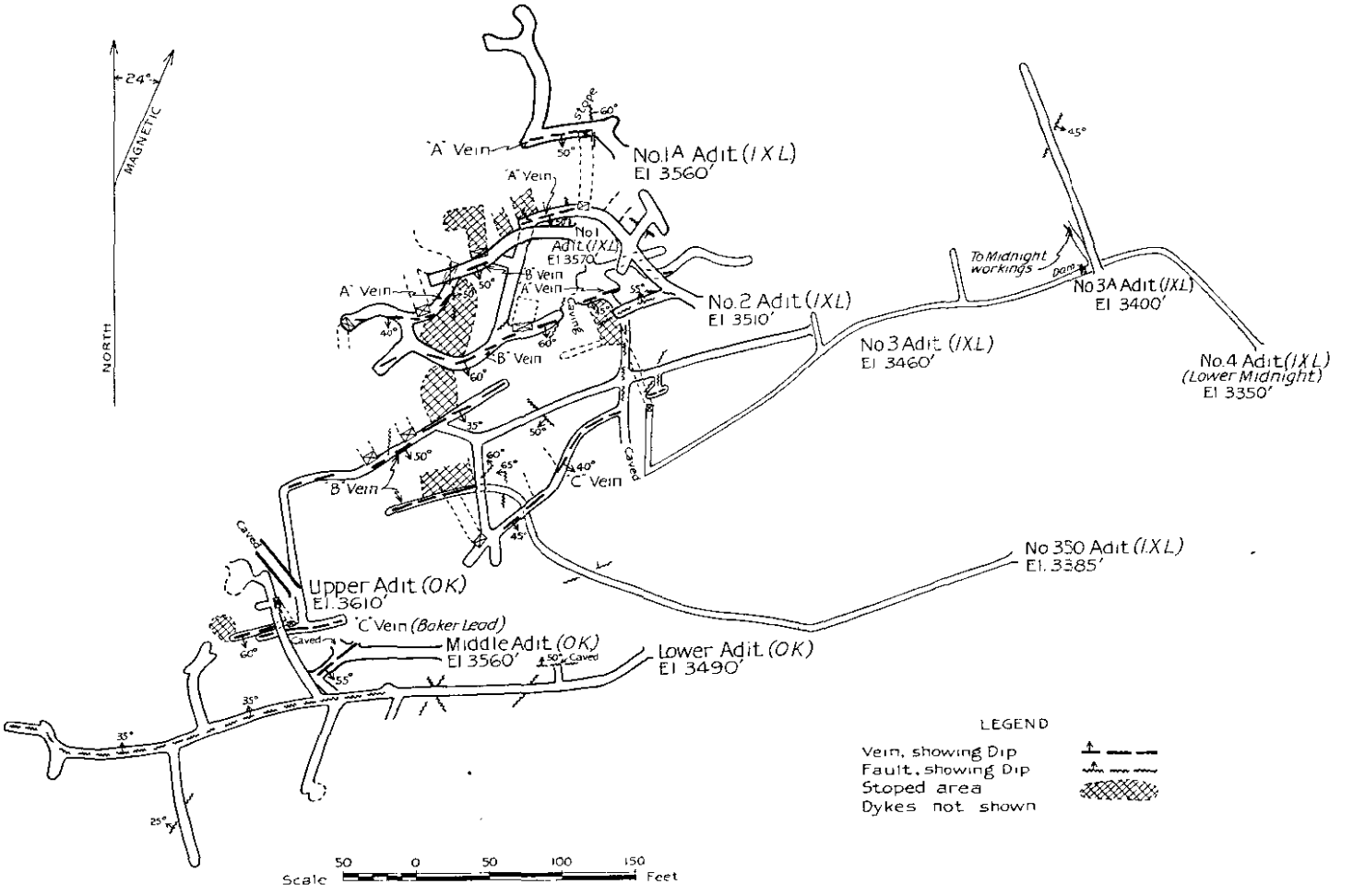
No. 1 adit is at an elevation of 3,570 feet. The vein-section in the adit is only 20 feet long; it pinches out both along the strike and up the dip, but maintains such widths and values down that an underhand stope was driven on the vein. Closely spaced cross-faulting has fractured the dense andesite badly at the west end. At 55 feet from the portal a dyke, locally known as No. 1 dyke, strikes east across the adit and dips 50 degrees north. It is a dense and massive lamprophyre that consists of orthoclase and plagioclase phenocrysts set in a ground-mass of felted feldspar laths and abundant vermicular chlorite.

No. 1A adit is at an elevation of 3,560 feet. It has been driven on a lenticular section of the "A" vein 40 feet long which varies in width from 6 to 4 inches and, where widest, contains closely fractured quartz. There is very little gouge along the walls. At its eastern end, 25 feet from the portal, the vein has been cut by a major fault. This fault contains 2 to 6 inches of gouge between smooth walls. A very high-grade shoot of ore is reported to have been mined along the intersection of the fault and the vein from this level towards the second level. This very obvious localization of an ore-shoot by the intersection of the vein with a fault suggests that other ore-shoots or pockets are related to intersections of the veins with faults of a similar age. The adit is in fine-grained andesite.

No. 2 adit is at an elevation of 3,510 feet. The workings of this adit have explored the various ramifications of both "A" and "B" veins. The "A" vein is quite lenticular, has been badly faulted, and varies considerably in strike. The first section of the vein is 110 feet from the portal; this section averages 8 inches in width and contains quartz between firm walls. Towards the west the vein is cut by many small normal faults. It dies out towards the west. A crosscut driven to the south-west and a drift to the west picked up faulted segments of the "'A" vein. This drift follows differently striking sections of the vein southward and westward. In these sections the vein varies considerably in width from mere seams in the faulted andesite to quartz-filled fissures 4 inches thick that are usually bordered by a thin selvage of gouge. Towards the westerly end of the drift the vein is cut by a narrow, dense, basic dyke.

The southernmost drifting in No. 2 adit has explored the "B" vein over a length of 130 feet. The "B" vein varies considerably in width. In the east face it is only a small seam in the andesite; whereas 25 feet west from this place it is 18 inches wide, elsewhere along the drift the vein is approximately 4 inches thick. The strike of the vein varies from a few degrees south to a few degrees north of east; the dip averages 60 degrees south.

No. 2 adit intersects four different basic dykes. These dykes vary in width from 8 inches to 6 feet. In composition they vary from lamprophyres containing abundant biotite, and are



B.C. Department of Mines, 1935.

I.X.L. and O.K. Plan of Workings (modified from Leasing Syndicates' Plan).

usually decomposed, to those that contain feldspar accompanied by a little biotite and shreddy amphibole, and are usually dense and quite firm. These dykes are locally designated by numbers from 1 to 4. No. 1 dyke has been encountered in No. 1 adit. The adit is driven in massive, dense andesite; most of it is a uniform dark green, but some is mottled with small 1-inch patches of chocolate-coloured areas of serpentinous material.

No. 3 adit is at an elevation of 3,460 feet. This adit explores the downward continuation from No. 2 of both "A" and "B" veins and also a third vein that has been designated the "C" vein. This is thought to be the eastward extension of the Baker vein from the *O.K.* to the *I.X.L.* At a place 130 feet from the portal a crosscut has been driven north that intersects the "A" vein. This vein has been stoped both up and down for a considerable distance to the west and drifted on to the east for approximately 40 feet. On the walls of the stoped area the vein is fairly uniform in width, both along the strike and the dip, but in the drift to the east it is discontinuous and consists of disconnected lenses of quartz. At a place 240 feet from the portal a short crosscut 30 feet long intersects the "B" vein. This vein has been followed by a drift for some 170 feet. The vein has been developed upwards by stopes and raises.

Opposite the short diagonal crosscut and for several feet on either side, the main vein has split into three veins a few inches wide. The hanging-wall vein is constant in width, whereas the others pinch and swell. These three veins all have a smaller dip than ordinarily; they average 30 to 35 degrees south. In the east face the vein narrows to 3 inches of quartz which has frozen walls. At a place 50 feet from the west face the "B" vein goes into the wall as a 6-inch stringer of quartz. The westward continuation of this drift is offset about 10 feet to the north. This portion of the drift contains small discontinuous lenses of quartz that are thought to constitute a new vein, rather than to be a continuation of the "B" vein. At a place 130 feet from the portal a crosscut to the south intersects the third vein (or "C" vein) at 25 feet. This has been followed by a drift to the south-west for about 120 feet. This vein strikes from south-west to west. A short crosscut and drift 110 feet from the portal shows some lenticular quartz that is probably an eastward continuation of this vein.

The "C" vein is from ½ to 6 inches wide. In some places it forms the foot-wall of a crushed zone and in others it has frozen walls. Towards the west end of the "C" vein-drift, the vein dies out on entering the diorite. The diorite is medium-grained and consists of light-green chloritic hornblende and white feldspars. However, "C" vein is present again in a drift at the extreme south-west end of No. 3 adit as a strong quartz-filled fissure. This part is continuous with the Baker lead in a stope beneath the lowermost *O.K.* adit.

Of the four numbered dykes occurring in No. 2 adit, only No. 2 dyke is present in this adit; it occurs in the floor of the stope driven from the first crosscut to the north. Here it is a badly decomposed mica lamprophyre 2 feet wide that occupies a normal fault which has displaced the vein 4 feet down the dip of the fault. A narrow mica-lamprophyre dyke that cannot be correlated with any of the others is found in the face of the extreme west end of the drift from the last-mentioned stope. With the exception of the diorite mentioned above, the adit is driven in typical fine-grained andesite that in a few places shows brown patches indicating incipient serpentinization.

The 350 adit is at an elevation of 3,385 feet. In this adit the vein has been drifted on for 50 feet and stoped extensively. The vein is a well-defined quartz fissure-filling from 4 to 12 inches wide; however, in the west face this changes to quartz-lenses with frozen walls. These contain numerous rock fragments and show evidence of replacement having been more important than fissure-filling.

A badly decomposed mica-lamprophyre dyke extends from the north wall of the adit at 50 feet from the portal to the south wall at 120 feet. A 10-foot section of green andesite mottled by brown serpentinous areas intervenes between the dyke and the next rock-type, a biotite monzonite. This extends to a place about 210 feet from the portal. The monzonite is characterized by a coarse granitic texture and by two mineralogical phases, a biotite-rich phase at the borders where in contact with the andesite and a feldspar-rich phase within the main mass. From 210 feet to the face the rock is typical andesite. However, in the vicinity of a fault at 300 feet, abundant serpentine has developed in the andesite over a zone 4 feet wide.

No. 4 adit is at an elevation of 3,350 feet. The first 145 feet of this is on *Midnight* ground and that part on *I.X.L.* ground was filled by dammed-up water at the time of the writer's visit. The timbering in this adit extends to within 10 feet of the crosscut to the *Midnight* stopes,

and the dam is only 10 feet beyond this. The rock exposed in this section is a hard, dark, micaceous phase of the monzonite such as occurs in the 350 adit.

An adit at an elevation of 3,400 feet near the *Midnight* workings has been called No. 3A for reference. It has been driven at north 20 degrees west for 153 feet, but throughout this distance it did not encounter any vein. The predominant rock is a fine-grained andesite, but there are two areas of a dense, highly siliceous phase—one, a zone 4 feet wide that is 40 feet from the portal, and the other an indefinite zone in the face.

At present the property is leased to a syndicate, with Ole Osing in charge of the mining operations, which were confined during the summer to stoping on the vein from the 350 adit. Compressed air supplied by a small compressor is used.

O.K.

The *O.K.* property includes but one claim, the *O.K.*, located in 1892 and Crown-granted in 1895. The workings are immediately west from those of the *I.X.L.* Three adits on the property give access to rather extensive workings, but at the time of the writer's visit the upper two were badly caved and only the lower could be fully examined.

The uppermost *O.K.* adit is at an elevation of 3,610 feet. Old plans and reports indicate that the workings on this level are quite extensive and that at least one vein was discovered and worked.

The middle *O.K.* adit is at an elevation of 3,560 feet. Most of this adit was badly caved at the time of the writer's visit and only a short section of the vein that had been intersected by a crosscut 70 feet from the portal could be examined. The vein is the usual quartz-filled-fissure type, strike south 65 degrees west, dip 50 degrees south-east, cutting serpentinized andesite. Old maps and reports indicate that no other vein was encountered on this level.

The lower *O.K.* adit is at an elevation of 3,490 feet. From this level a vein, called the Baker lead, has been developed. Near the end of a crosscut that has been driven 90 feet south from a place 240 feet from the portal an underhand stope follows this vein to the floor of the No. 3 *I.X.L.* adit. An intermediate level 30 feet below the bottom *O.K.* adit and leading from this stope has been driven westward along the vein for 40 feet. A normal strike-fault along the vein on this level has faulted it so that the portion above the sub-level has been displaced to the north-east. Between this level and the No. 3 *I.X.L.* the vein dips quite steeply and varies in width from a few inches to 2 feet. It is quite tabular and definitely represents a quartz-filled fissure. The main portion of the lower *O.K.* adit follows a well-defined fault. This is first encountered at 170 feet from the portal and continues for about 260 feet to the face with only moderate changes in strike. The amount of gouge and crushed country-rock in the fault varies along the strike. The predominant rock in the lower working is serpentine, which occurs in the main drift, but the two crosscuts to the north encounter andesite and serpentinized andesite approximately 40 feet north of the main drift and the serpentine. The contact is not sharp, but grades from serpentine that is almost soapstone into serpentinized andesite and then into andesite. Biotite monzonite occurs between 45 and 55 feet from the portal. The boundaries are, however, very irregular and much complicated by the presence of lamprophyre dykes. A 4-foot lamprophyre dyke also crosses the main drift where the first crosscut to the south has been driven.

In June John Hendrickson and associates, lessees, were stoping ore from the Baker lead beneath the lower adit. Air from a small compressor was being used.

Midnight.

The *Midnight* consists of one claim, the *Midnight*, Crown-granted in 1897. It adjoins the *I.X.L.* claim on the east and most of the workings are adjacent on the north-east to the *I.X.L.* workings. The general geology is very similar to that of the *I.X.L.*, but, owing to more abundant faulting and a definite lenticular habit, the veins are perhaps more difficult to follow and have not been developed to such a great extent.

The writer was able to discover four adits on the property, referred to as the upper, middle, and lower *Midnight* adits. Three of these are immediately north-east from the *I.X.L.* workings and a fourth is some 800 feet north-east from the *I.X.L.* No. 4 adit.

The upper *Midnight* adit is at an altitude of 3,420 feet and is distant 240 feet horizontally in a direction of north 30 degrees west from the *I.X.L.* No. 4 adit. The adit has been driven in a direction north 40 degrees west for 80 feet, thence north 20 degrees east for 80 feet to a point of reference " A." From here two workings lead westward; the first, a short drift which follows a narrow pinching quartz-seam, in a direction of south 85 degrees west for 25 feet to

a normal fault that drops the vein 4 feet into the foot-wall, and the second an exploratory crosscut in a direction of north 30 degrees west for 90 feet, thence north 75 degrees east for 40 feet; this working encountered three well-defined faults but no vein material. From " A " the adit is a drift on the vein in a direction of north 55 degrees east for 85 feet. In the immediate vicinity of " A " a stope ranging from 10 to 25 feet wide goes down on the vein and connects with the lowermost adit. Twenty-five feet eastward from " A," a winze was sunk on the vein which, as now seen, consists of 4 inches of crushed quartz in a fissure that strikes north 75 degrees east and dips 45 degrees southerly.

Two small stopes go up on the vein, one opposite the winze and another on a section of the vein 60 to 80 feet east from " A." A short working leads northward between these stopes. The vein as seen in the floor opposite the easterly stope is lenticular, ranging from a thin seam to 3 inches of quartz; it is cut by two mica-lamprophyre dykes and at the east end it has been lost where cut by a steeply dipping north-south fault. At 100 feet from the portal a winze was sunk on a small pocket of quartz about 10 feet long that occurred in a narrow seam in the rock. This adit is driven in fine-grained andesite that has been cut by black mica-lamprophyre dykes.

The middle adit, a short distance below the upper, is distant 175 feet horizontally in a direction of north 40 degrees east. The adit begins in a direction of north 30 degrees west for 40 feet, but here bad caving prevented further examination. In the floor of this first part there is a strong quartz vein, from 6 inches to 3 feet wide, strike north 30 degrees west, dip 70 degrees south-west, in andesite. This vein is reported to be stoped to the lower adit.

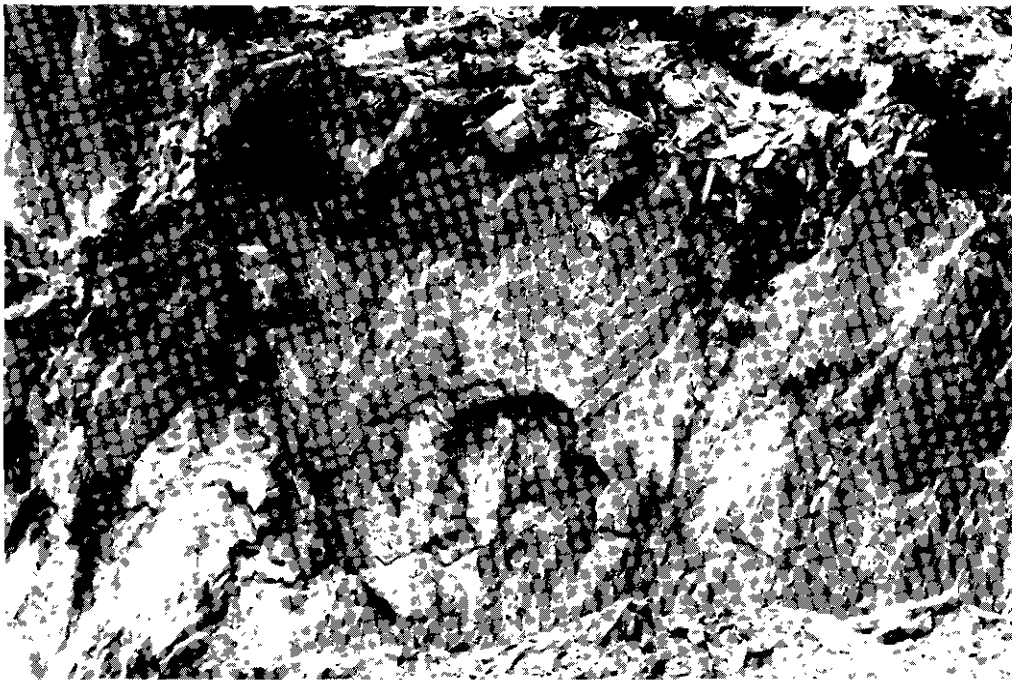
The lower *Midnight* adit, altitude 3,350 feet, corresponds to No. 4 of the *I.X.L.*, the first 140 feet of which is in *Midnight* ground. Just beyond this the adit branches, the *I.X.L.* part westward and the *Midnight* part northward. From here the *Midnight* adit goes north 30 degrees west for 45 feet, then north 5 degrees east along a slightly curving course for 150 feet to a reference point " A." Here a short section of a quartz vein was encountered and stoped by an irregularly shaped stope between this and the reference point " A " in the upper level. Where examined in the west side of the stope near the *I.X.L.-Midnight* boundary, and about 20 feet from the floor of the lower adit, the vein was quite sinuous, tight, and varied from 6 to 8 inches in width; the vein-filling was predominantly quartz. The strike is east and the dip 45 degrees south. From " A " the adit leads north 60 degrees east for 65 feet to a reference point " B." The last 30 feet of this section is through a badly decomposed mica-lamprophyre dyke that strikes north 30 degrees east and is approximately vertical. From " B " a crosscut goes eastward for 30 feet to a drift that goes north for 30 feet and south for 60 feet on a strong quartz vein that strikes north and dips 45 degrees west. The vein ranges from 2 inches to 6 feet in width between tight walls and pinches out at either end of the drift. For approximately 45 feet from the north end of the drift the vein has been stoped to the surface. The south end of the drift is in very dense and highly silicified rock; at the north end a 2-foot mica-lamprophyre dyke, strike north 30 degrees east, with a steep dip, cuts the vein; elsewhere the drift is in dense andesite. From " B " the adit goes north for 30 feet, mostly through a lamprophyre dyke, then north 45 degrees west for 30 feet to reference point " C." From " C " a crosscut goes north 75 degrees east for 25 feet to a drift which has been driven south for 25 feet on a section of a vein that averages 12 inches in width, strike north, dip 60 degrees west. Near the middle of this drift a steep fault, strike north 20 degrees east, has moved the south portion of the vein from the east wall of the drift to the west. The vein in this drift is reported to have been stoped to the middle adit. From " C " the adit goes north 75 degrees east for 70 feet, thence north 10 degrees east for 30 feet to a wide drift that turns south-eastward for 25 feet. This drift is on a curving section of the vein which strikes 70 degrees west and is as wide as 2 feet, but towards the north-west end narrows to 2 inches and towards the south-east end it is represented only by two slips in the andesite. The vein-filling is quartz.

In the lower adit the predominant rock is typical fine-grained andesite which is cut by mica-lamprophyre dykes. However, a zone about 6 feet wide of light-green silicified rock strikes north along the east wall of the adit between 120 and 180 feet from where the adit branches from the *I.X.L.* No. 4 level. The walls of this zone are ill-defined and are bounded by numerous and curving slips with varying attitudes.

An adit was driven on the *Midnight* claim from a place 100 feet north from the intersection of the upper road to the *I.X.L.* new ore-bins with the lower road to the portals of *I.X.L.* adits

Alleo Silver Mines, Ltd., Western Side of Basin. No. 4 Adit is in Small Draw to the Right.

Looking East from Thunderbird Property, Windermere Area.



Folding in Sedimentary Rocks on Highway, East Side of Kootenay Lake, South of Gray Creek.

Pack-train returning from Teddy Glacier Property.

Nos. 4 and 350, etc. The portal of this adit is only a few feet lower than No. 4 of the *I.X.L.*, and is distant from it 480 feet west and 600 feet north. It has been driven south 15 degrees west for 110 feet, then south 60 degrees west for 120 feet and south 85 degrees west for 70 feet; at 100 feet a working goes off at 15 degrees for 14 feet.

The adit intersects several well-defined faults but no veins; faults occur at 100, 115, 175, and 290 feet from the portal. Most of these contain abundant gouge and sometimes narrow veinlets of calcite. The adit is driven in dense andesite.

At the time of the examination in June the property was leased by the Midnight Syndicate, of Rossland; Nick Leface and partner, of this syndicate, were hand-mining in the west side of the stope between the lower and upper adits.

SILVER-LEAD-ZINC DEPOSITS.

Doctor Fork of Findlay Creek, Windermere Mining Division.

Key.

This group consists of four claims staked in the summer of 1934 and two staked later, held in the names of the three Blake Bros., of Skookumchuck, and their associates. Leaving the highway 3 miles northerly from Canal Flats, an old logging-road is followed for 12 miles, thence 13 miles of pack-trail leads to the property, at elevations between 8,000 and 9,000 feet above sea-level, which is situated at the head of the East fork of Doctor creek, a tributary of Findlay creek.

Near the property two tributaries of the East fork of Doctor creek rise separately in a large basin. The west tributary rises in a small lake, flows through a short canyon, and is divided from the East branch, which rises in a meadow, by a flat-topped rock ridge. A cabin has been built on the meadow. To the east and south the rim of the basin is about 3,000 feet above the meadow and is formed of porphyritic granodiorite with large feldspar phenocrysts, while to the west the rim is quartzite, apparently overlain by greenstone for some distance.

The ridge between the creeks consists of greenstone on the east, and to the west it is a succession of quartzite-beds varying from thin argillaceous to thick cherty beds all more or less micaceous. The strata strike in general from north to north 30 degrees east and dip generally at about 60 degrees to the north-west.

The canyon previously mentioned apparently marks a fault and along it the beds vary greatly in dip and strike and at places are quite contorted. West of the canyon the quartzite is overlain by greenstone for some distance. Some of this greenstone may be a fine-grained diorite. Beyond this, quartzite outcrops again and is intruded by greenstone sills.

The claims are located to cover the western half of the ground between the tributaries and extend partly up the western rim of the basin. Much of the ground is covered with slide-rock. When the property was visited in mid-September a light snow had fallen.

On both sides of the short canyon mentioned, lenses and wedges of sulphide mineralization occurring along bedding-planes of the more or less metamorphosed, sericitized, and contorted quartzite consist of galena, pyrite, and minor amounts of sphalerite. A grab sample of this material taken by the Resident Mining Engineer in 1934 assayed: Gold, 0.02 oz. per ton; silver, 9.2 oz. per ton; lead, 17 per cent.; zinc, 1.5 per cent.

On the western side of the basin, well up the steep slope, at an elevation of about 9,000 feet, some 1,700 feet from the outlet of the lake, a vein is exposed for about 50 feet in fine-grained greenstone. The vein, strike about north 30 degrees east, dip 60 degrees north-west, is imperfectly exposed, but appears to be about 4 feet wide, containing quartz, siderite, and lenses of sulphides, including pyrite, galena, fine-grained sphalerite, and some arsenopyrite.

South-westerly about 150 feet along the strike a small cut exposes 6 feet of vein-matter mineralized principally with pyrite. The following samples were obtained from this vein:—

Gold.	Silver.	Lead.	Zinc.	Iron.	Remarks.
Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	
0.05	6.2	0.8	6.0	31.3	Heavy mixed sulphides of lead, zinc, and iron; 10 inches on hanging-wall of vein in greenstone.
0.10	0.8	Trace	14.0	.....	Selected pyrite from vein in greenstone.
0.01	80.4	36.0	8.0	.....	Selected cubic galena, first cut, vein in greenstone.

About 6 feet west of this cut a sample from a 2-inch fracture in the greenstone containing serpentine and a little fine-grained sulphide assayed: Gold, trace; silver, 4 oz. per ton.

Just west of this the greenstone is in contact with quartzite, the contact apparently following the bedding of the latter. In the quartzite, not far from the contact, is another cut about 100 feet south-west of the first, exposing a fairly solid band of sulphides irregular in width and 9 inches at the widest point. The mineralization follows the bedding, which strikes north 10 degrees east and dips 60 degrees to the west. The following samples were selected from this material:—

Gold.	Silver.	Lead.	Zinc.	Remarks.
Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	
0.06	4.4	3.6	28.0	Selected coarse crystalline zinc and some pyrite.
0.04	21.0	24.0	10.0	Selected fine mixed sulphide from top cut.
0.02	15.0	13.9	14.9	Selected fine sulphide with fine yellow mineral; reported gold-bearing.

About 50 feet north-west of this cut is a lens of quartz 2 feet wide heavily mineralized with pyrite. A sample across this width assayed: Gold, trace; silver, trace; lead, *nil;* zinc, *nil.*

TOBY CREEK, WINDERMERE MINING DIVISION.

Thunderbird Mines, Ltd.

This private company, of which J. P. Farnham, of New York, is president, owns seven claims and has an option on three claims, all located on the steep sides of the basin at the head of Mickleson creek, a tributary entering Delphine creek from the north. There is a packers' camp on Delphine creek 2 miles by road from the junction with Toby creek and 21 miles from the town of Invermere. From the packers' camp a rather steep "go-devil" trail 4 miles long leads to the mine camp at an elevation of 7,500 feet.

The workings, which consist of pits, trenches, and short adits, are at elevations ranging from 8,700 to 10,100 feet. In addition to this work, mineralization has been exposed near the power-house and on the trail between the power-house and No. 3 adit. The country is extremely rugged and above camp-level there is practically no vegetation. The steep slopes rise to the main ridge, a spur of Mount Nelson. Small peaks on the crest of the ridge are at elevations exceeding 10,000 feet.

The rocks exposed are mapped on the Windermere sheet, Geological Survey of Canada Memoir 148, as Mount Nelson Series. They consist of dolomitic limestones, some quartzites, and slates, which in part have been much contorted. The rocks strike north-westerly and dip to the north-east. They have been cut by several faults of considerable displacement which are marked by extensive widths of shattered rock, and at some points by greenstone intrusives. Greenstone dykes found at other points are generally much altered. Some are schistose and some have been altered to brown ankeritic carbonate. Much of the limestone is cut by innumerable closely spaced fractures which are filled with veinlets of quartz. Mineralization occurs in this limestone along fractures occasionally marked by polished surfaces which follow the bedding, also along some cross-fractures.

Intense oxidation of the outcrops is generally marked by gossan, dark with manganese. Occasionally specks and small pieces of sulphide occur in it, while at two or three of the higher points constant freezing and rapid erosion have evidently preserved the sulphides from oxidation by ground-waters. Three of the lowest exposures are in tight fractures with but little sign of oxidation and in them galena and light-coloured sphalerite are to be seen. At the higher points galena containing grains of pyrite varies from quite fine-grained steel galena to moderately coarse-grained cubic galena, stained with copper carbonate probably derived from grey copper. Copper carbonate is to be seen at points in the limestone adjacent to the fractures. Disseminated galena was also noted in the centre of a piece of limestone impregnated with siderite, the outer surface of which was dark with manganese and iron oxides.

Recent work includes driving No. 3 adit a distance of 130 feet (as at September 15th) at an elevation of 8,700 feet, which exposed evidence of shearing along the bedding of limestone stained with iron oxide, but no commercial mineralization has yet been discovered. There is

also a 20-foot crosscut and a 40-foot drift following a narrow seam of gouge, along which some quartz and a little pyrite have been developed.

About 250 feet south-west of No. 3 adit a cross-fracture, strike north 25 degrees east, dip 45 degrees north-west, has been traced 60 feet on the surface and 40 feet by rock-cut and adit. Sulphides occur in lenses along this fracture, the largest lens having a length of 15 feet and maximum width of 14 inches, which appeared to pinch out in a pit about 3 feet below drift-level.

Mineralization, usually consisting of very dark gossan, has been traced in cuts to No. 1 adit about 2,000 feet north-west of No. 3 adit and in the same segment. Occasionally there is evidence of movement along the bedding represented by polished planes. At some points there is a little sulphide to be seen. No. 1 adit is caved, but about 40 feet above it in cut " D " at elevation 9,550 feet the writer obtained the following section across a total width of 38 inches:—

Width.	Gold.	Silver.	Lead.	Zinc.	Copper.	Remarks.
Inches.	Oz. per Ton.	Oz. per Ton.	Per Cent.	Per Cent.	Per Cent.	
2	2.94	75.0	22.7	1.9	1.0	Hanging-wall streak, selected lumps of sulphide.
7	0.02	27.0	13.5	.....	0.4	Manganiferous gossan showing some galena.
15	.....	.....	.....	.....	.....	Limestone " horse."
14	*Nil*	*Nil*	Trace	.....	.....	Black gossan.

About 2,000 feet west of this point under the peak are two cuts in a third segment at an elevation of about 10,000 feet which were filled by snow. Some steel galena containing fine grains of pyrite and showing stains of copper carbonate had been dug from these cuts. Lower down are some exposures of gossan.

No. 2 adit, 12 feet long, at an elevation of 8,875 feet and about 2,000 feet westerly from No. 3, was being driven by hand. The face showed 2 inches of manganese-stained, silicified limestone along a fracture following the bedding. A little galena was developed in narrow fractures branching from the larger fracture into the limestone.

Permanent buildings include a mess-house, one camp building, the power-house, blacksmith-shop, and powder-magazine. A 235-cubic-foot Gardner Denver compressor and a 16-k.v.a. generator driven by a gasoline-engine are installed in the power-house.

Field, Golden Mining Division.

Monarch.* In view of the many inquiries and complaints made to this Department, in the light of recent developments at the *Monarch* mine, regarding statements issued from time to time by Base Metals Mining Corporation, the writer has prepared a review of these statements and also of operations at the *Monarch* mine from information on file in his office. From the time of incorporation to September 4th, 1935, Goldfield Consolidated Mines, Limited, of Nevada, had directorial control, and Frank Eichelberger, general manager, was in charge of operations. Mining Corporation of Canada did not obtain directorial control of Base Metals Mining Corporation until September 4th, 1935. Since that time an effort has been made and is continuing to discover other ore-bodies. The property was last examined by H. Sargent, Resident Engineer for No. 5 District, in September, 1935.

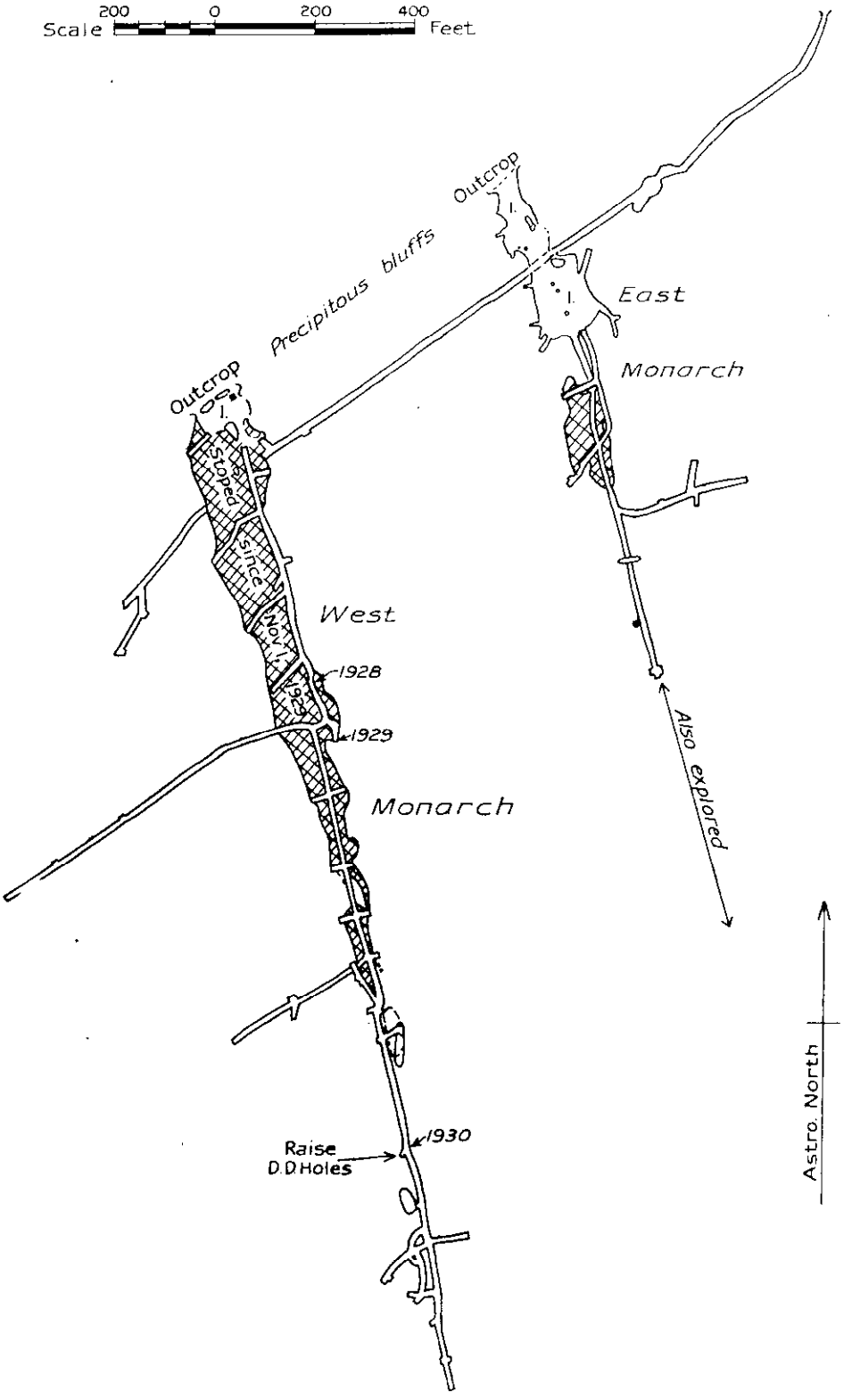
The workings of the *Monarch* mine are situated in the precipitous face of Mount Stephen, about 3 miles east of Field. They are about 1,000 feet above the railway-tracks of the main line of the Canadian Pacific Railway.

Mineralization consists of a replacement in limestone by galena and sphalerite.

Three ore-bodies have been developed—the East Monarch and West Monarch on the south or Mount Stephen side of the Kicking Horse valley, and the Kicking Horse on the north side.

The property now known as the *Monarch* mine was staked in 1884 and has been developed and worked intermittently since that time. From 1884 to 1910 approximately 2,420 tons of ore was mined.

* By the Provincial Mineralogist.



Monarch Mine. Plan of Workings.

A 70-ton concentrating-mill was erected in 1912 and production from 1912 to 1924, inclusive, amounted to 40,015 tons. Most of the ore mined during this period came from the East Monarch ore-body. The areas mined during this period are shown without pattern on the plan and are numbered 1.

In 1925 the property was acquired by the A. B. Trites interests (Pacific Mines Development and Petroleum Company). The West Monarch was explored to a point 500 feet from the outcrop.

On December 6th, 1927, an option on the property was taken by Frank Eichelberger for $236,000 and 25 per cent. of net profits; the latter could be converted for $125,000 within two years.

On March 15th, 1928, an agreement was made between Eichelberger and Goldfield Consolidated Mines, Limited, of Nevada. Eichelberger had paid $20,000 on his option.

By the end of 1928 the West Monarch ore-body had been explored to a point 600 feet from the outcrop. This point is shown on the plan by the date 1928. At this stage, development (estimated from the plans and figures given this Department by the company, Annual Report, 1929) should have partially developed 160,000 tons of ore. The Minister of Mines' Annual Report for 1928 gives 50,000 tons in the Kicking Horse and 150,000 tons for East and West Monarch combined. Therefore, the estimated figures is perhaps too high. However, it will be used.

On February 25th, 1929, Base Metals Mining Corporation was formed to take over the property. By this deal Goldfield Consolidated received 1,300,000 fully paid shares in the new company. Mining Corporation of Canada, agreement of February 25th, 1929, took 355,000 shares in the new company for $345,000 and a further 345,000 shares in consideration of the covenant of Mining Corporation to assume the balance of the purchase price to A. B. Trites, but not to exceed the sum of $341,000. The first $345,000 provided for mill-construction and development.

In 1929 the present 300-ton mill was erected and put into operation. Production to the end of the year was 1,730 tons.

By the end of 1929 the West Monarch ore-body had been explored a further 110 feet from the outcrop. This point is shown by the date 1929 on the plan. The additional ore partially developed would be about 30,000 tons based on figures for drifting, crosscutting, and raising given by the management.

It is stated in the Annual Report of the Minister of Mines for 1929 that " The principal development has been done in the West Monarch, which has been explored by drifting, crosscutting, and raising for a length of about 850 feet, with continuous ore throughout. The width of the deposit is about 130 feet, with a tendency to *taper slightly* as exploration proceeds to the south. . . .

" The whole ore-body will, *it is understood*, average around 26 per cent., combined metals in the proportion of, roughly, 14 per cent. lead and 12 per cent. zinc."

It is to be noted that as early as the end of 1929 the ore-body was showing a tendency to taper slightly to the south.

By the end of 1930 exploration had reached a point 1,525 feet from the outcrop. This point is shown by the date 1930 on the plan. It is apparent from an examination of the plan that the main drift passed out of ore about 1,260 feet from the outcrop. It is also apparent from the crosscuts shown on the plan that the width had narrowed to half or less than half of the width of the area developed to the end of 1929. This work would indicate about 35,000 tons of additional ore.

Let us now review the statements issued by Base Metals Mining Corporation up to and including the period ended 1930.

The first report bears the date March 20th, 1930, and is signed by Frank Eichelberger by order of the Board of Directors. The following quotations are from this report:—

(1.) " Development-work has been previously carried on and, at the time of the formation of the company, 300,000 tons of ore were developed in the three ore-bodies."

(1A.) " The mill has been brought up to its rated capacity. The ore mined and milled to date has come from the West Monarch, in a portion of the mine which is below the average grade. The mill extraction has averaged 97 per cent. of the lead, 90 per cent. of the zinc, and 85 per cent. of the silver. The economic recovery of the metals has averaged 96 per cent. of

the lead, 75 per cent. of the zinc, and 75 per cent. of the silver from an average head assay of 14 per cent. lead, 8 per cent. zinc, and 1.6 oz. silver. The average grade of the lead concentrate has been 6 oz. silver, 75 per cent. lead, and 5.4 per cent. zinc, while the zinc concentrate has averaged 58 per cent. zinc, 2 per cent. lead, and 2 oz. silver."

(2.) "During the construction period only a limited amount of development was accomplished, chiefly in the West Monarch ore-body. This advance exposed 75,000 tons additional, averaging 3 oz. silver, 22 per cent. lead, and 19 per cent. zinc, bringing the total for this ore-body to approximately 300,000 tons averaging 2.1 oz. silver, 16 per cent. lead, and 14 per cent. zinc. The ore in the face is of excellent grade."

(3.) "Similarly, the East Monarch ore-body has now developed approximately 50,000 tons of ore averaging 2 oz. silver, 18 per cent. lead, and 12 per cent. zinc, with the same character and grade of ore continuing in the face."

(4.) "The Kicking Horse ore-body remains at approximately 50,000 tons developed, of an average grade of 3 oz. silver, 5 per cent. lead, and 15 per cent. zinc. No work was done on this ore-body during the construction period."

(5.) "The fact that the West Monarch ore-body has been proven for a distance of over 900 feet, with the grade of ore improving, and the face of the south drift in the best ore so far encountered in the mine, gives great encouragement for future development. The total developed tonnage of ore as of March 1st, 1930, is approximately 400,000 tons."

Remarks.—(1.) Annual Report, Minister of Mines, for 1929:—East Monarch: "Only a few hundred feet of exploratory work has been done on the East Monarch deposit beyond the old stope, 350 feet long, from which past production was made. In the new workings a substantial body of ore has been partially explored by drifting, crosscutting, and raising, but this work is not sufficiently far advanced to indicate the possible dimensions of this deposit, which, however, occurs under conditions similar to the West Monarch."

Fifty thousand tons is estimated for the Kicking Horse deposit.

West Monarch: According to the Department's estimate for the end of 1928, 160,000 tons of ore was indicated in this part of the mine, or approximately 210,000 tons for the whole property.

(2.) The limited amount of development done during the construction period in 1929 is stated to have developed 75,000 tons of ore in the West Monarch, bringing the total for this ore-body to 300,000 tons. The Department's estimate is that 190,000 tons was indicated at the end of 1929.

(3.) In the Annual Report of the Minister of Mines for 1929 it is stated that no estimate could be made of ore in the East Monarch.

(5.) The Department's estimate of indicated ore at the end of 1929 would be 240,000 tons exclusive of an uncertain tonnage in the East Monarch.

No report appears for the year 1930, but a statement was made to this Department from the management containing:—

"The ore developed by the year's work is slightly thicker and narrower than that in the older northern part of the ore-body. A somewhat greater tonnage of ore has been developed during the year than has been mined, and it is of a somewhat higher grade, averaging about 40 per cent. combined metals.

"In the East Monarch mine, drifting and stoping has been carried southward 290 feet during the year.

"Approximately 1,300 feet of diamond-drilling has been done on and near the two ore-bodies.

"The mill was shut down on October 15th, but development continued until the end of the year."

The Department's estimate is that approximately 35,000 tons of additional ore was indicated in the West Monarch and an unknown amount in the East Monarch.

Production amounted to 75,000 tons for 1930. According to the Department's estimate, 225,000 tons of ore had been partially developed in the West Monarch to this date, and subtracting 75,000 tons mined it would leave 150,000 tons in this body. It is possible that sufficient ore had been partially developed in the East and West Monarch ore-bodies to warrant a statement that *indicated* ore resulting from the year's development-work equalled that mined.

The point to bear in mind is that by the end of 1930 it should have been evident to the management that the West Monarch ore-body had pinched out, that it had decreased rapidly in width during the year's development, and that indicated ore reserves in this body had been reduced.

The mine was closed during 1931, 1932, and the first six months of 1933.

On June 4th, 1933, Frank Eichelberger and associates, of Toronto and New York, and Mining Corporation acquired Goldfields Consolidated's remaining 51 per cent. interest in Base Metals Mining Corporation.

In 1933, Mining Corporation and Goldfields Consolidated, who had advanced moneys during the shut-down, received 289,975 shares for these advances at apparently $1 per share.

A report to shareholders dated October 15th, 1933, states: " Developed tonnage represents a four-year supply of ore at the present rate of milling." The rate of milling was approximately 300 tons per day; therefore, four years' supply of ore would be approximately 400,000 tons. The Department's estimate would be 200,000 tons plus an unknown amount, not over 47,000 tons, in the East Monarch.

The annual report of Base Metals Mining Corporation, dated April 21st, 1934, contains a report by Frank Eichelberger, general manager, dated April 17th, 1934, containing the following statements:—

" Development: A complete geological survey of the Monarch Mines was made and 286 feet of crosscuts, 70 feet of drifting, and 72 feet of raising was done.

" The result of this work was to extend the lateral limits of the ore-bodies and to prove the continuation of ore in the south end of the West Monarch. The total development footage was 428 feet.

" The total cost of development-work, including work preliminary to starting operations, was $10,334.60.

" Ore reserves: When the mine was reopened in August, 1933, ore reserves were:—

	Ore.	Silver.	Lead.	Zinc.
	Tons.	Oz. per Ton.	Per Cent.	Per Cent.
West Monarch	318,100	2.4	18.0	18.0
East Monarch	41,500	1.1	6.2	15.2
Kicking Horse	75,000	3.0	5.0	15.0
Totals	434,600	2.4	14.6	17.2

" Since operations were resumed development-work has put more ore in sight than has been extracted."

The development-work mentioned would reasonably prove 22,000 tons of ore if all carried out in the ore-body.

In 1933, 35,612 tons of ore was mined; therefore, reserves as at the end of 1930 would be reduced 13,000 tons according to the Department's estimates. Allowing 150,000 tons in the West Monarch, 50,000 in the Kicking Horse, and 47,000 in the East Monarch at the end of 1930, the total would at the end of 1933 be 234,000 tons.

A company quarterly report dated July 15th, 1934, states: " Stoping during this period has proven the West Monarch ore-body to have greater widths and thicknesses and to date no definite western limit has been reached in any of the present working stopes."

A company quarterly statement dated October 15th, 1934, states: " In the West Monarch, considerable additions have been made to known widths and thicknesses of the ore-body, with the result that ore reserves have been more than maintained."

In the company's annual report dated April 12th, 1935, the report of Frank Eichelberger, general manager, dated March 15th, does not give any definite figures on ore reserves or tonnage developed during the year. The following statements are from this report:—

" Mining: During the year, 96,830.7 wet tons were trammed to the mill, 5,043 tons coming from the East Monarch and the balance from the West Monarch ore-body. Broken ore

reserves at the end of the year were estimated at 5,000 tons. All mining and aerial tramming costs, including office, overhead, insurance, and contingencies, amounted to $100,288.80, equivalent to $1.035 per ton of ore trammed. Stoping showed the stope limits, as adduced by the early development-work, were conservative, and also that ore proved to be continuous in the south section of the West Monarch ore-body where previously there had seemed to be a break in its continuity.

" Development: During the year 933 feet of drifting, 1,286 feet of crosscutting, and 1,020 feet of raising was done, a total of 3,239 feet of work. There was also 5,164 feet of diamond-drilling. Of this work, 229 feet of raising and 132 feet of drifting was for ore production and waste-disposal purposes, the remainder being development looking to extending the present ore-bodies and searching for others.

" High-grade zinc mineralization was encountered in the south end of the West Monarch and the ore-body developed for 120 feet. Drill-holes from 207 show this is probably the continuation of the main ore-body. The East Monarch ore-body stope limits were extended 45 feet and drilling showed mineralization for a width of 85 feet at the end of the production drift. This mineralization is parallel to the strike of the known ore-body, and the production drift will have to be extended and, after raising to the ore, crosscutting and drifting will be done to prove its extent. This ore was drilled just at the close of the year."

It is worthy of note that 3,239 feet of development-work was done during 1934. During 1930 and 1933 only 1,523 feet of development was done. Definite statements regarding maintenance of ore reserves were made on the basis of the 1930 and 1933 work, but not on the greater amount of work done in 1934, except the quarterly statement on October 15th, 1934, previously quoted.

In 1934, 94,880 tons of ore was mined, of which 5,043 tons came from the East Monarch. An examination of the enclosed plan indicates that no appreciable tonnage of ore was developed in 1934. Therefore, the West Monarch ore-body at the end of 1934 definitely appears to have been reduced to approximately 60,000 tons.

The mill was closed February 16th, 1935, and if run at full capacity, approximately 13,000 tons was mined in the first six weeks of the year. According to the estimates given, it would leave 47,000 tons of ore in the West Monarch.

The mill was started on June 25th, 1935, and continued in operation until approximately December 5th, 1935.

On September 4th, 1935, the direction of Base Metals Mining Corporation was taken over by Mining Corporation of Canada.

In September, 1935, when Mr. Sargent examined the property, the rate of milling was approximately 210 tons per day. On the basis of 200 tons per day production to October 23rd, when a statement was issued by the Board of Base Metals Mining Corporation that milling would be suspended because of lack of ore, production would be approximately 24,000 tons. On the basis of the Department's estimates, 23,000 tons of ore would still be left in the mine. It is apparent that the Department's estimates have been too high.

Mr. Sargent found in September, 1935, that production was coming from " sniping " in the old stopes, including the removal of pillars, and from stoping the southerly extension of the West Monarch ore-body. He estimated that a section remained which might yield 30,000 tons.

Grade of Ore.—Production from 1910 to 1924, inclusive, amounted to 40,015 tons. The recovery made was 48,319 oz. silver, 6,899,967 lb. lead, and 228,000 lb. zinc; the latter was recovered only during two years' operation. On an average basis of recovery of 80 per cent. for the lead and 70 per cent. for the silver, the grade would be 10 per cent. lead and 1.77 oz. silver.

Production from 1929 to 1934, inclusive, amounted to 207,272 tons, and the recovery was 286,721 oz. silver, 40,486,193 lb. lead, and 43,268,283 lb. zinc.

In the Base Metals Mining Corporation report of March 20th, 1930, Frank Eichelberger stated that economic recovery averaged 96 per cent. lead, 75 per cent. zinc, and 75 per cent. of the silver. On this basis, the grade of ore for this period would be 10 per cent. lead, 13.9 per cent. zinc, and 1.84 oz. silver.

Actual mill-feed, according to:—

	Lead.	Zinc.	Silver.
	Per Cent.	Per Cent.	Oz. per Ton.
Minister of Mines' Report, 1930	9.1	10.9	1.30
Base Metals quarterly report, October 15th, 1933	15.0	11.0	1.80
Base Metals quarterly report, July 15th, 1934	11.8	16.5	2.66
Base Metals quarterly report, October 15th, 1934	12.5	13.3	1.85
Base Metals annual report, March 15th, 1935	10.9	14.7	2.08

Only in one instance, for six weeks' operations, did the lead content of the ore milled approximate the content stated in reserves. The average is considerably below and the computed average is far below the figures given in ore reserves.

WOOLSEY CREEK, NORTH OF MAIN LINE OF C.P.R., REVELSTOKE MINING DIVISION.

Allco Silver Mines, Ltd. (N.P.L.).

This company, with head office at 708 Yorkshire Building, Vancouver, owns twenty-six mineral claims situated at the head of the Middle fork of Silver creek, about 12 miles by trail northerly from Silver Creek Siding on the main line of the Canadian Pacific Railway, 2 miles west of Albert Canyon Station. Known as Nos. 1 to 26 respectively, the claims are held by annual recording of assessment-work. Claims 14, 15, 21, 22, 23, 24, 25, and 26 were formerly known as the *Iron Cap group, staked in 1930 and described in the 1931 Annual Report under "Limestone Dyke* and *Iron Cap."* The other claims staked were recorded in 1934.

The country is rugged, being deeply cut by the large stream-valleys. The claims, covering an easterly-facing basin, the floor of which is at an elevation of about 5,900 feet, extend for about 2 miles westerly, crossing the divide, which has an elevation of about 7,800 feet, and cover some ground on the slope which is drained by Carnes creek.

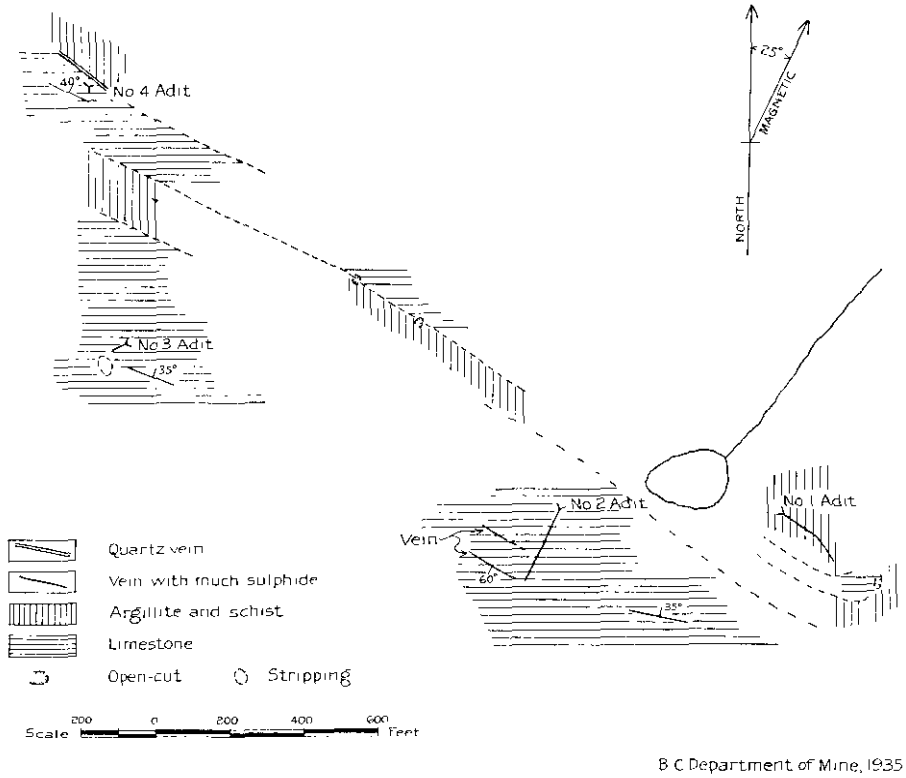
From Silver Creek Siding the route to the property follows the road to the *Snowflake* mine on the east side of Silver creek for about 4 miles. From this point a new road of good grade and width has been built to a point about 8 miles from Silver Creek Siding. Thence to the mine a pack-trail was being widened and at some points relocated to facilitate hauling with a caterpillar tractor. Towards the mine the grade is fairly steep.

The property was visited late in August and only the ground in the vicinity of the principal workings was examined in any detail. The workings consist of open-cuts and short adits around the southern and western sides and within an elevation of about 250 feet above the floor of the basin. There are also some cuts in a small knoll rising from the floor of the basin on the north side. The rocks exposed consist of slates, schists, and limestone, which strike from north-west to west and dip from 30 to 60 degrees to the north-east or north. North-east of the basin the rocks appear to be chiefly schists for some distance, while the south and west rims of the basin appear to be limestone. A band of limestone crossing the basin from the north-western corner is exposed for a width of 150 feet near No. 4 adit. Somewhat south of No. 3 adit the width appears to be less than 100 feet. The contact with the slates and schists to the north is faulted. South-west of this limestone there is a band of slate 150 feet wide at the western side of the basin and of undetermined width at the south-eastern corner. South-east of this, limestone is again exposed and, although its width was not determined, it appears to extend for a considerable distance.

In the larger mass of limestone south-west of No. 2 adit two parallel fractures have been exposed about 100 feet from the portal. The more southerly one, exposed for a length of 150 feet, is a narrow fracture from 2 to 4 inches wide, containing oxidized material with quite a lot of galena. A sample of the selected galena assayed: Gold, 0.04 oz. per ton; silver, 94.4 oz. per ton; lead, 63 per cent. The other fracture, about 75 feet north from the first, is exposed by a trench along the outcrop for 60 feet, and by pits for a further 60 feet easterly from the east end of the trench. For a length of 15 feet there is a width apparently related to a cross-fracture, of 2 to 5 feet of rusty gossan containing massive pyrite. Selected pyrite assayed: Gold, trace; silver, 1.8 oz. per ton; lead, *nil.* The strike of the fracture is north 60 degrees west or about the same as the limestone, but the dip is steeply to the south, while the limestone-beds dip at about 35 degrees to the north.

Farther west above No. 3 adit (*see* map), about 80 feet south-west of the portal, two lenses, each about 3 feet thick, containing sulphides appear to be partial replacements of certain beds of limestone and are separated by about 8 feet of rusty thin-bedded limestone. The upper lens contains some unaltered pyrite and the lower one pyrite and fairly massive sphalerite. The top half of the lower lens consists of a seam about 6 inches thick of fairly solid pyrite, and the bottom half of fairly massive sphalerite with some pyrite. Selected sphalerite assayed: Gold, trace; silver, 1 oz. per ton; lead, *nil;* zinc, 42 per cent. Selected pyrite assayed: Gold, trace; silver, 1.8 oz. per ton.

A third type of occurrence appears to be related to the contact between the limestone and the schist. Although the contact was not traced with accuracy and it is not well exposed at the south-east corner of the basin south of No. 1 adit, yet it is probable that the narrow band of limestone 150 feet wide near No. 4 adit extends across the basin on a general strike of north 60 degrees west. The contact is a faulted one and near No. 1 adit it appears to follow a less



Alleo Silver Mines, Ltd. Sketch-plan showing Workings.

regular course. Two open-cuts above No. 1 adit expose sulphide mineralization, principally solid galena, developed in the limestone close to the contact. The exposures suggest that the solid sulphide mineralization is narrow and insufficient work has been done to indicate its continuity. From the lake in the basin to a cut on the southerly side of a knoll rising from the basin's floor are irregular outcroppings of a narrow, barren-looking quartz vein, which is assumed to mark the southern contact. The cut mentioned and another 200 feet westerly on the western end of the knoll expose the contact of limestone and schist. There is about 3 feet of more or less sheared rock with some quartz stringers and a little sulphide. The strike varies somewhat and the dip is steep to the north. Six inches of sheared matter with some quartz and a little galena, exposed in the western cut, was sampled and assayed: Gold, 0.06 oz. per ton; silver, 3.6 oz. per ton.

About 900 feet north-west from this cut and immediately north of No. 4 adit the contact is exposed in the bed of a small stream. A quartz vein varying from 8 to 24 inches wide,

apparently unmineralized, has been followed for 200 feet up the creek in the sheared rock at the contact. *Near No. 4 adit a vein of galena, conforming to the strike of the limestone-beds* and of irregular width up to 1 foot, branches off from the sheared contact. It appears to pinch at the top, while its horizontal extent is not shown.

There are other mineral occurrences on the property, but so far little work has been done on them and for the present they would seem to be of minor importance.

No. 1 adit, which was apparently headed for the cuts on the hillside above it, was driven 197 feet in graphitic thin-bedded sediments on a general bearing of south 45 degrees east, although it is not straight. Due to the local warping of the contact this adit was being driven parallel to rather than directly towards it.

No. 2 adit was driven by hand for 220 feet on a course of south 25 degrees west, about at right angles to the strike of the bedding. At that distance it should have cut the downward extension of the more northerly fracture and possibly also of the southerly fracture exposed on the surface. Two fractures were crossed, but they were tight and not well mineralized where the adit intersected them.

No. 3 adit, driven for 45 feet at south 70 degrees west in thick-bedded limestone, exposed slight mineralization on some joint-planes. No work was being done at this point at the time of examination, but results to be obtained are quite doubtful, as the mineralization exposed on the hillside above appears to follow the bedding, which dips about parallel to the slope of the hill. This adit was slowly crossing the beds and getting farther from the mineralization on the surface.

No. 4 adit, in 20 feet at north 50 degrees west, was designed to intersect the mineralization exposed in the creek, but had not reached its objective.

Lardeau Camp.

Teddy Glacier. This property, consisting of seventeen claims and fractions situated at the head of the Middle fork of Sable creek, is owned by Teddy Glacier Mines (1933), Limited; registered office, 555 Howe Street, Vancouver. The property was originally staked by Geo. Ritchie and Geo. Edge, who discovered ore in float issuing from the front of the glacier. In 1924 the ice retreated and the ore was found in place. During the summer of 1927 Detroit capital purchased a 50-per-cent. interest in the property. In 1929 the Bush & McCulloch interests employed thirteen men, and considerable improvements were made to the trail and a crosscut adit continued towards the Dunbar vein after the installation of a 60-horse-power Diesel engine and a Gardner compressor. Recently an English syndicate optioned the property and has done a good deal of development-work.

The property was reported upon in the 1924 Annual Report as the *Ritchie* group and as *Teddy Glacier* in the Reports for 1925 to 1930. It is also described in Geological Survey Memoir 161, "Lardeau Map-area."

The camp and principal workings are at an elevation of approximately 7,800 feet. There is a wide stretch of moderately sloping country covered by the glacier and by glacial debris, except where ridges project through the cover. The camp is about 13½ miles from Camborne and at about 5,800 feet higher elevation and access is rather difficult. A wagon-road extends some 4½ miles from Camborne. Beyond this point a narrow-gauge cart-road has been built for about 4 miles to the "Forks," at which point there is a packers' camp. Beyond this a steep pack-trail 5 miles long leads to the mine. The English syndicate, represented by J. Ellis, manager at the mine, began work late in 1934, but lack of supplies made it necessary to suspend operations. Fuel and some mine supplies were flown to the property and dropped from the air. Operations were resumed late in February. When the writer visited the property late in August a twenty-horse pack-train was being used to transport supplies from the "Forks" to the mine.

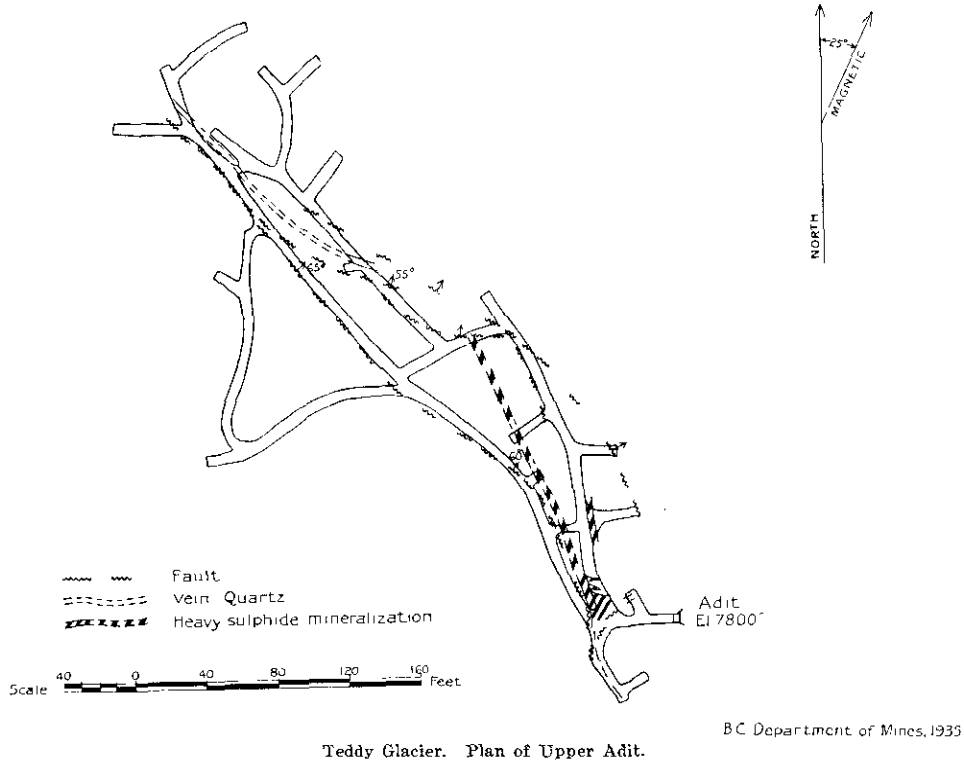
The English syndicate worked principally on the upper level, on which a total of about 1,600 feet of crosscutting and drifting has been done.

An adit designed to gain a depth of 180 feet below the upper level by driving about 600 feet north-westerly was in about 60 feet when the property was visited. As the results on the

upper level were not considered to be sufficiently encouraging, it was decided to abandon the project, and the property was shut down in September, 1935.

Late in August the "big showing" mentioned in former reports was still covered by the glacier, while the camp building had been built on another showing. Only the "carbonate lead," as it was called, which may be the "Dunbar lead" mentioned by A. G. Langley in the 1927 Annual Report, was exposed.

At the head of Eva branch, South fork of Sable creek, about 7,800 feet above sea-level, is the *Teddy Glacier* group. It was originally staked by George Ritchie and George Edge, who discovered ore in float issuing from the front of a glacier. In 1924 the ice retreated and the ore was found in place. The property is now owned by the Teddy Glacier Mines, Limited, financed in Vancouver, with F. R. Blochberger in charge of development-work. During the summer of 1927 Detroit capital, for which C. G. Bush is engineer, purchased a 50-per-cent. interest in the property and considerable development is planned. An aerial tram and a power-line from Menhenick creek to the property have been mentioned as possibilities, and in 1927 it was understood that an adit was being contemplated to tap the surface showings at



Teddy Glacier. Plan of Upper Adit.

400 feet depth. A trail from Incomappleux River wagon-road connects the property with Camborne, about 13½ miles away. A small but serviceable cabin stands near the surface showings.

The rocks on the property are carbonaceous to graphitic schists, grey argillaceous schists with calcareous varieties grading to pure crystalline limestones, and fine-grained to gritty quartzites. They strike north 45 degrees west and dip 75 degrees north-east on the average. To the north-east of the workings chlorite-schists and numerous small beds of grey marble appear in the sediments, and finally, about half a mile north-east, a large dyke of greenstone of dioritic appearance. Microscopic examination of it shows albite, orthoclase, and a small amount of quartz in a mass of accessory and secondary mineral. It is consequently more acidic than a true diorite and is probably allied to quartz monzonite or granodiorite. About 100 yards south-west of the main surface showing, the sediments are cut by a dyke of green-

stone which has been more or less completely carbonated to the familiar rusty weathering carbonate rock of the district.

On the property, particularly between the ore-showings and the summit almost due west, much complex, practically isoclinal, folding has taken place. It is accompanied by shearing, faulting, and on the summit the sediments dip flatly to the south-west. The schistosity maintains its normal easterly dip. This belt of folding continues north-west over one divide to the head of Dog creek and essentially the same rocks persist.

The most important mineralization on the *Teddy Glacier* is found along two fracture-zones. The more easterly strikes roughly north 10 degrees west and has been traced on the surface for over 120 feet and is possibly exposed again 80 feet farther north. It is mineralized with galena, pyrite, sphalerite, and some chalcopyrite in a gangue of white quartz and rock inclusions, the width varying from a few inches to 4 feet. The second vein, to the west of the first, strikes north 17 degrees west where exposed and has been traced for about 130 feet, varying in width after the manner of the first and being similar in all respects. In addition, there are numerous other quartz veins on the property which trend in various directions, but most frequently about at right angles to the strike of the formation. Many of them connect with the main veins and die out a short distance away from them. Mineralization in these veins is quite irregular, but some good showings have been uncovered, particularly near their junctions with the main veins. Where the first vein intersects the second one, and north of the latter, is the big showing; it is a large body of quartz some 30 feet long and carrying bodies, up to 5 feet wide, of coarse sulphides. It follows a somewhat more easterly course than the average strike of the eastern vein. Apparently the nature of the country-rock has had no important effect on the ore-deposition, although black carbonaceous schists mineralized with pyrite are most abundant near and west of the big showing. Whether the sulphides have replaced the limestones where these are intersected by the veins is a speculation that should be investigated, as such has been found to be the case in other properties in the Lardeau. The toe of the glacier lies 100 yards east of north from the big showing and in the float at its edge are some boulders of ore, indicating that further disclosures may be made as the ice recedes, which it is doing slowly but surely.

The sulphides, galena, pyrite, sphalerite, and chalcopyrite, occur in bunches in the quartz veins or as continuous bands, pinching and swelling along the strike and varying in width from practically nothing to 4 or 5 feet. They are coarse-grained or very fine-grained and the chalcopyrite is generally present in very minor amount. The finer-grained ore is an intimate mixture of the sulphides with grains of quartz and may require rather fine grinding for concentration. Examination under the microscope reveals many minute areas of tetrahedrite in the galena. Some movement has taken place along the veins since their formation, as the galena is in many cases sheared.

The following assays are quoted from the Annual Report, Minister of Mines, British Columbia, 1925:—

Description of Sample.	Au.	Ag.	Pb.	Zn.
	Oz.	Oz.	Per Cent.	Per Cent.
Coarse crystalline galena from a number of places; a substantial amount of this ore could be sorted out	0.08	39.5	74.6	1.2
Steel-grained galena containing pyrite and quartz, from various places; similar material occurs in quantity	0.04	23.3	53.1	10.3
Average sample across 5½ feet of ore and waste at the north-east extremity of the southern fissure, 78 feet from the big showing	0.29	17.6	31.3	7.2
Fairly clean pyrite selected from various places; this material occurs in abundance	0.28	16.7	1.6	.....

It is noted that the last assay is unexpectedly high in silver and that similar material assayed for the owners gave: Gold, 0.86 oz.; silver, 6.4 oz.; lead, 11.5 per cent.

The surface showings on the *Teddy Glacier* are very promising. The ore is of a good grade and should be easily concentrated. Underground development will be watched with interest.

The relation of the surface showings to the underground workings is not clear from previous descriptions. Apparently the upper level was designed to gain 35 feet of depth on the " big showing " and probably the distance to be driven was not great.

Galena, sphalerite, pyrite, chalcopyrite, and grey-copper mineralization have been described in earlier reports, which indicated that the pyrite carried fair values in gold and that silver values were somewhat less than ½ oz. per unit of lead. Well-crystallized mixed sulphides of lead, iron, and zinc, selected by the writer, assayed: Gold, 0.26 oz. per ton; silver, 8.6 oz. per ton; lead, 12.6 per cent.; zinc, 26.8 per cent.; while clean sphalerite assayed: Gold, 0.01 oz. per ton; silver, 1.4 oz. per ton; lead, *nil;* zinc, 62 per cent.

The accompanying plan of the upper level indicates the mineralization found underground as well as the general faulting. The workings are in a shear-zone, strike north-westerly. About 40 feet from the portal there is a width of about 15 feet of heavy mineralization exposed in a crosscut and in the pillar between the two drifts. To the east this mineralization appears to finger out into a great many narrow stringers largely filled with quartz. In the south wall of the above crosscut the mineralization is weak, and to the south and west and in the roof of the workings it dies out on approaching the fault-planes. The fault-plane on the east side of the westerly drift may be the western margin of mineralization (*see* map). Four crosscuts intersected similar mineralization varying from 15 inches to 6 feet in width, over an indicated length of about 160 feet, lying between the two drifts. The mineralization apparently dies out or is cut off at its northern extremity by a slip dipping north-east. A lens of similar mineralization is exposed on the east side of the easterly drift at the north of the first crosscut east from this drift. Its relation to the main mass of mineralization, 40 feet from the portal, is not apparent in the workings.

No definite evidence was seen underground regarding post- or pre-mineral faulting. There is a suggestion, however, that the sulphide mineralization is, to a considerable degree, a replacement-type along a north-westerly fracture, and is most intense where there is much cross-fracturing and dies out on approaching fault-planes along which there may have been some post-mineral faulting.

Burton, Arrow Lake Mining Division.

Silver Queen.

The *Grey Wolf, Grey Wolf Fraction, Red Fox, Black Fox Fraction,* and *Black Bear Fraction* claims are owned, and the *Red Fox Fraction* is leased, by H. E. Stones and his partner, J. Gayford, of Burton. The property is located near Silver Queen peak on the ridge between Canyon creek and Snow creek, some 13 miles easterly from Burton by road and trail. The present trail leads to the basin at the head of Goat Canyon creek, from which a footpath about 2½ miles long following the crest of the ridge has been made to the property. There is another route following Snow creek, but this trail has not been completed. The property was described in the Annual Report for 1930.

The ridge drops steeply on the southern side to Snow creek, some 3,000 feet below. The slope on the northern side of the ridge is precipitous until the basins at the heads of tributaries of Canyon creek are reached.

The West Kootenay Sheet, Map 792 of the Geological Survey of Canada, published in 1904, indicates that this area is underlain by rocks of the Slocan series. The rocks observed consist of tuffaceous sediments, crumbly sandstone, limy and more or less schistose argillite, greenstone, and some aplite and granodiorite dykes.

The ridge running westerly from Silver Queen peak consists of impure tuffs and sandy sediments striking east to north-east and dipping steeply to the south. They are intruded by numerous dykes of andesitic greenstones and aplite. The peak consists of a knob of granodiorite. On the ridge some 700 feet westerly from Silver Queen peak there is a band of rather coarsely crystallized white calcite about 3 feet wide lying to the west of some impure tuff and apparently followng the bedding. About 150 feet down the southerly slope in a direction of south 45 degrees west and at an elevation of about 7,700 feet a 20-foot open-cut has been driven into the hill on a similar band of coarsely crystallized calcite lying between beds of crumbly sandstone, strike north 40 degrees east, dip 55 degrees north-west, and apparently pinching as it goes down.

A little pyrite and some streaks of fine black sulphide were noted in the calcite. Selected material containing pyrite and the black streaks assayed: Gold, 0.10 oz. per ton; silver, 28 oz. per ton. Kidneys of black material, probably manganese oxide containing nodules of calcite, were noted in the crumbly sandstone.

Some 300 feet south 55 degrees west down the slope is another cut at elevation 7,550 feet, exposing 1½ to 2½ feet of coarsely crystalline calcite, with up to 8 inches, towards the foot-wall side, of rusty material and also some galena. Three samples across the full width assayed: Gold, 0.06 oz. per ton; silver, 7.5 oz. per ton. This band also lies between beds of crumbly sandstone, strike north 45 degrees east, dip 55 degrees north-west. Near the bottom of the cut a 2½-foot aplite dyke is exposed cutting the band of calcite. Below the dyke, calcite, probably drag, is exposed following the lower contact to a point 10 feet east of the band above the dyke. At elevation 6,850 feet, some 1,200 feet south 50 degrees west down the side-hill, a shaft about 30 feet deep has been sunk which was inaccessible. On the dump some calcite showing a little sulphide was noted. Three hundred and fifty feet farther, south 60 degrees west, downhill is an adit. The portal is 10 feet to the north-west of an exposure of calcite in doubtful relationship with crumbly sandstone. The calcite is mineralized with galena and the overburden shows much iron and manganese oxides. An outcrop of aplitic granite about 50 feet wide occurs 60 feet west of the portal. There are about 350 feet of workings in the adit, including a branch to the left near the portal. The calcite-band exposed at the portal is not seen underground, having been cut off by a fault observed at the outcrop. The adit is principally in limy greenstone. About 25 feet from the portal it crosses a shear running a little west of north. A drift follows this for about 55 feet, then turns east for 40 feet. The first shear is intersected by another and near the junction some quartz and fine-grained sulphide are developed. The fine sulphide, consisting largely of pyrite, assayed: Gold, 0.04 oz. per ton; silver, 20 oz. per ton. The main adit-working is driven north-easterly for about 115 feet, then turns northerly for 115 feet and ends in aplitic granite. The contact has a low dip to the east. A sample taken near the portal of the adit, consisting of silicified rock with some red stain, possibly ruby silver, assayed: Gold, 0.10 oz. per ton; silver, 31 oz. per ton.

SILVER-LEAD-ZINC MINERALIZATION.

North of Blaeberry River, Golden Mining Division.

Seward.

These claims, as well as several others, were staked in 1934 on the southerly slope of Willow Bank mountain north of Blaeberry river, 10 miles north of Golden and about 3 miles east of the railway, in the vicinity of a small stream locally called " Pole Cabin creek." The original locations were made by Roy and J. A. Seward. A long ridge runs south-easterly from the mountain and forms the south-easterly side of Pole Cabin Creek valley. The rock formations exposed consist of blue limestone, more or less dolomitic, overlying thin-bedded shales. Practically no work has been done.

Numerous intersecting veinlets filled with calcite, quartz, and occasionally with small bunches of sulphides occur in the more massive blue limestone. Selected galena from this type of mineralization containing very little tetrahedrite (grey copper) assayed: Gold, trace; silver, 28.5 oz. per ton; lead, 80.9 per cent.; copper, *nil*. There are also some larger veins a few inches in width mineralized with a small amount of tetrahedrite, which does not, however, appear to be rich in silver. A sample of quartz showing much copper-stain and some tetrahedrite assayed: Gold, trace; silver, 10 oz. per ton; lead, 1.5 per cent.; copper, 1.5 per cent.

Work has been done by the Seward Bros. at three points: At the creek-level, about 1¾ miles by trail north-westerly from the farm buildings, where numerous intersecting veins ½ to 2 inches wide contain small nodules of galena. About 1¾ miles north-westerly from the first point, on the southerly side of the ridge south-west of Pole Cabin creek, for 6 feet along a fracture of northerly strike intersected by numerous cross-fractures, there is a 2-inch streak of fairly solid galena; however, blasting to a depth of 1 foot removed most of the galena. On the north-eastern side of the creek opposite this point and for half a mile down-stream, quartz veins 2 to 6 inches wide are seen in the limestone cliffs which form the wall of the canyon. Quartz in the talus shows a good deal of copper-stain and some tetrahedrite. There are also two quartz-lenses of some size. One of them is about 4 feet wide and shows some

small lenses of galena and a little tetrahedrite. Another lens of white quartz 6 to 8 feet wide, in which no mineralization was seen, occurs 100 feet down-stream.

QUARTZ-LENSES IN SHALE.

North of Blaeberry River, Golden Mining Division.

Four claims were staked in 1934 on the east side of Willow creek, about a mile northerly from Blaeberry river, in the names of J. Moyer, F. Bergenham, O. Bergenham, and H. C. Beresford. The valley of Blaeberry river is fairly wide; Willow creek enters it from the north-west, flowing from the moderately steeply-sloping north side of the main valley. The country is well wooded, principally with lodgepole pine. Outcrops are scarce.

From the main road along the Columbia river there is a fair road up Blaeberry river as far as the Deacon ranch, about 4 miles, thence a rather rough trail leads to the claims.

The rock formation exposed in the vicinity of the workings is a soft, brown, thin-bedded shale, strike from north 45 degrees west to north 75 degrees west, dip steep north-east. There are two open-cuts; the southerly one exposes 3 feet of vein-matter apparently following the bedding of the shale, strike north 70 degrees west, dip 85 degrees north. There is an outcrop of white quartz about 5 feet wide, 65 feet north 70 degrees west from the open-cut. The second cut is 70 feet north 35 degrees west from this outcrop. The north-easterly end of this cut exposes the foot-wall of a rib of white quartz 5 feet wide traceable 10 feet north-westerly and 30 feet south-easterly from the cut. In the cut, 3 feet from the foot-wall (south-west) of this quartz, are 4 inches of vein-matter, and from 8½ to 10 feet south-west of the quartz is another 2½ feet of vein-matter. This 5-foot quartz-band and the two narrower bands also appear to follow the bedding, strike north 45 degrees west and dip steeply to the north.

White quartz is the principal vein material and is practically unmineralized. There is also some calcite and some inclusions of chloritic wall-rock, which show a little iron-stain.

Three samples were taken: (1) Consisting of 10 lb. of material obtained by taking several chip cuts across the 5-foot quartz-band at the second cut; (2) a sample of the 2½-foot vein in the second cut consisting of quartz, calcite, and some included wall-rock; (3) selected material, principally rust-stained calcite and altered wall-rock, selected from the two cuts. All were assayed for gold and silver, the assay being *nil* in all cases.

The country was examined on both sides and to the south-east of the cuts, also for about half a mile north-west of the second cut. Fairly heavy float was found to 130 feet north-west of the second cut, but at 150 feet north-west on the strike there is an outcrop of shale striking north 70 degrees west and dipping steeply to the north-east. North-west of this point there are no vein-outcrops and very little float of vein material were found.

PROGRESS NOTES.

Smelter Operations.

Consolidated Mining & Smelting Co. of Canada, Ltd., Trail, B.C.—The improved prices for lead and zinc during the year have encouraged increased production at the smelter. Towards the end of the year a daily production of 470 tons of refined lead and 350 tons of refined zinc was reached, which are higher rates of production than have obtained at any time formerly. The silver production reached some 20,000 oz. daily. New production records for all three metals were established this year. In addition, there were substantial values in gold and cadmium.

The customs mill was in operation part of the year treating Rossland copper-bearing gold ore. The concentrates produced with some crude ore were smelted in a lead-furnace as outlined in the 1933 Annual Report. Copper contained in these ores is separated from the lead bullion by drossing and is sent to Tacoma for final treatment. The copper produced was materially less than in 1934.

Though somewhat less than the output for 1934, production of fertilizers was in good volume despite the fact that there was some curtailment due to the longshoremen's strike at Coast ports.

The principal item of new construction is a plant to recover sulphur dioxide from zinc roaster gases. This plant is expected to be in operation in 1936.

LODE-GOLD DEPOSITS.

Cranbrook Area.

Kimberley Goldfields Consolidated, Ltd.—This company, with forty-six claims on Sawmill creek, drove an adit 50 feet and then suspended operations early in the year.

Little Sullivan.—This property and adjoining claims, staked 3 miles south of Cranbrook by L. P. Sullivan and associates, were prospected by surface work. Two shallow shafts have been sunk.

Midway.—This property, at Aldridge, owned by J. Leask and associates, of Cranbrook, was under bond to B.C. Cariboo Goldfields, Limited, until late in the year. The drift has been extended to a length of about 1,350 feet. Work has been stopped since midsummer.

Southern Kootenay Lake.

Bayonne Consolidated Mines, Ltd.—This company was incorporated under the laws of British Columbia in April, 1935, with an authorized capital of 2,000,000 shares of no par value. The existing tractor-road from Tye Siding was improved and made passable for trucks. New camp and mine buildings were constructed at the mine. Underground work was limited to the removal of a car of ore from No. 1 level for bulk-sampling purposes, and to driving a short crosscut by hand on No. 3 level. Work stopped for the winter in October.

Late in the year Grull-Wihksne Gold Mines, Limited, acquired an interest and direction of the company and made preparations for resuming work.

Wisconsin.—Development at the *Wisconsin* and *Lucky Strike* Crown-granted claims located on Hughes creek, a tributary to Midge creek some 13 miles from the Canadian Pacific Railway siding at the mouth of Midge creek, was financed by A. C. Frost, of Seattle. The same interests have agreements covering near-by claims not yet Crown-granted. A description of this property appeared in the Annual Report for 1929 and in Bulletin No. 1, 1932, "Lode-gold Deposits of British Columbia."

E. W. McQuade was in charge at the property. Work began in June and ceased for the winter on October 22nd, a crew of sixteen men having been employed. The trail was reopened and a small compressor, oil-engine, and hoist were installed. The winze on No. 1 level was deepened from 64 to 151 feet and a station was cut at 150 feet. A heavy flow of water was encountered in the winze.

Vicinity of Nelson.

Many small properties were operated, usually by lessees, including Anderson Creek, Evening Mountain, and Toad Mountain areas, and ten properties made small shipments of ore or concentrates to Trail. Two of these exceeded 50 tons; G. T. Gormley, leasing the *Venus-Juno* group, shipped 93 tons and the *Granite-Poorman* shipped 233 tons of ore and 11 tons of concentrates. Between Nelson and Ymir the *Euphrates* shipped 24 tons, the *Fern* 2 tons, and the *Porto Rico* 32 tons. Lessees operating at the *Porto Rico* shipped two car-loads of ore in 1934 and one in 1935.

Granite-Poorman.—At this property, west of Nelson, the mill is now reconstructed at a site convenient to an adit designed to be connected with the *Hardscrabble-Poorman* workings at the 300 level. Work on the adit has been suspended for some time.

The *Hardscrabble* and *Poorman* workings have been unwatered and connected by completing a crosscut on the 300 level (300 feet on the slope below No. 4 level).

At the *Granite* mine recent work has had as its object the solution of fault problems. The mill was given a test run this autumn. During the year approximately 201 tons of ore and 11 tons of concentrates were shipped to Trail.

Fern.—This property consists of five claims located on the south side of Hall creek, about 3 miles by road from Hall, on the Nelson–Salmo road. The property is described in Geological Survey of Canada Memoir 94, also in the Annual Reports for 1896, 1915, and 1927, and in Bulletin No. 1, 1932, "Lode-gold Deposits of British Columbia."

Last year, according to the prospectus of the Gold Fern Mines, Limited, an assignment of option for lease and purchase of the property was secured.

In 1934 a crosscut was started some 800 feet below No. 4 level and driven about 160 feet when work was suspended. In 1935 work was resumed under the management of Neil

McKechnie, consisting of surface prospecting and cleaning out old workings, with the result that not far south-east from the portal of No. 1 level the "B" vein has been exposed for a length of 110 feet.

A new adit-crosscut, No. 5, started 150 feet in elevation below, was driven 50 feet of an estimated 150 feet required to reach the vein. Two tons of oxidized vein-matter was shipped to the smelter at Trail from a vein exposed near an old winze 120 feet east of No. 3 portal and from a narrow fissure above No. 1 level. All work was suspended in December.

Vicinity of Ymir.

Gold Cup.—The Gold Cup Mining Company, Limited (private), of which E. R. K. Waite is president, held twenty claims, including three which are Crown-granted, situated about 4 miles north of Ymir and 1 mile due east from the main road. The workings and camp are at an elevation of about 5,000 feet. An old shaft and an adit-level on the *Ohio No. 7* claim were reported on in Memoir 94, Geological Survey of Canada. The present operators opened and did some work in the old adit.

About 1,750 feet north-west from the old adit a crosscut was started and driven about 330 feet on a course of south 72 degrees east to test the downward extension of a quartz-lens outcropping 160 feet above. A tractor-road was built to the property and new camps and mine buildings have been erected. Work ceased in the middle of December.

Clubine Comstock Gold Mines, Ltd.—Development at the *Boulder City* group, 3½ miles north of Salmo, was continued during the early part of the year, but the property was shut down during the summer. About 29 tons of ore was shipped to Trail.

Howard.—This property, located on the east side of Active (South fork of Porcupine) creek, about 7 miles by road south-east of Ymir, has been described in various Annual Reports and in Memoir 172, Geological Survey of Canada. It has been bonded to Durango Gold Mines, Limited, of Vancouver, and development-work has been going on more or less continuously since November, 1934.

During the summer a good trail suitable for caterpillar tractors was built from the end of the road on Active creek to the mine. A Sullivan 400-cubic-foot compressor driven by a 72-horse-power Petters Diesel engine has been installed at the mine.

Wesko Exploration and Development Co., Ltd.—At the *Centre Star* mine the 300 level at 3,630 feet elevation and the 560 level at 3,367 feet elevation were started this year and 4,013 feet of drifting and crosscutting done on them, also 1,101 feet of diamond-drilling. A 1,400-cubic-foot Ingersoll-Rand compressor was installed and the upper terminal for an aerial tramway was built near the 560 level portal. Clearing and grading of the proposed mill-site and of the right-of-way for the proposed water-supply line were done in the autumn, though no definite plans for mill-construction have been made. The writer is indebted to the manager, Harold Lakes, for the above information.

Ymir Consolidated Gold Mines, Ltd.—This company, operating the *Ymir* and adjoining *Goodenough* mines near Ymir, shipped 4,260 tons of ore from the *Goodenough* in 1934. A new mill of 100 tons daily capacity began operation on July 18th, 1935, and was shut down on November 30th.

The mill made a flotation concentrate containing lead, zinc, and iron minerals which was not very high grade in gold and silver. Freight and treatment charges were accordingly heavy. It is apparent that the ore from the *Ymir* mine was below a profitable grade and ore from the *Goodenough*, although better grade, was more limited in quantity.

Ymir Dundee Gold Mining Co., Ltd.—On this property development-work was continued until summer and the ore obtained in part from development, amounting to 667 tons, was shipped to Trail.

Wilcox.—At this mine work was continued by the lessees, D. H. Norcross, J. J. Cullinane, and associates, between April 1st and November 4th. The following information was kindly supplied by D. H. Norcross: Tons milled, 1,595; recovered as bullion, 466.6 oz. fine gold and 471.7 oz. silver. Concentrates produced, 101.66 tons, containing 161.5 oz. fine gold, 584.2 oz. silver, and 11,526 lb. lead.

No. 1 ore-shoot produced 500 tons of oxidized ore. No. 2 ore-shoot, which averages about 16 inches in width, produced the balance. This ore-shoot in the western section of the mine lies in contact with the roof-pendant where it has spread in a "T" shape.

Ymir Yankee Girl Gold Mines, Ltd.—This company, at Ymir, after shipping fluxing-ore to the Trail smelter for a long period, was equipped with a mill which came into production on January 18th, 1935. The general flow-sheet was described in the Annual Report for 1934. Information concerning milling and production was kindly supplied by the manager, H. W. Seamon. The mill, with normal capacity of 100 tons daily, produced 1,068.9 tons of lead concentrates, containing 5,349.04 oz. gold, 23,141.9 oz. silver, and 529,116 lb. lead, which was shipped to Trail. Cyanidation of the zinc-iron flotation concentrate yielded 2,726.2 oz. gold and 5,153 oz. silver. The cyanide plant precipitate was at first shipped to Trail, but the gold and silver contained are now recovered as bullion at the property.

Mine-development during the year included drifting from a winze sunk below the 1,235 level.

Erie Creek, Nelson Mining Division.

Relief-Arlington Mines, Ltd.—This company during the year at the *Second Relief* mine sank a 2-compartment shaft and established a sixth level 150 feet below No. 5 level. Deepening the shaft was commenced late in November. Recovery to November 7th has been principally in the form of a flotation concentrate shipped to the smelter at Tacoma. Production for the year was 12,998 dry tons milled, containing 4,209 oz. gold.

A new mill was completed and operation began on December 20th, treating 75 tons per day by cyanidation. Waste discarded by sorting amounts to about 25 tons, making a total of 100 tons of mine ore handled per day.

Arlington.—The mine and dump were thoroughly sampled by engineers of the Premier Gold Mining Company; their report is not yet available. Lessees shipped some sorted ore from the mine to Trail amounting to 341 tons of ore, containing 617 oz. gold and 1,439 oz. silver.

Keystone.—F. Golightly, of Erie, with two men sorted ore from the dump on this property, some of which had been stoped earlier in the season; 171 tons was trucked to Trail.

Sheep Creek Camp.

Golden Fawn.—This group, lying on the ridge north of the *Nugget* mine, is referred to in the Annual Reports of the Minister of Mines and in the Geological Survey of Canada Memoir 172.

The Fawn Mining Company, of Vancouver, acquired an option covering the property in 1933. Work was commenced in May, 1935. The old adits were cleaned out and No. 3 was advanced 50 feet.

A road somewhat more than a mile in length was built connecting with the road to the *Reno* mine, also a new camp and a compressor-house and shop.

A Holman steel-sharpener and a Holman 500-cubic-foot air-compressor driven by a Ruston Diesel engine were installed. At present No. 5 level, about 290 feet below 3 level, is being driven from the west side of the ridge at elevation 6,420 feet.

Gold Belt Mining Co., Ltd.—Work on this property in 1935 consisted in extending the drifts on the 200 level, about 85 feet of drifting and crosscutting on the 600 level, and raising 130 feet on the *Bruce* vein at a point west of the main crosscut on the 600 level. Three drill-holes totalling approximately 2,400 feet were put down from the 600 level. The 1,850, a deep-level adit 1,250 feet below the 600 level, has been driven 700 feet. The old drift on the *Columbia* vein has been advanced about 80 feet. Preparations have been made to crosscut this vein at a depth of 125 feet below the drift.

A branch road about half a mile long was built to the 1,850 level portal from the main road west of the *Reno* mill. A shop, compressor-house, and change-house were built on sites convenient to the portal as well as a new camp accommodating forty men.

Kootenay Belle Gold Mines, Ltd.—J. P. McFadden, manager of this mine, kindly provided the following information: This year's No. 3 level adit-crosscut was driven 350 feet in elevation below No. 2 level. At 1,076 feet from the portal the crosscut intersected the "A" vein. A supply-tram has been built from the road to No. 3 level and an aerial tramway to transport ore from No. 3 level to the mill has been completed. The *Kootenay Belle* mill began operations in November, 1934. Recovery is in the form of corduroy-blanket concentrates and flotation concentrates shipped to Trail.

The Hadsel mill treats mine ore and delivers a product about 87 per cent. minus 200 mesh. About 45 tons of ore daily has been milled averaging about 0.43 oz. gold per ton. Total ore treated was 14,650 tons, from which 5,845 oz. gold and 2,207 oz. silver were recovered.

Reno.—This mine is under the management of W. S. Ellis, who kindly provided the following information: The 521 sub-level drift west was extended and encountered an ore-shoot 157 feet long and 2.4 feet wide. Development consisted chiefly of drifting on Nos. 7, 8, and 9 levels. On the seventh level west and the eighth level east ore was found beyond the recently known limits. Development on the eighth and ninth levels will be stopped pending shaft-sinking to the tenth and eleventh levels. In the meantime, recently developed ore on No. 5 level will be stoped.

Development was done at the *Nugget* mine, which, in conjunction with the *Motherlode*, is owned by Reno Gold Mines, Limited. At present the *Nugget* drift at the No. 5 level is being extended to explore the *Nugget* vein in the eastern Quartzite belt.

During the year 39,862 tons of ore was milled, containing 21,579 oz. gold, 10,092 oz. silver, and accompanied by lead and zinc.

Sheep Creek Gold Mines, Ltd.—This company commenced production at the old *Queen* mine on May 20th, 1935, in its new cyanide-mill and from 125 to 130 tons has been treated daily. The following notes were kindly supplied by the manager, H. E. Doelle: With the exception of a small tonnage from the west ore-shoot above No. 5 level, the ore was mined from the east shoot, mostly from above No. 7 level. Development for the year comprised 315 feet of sinking, 319 feet of raising, and 2,061 feet of drifting and crosscutting. Most of the drifting was done on No. 8 level and the east ore-shoot proved for 420 feet. The vein was found on the west side of the *Queen* fault on No. 8 level, but not developed. The west ore-shoot was developed by drifting on Nos. 3, 5, and 7 levels. To the end of the year production totalled 28,197 dry tons of ore, containing 9,081 oz. gold and 2,517 oz. silver.

Ore Hill.—This property, consisting of five Crown-granted claims and fractions situated near the head of Billings (Coon) creek, immediately north of the *Summit* group, is reached from the end of the road at the *Queen* mill by following about 2½ miles of rather steep trail. References appear in the Annual Report for 1917 and in Memoir 172, Geological Survey of Canada. Joe Gallo, of Nelson, has acquired a lease and bond on the property. In the summer, after improving the trail, a small crew prospected the property, also sorted some shipping-ore from two new showings and from an old adit dump.

In the autumn arrangements for financing were made and toward the end of the year an adit was started to intersect a new discovery at a depth of 100 feet, the estimated length of the drive required being 320 feet. No ore had been shipped at the end of the year.

Pend d'Oreille River Area.

Bunker Hill (Waneta).—This group consists of two Crown-granted mineral claims, the *Bunker Hill* and *Mormon Girl*, and fourteen adjoining claims held by location. They are on the east side of Limpid (16-Mile) creek, a tributary of the Pend d'Oreille river. The property has been fully described in the Minister of Mines' Annual Report for 1934. Early in the season a crew of men was engaged in making preparations for the construction of a road from the camp to the adits and surface workings and for the driving of a new low-level adit.

Rossland Camp.

Ores of this camp are valued chiefly for their gold content. Silver is also present, usually with low values in copper. In a few cases there are quite high values in silver with moderate values in lead.

Company Leases.—With a view to providing employment for residents of Trail and Rossland who were former employees of the company, then unemployed, the Consolidated Mining and Smelting Company of Canada in 1933 offered sections of its mining properties in the vicinity of Rossland for lease. Production from these leases and from independent mines in the vicinity reached very considerable proportions, exceeding the volume of such ore which could be handled economically at Trail, and resulted in the accumulation of Rossland ore in the yards at the smelter.

In order to reduce the rate of production to a volume which could be handled economically at the smelter, new leases were granted in 1935. These provide that those employed must be

former employees of the company resident in Rossland or Trail and the production per lease is limited to a maximum of 25 tons each month. The quantity of similar ore from independent shippers accepted per month is also limited.

The effect of this policy at Rossland will be to restrict the benefits of employment to otherwise unemployed residents of Rossland and Trail who are former employees of the company and will increase the time during which such employment will be possible.

Production by lessees at the Rossland mines of the Consolidated Mining and Smelting Company for the year 1935 was approximately 32,900 dry tons, containing $680,000 gross value in gold and silver, for which the settlements amounted to $480,000 after freight and treatment charges had been deducted. The value which the silver content contributes to the amount is small.

Approximately 120 individuals and partnerships, leasing sections of company mines, made shipments to the smelter. Part of this number is due to rearrangements of partnerships which were frequently composed of a number of miners. Before the new leases were granted lessees in some cases hired a number of employees.

In the last quarter lessees shipped a total of 2,650 dry tons, having a gross value of $67,480 in gold and silver and a net value after deducting freight and treatment of $50,560. This is about one-fourth of the average for the earlier periods. The number of shippers was sixty-one, while the quantity per shipper averaged much less than in the earlier periods. It is understood that approximately fifty men were working on company leases at the end of the year.

Independent Shippers.—In the vicinity of Rossland fourteen properties working in most cases on a leasing basis made shipments to Trail. The total from these independent shippers was 1,600 tons, as against 1,036 tons from eleven shippers in 1934. The 1935 shipments are listed below.

Mine.	Tons of Ore shipped.	Mine.	Tons of Ore shipped.
Bluebird	49	*Lily May*	24
Cliff	247	*Mayflower*	90
Evening Star	624	*Midnight*	95
Georgia	4	*O.K.*	55
Hattie	9	*Silverine*	22
I.X.L.	165	*Ural*	4
Jumbo	196	*Mighty Midas*	16

Fire Valley, Arrow Lake Mining Division.

From the *Paladora* group, consisting of three claims about 27 miles north-west from Edgewood by road, S. P. Pond shipped 60 tons of ore averaging 0.78 oz. gold and 3.9 oz. silver per ton.

Slocan Area.

L.H.—This property comprises the following Crown-granted mineral claims: *L.H., Harlem, Baby Ruth, Camden, C.B., St. Joe, Bain Fraction,* and *Summit.* The property is at the head of Vevey (L.H.) creek and is between elevations of 5,200 and 5,600 feet. The geology and mine-workings have been adequately described by C. E. Cairnes in Memoir No. 184, published in 1935 by the Bureau of Economic Geology, Department of Mines, Ottawa. Work has been temporarily suspended on the property.

Lardeau Area.

Meridian Mining Co., Ltd.—This company has continued mining and milling operations on its consolidated groups of claims at Camborne. However, most of the work during 1935 was confined to mining and milling ore from the *Criterion* vein as exposed in the *Criterion Nos. 1* and *2* in the Rossland adits.

Breaking of ore in the stopes in the above-mentioned levels ceased in November and a programme of development-work was initiated. It is understood that the programme is to crosscut north-eastward from the *Criterion No. 2* adit to the *Eva* shear; to drift on this and raise to the upper workings of the *Eva.* Since November ore for the mill has been obtained by drawing from the stopes.

Silver-Gold Deposits.

Slocan Valley.

Shipments of crude ore valued for its gold and silver content were made to Trail during the year from the following properties in the vicinity of Slocan City:—

	Tons of Ore shipped.
Lemon Creek-Springer Creek area—	
Chapleau	50
Meteor	17
Port Hope	1
North of Slocan City—	
Gold Viking	7
Republic	65
White Hope	16

Dry Silver-ore Deposits.

Slocan Camp.

Dry silver ores—that is, siliceous ores with values in silver but comparatively little lead—were produced principally from the vicinity of Slocan City. They are also produced at other points in the Slocan camp. Usually the dry ores come from veins in or near the Nelson batholith.

Ottawa.—This property, consisting of twenty-one claims on Springer creek owned by the Consolidated Mining and Smelting Company of Canada, is under lease and bond to a Spokane group represented by W. R. Green. The latter, with three or four men, built a new camp and has been engaged in reopening and retimbering No. 5 level. The property is described in Geological Survey of Canada Memoir 184 and various Annual Reports; that of 1921, by A. G. Langley, being of especial interest. The following paragraphs are quoted from Langley's report:—

"The ore deposits occur in a sheared fissure in granite. The character of the ore-bodies would indicate that they owe their origin to replacement by the circulation of mineral-bearing solutions or vapours through small channels and filling interstices in the sheared material between the walls of the fissure, and that continuity might be expected with depth.

"The ore occurs in lenses of considerable dimensions, the stoping-width being as great as 8 feet. The ore is essentially a 'dry' silver ore consisting of argentite with which is occasionally associated small leaves of native silver, the latter, no doubt, being of secondary origin. The gangue is quartz and country-rock. In places barytes is the predominant gangue and is invariably associated with high values. It is both a difficult ore to sort and to recognize underground, as often lean-looking material will run well in silver.

"In the past only the highest-grade ore was shipped owing to the difficulties presented by the concentration of the silver minerals. Hence the dumps contain some high-grade and a considerable tonnage of second-grade ore, while there is a possibility of winning a fairly large tonnage of mill-feed from the old stope fillings.

"The fissure dissects the hillside in a northerly and southerly direction and dips at 37 degrees to the east. The mine has been opened by five adit-tunnels at vertical distances of 100 feet. The uppermost, or the No. 1, is the old original prospect-tunnel and is no longer of any consequence. The Nos. 2, 4, and 5 are in good condition and the No. 3 is caved. Below the No. 5 there is still another level, the No. 6. This does not come out to the surface and is now full of water. It is interesting to note that the ore-shoots showed a marked increase in size as depth was gained. The ore has been stoped out above the No. 5, although there are places from which small tonnages can be mined, while further prospecting on the hanging-wall side may reveal the presence of parallel shoots. By a rough estimation the dumps contain about 25,000 tons in which the values are bound to be spotty. In order to arrive at an estimate of the tonnage suitable for mill-feed, extensive and costly sampling would have to be undertaken. Shipments made so far have been encouraging; for instance, 700 tons shipped in 1919 averaged 19.8 oz. in silver, while another 700 tons recently treated by the mill averaged 12 oz. in silver."

As certain rather optimistic reports concerning the ore reserves at this mine have been circulated, it is considered advisable to mention that the official production figures from 1903 to 1934 were 6,448 tons, containing 764,650 oz. silver and 750,540 lb. lead; there was no production between 1926 and 1934. The total tonnage given includes ore removed from the dump.

In Geological Survey of Canada Memoir 184, Cairnes says: "In 1921, 1,440 tons of mill-feed averaging less than 5 oz. in silver were extracted. Production of all other years has been of higher-grade material and has, exclusive of 1921, amounted to 4,758 tons of ore with an average content of 159 oz. of silver a ton." From this it would appear that the total of crude shipping-ore taken from the stopes amounted to 4,758 tons. It is quite improbable that in mining this quantity of shipping-ore any very large tonnage of second-grade ore could have been left in the stopes.

Crude Ore.—Shipments of crude ore, usually from leasing operations, were made to Trail from the following properties. Of these properties the *Molly Hughes* at New Denver produces ore carrying important values in gold.

Section and Mine.	Tons of Ore shipped.
Springer creek—	
Alma	2
Cub	9
L.T. (also known as *Olympic*)	6
Morning Star	4
Riverside	3
Enterprise creek—*Buster*	2
Silverton—*Metallic*	23
New Denver—*Molly Hughes*	61
Kane creek (Three Forks)—*Black Grouse*	11

Silver-Lead-Zinc Deposits.

Cranbrook Area.

Sullivan.—The Consolidated Mining and Smelting Company of Canada, Limited, continues to be the most important factor in the economic life of the East Kootenay district and during the autumn brought this property to peak production. Total production for the year amounted to 1,861,245 tons, comprising 1,859,171 tons of lead-zinc ore shipped to the concentrator at Kimberley and 2,074 tons of crude lead ore to the smelter at Tadanac, an increase of 112,844 tons over the production of 1934. During the year the mine worked 278 days, the coarse-crushing plant 281.5 days, and the concentrator 312 days. The concentrator treated 1,859,221 tons, an average of 5,959 tons per day, and produced 226,837 tons of lead concentrates and 209,078 tons of zinc concentrates.

An interesting feature in this year's operations is the filling of "K stope" with boulder-clay from the surface. This is an initial and, to some extent, an experimental step in the programme designed to make possible recovery of the large tonnage of ore in mine pillars.

Dibble Mines, Ltd.—This company, promoted in Calgary by G. M. Wittichen, employed two or three men during the season, driving a crosscut 180 feet into the hill at 6,500 feet elevation. The *Dibble* group lies in a basin 4½ miles by steep pack-trail from the end of a branch road 10½ miles south-easterly from Fort Steele. Years ago there was some production of silver ore from small scattered quartz-lenses in schist exposed on the surface.

Sirdar.—This claim, leased by a Calgary syndicate represented by W. W. Douglas, is reached by a branch from the road to Bull River power plant, some 21 miles south-east from Fort Steele by road. A shaft sunk this year to a depth of 24 feet was full of water when the property was visited. This shaft prospects a showing which at the surface is 12 feet wide consisting of quartz containing fragments of limy wall-rock and bunches of sulphide mineralization, principally pyrite with some galena.

Pend d'Oreille River Area.

Michaely Silver Lead Co.—This company, operating the property formerly known as the *Red Rock* group, on the north side of Salmo river, shipped 35 tons of silver-lead ore to Trail.

Slocan-Ainsworth Camp.

Western Exploration Co., Ltd.—This company owns the *Mammoth* mine and the *Standard*, adjoining it on the west. The *Mammoth* has been developed on seven levels, a flotation-mill built at Silverton, and a tramway from the mine to the mill when operations were suspended in 1930. Geological Survey of Canada Memoir 184 and the Annual Reports for 1926, 1928, and 1929 describe the mines and the new mill. During the past few years lessees shipped some ore from both mines and are still working in the *Standard*.

In the past summer the property was reopened under the management of A. M. Ham. Milling was commenced in July. After tuning up the mill and doing initial work at the mine a daily production of about 100 tons was reached. Lead concentrates were at first shipped to Trail and later to Europe.

Fisher Maiden.—This property, consisting of the *Fisher Maiden* and *Troy* Crown-granted claims on Silverton creek, about 8 miles by road and trail from Silverton, is owned by the Fisher Maiden Troy Mining Company. References are Geological Survey of Canada Memoir 184 and Annual Reports for 1896, 1904, and 1926.

The property had been idle for several years until the summer of 1935, when, financed by subscriptions from the larger shareholders of the company, some work was undertaken by J. L. Prickett and a small crew. The old route up Silverton creek was reopened and in part relocated. A good log cabin was built at the mine. No. 5 level on the *Fisher Maiden* vein was cleaned out and retimbered from the surface to caved ground encountered farther in. A shipment of 9 tons of ore was made to Trail.

Monitor.—The Slocan-Monitor Silver Mines, Limited, to which reference is made in the Annual Report for 1934, began work at the property with a small crew in June, 1934. Recently it was decided to install a portable compressor and a machine-drill. Three short raises have been put up from No. 5 level and the drift has been advanced 200 feet. Recently No. 4 fault has been crossed and it is hoped that the vein will shortly be picked up beyond. In the upper levels a good ore-body was worked beyond this fault.

Noble Five Mines, Ltd.—This company, of which Paul Lincoln is president and manager, resumed operation of its property at Cody in the spring. In June the mill began operations after a five-year shut-down. Operating on day shifts the plant milled about 30 tons daily. Ore was mined on the 1,800 and 800 levels. Work was stopped again in the late autumn when a cold snap caused difficulty with the water-power supply.

Ross Mining Syndicate (N.P.L.).—The Ross Mining Syndicate, Limited (N.P.L.), leased the *Wellington* mine, part of the *Whitewater* mine at Retallack, and the *Rambler-Cariboo* mine in McGuigan basin. The tramway from the old *Rambler* mill in the basin to a newer mill on Seaton creek was reconditioned. Tailings from the old mill were trucked and trammed to the *Whitewater* mill, which treated 80 tons daily until early in December. Concentrates averaging about 50 per cent. lead and 80 oz. silver per ton and zinc concentrates averaging about 50 per cent. zinc and 27 oz. silver per ton were shipped both to Trail and to Europe.

Development was done by hand on the *Wellington* group. At the *Whitewater* mine a 100-foot raise was put up from No. 10 level and 150 feet of drifting was done on a cross-fracture on No. 14 level. Some ore from the *Whitewater Deep* workings was milled during the year.

Lucky Boy.—This group of three claims held by annual recording of assessment-work and owned by Charles Lind, of Kaslo, is situated on the south side of Kaslo creek, 14 miles from Kaslo on the railway, and lies immediately east of the *Contact* group, owned by A. J. Curle. The claims cover benches along Kaslo creek.

Exploration consists of surface-trenching and an adit 75 feet long, from which a branch drift commencing at a point 35 feet from the portal has been driven to the contact of limestone and thin-bedded argillaceous sediments. Some massive galena and sphalerite is developed in the limestone.

Burton, Arrow Lake Mining Division.

Black Bear.—This property, adjoining the *Millie Mac* and the *Great Western* properties and owned by H. E. Forster, of Wilmer, is reached by 4½ miles of steep pack-trail from the end of the wagon-road near the Blue Grouse creek on the north side of Caribou creek.

C. Marshall and C. A. Marshall, of Burton, have done surface work in the past two seasons, consisting of cuts exposing a shear-zone which appears to be the same as that upon which the *Millie Mac* and *Black Bear* underground workings and the open-cuts at the *Great Western* are located.

Eureka.—This group consists of two claims, *Eureka No. 1* and *Eureka No. 2 Fraction*, held in the names of Annie Prough and R. H. Brett, of Burton, which extend southerly from Caribou creek at a point some 15 miles by road and trail north-easterly from Burton. The camp is on a low bench on the north side of Caribou creek. South of the creek the closely timbered side of the valley rises steeply from a low bench a few feet above creek-level. John Prough and Walter Isaacs have been driving No. 2 level by hand. Three adits have been driven south-westerly on a graphitic shear-zone in limestone from the western side of a small stream: No. 1, elevation 4,100 feet and 1,500 feet from Caribou creek; No. 2, elevation 4,280 feet; and No. 3, elevation 4,350 feet.

Crude Silver-lead Ore, usually produced by lessees, was shipped from numerous properties to the smelter at Trail. G. H. Grimwood, of Nelson, representing Ayerton & Cohen, of London, England, supplied information that ore from the *Banker*, *Jackson*, and *Whitewater* mines had been exported to Europe. The following list gives the names of properties and amount of crude ore shipped during the year; 163 tons from the *Banker*, 10 tons from the *Jackson*, and 30 tons from the *Whitewater* were shipped to Europe. The other shipments went to Trail. Ore from the *Western* at Three Forks carried important values in gold. Ore from the *Bosun* mine is frequently high in zinc. The shipments from the *Bosun* include ore won by jigging material from the dump.

Section and Property.	Tons of Ore shipped.
Springer creek—*Dayton*	4
Silverton-New Denver—	
Bosun	343
Cliff	16
Comstock	3
Fisher Maiden	9
Hewitt	7
Lucky Thought	190
*Mammoth**	62
Mountain Chief	64
Shannon	5
Standard	179
Three Forks-Sandon-Cody—	
Black Colt	180
Canadian group	22
Ivanhoe	29
Palmita	213
Payne	2
Reco	5
Rio	14
Ruth-Hope	233
Victor	64
Western	17
Wonderful	1
Ainsworth-Kaslo-Retallack—	
Banker	163
Daybreak	33
Jackson	10
Utica	5
*Whitewater**	49

* Also shipped concentrates.

PLACER-GOLD DEPOSITS.

Golden M.D.—Six dredging leases near Wood river, 90 miles north-westerly from Golden, were located in the fall by a Toronto syndicate and some prospecting and testing done on the ground with bore-holes. Prospecting on placer-ground was reported on Canyon creek and also on Quartz creek at Beavermouth.

Windermere M.D.—Placer-mining or prospecting was done on seven leases located on Findlay, Toby, and Dutch creeks.

Fort Steele M.D.—Placer operations were under way during the season on Perry, Sawmill, Palmer Bar, and Wild Horse creeks and Skookumchuck and Moyie rivers, and a number of small operators have been active. The total production from this area was 640 oz. placer gold. On Perry creek a Calgary syndicate undertook to drive to bed-rock, but work was stopped by the breakdown of their water-wheel. Driving of rock drifts was undertaken on Boulder creek by W. A. Drayton and on Moyie river near the falls by James Ewen and Dave Oscarson.

Nelson M.D.—On 49 creek there was some activity from which a recovery of 5⅔ oz. gold was reported. During the low-water period "snipers" were active along the Pend d'Oreille river below the mouth of the Salmo river. Late in the year a considerable amount of interest was taken in the ground along the lower Salmo river, where in a short time two men recovered 27 oz. gold from two 250-foot leases. Recovery of 1 oz. was reported from Erie creek.

Arrow Lake M.D.—West of Whatshan lake, on Holding creek and on Eureka creek below the mouth of Holding creek, four men working on three leases recovered 6 oz. gold. Holding creek is a tributary of Barnes creek.

Slocan City M.D.—Recovery of 4 oz. gold was reported from placer operations on Lemon creek.

Ainsworth M.D.—On the Duncan river four placer-miners recovered 30.8 oz. gold. On Fry creek 8 dwt. 7 gr. placer gold was recovered.

Revelstoke M.D.—There was, as usual, some "sniping" along the Columbia river and on other streams. Coughlin Gold Mines, Limited, operated the *Theda Bara* group of five leases on Camp creek, about 3½ miles easterly from the road and 60 miles north from Revelstoke. A drag-line scraper operated by a steam donkey-engine was used in excavating for sluices and in moving top gravel. Preliminary work was still in progress when the property was visited at the end of August. It is understood that L. N. Remillard is doing some drifting during the winter on leases recently relocated on French creek.

PART F.

WESTERN MINERAL SURVEY DISTRICT (No. 6).

BY

B. T. O'GRADY.

GENERAL SUMMARY.

During the period under review most of the mining activity in the Western Mineral Survey District was concerned with lode-gold exploration, development, and production. District No. 6 includes the following eleven Mining Divisions: Victoria, Alberni, Clayoquot, Quatsino, Nanaimo, Vancouver, New Westminster, Yale, Ashcroft, Clinton, and Lillooet. No first-hand information was obtained on the numerous activities outside the areas visited. Productive and exploratory operations in the Bridge River camp continue to provide employment for a large aggregate number of men. Work was suspended at some of the outlying properties, promoted during the boom period, due to lack of funds or other reasons, but geological investigations which have been made may lead to resumption of work in some cases. Prospecting by individuals, partnerships, and syndicates was generally actively conducted throughout the district.

LODE-GOLD DEPOSITS.

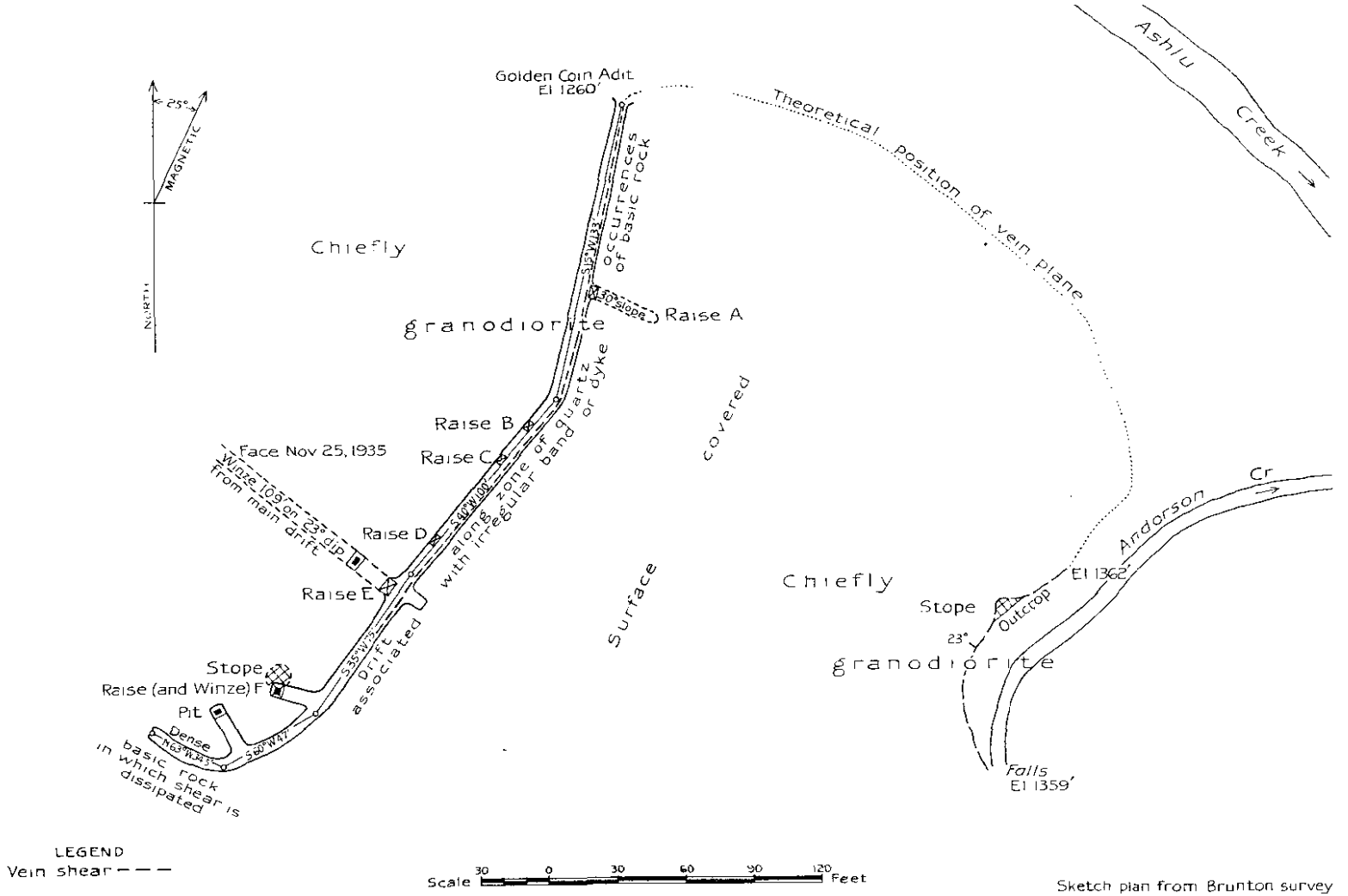
SQUAMISH DISTRICT.

Ashloo Gold Mining Syndicate.

The property of this syndicate consists of the *Golden Coin*, *Robbie Burns*, *Highlander*, *Devonian*, *Derby*, *Petro*, *Fonk*, and *Grandview* mineral claims, formerly known as the *Gold Coin* group. There are also eight adjoining claims, held in trust for the syndicate, which are recent stakings. All the claims are held by location. The property adjoins Ashlu creek, a tributary of the Squamish river, at a point about 8 miles north-west of the junction, and therefore in the Vancouver Mining Division.

Access to the property is had, first by motor-road, about 22 miles in length, from Squamish to Upper Squamish, where there was formerly a bridge over the Squamish river. This was demolished many years ago and the crossing of this very wide and locally swift stream is now made by boat. From the western bank a wagon-road about 2 miles in length connects with the packer's camp, from which a wide trail 6 miles long extends to the mine camp. Transportation improvements made by the syndicate during 1935 include: Widening and partial reconstruction of the trail; repairs to the 2-mile section of old wagon-road, with replacement of the bridge over Ashlu creek; and the building of a 116-foot-span suspension bridge to connect mine-workings and buildings on opposite sides of Ashlu creek. When it becomes necessary the Squamish River crossing could be improved without great expense by the installation of a ferry operating on an overhead cable utilizing the swift current. The road from the western bank of the river, at elevation of 150 feet above sea-level, to the packer's camp at 175 feet elevation, crossing Ashlu creek en route, passes over level forested lands and flats to the foot of the mountain. Thence the trail, running diagonally towards Ashlu creek, climbs in a length of 1.75 miles to the summit of the divide at 1,750 feet elevation. From this point it continues north-westerly along the high ground sloping to Ashlu creek for 4.25 miles, gradually descending to the mine camp at 1,375 feet elevation. The obvious route for the trail would be to follow Ashlu creek more closely, but this is stated to involve considerable expense due to the steep, rocky, and rugged nature of much of the ground. For extended use partial relocation of the existing trail route would be desirable to eliminate unnecessary steep pitches and adverse grades.

Resembling the general topography of the Coast range, the local relief is rugged, with steep slopes flanking Ashlu creek, which, opposite the *Golden Coin* workings, flows through a canyon about 50 feet deep and 75 feet or more in width. Its two tributaries in the immediate vicinity, Pykett and Andorson creeks, also follow gorge-like courses, though not so deeply cut as Ashlu creek. Locally, all three streams have steep gradients, that of Ashlu creek approxi-



Ashloo Gold Mining Syndicate. Sketch-plan of Golden Coin Workings.

mating 10 per cent. Approaching their junction with the latter stream, which is a considerable torrent, Pykett and Andorson creeks, with comparatively small flows, descend steeply in falls and cascades. The Ashlu Creek drainage area includes fine stands of commercial timber, large areas adjoining the mining property having formerly been held as timber limits. The principal trees in the immediate vicinity are fir, cedar, hemlock, and balsam. Occasional firs and cedars are up to 6 feet or more in diameter. Ample timber is therefore conveniently situated for all possible mining or construction requirements.

The Ashlu Creek area has not been mapped geologically, but from reconnaissance-work along the line of the Pacific Great Eastern Railway to the east and along Jervis inlet to the west it is seen to be well within the Coast Range batholith. The Coast Range batholith is not by any means a continuous area of granitic rocks, but contains many roof-pendants, some of great extent.

On the claims under discussion granitic rock types include a light- to medium-coloured fairly coarse-grained granite, and a granodiorite, a darker rock containing a large percentage of ferromagnesian minerals. The former appears locally as dykes and small areas within the latter. The mineralized quartz deposits are intimately associated with a narrow zone of dark, basic, fine-grained highly altered rock traversing the granodiorite. Its relation to the lighter granite, which adjoins it on the hanging-wall side at points in the *Golden Coin* drift, is not known. Samples of this dark rock in or along which the deposits occur were found to show igneous characteristics in some specimens, the suite in general strongly suggesting contact phenomena whereby a hybrid rock such as is formed along a contact phase of granitic rock has been produced. At one point on Pykett creek this rock resembles a dyke-structure, 6 to 8 feet wide, on the hanging-wall of the quartz-showing, granitic rock being exposed on the foot-wall. In the adit on the *Golden Coin* claim similar dark basic material forms the wall-rocks, but, as far as noted, lacks any definite structure, being distributed in irregular outline on one or both walls or as inclusions in the quartz, and generally blending with the surrounding granitic rocks without any definite lines of demarcation. The deposits consist of quartz, with adjoining or included wall-rock, mineralized with pyrite, chalcopyrite, and occasionally pyrrhotite in irregular bunches, masses, and dissemination, generally where the gangue is fractured. Gold values fluctuate with the percentage of sulphides present and appear to be associated with pyrite rather than with chalcopyrite. Where sulphides are absent assays show little or no gold values.

Large sampling operations would be necessary to determine average values in the *Golden Coin* ore-shoot area. In the *Golden Coin* adit the quartz-zone, the total width of which is not fully exposed, is developed in bands, lenses, and stringers along the hanging-wall side of a shear.

On Pykett creek the apparent extension of the *Golden Coin* deposits occurs chiefly as continuous bands of quartz developed along a well-defined fissure. The strike of the fissure varies from southerly on Pykett creek to south-west on the *Golden Coin*. The dip averages about 23 degrees to the west, though in the latter workings there are local rolls and approximately horizontal attitudes.

Originally known as the *Golden King* group, staked in 1923, the *Golden Coin* property was acquired by the present syndicate in 1934. References to the *Golden King* and *Golden Coin* are contained in the Reports of the Minister of Mines for 1924, 1925, 1926, 1927, 1930, 1932, and Bulletin No. 1, 1932, "Lode-gold Deposits of British Columbia."

In describing the surface and underground workings the *Golden Coin* and Pykett Creek areas will be dealt with separately.

Golden Coin.—The outcrop along the western side of Anderson creek is at an elevation of from 1,359 to 1,362 feet, or practically horizontal. On the hanging-wall side of a strong shear, quartz bands and stringers, in a zone 32 to 37 inches wide, are exposed over a length of 106 feet. At the southern end the outcrop is covered where it goes under a vertical bluff over which Anderson Creek cascades. Continuing northerly from the falls, at the foot of which the quartz, in bands and stringers, is under shallow water, there is a stope between points 67 and 80 feet from which a shipment was made in October, 1934, of 5.9 tons, assaying 3.40 oz. gold per ton. This stope is 8.5 feet down on the dip and from 32 to 34 inches wide. Between chainages 80 and 106 feet the quartz-showing is up to 37 inches wide. Northerly from the latter point quartz is not much in evidence, giving way to crushed siliceous material along the foot-wall shear which continues for 50 feet along the trail, cut out of the

canyon-wall, to where it is hidden by overburden. Sulphides, which are abundant along the edges of the stope, occur in sparse disseminations through the quartz to the north and south of the stope.

The outcrop is exposed again at the portal of the *Golden Coin* adit, elevation 1,260 feet. From this point a drift extends along the mineralized zone partly developing an ore-shoot below the stope on the Andorson Creek outcrop, the backs measured along the dip being over 230 feet.

The relationship of the surface and underground exposures, with details of the adit-workings, are shown on the accompanying plan. Referring to this and chaining in feet southerly along the adit from the portal, general conditions are as follows: From 0 to 83 feet (raise A) the quartz-showings, crushed and broken, occur irregularly in bands, patches, and stringers, with inclusions and partings of rock. Raise A, 31 feet up, measured along the local dip of 30 degrees, exposes irregular small patches of quartz with discontinuous quartz stringers up to 4 inches wide sparingly mineralized with scattered pyrite. A little southerly from raise A the quartz shows more continuity and mineralization. At chainage 103 feet, on the western side of the drift, there is from 33 to 42 inches of quartz showing small scattered patches of pyrite. On the eastern side of the drift, between raise A and chainage 103 feet, there is a zone of quartz stringers from 20 to 30 inches wide, including a continuous hanging-wall band, from 3 to 10 inches in width, in which iron and copper sulphides are concentrated. At chainage 121 feet, on the eastern side of the drift, against the hanging-wall, the quartz is 20 inches wide, with fairly abundant iron and copper-sulphide mineralization, occurring in small patches and irregular disseminations. At this point a selected sample gave: Gold, 0.93 oz. per ton; silver, 1 oz. per ton; copper, 0.6 per cent. Quartz is also showing in the roof; its full width, here as at other points, is not exposed in the drift. At chainage 133 feet, where the drift bends south-westerly, there is 50 inches of quartz well mineralized with areas of massive pyrite and small scattered sulphide aggregates, and a sample across 44 inches assayed: Gold, 0.62 oz. per ton; silver, 0.6 oz. per ton. At chainage 148 feet, raise B, 5 feet up, exposes quartz, 16 inches wide, containing disseminations and small masses of pyrite. Between raises B and C the quartz is in the roof or hanging-wall side and not exposed in the drift. At raise D, chainage 212, the quartz is again well exposed in the roof. This raise, up 5.5 feet, shows a 62-inch width of quartz, including, towards the foot-wall side, a band 6 to 12 inches wide, well mineralized with pyrite. In other parts of this showing the pyrite is sparsely disseminated. In the drift between raise C and chainage 182 feet there is no appreciable amount of quartz, but between the latter point and raise D there are bands and patches of quartz sparingly mineralized with pyrite. At chainage 237 feet, where raise E was put up for a hoist-station, a full 66-inch width of quartz is again exposed, including a central 11-inch band in which pyrite is concentrated. No appreciable amount of sulphides is apparent in the rest of the quartz. On the opposite side of raise E, at chainage 241 feet, the quartz is 35 inches wide, with pyrite concentrated over a 13-inch foot-wall section. Summarizing the section described, the main showings are exposed at intervals in raises B, C, D, and E, and in the adit itself northerly from raise B toward raise A, mineralization decreasing as the latter point is approached. Continuing southerly along the working from raise E to the crosscut at chainage 308 feet, there are only irregular quartz stringers. At the face of this 21-foot crosscut, raise F, 6 feet up, has been driven entirely in granitic rock. At the foot of this raise the inclined winze F, 9 feet deep, exposes widths of from 18 to 36 inches of quartz, with rock inclusions, well mineralized with bunches of sulphides. From this point a shipment of 5.905 tons was made in August, 1935, assaying 3.40 oz. gold per ton. From the crosscut at chainage 308 feet to the crosscut at chainage 345 feet there are quartz stringers and isolated lenses containing sparsely disseminated pyrite. At the face of the latter crosscut, which is 22 feet long, a pit, or shallow winze, exposes a flat-lying 28-inch width of quartz containing lightly disseminated sulphides. The section between 345 feet and the face of the main adit, at 389.5 feet, is entirely within a dense, highly altered dark rock in which the shear has apparently been dissipated. When the property was visited early in October the winze in the crosscut opposite raise E was sunk 64 feet on a 23-degree dip. The hanging-wall quartz is well exposed in the 20-foot crosscut approach, the roof having been blasted down for a hoist-station (raise E). At the collar of the winze the quartz is from 51 to 54 inches wide, including a well-mineralized band 12 to 24 inches wide, along the hanging-wall.

Continuing down the winze at 3 feet the quartz splits into bands, irregular patches, and stringers. On the northern side of the winze, between 30 and 62 feet, along the foot-wall side there is a continuous band of quartz from 22 to 50 inches wide with some rock inclusions. Adjoining this quartz-band there are widely spaced stringers in places. In the face, at 64 feet, the foot-wall quartz, which is irregularly mineralized throughout with streaks and masses of iron sulphides, splits into two narrow bands and some stringers. Samples taken in the face across two bands of quartz, 13 and 6 inches wide, assayed respectively: Gold, 0.02 oz. per ton; silver, trace; and: Gold, 1.34 oz. per ton; silver, 1.4 oz. per ton. On the southern side of the winze from 3 feet to the face at 64 feet there is a continuous band of quartz, 10 to 18 inches wide, along the foot-wall, which is part of a zone 4 to 6 feet wide, made up of bands, stringers, and patches of quartz well mineralized in places with streaks and masses of sulphides. Since the property was visited the winze has been sunk to 89 feet (November 25th).

At 80 feet in the winze on the northern side small aggregates of scheelite were noted, a picked specimen of which assayed 44.41 per cent. tungsten. Discussing conditions in the *Golden Coin* workings, the most continuous and definite exposure is that in the upper 60-foot section of the main winze opposite raise E, the average width of mineralized quartz being about 4 feet. To the north of the winze the ore-shoot is chiefly in the hanging-wall of the main drift, as exposed by quartz sections cut in raises B, C, and D. Northerly from raise B mineralization of interest shows in the drift to about chainage 121 feet. Southerly from the main winze, high-grade ore is exposed in the shallow winze F, in crosscut at chainage 308 feet, and sparsely mineralized quartz shows in the pit in the crosscut at chainage 345 feet.

Assuming continuity between the exposures in the drift-workings, the indicated length of the ore-shoot is roughly 200 feet. The foot-wall shear is strong in the section between the portal and the main winze. Southerly from the latter point, the shear is less pronounced and becomes obscure as stated above. In this connection the present workings do not definitely preclude the possibility of some extension of the deposits to the south. There is a suggestion of a split in the mineralized quartz-zone in the adit south of the bend at chainage 133 feet, where there are a number of broken quartz veinlets apparently associated with a shearing striking southerly as opposed to the south-westerly strike which has been followed.

The Anderson Creek outcrop, beyond the immediate vicinity of the stope, 13 feet long, is not sufficiently well exposed and samples could not be taken or the length of the ore-shoot measured, but it appears to be considerably shorter than in the drift below. A raise in the ore-zone from the latter to the surface would be necessary before the exposures at the two horizons could be correlated and an estimate made of probable tonnage available in this section. The zone of quartz occurrences in the *Golden Coin* drift is wide and exposures at the two horizons are not necessarily in the same plane.

Pykett Creek.—The Pykett Creek showings, although widely separated from the previously described workings, are believed to be on the extension of the same fissure. The first outcrop north of Ashlu creek is 726 feet distant along a bearing of north 7 degrees 50 minutes east from the portal of the *Golden Coin* drift. Throughout this length the outcrop is either under Ashlu creek or obscured by debris. Continuing from this point (elevation 1,271 feet), there is a continuous quartz-outcrop extending for 182 feet along the foot of a canyon-wall about 30 feet high. The quartz, varying in width from 1 to 3 feet, is apparently very sparsely mineralized with iron sulphides, but irregular zones of oxidation, occurring where the gangue is fractured in places, indicate the original presence of sulphides or pyritized inclusions of wall-rock. About the centre of this outcrop, or at chainage 93 feet, elevation 1,291 feet, an adit has been driven 25 feet northerly along the strike. Gold values here are understood to be very low. Between chainages 182 and 635 feet the outcrop is covered with dirt and boulders from the steep north-western bank of the creek. From the latter point to 641 feet on the hanging-wall side, quartz occurs up to 16 inches wide, the foot-wall section being covered. At chainage 644 feet, elevation 1,454 feet, there is an adit 32 feet long driven north 15 degrees east along the strike of the quartz. Along the eastern wall of the drift conditions are as follows: At the portal the hanging-wall band of quartz from 2 to 5 inches wide is separated from the 15-inch-wide foot-wall band by 22 inches of iron-stained rock. At 10 feet in from the portal the two quartz-bands unite and form a 30-inch width, which is continuous until it reaches the face, where it is 42 inches wide, excluding quartz in the roof. On the western wall of the drift there is a zone of stringers and narrow lenses of quartz.

The showings are well mineralized in general with irregular masses and streaks of pyrite, together with occasional chalcopyrite. Near the portal there are slight copper-carbonate stains. It was from this 32-foot adit that a shipment of 2.5 tons of sorted ore was made which assayed 5.10 oz. gold per ton. No stoping was done.

Continuing again from the north-eastern side of the portal to chainage 660 feet, the quartz-outcrop, with rock inclusions, is 4 feet wide. From this point to 666 feet there is a shearing accompanied by iron-stained, crushed, siliceous material over a width of 30 inches. From 666 to 693 feet the outcrop is covered by boulders and alluvial material, and from the latter point to 699 feet the outcrop consists of sheared and crushed iron-stained rock up to 17 inches wide. Beyond this point, which is at elevation 1,460 feet, the outcrop is covered. Other exposures, not visited, are reported farther to the north-east.

In the section examined Pykett creek flows south-westerly over, or very close to, the outcrop and diagonally along the dip of the fissure, which, in the very limited underground workings, strikes about north 10 to 15 degrees east. The dip varies from 25 to 35 degrees westerly. Much of the outcrop cannot be examined in detail due to its relative inaccessibility, as the torrent washes against it and other parts are covered with gravel and debris.

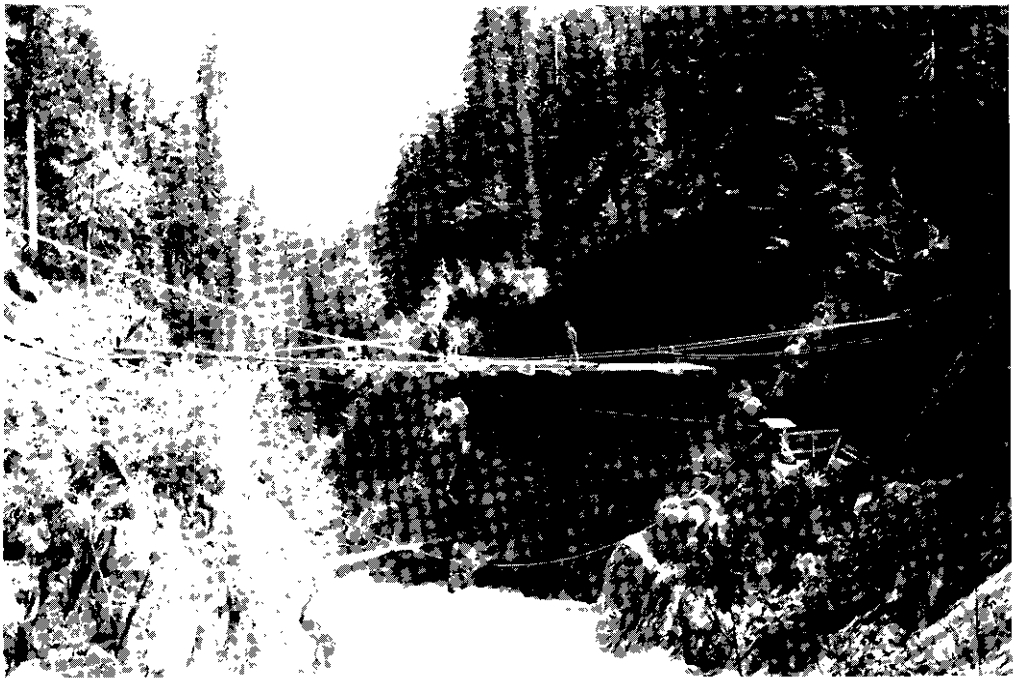
Summarizing conditions in the Pykett Creek area examined, the better values are concentrated in the upper adit, where there appears to be a lens continuous within the present limits of this working. Immediately below and above the portal, erosion in the plane of the deposit exposes it on the dip. In this aspect, on account of poor exposures, no appreciable continuity of mineralization was noted. The good ore in the upper adit indicates a shoot the dimensions of which remain to be determined by further development. While no appreciable amount of quartz is in evidence at the north-eastern end of the outcrop, the shear appears to continue under the overburden.

Additional camp buildings, on a site across Ashlu creek from the *Golden Coin* adit, have been constructed by the syndicate to accommodate fifteen men. Water-power, which has been developed by Anderson creek, involved the construction of a masonry and timber dam, the clearing and grading of a water-line right-of-way. and the laying of a steel pressure pipe-line 1,489 feet in length. A power-plant building houses the 75-horse-power water-wheel, belt-connected to a 401-c.f.m. Gardner-Denver 6-cylinder 2-stage air-compressor.

Cayoosh Creek-Duffey Lake Area.

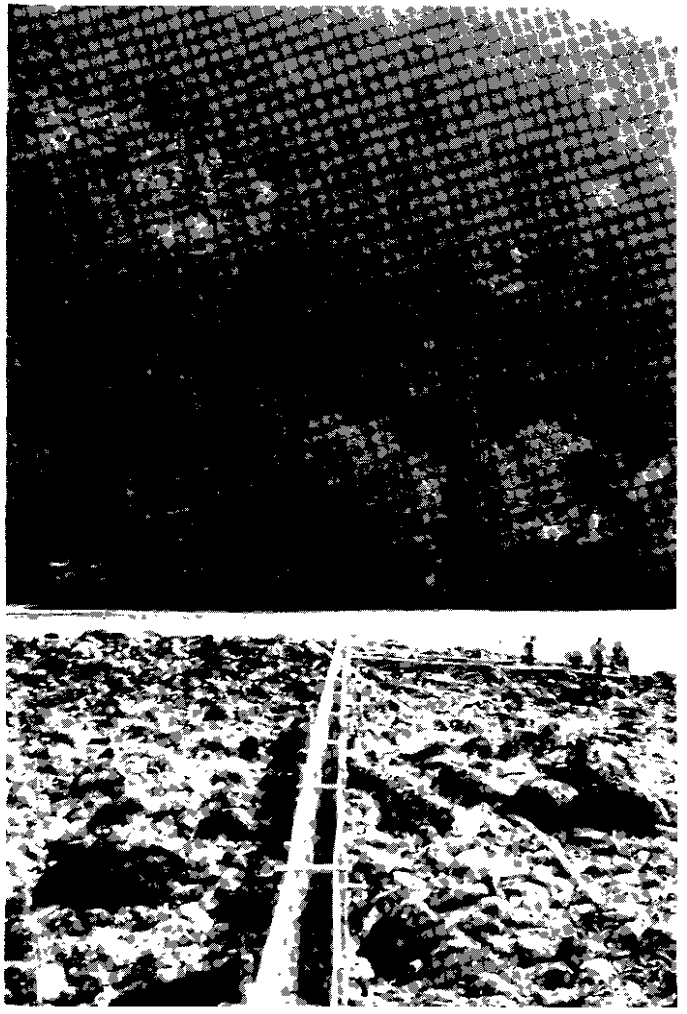
Bonanza Cache Gold Mines, Ltd.

The holdings of the Bonanza Cache Gold Mines, Limited, in the Lillooet Mining Division, comprise the following ten Crown-granted claims: *Ruby, Mineral Point, Golden Strike, Golden Eagle;* the *Bonanza* group, Lots 123 128, inclusive; together with thirty-two claims and fractions held by location; included in the latter are the *Morning Glory* group of seventeen claims and the *Marygold* group of two claims. All told, therefore, there are forty-two claims held by this company. The *Bonanza Cache* property, which was the only one being actively worked at the time of inspection, adjoins Cayoosh creek 12 miles by motor-road south from Lillooet, a station on the Pacific Great Eastern Railway, or 9.5 miles from Craig Lodge at the eastern end of Seton lake. The *Golden Cache* lies to the north-west of the *Bonanza Cache,* with which it is connected by a steep trail, extending from 1,500 to 2,850 feet elevation, on the northern side of Cayoosh creek. The *Morning Glory* group lies on both sides of Phair (Cottonwood) creek, some prospecting having been done at a point about 1.75 miles by trail from Cayoosh creek. The *Marygold* group is east of Seton lake in the angle between Cayoosh and Enterprise creeks. The claims comprising the *Bonanza Cache, Golden Cache,* and *Morning Glory* groups are shown on a plan prepared by Noel Humphrys, British Columbia land surveyor, of Vancouver. This also shows the local topography in contours at 100-foot intervals. Within the area visited Cayoosh creek follows a narrow gorge with steep sides and in the vicinity of the *Bonanza Cache* the northern wall of the valley is nearly perpendicular. Elevations range from 750 feet at Seton lake to 1,500 feet at the *Bonanza Cache* camp adjoining the creek, and the mountains on both sides rise to between 6,000 and 7,000 feet above sea-level. At the time of the writer's visit (end of June) Cayoosh creek was reported to have a flow of about 1,000 cubic feet per second. Its gradient is very steep below the camp where the creek falls 112 feet in a distance of 1 mile. Except on the more precipitous rock bluffs, trees, including yellow pine, jack-pine, balsam, and spruce, cover the mountain-slopes. Cottonwood grows in the valley-bottom of



Suspension Bridge over Ashlu Creek at Property of Ashloo Gold Mining Syndicate, Squamish Area.

Placer Training Camp, Nanaimo River.



Placer Training Camp. Fraser River at Mouth of Emory Creek near Yale.
Main Sluice and Laterals.

Rocking Gold-bearing Gravels on China Creek, Alberni Canal.

Phair (Cottonwood) creek, with cedar, spruce, and fir on the steep slopes. The trees are up to 18 and 24 inches in diameter. The flats at intervals along Cayoosh creek provide suitable places for camp-sites. The section of road between Craig Lodge and the *Bonanza Cache* is narrow, with many steep gradients, but the road-bed was in good condition and mine supplies were hauled by truck without difficulty.

Geological Survey of Canada publications covering the surrounding area include the following: Summary Report, 1933, Part A, "Lillooet Map-area"; Memoir 130, "Geology and Mineral Deposits of the Bridge River Map-area"; and Memoir 118, "Mineral Deposits between Lillooet and Prince George." The first mentioned approaches Cayoosh creek most nearly and the accompanying "Geological Sketch of Lillooet Area," Fig. 5, adjoining page 70-A, shows the formation in the vicinity of the *Bonanza Cache* to be composed chiefly of sediments. These rocks are understood to have been correlated with the Bridge River series, mainly sediments. Argillites predominate in the vicinity of the properties under discussion, their composition ranging from carbonaceous, argillaceous phyllite to calcareous argillite or argillaceous limestone. On the *Bonanza Cache* these rocks are dark to shiny black and much sheared, so that the bedding-planes are difficult to determine. On the *Golden Cache* similar rocks are light grey in colour. Dark argillaceous rocks are found on the *Morning Glory* group on Phair (Cottonwood) creek, a tributary of Cayoosh creek. The lower adit on the *Golden Cache* is driven in massive, greenish limy rock. Outcrops of diorite, fine-grained in part, were noted on the *Bonanza Cache* and of fine-grained diorite (possibly quartz diorite) on the *Morning Glory*. These, occurring as dykes from a few inches up to 15 feet or more in width, apparently follow the bedding-planes of the argillites in most cases, but may cut across the formation at some points. Altered hornblende diorite is exposed on the eastern side of Phair creek above the *Morning Glory* claim, but structural relationships are not known. Mineralization, consisting mainly of quartz with small amounts of iron sulphides, chiefly pyrite, is referred to the period following dyke-intrusion. In the Bridge River area the mineralization is attributed to the Bendor quartz diorite. Outcrops of similar rock are reported to have been noted in the Cayoosh Creek area. The nearest definitely known area of quartz diorite related to the Bendor batholith is on Lost creek, to the west of Cayoosh creek, as shown in the Geological Sketch, Fig. 5, previously referred to.

In the area examined the character of the deposits can be summarized as consisting of elongated lenses and stringers of quartz conforming in strike and dip with the argillites. No definite fissuring or vein-structure was noted. The general trend of the formation is to the north-west, with local variations, where strikes are northerly. Dips are from horizontal to 25 degrees to the north-west or south-east in accordance with the folding.

References to the past history of the *Bonanza Cache* and *Golden Cache* properties are contained in the Report of the Minister of Mines for the years 1888, 1889, 1891, 1895, 1897. A useful perspective of past conditions is afforded by the report of W. A. Carlyle, Provincial Mineralogist, page 553 *et seq.*, Report of the Minister of Mines, 1897. This was extensively quoted in the Special Report previously mentioned. Reference is made to the past operations of the 10-stamp mill, which was operated for a short period during the late nineties, the returns for 755 tons first crushed being about $4.45 per ton. The old mill adjoins the camp of the present company on Cayoosh creek. The *Morning Glory* and *Marygold* claims are recent locations.

The several properties are described separately as follows:—

Bonanza Cache.—At point "A," elevation 2,770 feet, exactly 300 feet from the south-east corner of Lot 124, on the boundary between *Bonanza* Lots 124 and 125, and on the apex of a sharp ridge, an approximately vertical shaft has been sunk about 60 feet (estimated, as lower portion inaccessible without a rope). Fifteen feet below the collar an adit, 16 feet long to the south, connects with the surface. The section of shaft above the adit develops a quartz-showing, 12 to 21 inches wide, which strikes north-westerly, with a dip of 85 degrees to the south-west. Minor amounts of pyrite occur in disseminations through the quartz. In the adit the quartz, occurring as parallel bands and stringers in a zone 30 inches wide, spreads out flatly along the bedding-planes of the enclosing argillites, which at this point, due to local folding, strike north. On the southern side of the ridge, below the adit, quartz stringers dip at 20 to 25 degrees to the west. A sample which assayed: Gold, 0.04 oz. per ton, and silver, trace, represents the quartz-lens 12 to 18 inches wide and 16 feet long in the adit.

Two thousand feet measured north 26 degrees west from point "A," and on *Bonanza* Lot 123 claim, two adits, at 1,680 and 1,653 feet elevation, are connected by an inclined shaft 58 feet long on a 25-degree slope. These are designated for convenience as "B" workings. The shaft is sunk on the outcrop of a zone of quartz-lenses and stringers. From the collar a drift-adit extends 26 feet south, then 16 feet south 15 degrees east. Stoping has been done to a height of 10 feet and a width up to 10 feet along the 26-foot section of adit, also along the surface for a short distance northerly from the shaft-collar. The dump here contains a considerable proportion of quartz mixed with dark argillite which forms the wall-rocks of the deposits. Occasional pyrite is present in the quartz, some of which is iron-stained. A sample which assayed: Gold, 0.14 oz. per ton, and silver, 0.02 oz. per ton, represents selected quartz such as might be sorted out from the dump. The lower adit, 97 feet long, is driven south 35 degrees east, of which the first 25 feet is a caved timbered approach. The bottom of the shaft connects with the adit at 53 feet in from the portal. From point 97 feet the working continues south 25 degrees east for 67.5 feet, and then south 47 degrees east for 51 feet to the face. At 64 feet back from the face a branch working extends south 27 degrees west for 25 feet. The quartz occurrences are localized near the collar of the shaft, and there is but little quartz in evidence at the lower horizon. Nor was there any continuity of mineralization noted in the eastern extremities of the two adit-drifts. The next working is at point "C" on the *Surprise* claim at 1,580 feet elevation, 445 feet distant from "B" workings along a bearing of south 44 degrees west. Here a lenticular quartz occurrence, 10 feet long and up to 12 inches wide, has been explored by an adit 48.5 feet long driven south 50 degrees east along a plane of local fracturing in the argillites, which are crushed and contorted. As in the case of "A" and "B" workings, the quartz-showings at "C" have no specific definition, but coincide with the stratification of the enclosing rocks, the planes of which are flat, with a tendency to dip to the north-east. A sample which assayed: Gold, trace, and silver, trace, represents selected quartz, no definite sections being available to sample.

To test these quartz-lenses and stringers at depth an exploratory adit was being driven at point "D," elevation 1,480 feet, 290 feet distant from "C" adit along a bearing of south 22 degrees west. This crosscut, known as the Noel tunnel, was started in 1934 and had been driven 1,042 feet to June 30th, 1935. It is situated centrally in relation to "A" working, lying to the south, and "B" and "C" workings to the north. It passes through shiny black argillites, having been driven in a north 80 degrees east direction, cutting across the dip of the formation, which is flat-lying or gently folded. The rocks tend to strike north-westerly, with dips up to 25 degrees to south-west and north-east. Numerous stringers and patches of quartz show in the northern or southern wall of the crosscut, apparently conforming to the attitude of the enclosing strata. The quartz occurrences, slightly mineralized with iron sulphides at some points, are indefinite and lack continuity. A lens between points 406 and 412 was explored by a drift run 12 feet south 32 degrees east. A sample, taken by the writer, which assayed: Gold, *nil*, and silver, *nil*, represents selected quartz, containing scattered disseminations of iron sulphides, from stringers between points 960 and 1,024 feet in from the portal of the crosscut. A sample which assayed: Gold, 0.10 oz. per ton, and silver, 0.02 oz. per ton, was selected from an indefinite patch of mineralization at 1,000 feet in from the portal.

Owing to the lack of definition or continuity of the lenses in the widely separated "A," "B," and "C" workings and the folding of the flat-lying argillites in the Noel crosscut, it was not evident to the writer what results might be looked for at the deep level. The possible interest of other lenses which might be encountered would be indicated by the values found in the lenses explored by the upper workings. The writer's samples represent selected material, the lack of continuity preventing samples being taken over specific lengths and widths indicating tonnage. At the portal of the Noel crosscut were combined engine-house and blacksmith-shop and dry-house. The compressor equipment, driving one machine and steel-sharpener, included a 75-horse-power Rushton-Lister Diesel engine. The camp, about 1 mile up-stream from the low-level site, provided accommodation for twenty men. Work which, at the time of the writer's visit, was proceeding with a crew of fifteen men was subsequently discontinued.

Golden Cache.—The old workings of this group, hereinafter described, are in the centre of the *Golden Eagle* claim, 2,500 feet measured along a bearing of north 74 degrees 18 minutes west from the portal of the Noel "tunnel" of the *Bonanza Cache* group and on the northern or opposite side of Cayoosh creek. There are five short adits within a length of 130 feet which

have been driven into the face of a perpendicular cliff to explore and mine flat-lying lenses of quartz which apparently dip and strike parallel to the enclosing light-grey argillites. Mineralization in evidence consists of scattered pyrite.

The adit-portals extend south-westerly along the cliff-face from elevations of 2,850 to 2,882 feet. The three adits at the lower (or north-eastern) end, enclosed within a length of 60 feet, give access to a stope of irregular outline. This stope, from which quartz was formerly trammed to the old 10-stamp mill, is about 105 feet long, up to 50 feet wide, and up to 20 feet thick. The longest dimension is along the strike, which is approximately north-west. The width measured along the dip to the north-east of between 14 and 25 degrees is from 50 feet near the outcrop to 10 feet at the back or north-western end. Surrounding the edges of the stope, where small lenses and stringers of quartz remain, prospect-workings, consisting of short levels, a raise, and a winze, failed to prove the continuity at depth or along the strike. Diamond-drilling was done in 1934 as follows: Holes Nos. 1 and 2, 265 and 250 feet long respectively, were drilled to the north-east of the stope to explore the ground on the projected dip of the mined area. A third hole was put down 500 feet vertically to explore the ground along the strike to the south-east at the foot of the bluffs. A sample which assayed: Gold, trace, and silver, trace, represents selected quartz-remnants from the big stope. The other two adits on the cliff-face, in order from the south-western extremity of the stope-workings, are in 8 and 18 feet respectively. They explore flat-lying quartz stringers and lenses in the argillites. In the first or shorter adit a sample which assayed: Gold, trace, and silver, trace, represents a width of 4 feet on the north-east side of the portal, no appreciable amount of quartz being present on the south-west side. The quartz is slightly iron-stained and contains minor amounts of pyrite. At the portal of the other adit a sample was taken across 2 feet of inter-banded quartz stringers and country-rock, no mineralization being noted. This assayed: Gold, trace; silver, trace. The ground along the strike of these lenticular quartz-showings was tested without success by a branch working extending south-westerly from the stope below. At 2,650 feet elevation, on the edge of a rock-slide at the base of the cliff, an old adit has been driven slightly west of north for a length of 180 feet in massive, greenish limy rock. Thin scales of calcite have been deposited on the walls of the working in places where water is dripping. This working explores the ground below the north-western extremity of the stoped area. It would have to be extended some distance easterly to test the projected downward continuation of the stoped area, which dips flatly to the north-east.

Morning Glory.—On this claim on Phair (Cottonwood) creek, 1.75 miles by trail from Cayoosh creek, some shallow prospecting-work was done in 1934 on a quartz-showing outcropping along the edge of the creek, which at this point flows through a narrow rocky canyon. The elevation is 2,280 feet. The small amount of work done indicates stringers and elongated lenses of quartz conforming in attitude with the locally folded and contorted dark-coloured argillaceous rocks. Mineralization consists of scattered disseminations of pyrrhotite and pyrite. Individual lenses up to 5 feet in width occur in a zone up to 12 feet in width. Three samples represent, first, silicified country-rock containing thin films of pyrrhotite; secondly, selected quartz mineralized with disseminated pyrrhotite; and, thirdly, selected quartz with pyrite. These assayed: Gold, *nil;* silver, *nil.* In the hanging-wall section of the quartz-showings there is a dyke of fine-grained diorite, possibly quartz diorite, 10 to 15 feet wide, also apparently conforming in strike and dip to the bedding-planes of the argillites.

Marygold.—The two claims comprising this group were not visited. These were recent locations, two assessments having been recorded in connection with open-cuts made.

Silver Queen. This group, in the Lillooet Mining Division, comprises eighteen mineral claims which are held by location and owned by S. Beiler and W. G. McMorris.

No map showing the local geographical features correctly is available. The property is about three-quarters of a mile westerly from the north-eastern end of Duffey lake, which is at the head of Cayoosh creek, flowing north-easterly to Lillooet. The workings are situated above timber-line on the steep to precipitous ground forming the eastern and south-eastern sides of the basin at the head of the small stream locally known as Beiler creek, which, flowing north-easterly, joins Cayoosh creek at a point about 2 miles north-east of Duffey lake. Elevations of the workings inspected range from 6,550 to 7,030 feet. The present means of access is by pack-trail, about 20 miles in length, from D'Arcy Station, on the Pacific Great Eastern Railway, at the southern end of Anderson lake. From this point the trail extends

along the valley of Haylmore (Cedar) creek to its north-westerly-flowing tributary, locally known as Common Johnny creek; then along the latter stream to near its head (west of Duffey lake), where the trail climbs in switchbacks from 5,000 feet elevation to the summit, at 7,350 feet elevation, which forms the divide between the streams flowing northerly into the Gates River (flowing into Anderson lake) and Cayoosh Creek watershed areas. The valleys of Haylmore (Cedar) and Common Johnny creeks are well wooded. From the summit the trail descends in switchbacks to the cabin, at 6,500 feet elevation, in the Beiler Creek basin. The natural, but considerably longer, route would be to connect with the old trail, fallen into disuse, which follows Cayoosh creek to the end of the motor-road at the *Bonanza Cache* property, about 12 miles from Lillooet.

The local geology has not been mapped, the nearest work of this nature being as shown on Fig. 5, opposite page 70-A, Geological Survey of Canada Summary Report, 1933, Part A, "Lillooet Map-area." On the summit at the south-western end of the *Silver Queen* basin there are outcrops of a wide granitic dyke. In the immediate vicinity of the deposits the formation consists chiefly of metamorphosed, schistose, sediments grading from shale to argillite. The local strike of these rocks, which are possibly members of the Bridge River series, is from north 10 degrees west to north 12 degrees west, dips being from 40 to 75 degrees or more to the north-east. Traversing these rocks are quartz-filled fractures striking south 75 degrees east (uphill), with dips between 45 and 67 degrees or more to the south-west. Cutting these, and generally displacing them for a few feet, there are several basic dykes striking south 50 degrees east, with dips of from 50 to 55 degrees to the north-east. Most of the superficial work has been done along the outcrop of two veins which have been exposed for lengths of 355 and 225 feet respectively. In the first case the ground is covered at the extremities, and in the second case there is evidently no continuity beyond the length specified as the vein does not persist into the rock bluffs directly along the strike at both ends of the developed section. Mineralization, consisting of streaks and disseminations of argentiferous tetrahedrite, is generally sparsely distributed but somewhat concentrated where the vitreous quartz is shattered or fractured. Oxidation is limited to copper-carbonate stains. The discoveries were made by S. Beiler in 1922 when the first claims were staked. The quartz vein-showings are on the south-eastern and on the eastern side of the basin. The southerly one, traced for a length of 355 feet, dips at 45 degrees to the south-west, or into the hill, the outcrop following the contour of the steep ground from 7,015 to 7,030 feet elevation. Starting at the eastern or higher end and chaining in feet westerly, the exposures are briefly as follows: From zero to 50, some stripping in which the quartz, 10 inches wide, is sparsely mineralized with disseminated tetrahedrite; from 50 to 208, outcrop covered with talus; from 208 to 214, an open-cut showing sparsely mineralized quartz, 18 to 20 inches wide, from which some tetrahedrite has been extracted and piled close by; from 214 to 239, outcrop covered with snow; from 239 to 247, some quartz, 16 to 18 inches wide, containing widely separated streaks of tetrahedrite; at 259 a caved open-cut filled with snow and a pile of quartz containing disseminated tetrahedrite which indicates continuity; at 314 to 319, there is an adit 20 feet long, described later; at 320 beyond a dyke to 355, some stripping exposes quartz 8 to 16 inches wide, irregularly mineralized with streaks of tetrahedrite. Beyond the latter point the vein narrows down to where it is covered by talus. The adit previously mentioned has been driven 20 feet along a basic dyke, striking south 50 degrees east, and forming the south-western wall of the working. The quartz vein is exposed on the opposite wall and in the face. At the latter point it is 19 inches wide and very sparsely mineralized. At 2 feet back from the face it consists of interbanded quartz and country-rock over an aggregate width of 33 inches, tetrahedrite being somewhat concentrated in the hanging-wall 13-inch band. A selected sample from 3 or 4 tons of sorted material piled at the portal assayed: Gold, 0.03 oz. per ton; silver, 206.6 oz. per ton. Below the outcrop-workings and at 6,940 feet elevation a crosscut has been started. The workings on the parallel vein, about 2,300 feet to the north-east, are distributed over an outcrop-length of 225 feet between elevations of 6,830 and 6,925 feet. This vein dips at about 67 degrees to the south-west, or into the hill. Chaining westerly from the highest point and diagonally along the very steep, "bluffy," slope, conditions are briefly as follows: From zero to 6 feet, a 10- to 12-inch width of quartz, very sparsely mineralized with tetrahedrite; from 30 to 33 feet, a quartz-exposure, 12 inches wide, with no appreciable mineralization; from 88 to 93 feet, an open-cut showing a 64-inch width of quartz and included

country-rock. In the centre there is a 4-inch streak of shattered quartz well mineralized with tetrahedrite. This showing is not continuous across the cut, 5 feet away. Just east of the open-cut, or between chainages 84 and 88 feet, the vein is cut by a basic dyke. Continuing westerly, at chainage 128 feet, there is an open-cut in shale where the quartz, 63 inches wide, contains sparse streaks of tetrahedrite, this mineral being more highly concentrated over the 12-inch section adjoining the hanging-wall. A selected sample, such as might be sorted in very small quantities, assayed: Gold, 0.03 oz. per ton; silver, 493.9 oz. per ton. At chainage 160 feet there is an adit, 10 feet long, exposing quartz interbanded with crushed country-rock over an aggregate width of 32 inches. The 12-inch section adjoining the hanging-wall contains streaks of tetrahedrite. At chainage 225 feet, stripping shows the vein has split into quartz stringers with no appreciable mineralization. At this point there is a small pile of quartz containing sparsely disseminated tetrahedrite. At both eastern and western extremities of the 225-foot length, including the showings, there are bluffs, directly along the strike, in which vein-continuity is lacking. Summarizing conditions at the two points inspected, the tetrahedrite mineralization over narrow widths shows a habit of extreme localization, as in shattered or fractured quartz areas. A few tons of high-grade silver ore, similar to the material assayed, could be sorted out, but, as continuity of mineralization is lacking, systematic sampling over mining-widths would serve no useful purpose. Seasonal work on the claims has been limited to assessment requirements.

Twin Lake. This group, in the Lillooet Mining Division, consists of eight mineral claims held by location, which are owned by J. Morrison, A. McRae, and W. C. Elliott. No map correctly showing the local geographical features is available. The camp-site is situated on Elliott (Lawlaton) creek, about 15 miles south-easterly from D'Arcy, on the Pacific Great Eastern Railway, at the west end of Anderson lake. The prospected ground in the rugged Cayoosh mountains lies on steep, grassy, or bare rocky slopes above timber-line, between elevations of 6,800 and 8,150 feet. Altitudes of the adjacent summits are up to 9,000 feet or more. Creek-valleys in the vicinity are well wooded, the useful trees extending in general to an elevation of about 6,000 feet. The tent-camp, at 5,800 feet elevation, is reached by pack-trail about 17½ miles in length from D'Arcy. The route traversed, distances being roughly estimated, follows Haylmore (Cedar) creek for 13 miles to the junction with Common Johnny creek, its north-westerly-flowing tributary; then up the latter stream for about 2 miles to Elliott creek, which flows into it from the north-east. The trail then continues up Elliott creek for 2½ miles to the camp situated opposite a small southerly-flowing tributary locally known as Crystal creek. Prospecting, consisting of open-cuts and stripping, has been done at numerous widely separated points. A section of rock exposed by Crystal creek going south from the lower of two small adjoining lakes is as follows: Above 7,330 feet elevation, greenstone of unknown extent; between 7,330 and 7,250 feet elevation, serpentine 300 feet wide, which locally strikes about north 40 degrees west, with dips of from 55 to 60 degrees to the north-east; between 7,250 and 6,800 feet elevation, part of a large area of sediments, chiefly consisting of schistose, argillaceous sediments and brown-weathering argillites, but including quartzite and cherty quartzite. The heavily iron-stained serpentine, locally described as the " red dyke," is a prominent feature forming the summit of the ridge for some distance easterly from the twin lakes. It is cut by irregularly branching, black basic dykes which have the same general trend. Adjoining the dykes the serpentine is silicified or contains quartz stringers accompanied by pyritization of the adjacent rock; the iron sulphides occur in some places as fine, granular disseminations, and in others in the form of cubes ⅛ inch in diameter. Granitic or dioritic rocks, while not actually seen, are known to be exposed across the valley of Elliott creek. All the mineralized occurrences are within the sediments which adjoin the lower serpentine-contact for a length of at least 1 mile. At one point, about 3,000 feet easterly from Crystal creek, there is a parallel band of serpentine, 70 feet wide or more, 200 feet stratigraphically lower than the upper one, with sediments in the intervening area. A specimen of the lower serpentine, containing finely disseminated sulphides, assayed: Gold, trace; silver, 3.2 oz. per ton; platinum, *nil.*

In the argillaceous rocks, mineralization consists of argentiferous tetrahedrite in scattered streaks and disseminations in quartz-filled fractures striking diagonally up the mountain-side from south 70 degrees east to east and dipping to the north at angles of from 65 to 73 degrees.

Picked specimens assayed up to 307.2 oz. silver per ton. These occurrences are generally exposed for short lengths at widely separated points.

In one case, described later, the mineralization consists of stibnite in a siliceous gangue associated with east-west vertical fracturing in quartzite. A sample of this character assayed: Gold, 0.02 oz. per ton; silver, 2.6 oz. per ton; stibnite, 43.5 per cent. The workings resulting from seasonal prospecting done by J. Morrison are briefly summarized as follows: Open-cuts have been made adjoining Crystal creek at elevations of 7,010, 6,905, and 6,800 feet, on ground sloping from 20 to 25 degrees. These cuts expose for short lengths, up to 40 feet, sparsely mineralized quartz, from 1 to 3½ feet in width, the quartz in the wider sections being interbanded with rock. The ground along the strike to the east of the creek is covered with overburden, and to the west continuity is not apparent where the formation is exposed. Starting from the lower of the twin lakes at the head of Crystal creek and going easterly for about 1,500 feet along the contour of the side-hill, which slopes between 30 to 35 degrees towards Elliott creek, there are open-cuts and outcrops over an aggregate length of 140 feet between 7,300 and 7,355 feet elevation. Chaining in feet from west to east, the showings are as follows: From zero to 15, quartz 20 inches wide is exposed sparsely mineralized with tetrahedrite, from which picked specimens assayed: Gold, 0.05 oz. per ton, and silver, 307.2 oz. per ton; from 65 to 68, the same conditions exist; from 88 to 90, the quartz, from 8 to 18 inches wide, is similarly mineralized; at 110 feet, the quartz apparently splits into stringers; at 140, an indefinite quartz-showing mineralized with specks of galena, which, with rock inclusions, has a maximum width of 5 feet. Continuing easterly, there are, between estimated distances of 1,500 and 3,000 feet from Crystal creek, similar showings at widely separated points, as follows: At 7,375 feet elevation, a quartz-outcrop 6 feet wide, including sparse tetrahedrite mineralization over the 7-inch hanging-wall section, no continuity being apparent in the rock-outcrop immediately to the east; between 7,420 and 7,440 feet, much barren quartz lacking specific definition, containing specks of galena in spots; between 7,650 and 7,660 feet elevation and adjacent to the main serpentine foot-wall, there is a quartz-showing 25 feet long and from 20 to 28 inches wide, including a central, comparatively well-mineralized 9-inch streak; at 50 feet to the east and at a stratigraphically lower horizon, a showing 8 feet long comprising two 12-inch bands of quartz separated by 18 inches of rock, the hanging-wall quartz containing specks of tetrahedrite; beyond this there is a wide band of cherty quartzite; at 7,875 feet elevation, broken short sections of quartz are found up to 2 feet wide, sparsely mineralized, in shattered argillaceous sediments, a specimen of the best material assaying: Gold, 0.02 oz. per ton, and silver, 82 oz. per ton. About 4,500 feet easterly from Crystal creek and at 8,150 feet elevation, quartzite outcropping in rugged bluffs forms the summit of the ridge overlooking Lizard creek, an easterly-flowing tributary of Cayoosh creek. Just west of this point, which is on the divide separating the drainage areas of Gates river and Cayoosh creek and at 8,135 feet elevation, an open-cut shows stibnite as streaks and bunches in decomposed siliceous gangue, associated with east-west striking, apparently vertical fracturing. The showing, covered at both ends by shattered rock, consists of two bands of the stibnite mineralization, separated by from 2 to 3 feet of quartzite. A sample across the northern band, 8 to 14 inches wide, assayed: Gold, trace; silver, 0.8 oz. per ton; and a sample across the southern band, 16 to 24 inches wide, assayed: Gold, 0.02 oz. per ton; silver, 2.6 oz. per ton. The latter contained 43.5 per cent. stibnite. Other showings are said to have been found on the Lizard Creek slope below the summit, but snow prevented inspection.

Summarizing conditions in the prospected sections of the *Twin Lake* group area, average silver values in the tetrahedrite occurrences are evidently very low in what appear to be, for the most part, elongated quartz-lenses along similar lines of fracturing. The last occurrence mentioned, on the summit, appeared to be more definite; silver values at this point, however, being practically negligible.

Lillooet Area.

Gold Ridge and Frances.

The *Gold Ridge* group of eight claims held by location, in the Lillooet Mining Division, is owned by F. Dillon and Mrs. Dillon, W. Dillon, and H. D. Cheng. The property is situated on the southern fork of Sallus (Eleven Mile) creek, about 5½ miles easterly from the main road following the Fraser river northeast of Lillooet. The prospected ground is on the lightly wooded, fairly steep slope to the south

of the creek between elevations of 5,460 and 5,560 feet, the creek-bottom opposite the workings being at 5,400 feet elevation. The property is reached by pack-trail, about 6½ miles in length, which leaves the Lillooet–Pavilion highway at a point approximately 12 miles from Lillooet.

In the route traversed, which is fairly densely wooded with pine and fir, the rocks are generally covered with overburden. A considerable area of granitic rock, referred to the Mesozoic era, is exposed half a mile to the north of the trail at a point about 3 miles easterly from the highway. Where the work has been done, rock-exposures consist of silicified phases of limestone. No mineralization other than light iron-stain was observed, and six samples gave assays of from *nil* to a trace in gold and silver. The local strike of the rocks, which was not definitely ascertained, appears to be south-easterly going uphill. Three large widely separated excavations have been made at elevations of 5,460, 5,500, and 5,560 feet respectively. In the central exposure the rock is decomposed adjoining a basic dyke. In the area of granitic rocks previously mentioned there is a separate group of four claims, known as the *Frances*, held by location and owned by the Dillon family. A considerable amount of trenching and open-cutting, mostly shallow, has been done on the steep slope between elevations of 5,920 and 6,015 feet, also on the gently rounded summit at the latter elevation. Some of the trenches have not reached bed-rock and the bottoms of others are filled with soil or debris. In the most definite exposure the mineralization, in weathered or disintegrated granite, consists of sparse disseminations or specks of chalcopyrite, pyrite, and molybdenite in narrow bands of quartz associated with fracturing which strikes north-easterly, with dips of from 42 to 50 degrees, or steeper, to the south-east.

Exposures in this group of surface workings, going north-easterly along the outcrop, are as follows:—

Elevation.	Width.	Gold.	Silver.	Remarks.
Feet.	Inches.	Oz. per Ton.	Oz. per Ton.	
5,920	20	0.01	0.6	Hanging-wall band of quartz.
5,920	3	0.01	1.4	Foot-wall quartz stringer separated from hanging-wall band by 9-inch parting of decomposed granite.
5,932	8 to 18	Trace	0.4	Selected best mineralized quartz.
5,960	5 to 12	Not assayed	Not assayed	Silicified crushed rock, including some brecciated quartz.
5,975	20	Trace	0.6	Iron-stained quartz.
5,980	6	Not assayed	Not assayed	Quartz; no appreciable mineralization.
5,985	2	Not assayed	Not assayed	Quartz; slightly iron-stained.
5,990 to 6,005	.....	.....	.....	Trenches mostly in soil; no continuity proved.

To the south-west, and below 5,920 feet elevation, shallow cuts have been put in without proving continuity in this direction, though this is not conclusive.

Bridge River Area.

Goldside Mines, Ltd.

This company's Taylor Basin property, where work is proceeding, consists of the following eight claims, all held by location: *Polaris Peak, Tit Bit, Sunburst, Rapidian, Preference, Magma, Vortex,* and *Octopus Fraction.* In addition, five contiguous groups of claims have been acquired by the company under option agreements. These, which are also held by location, are as follows: (1) *I.X.L. Nos. 1* to *6*, inclusive; (2) *Northern Light Nos. 1* to *8*, inclusive; (3) *Homestake Nos. 1* to *5*, inclusive; (4) *Viking Nos. 1* and *2;* (5) *Peak* group, consisting of the *Thunder Peak* and *Lightning Peak.*

The property described is situated within Taylor basin at the head of Taylor creek, a tributary of Tyaughton creek, which in turn flows into Bridge river. The mine camp, on the *Homestake No. 4* claim, is located 1,600 feet measured south 30 degrees west from the forks of Taylor creek 4 miles above its mouth. The camp is situated on a wooded knoll within the basin, the boundaries of which consist of broad, smoothly rounded, bare ridges rising to elevations of about 8,000 feet. The upper slopes consist of talus and rock slides, through

which emerge rugged outcrops of rock. The middle slopes, covered by a heavy mantle of glacial drift, are traversed by snow-fed creeks and are covered with patches of a shrub-like growth of balsam-fir, together with a rank growth of grass and wild flowers. The low areas along Taylor creek and basin are well wooded with balsam-fir and occasional spruce. The present means of access is by pack-trail about 8 miles in length, which branches off the road near the south-western extremity of Tyaughton lake. This road, about 3.5 miles in length, leaves the Bridge River road east of the Pearson Ponds at a point about 35 miles from Bridge River Station on the Pacific Great Eastern Railway. The trail climbs from 3,200 feet elevation at the lake to 7,200 feet at the Taylor Basin pass in a distance of about 5 miles. From this point the main trail, 3 miles in length, descends to the Goldside camp at 6,300 feet elevation. All elevations mentioned are relative, being derived from aneroid readings. The natural grade for a new outlet, if warranted by future development, would be down Taylor and Tyaughton creeks to the Bridge River highway. A preliminary survey of this route is said to have been made.

Interpreting the formations in the Taylor Basin area from the preliminary classification afforded by C. W. Drysdale and W. S. McCann in the Bridge River Map-area, the oldest underlying rocks exposed consist of highly metamorphosed sediments of the Bridge River series which has been referred to the Pennsylvanian-Permian. These are represented by thin-bedded cherty quartzites as exposed in shallow cuts along the edges of a small creek in the north-western corner of *Northern Light No. 1* mineral claim. Next in ascending order are serpentines tentatively assigned to the Triassic. Dense to porphyritic rocks of this general character, more or less altered from their original composition, are exposed in and around No. 2 adit in the northern section of the same mineral claim and at other points in the basin. The Eldorado series, assigned to the Lower Cretaceous, is represented locally by conglomerates lying across Taylor creek where it falls steeply at the eastern end of the property and by grey feldspathic sandstone in the north-western part of the *Northern Light No. 5* claim.

On the north-western side of the basin several areas of diorite, believed to be lenticular in outline, are exposed in extensive outcrops. These rocks, to which occasional patches of roof-pendant sediments adhere, have been mapped as being related to the Bendor batholith of post-Lower Cretaceous age. The deposits of interest found in the diorite consist of curving fractures, with general north-easterly strike and dips from vertical, or nearly so, to the north-west. Mineralization consists of quartz containing banded and disseminated sulphides, the most abundant mineral being arsenopyrite, frequently accompanied by pyrite and occasionally with both pyrite and sphalerite. Chalcopyrite is reported to have been identified in some specimens. Oxidation is not much in evidence, being confined to staining of the sulphides at surface outcrops with seams of rusty decomposed material along fracture-planes. Gold values appear to fluctuate in proportion to the percentage of arsenopyrite present. The assay and analysis of 4,643 lb. of ore shipped to the Tacoma smelter by the Goldside Mines, Limited, in December, 1934, and made available by the company, is as follows:—

Gold, 1.74 oz. per ton; silver, 0.06 oz. per ton; copper, 0.05 per cent.; zinc, *nil;* arsenic, 19.56 per cent.; antimony, trace; iron, 13.9 per cent.; silica, 44 per cent.; lime, *nil;* sulphur, 6 per cent.; alumina, 5.9 per cent.

Mineralized fractures have been persistent as far as development-work has gone. Widths are generally very narrow, the largest zone, from which the shipment was made, being 18 feet long and 10 to 12 inches wide, with a local swelling to 20 inches in the central part.

The first staking of mineral claims in the immediate area is reported to have been that done by Grant White in 1910 on the divide between Taylor and Eldorado basins. These claims adjoin the *I.X.L.* group. In 1912 E. J. Taylor and his partner, while prospecting, are said to have panned gold colours along the upper reaches of Taylor creek leading to the subsequent discovery of auriferous arsenopyrite on what is now the *Northern Light* group, staked in 1932; additional claims having been staked since. The workings examined are on the slope forming the northern side of the basin.

Taking the camp as a starting-point, the No. 1 adit, which is the principal working, is on the *Northern Light No. 6* claim, 3,800 feet distant along a bearing north 63 degrees west. This is being driven as a crosscut to test the projected downward continuation of the surface showings, which are as follows: At 7,513 feet elevation, a shallow pit, from which the previously

mentioned test shipment was extracted, exposes a zone 18 feet long and from 10 to 12 inches wide, well mineralized with arsenopyrite, which strikes north 20 degrees east along the contour of the mountain-slope and dips 70 degrees to the north-west, or into the hill. At the southern extremity of this zone the arsenopyrite mineralization, in streaks an inch wide or less, turns and follows a slip or fracture striking south 80 degrees west up the hill and dipping at from 86 degrees to the north to vertical. At 14 feet along this course a curving south-westerly-striking fracture, in which streaks of similar mineralization up to 3 inches wide are exposed by cuts at intervals, is traced for 155 feet to where another definite zone is exposed at an elevation of 7,615 feet. At this point the mineralized fracture continues for a length of 20 feet along a strike of south 80 degrees west, the dip being from 85 degrees to the north to vertical. This 20-foot section, throughout which arsenopyrite mineralization occurs from 3 to 5 inches in width, is represented by a sample which assayed: Gold, 1.68 oz. per ton; silver, 0.3 oz. per ton. At the upper or western extremity snow prevented further tracing of the fracture.

At the northern end of the principal surface showing at the pit, elevation 7,513 feet, seams of the typical mineralization follow a fracture down the hill along a course north 55 degrees east for 19 feet, then north 68 degrees east for a length of 50 feet to the limits of the open-cuts in this direction. Dips along these last two bearings are from 77 to 80 degrees to the north-west. In the vicinity of the pit a triangular condition is indicated by the apparent junction of the curving, more easterly-striking fractures just west of the 18-foot length (striking north 20 degrees east), combined with the slip mineralization striking south 80 degrees west. The triangle so formed would be 18 by 14 by 28 feet, the first dimension representing the principal zone at the pit. Parallel fracturing accompanied by streaks of mineralization is indicated by cuts 100 feet westerly from the pit at elevations between 7,550 and 7,600 feet. Farther up toward the summit other zones similar in character are said to be exposed, but snow conditions prohibited inspection at higher elevations. Before driving the No. 1 adit, hereinafter described, a hole was drilled with a Boyle Bros. X-ray diamond-drill to a depth of 90 feet below the surface.

On July 10th, 1935, the length of this adit at 7,350 feet elevation was 414 feet, having been driven as a crosscut along a course of north 78 degrees west, which is in direct line with the centre of the principal surface showing at 7,513 feet elevation. A point vertically below this surface exposure is reached at 239 feet in from the portal. Allowing for the 70-degree westerly dip, the projected position of the objective is about 298 feet in from the portal, but a steepening of dip apparently occurred as conditions of mineralization somewhat similar to those at the surface were encountered at points 267 and 277.5 feet in from the adit-portal. The details of this main working are as follows:—

The formation exposed in the adit is diorite grading from dark unaltered rock to light-coloured phases.

Chaining in feet from the portal narrow widths of mineralization, chiefly consisting of pyrite and arsenopyrite, accompanied in spots by sphalerite, were intersected at 153, 185, 255, 263, 267, 277.5, 322, 335, and 356 feet. Widths vary from 1 to 10 inches, being extremely narrow for the most part. Samples taken by the writer at points 277.5 and 335 feet from the portal, across widths of 7 and 5 inches, assayed: Gold, 0.06 oz. per ton; silver, 0.6 oz. per ton; and: Gold, 0.14 oz. per ton; silver, 0.3 oz. per ton, respectively. At 267 feet in from the portal a drift about 100 feet long has been driven north 30 degrees east for 28 feet; then north 40 degrees east for 14 feet; then north 29 degrees east for 26 feet; then north 70 degrees east for 10 feet; and from thence to the face north 20 degrees east.

The quartz vein, followed by the drift for the first two courses, dips between 55 and 70 degrees to the north-west, and is from 3 to 8 inches wide exclusive of silicified, slightly mineralized adjacent wall-rock. A sample covering the section from 0 to 15 feet, and representing the section between 15 and 30 feet and from 7 to 3 inches wide, assayed: Gold, 0.24 oz. per ton; silver, trace. Tracing this vein beyond the latter point was difficult owing to pronounced shearing, accompanied by heavy gouge which caused caving from the roof. At point 47 a quartz vein 6 to 8 inches wide, represented by a sample which assayed: Gold, 0.34 oz. per ton, and silver, 0.8 oz. per ton, appears in the western wall of the drift. This strikes north 40 degrees east, with a dip of 75 degrees to the north-west, and is, apparently,

the continuation of the mineralized fracture intersected at point 277.5 in the main adit. Beyond this point caving from the roof made close inspection impracticable, but the last-mentioned vein can be seen at point 52 where it follows along the eastern wall of the drift for a short distance. From that point the roof was caving dangerously and the last 30-foot section to the face was completely blocked. In the main adit, 307 feet from the portal, a curving drift had been driven south-westerly for 84.5 feet. In the section towards the main adit the drift follows a zone of shearing accompanied by some silicification and scattered, irregular, iron sulphide mineralization. At chainage 62 feet from the main adit the drift cuts a 4-inch quartz veinlet, mineralized with banded sphalerite, pyrite, and arsenopyrite, which strikes north 45 degrees east and dips at 56 degrees to the south-east. This occurrence is the apparent continuation of the 3 inches of mineralized quartz cut at a point 322 feet in from the portal of the main adit. Continuing along the drift, a 3-inch quartz stringer, mineralized with sphalerite and arsenopyrite, is intersected at point 68. Beyond here to the face nothing of interest was noted.

The No. 2 adit, at 6,450 feet elevation, is on the *Northern Light No. 1* claim, 1,300 feet measured along a bearing north 65 degrees west from the camp. Exploration conducted in this vicinity has no connection with the previously described deposits in the No. 1 adit area. Extensive ground-sluicing, known as the "big open-cut," was done from 6,450 to 6,475 feet elevation prior to driving No. 2 adit immediately adjoining this surface working to the south-west and roughly parallel with it. The big open-cut, trending north-westerly up the hillside, is about 210 feet long, tapering from a narrow ditch at both extremities to a width of between 20 and 30 feet towards the centre. The overburden is from 10 to 12 feet deep and the sides have largely caved in. According to the Report of the Minister of Mines for 1934, page F 32, several narrow partly decomposed quartz stringers, mineralized with arsenopyrite, were originally exposed in the long ground-sluice open-cut. The writer's sample No. 6679, which assayed: Gold, 0.30 oz. per ton, and silver, trace, was of selected arsenopyrite in more or less decomposed gangue from what appeared to be a pocket or small lens in the central part of the big cut. Conditions were obscured by water and caving. The No. 2 adit, where work has been suspended, is 272 feet long, following a bearing north 67 degrees west. At a point 95 feet in from the portal a branch extends north 22 degrees west for 33 feet to where it forks, one sub-branch being driven to north 25 degrees east for 28 feet, the other north 45 degrees west for 29 feet. The underground workings expose an irregular contact between diorite and serpentine. For 174 feet from the portal the main adit is in serpentine, then in diorite for 250 feet, and serpentine thereafter to the face at 272 feet. From 122 to 224 feet the main adit is directly under the wider part of the big open-cut. From near the portal to point 44.6 a highly metamorphosed dyke 3 to 4 feet wide trends with the adit, and dips from 30 to 50 degrees to the north-east, cutting the serpentine. The branch workings, which also extend under the surface workings, are in serpentine, with the two extremities just entering the diorite. The only mineralization noted underground is in the main adit between 232 and 237 feet from the portal, where it is very indefinite and consists of films of arsenopyrite in cleavage-planes in diorite associated with a zone of fracturing striking from north 37 degrees east to north 40 degrees east. A grab sample of this mineralized rock, assayed for the company, gave: Gold, 0.04 oz. per ton.

All the underground workings described were driven since the examination was made and recorded in the Report of the Minister of Mines for 1934.

Summarizing existing conditions in the No. 1 adit area, widths of auriferous arsenopyrite mineralization are extremely narrow. It is not known if the fractures extend into other rock formations, the situation being obscured by snow at the upper or south-western end and overburden at the north-eastern extremity of the area explored. In the No. 2 adit area no definite measurable mineralization is exposed. In addition to the workings mentioned, a considerable amount of surface prospecting has been done on the company's Taylor Basin property, consisting of test-pits, open-cuts, and trenches. The sides have in most cases caved, preventing inspection. However, no discovery of importance has been reported in connection with them and efforts have been concentrated in the No. 1 adit area, considered the more important objective by the management. All work has been done by hand. S. H. Davis is in charge of the present crew of eight men.

TASEKO RIVER AREA SOUTH-EAST OF TASEKO LAKE (UPPER TASEKO RIVER).

Taylor-Windfall Gold Mining Co., Ltd.

The property of this company consists of the *Windfall* and *Windfall No. 2* Crown-granted claims, together with the *Battlement, Sunshine, Sunnyside, Buzzer No. 2, Buzzer No. 3, Buzzer No. 4,* and the *Windfall Fraction* mineral claims held by location. Lately the adjoining *Province* Crown-granted claim has been acquired. Situated in the Clinton Mining Division, the property is on Battlement creek, adjoining its junction with the Taseko river, about 9 miles easterly from Taseko lake.

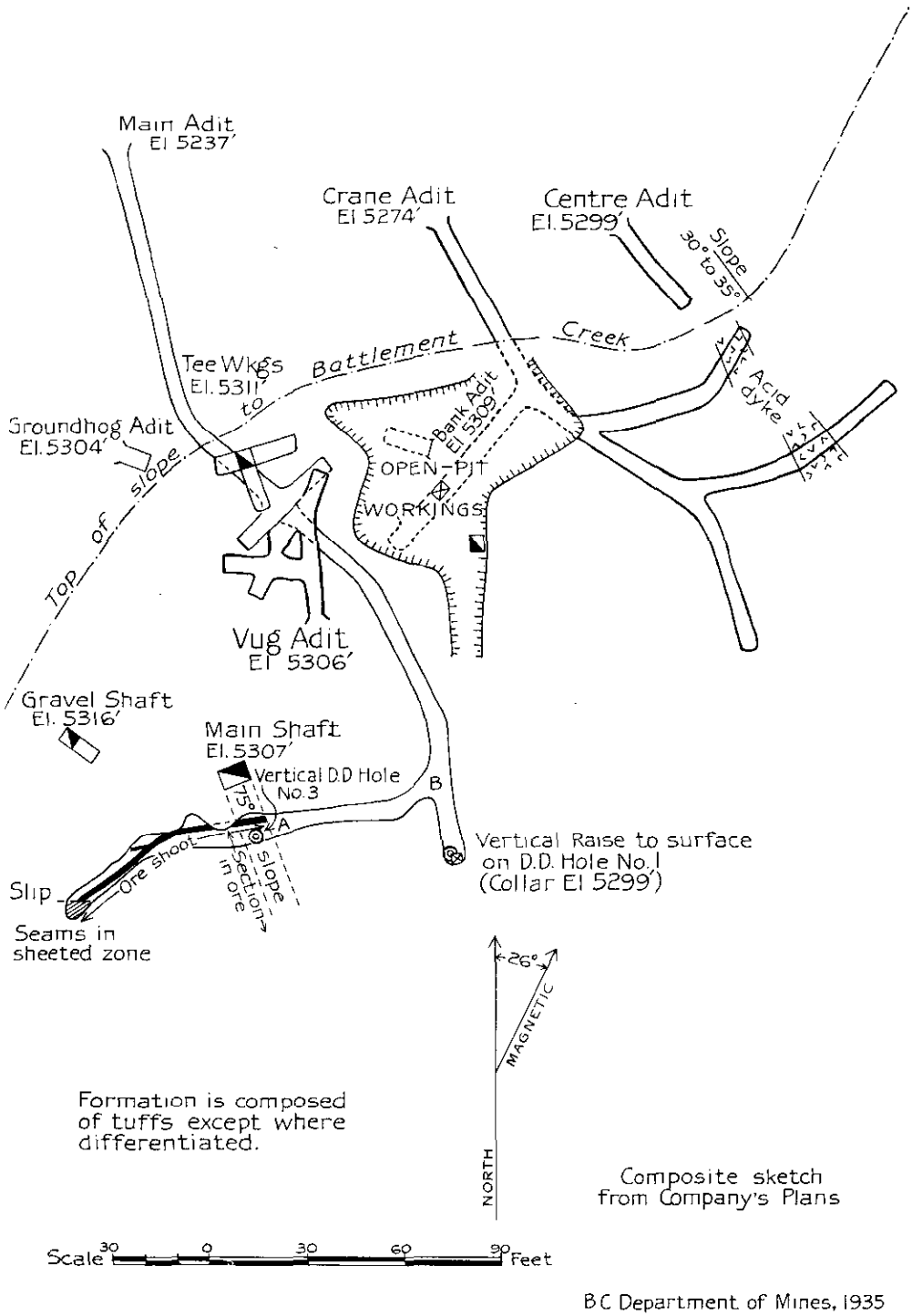
The workings adjoin the mine camp, elevation 5,300 feet, which is located on a small bench forming part of the ridge on the eastern side of Battlement creek. From the top of the bank the ground falls abruptly for 90 or 100 feet to the creek, slopes being from 30 to 35 degrees or more. Just south of the developed area the gentle slope becomes steep as the Taseko River flats, at about 5,100 feet elevation, are approached. To the north of the property, Battlement ridge, with its castellated summits, forms a rampart wall of bedded volcanics, rising to 8,000 feet or more in elevation. South of the Taseko River valley, mountain altitudes in the batholith areas are similar, but the slopes, terminating in sharp, irregularly serrated peaks, are more uniform. The valleys and lower mountain-slopes are well wooded, chiefly with fir and jack-pine.

During the summer months the *Taylor-Windfall* can be reached from the Bridge River highway by pack-trail, 38 miles in length, following Gun Creek valley to Trigger lake; thence along Warner creek, crossing over Warner pass, elevation 7,800 feet, and down Denain creek to the Taseko River valley. Taylor pass, at about 7,100 feet elevation, is also used on occasion, but this involves a longer route. An alternative route, open for horse transportation for a much longer season, is from Hanceville, in the Chilcotin district, to the northern end of Taseko lake; thence southerly, and to the east of the lake, to where connexion is made with the trail, 12 miles in length, leading from the southern end of the lake to the *Taylor-Windfall.* The aeroplane-landing is at the south end of Taseko lake and during 1934 and 1935 most of the supplies and men for the seasonal operations were brought in by plane from Shalalth, on Seton lake. The Hanceville outlet, which serves a large district containing mineral occurrences, is being gradually improved. The distance from Hanceville to the *Taylor-Windfall* is roughly estimated at 85 miles.

The general geology of the area under discussion is shown on Fig. 5, " Gun Creek Area," accompanying the report of V. Dolmage in Geological Survey of Canada Summary Report, Part A, 1928. The northern side of the Taseko River valley is underlain by the Taseko volcanics of Cretaceous age. To the south of the river the formation consists of quartz diorite of the Coast Range batholith. The batholithic rocks intrude the Taseko formation and, near Battlement creek, the contact extends along the bottom of the river-valley. The Taseko formation, in which the deposits on the *Windfall* claim are situated, is composed of fragmentals and tuffs which strike north-westerly parallel to the general trend of the contact and dip to the north-east, into the hill, at from 12 to 25 degrees. According to Dolmage, this attitude is probably flatter than that of the underlying batholithic contact which dips in the same direction.

Certain tuff-beds in the adjacent Taseko formation area have been extensively silicified and pyritized limonite deposits having been formed in several valleys from the oxidation and leaching of the pyrite. (Geological Survey of Canada Summary Report, Part A, 1920, " The Limonite Deposits in Taseko Valley.")

The gradually unfolding geology shows that the rock formation at the *Windfall* deposits (this claim name is used to distinguish it from the copper mineralization in the quartz diorite on the *Buzzer* claims of the same property) is not a distinct, uniformly silicified bed of tuff as at first supposed, but is tuff irregularly or locally silicified adjoining fractures with which ore occurrences are associated. Sharp distinctions are generally lacking whereby separate beds can be accurately delineated and local rock-structures are consequently diffidult to determine. Pyroclastic rock-types revealed by diamond-drilling, to a maximum depth of 313 feet, show at the top of the section shallow beds containing fragments of greenstone composition. Underlying these beds is an assemblage of grey to green tuffs consisting largely of a light-coloured ash matrix enclosing fine to coarse darker fragments of basic material. Some areas of these



Taylor-Windfall. Sketch-plan of Main Workings.

rocks, lacking the darker fragments, are seemingly composed of clean white ash. The latter phase, and the coarsely fragmental one, are apparently more susceptible to silicification and pyritization as in the zones in which ore has been found. Pyrite is generally disseminated in fine granular form, but crystals are often large and well formed, specimens up to ¾-inch diameter being noted. The only intrusive rock-type known in the immediate vicinity is an acidic dyke of irregular width up to 15 feet, which, striking north-westerly, outcrops on both sides of Battlement creek and is cut by two branches of the Crane adit. Its dip is indefinite, due to convergence or divergence of the walls. The dyke, which is not known to have any particular significance in regard to the economic mineralization, has been completely altered, widely spaced quartz phenocrysts being the only recognizable original constituents. The original exposures of disintegrated ore found within or adjacent to decomposed tuffs consisted of eight or nine disconnected rich pockets, occurring within an area of, roughly, 200 by 120 feet. These were dug out some years ago and conditions are now largely obscured. It is recorded that these pockets were of small size, the largest being about 12 feet in length, but in general varying from 6 to 8 feet long. They were irregular in width and quite shallow, the deepest extending 16 feet below the surface. Where opened up in solid rock the cavities had definite walls. Mineralization consisted of coarse gold, in small angular crystalline fragments and sponge-like particles, occurring in a loose decomposed matrix, which included detached crystals of quartz, tourmaline, rutile, and pyrite, with iron oxides, occasional barite, and in places fragments of silicified tuff. These ore-pockets, which lacked continuity and apparent definition, were found to occur in silicified tuff areas associated with fractures mostly striking from north-east to east. In all cases silicification was cut off by minor slips. Adit-workings at lower elevations, which were driven along the same fractures in which the superficial pockets occurred, failed to find any continuity of mineralization or even of silicification. Detailed description of the earlier underground exploration which was not productive and has no particular economic application is omitted.

Latterly, development has been proceeding on a different type of deposit, with which the remainder of this report is chiefly concerned. This consists of a definite ore-shoot, which was found underground and did not outcrop.

When seasonal work was discontinued in the late fall of 1935 this ore-body had been proved for a length of 55 feet and a depth of 81 feet, widths varying from 0.5 to 5 feet, with a general average of about 2 feet. The ore, which is quite distinct in form and character from that of the surface deposits, occurs in a fracture striking north 75 degrees east, with a southerly dip of 75 degrees. The gangue is soft, being composed chiefly of dark-green, amorphous chloritic material with more or less sericite, particularly on the hanging-wall and in end phases of the ore-shoot. Occasional horses or inclusions of silicified wall-rock appear in the fracture-filling as in the shaft, where the formation on the foot-wall side is uniformly silicified as opposed to irregular silicification on the hanging-wall side. Judging from visual inspection (as distinct from microscopic tests described later), the mineralization consists in general of pyrite either in small grains and masses scattered through the chloritic material or in pockets, particularly in the sericite, associated with tennantite and chalcopyrite. Occasional sphalerite was noted and small inclusions of barite. Gold values show no definite relationship to the visible mineralization, but rather seem to be dependent upon the barren-looking chloritic material, which, even in small amounts within comparatively large masses of sericite, definitely influenced the resulting assay. In this connection two microscopic analyses were made recently by the Department of Mines, Ottawa, one of a characteristic sample of the chloritic material and the other of a general 300-lb. mill-test sample. In the first the gangue was described as being composed of an unidentified amphibole somewhat chloritized, through which sericite was disseminated largely and in minute scales. Mineralization was said to consist of microscopic grains and aggregates of tetrahedrite, cuprite, and tetradymite, with which the gold was associated in sub-microscopic form. Only one particle of native gold was recognized.

In the second test "the ore-minerals in their order of abundance" were reported as "pyrite, tennantite, sphalerite, galena, chalcopyrite, two unknown minerals, and native gold." Quoting further, "the sulphides are relatively abundant for gold ores and form 15 to 20 per cent. of the sample. Pyrite occurs as masses which have been shattered and intricately veined by tennantite, sphalerite, galena, and chalcopyrite. Tennantite occurs as small irregular masses and grains which are locally abundant; it contains numerous small grains

of gangue, galena, and chalcopyrite, and is intimately associated with large and small grains of sphalerite. Sphalerite is present in considerable amount as coarse to fine grains mostly associated with tennantite; a bright-yellow mineral (unknown No. 2) occurs as extremely fine bands and grains along the sphalerite-tennantite boundaries. . . .

"Small amounts of chalcopyrite and galena occur chiefly within tennantite. Unknown No. 1, grey in colour similar to sphalerite, occurs in small irregular grains and crystals in gangue and in sulphides, and is probably older than the sulphides. Only one grain of native gold was seen in polished sections; this is extremely small (about 1,600 mesh) and occurs along a fine fracture in the tennantite."

Further in reference to the occurrence of the gold, a few hundred grammes of ground head sample were panned, from which a considerable amount of fine gold was obtained, "but none of the particles are larger than 280 mesh." The assay and analysis of the head sample made available by the company are as follows:—

"Gold	0.92 oz. per ton.
Silver	0.69 oz. per ton.
Copper	2.67 per cent.
Iron	8.00 per cent.
Sulphur	9.05 per cent.
Arsenic	0.92 per cent.
Lead	0.42 per cent.
Zinc	1.15 per cent.
Acid insoluble	62.50 per cent."

Tennantite is evidently a good indicator of values in the more minute occurrences of this mineral rather than in the large masses that occur associated with pyrite and chalcopyrite, as exemplified by the higher values obtained from the barren-appearing chloritic material than from heavy sulphide areas.

The sericite zones, lacking definite metallic mineralization, have little or no gold content. Assays show in places fair values; i.e., from 0.10 to 0.30 oz. per ton, over widths from 1 to 2 feet in the silicified rock adjoining the pay-streak, which in the shaft averages 1.22 oz. gold per ton across 2.55 feet. The drift assays averaged 1.09 oz. gold per ton across 1.4 feet, the full width of ore not being exposed in places. The above averages were supplied by E. E. Mason, mine superintendent, checked in part by sampling by the writer.

The history of the property, as derived from past reports, dates back to 1920, when E. J. Taylor made the discovery. (*See* Reports of Minister of Mines for 1922 and 1923.) After taking out a considerable amount of gold by panning and by means of an arrastre, he bonded the property to the Whitewater Gold Fields, Limited, a Vancouver syndicate, which carried on development in 1923 and 1924. During this period some bullion is stated to have been extracted with a Ross mill, the ore being derived from the surface area. Several adits driven below the surface pockets failed to encounter commercial ore. The property is next referred to successively in the Reports of the Minister of Mines for 1927, 1931, and 1934, and in the latter year it was acquired by the present company, which installed a 3- to 4-ton per day capacity Straub amalgamation-table mill, about 85 tons being milled which yielded bullion to the value of $7,209.73. In the same year diamond-drilling was done in close proximity to the surface workings. Footage aggregated 1,471 feet distributed in six holes. Of these, Nos. 2, 4, 5, and 6 holes showed no values, but, as these were put down without knowledge of the location of any probable ore-zones, this has no significance. Nos. 1 and 3 vertical holes gave interesting results. These are shown on the accompanying sketch-plan, the collars being at about 5,299 feet elevation and 60 feet apart horizontally.

The existing main adit, at elevation 5,237 feet, was extended for 88 feet to intersect diamond-drill hole No. 1, and, as shown on plan, a branch was driven 60 feet to the No. 3 hole. Neither encountered anything of value. A raise was then put up to the surface on diamond-drill hole No. 1 to investigate high sludge assays between footages 38 and 48. This failed to show any appreciable mineralization, sludge values in this case being attributed to the broken nature of the ground and proximity to surface ore-bodies. Subsequently a small vertical winze was sunk from the adit on diamond-drill hole No. 3 to investigate the core-footage between 74 and 84. At 8 feet below the level the winze intersected ore which continued to the bottom at 24 feet, where work was suspended at the end of the 1934 season. Following a late winter,

work was recommenced in the latter part of June, 1935. The new ore-body was exposed in the level above the winze by crosscutting and slashing and 70 feet of drifting was done to the west which developed a length of 55 feet of ore. A raise from the winze-collar to the surface was then put up 72 feet, on the 75-degree dip of the fracture, to form the upper section of an exploration-shaft. An additional 15 feet of height above the winze-collar was added to the fracture, but without definite value; the filling of this upper section of the "blind" ore-shoot being sericite without the chloritic material, with which values are chiefly associated. In August 7 tons of supplies, including hoisting plant, were taken in by plane. Following installation of the hoist, which is directly geared to a Pelton wheel, the raise was prepared for sinking in a 9- by 6-foot section, then driven through and enclosing the winze to a present slope depth of 153 feet below the surface. When work is resumed it is proposed to continue sinking on the ore, 3 feet wide at the bottom of the shaft, to a slope depth of about 240 feet below the surface and, by lateral work, to test the intersection of the ore of identically the same type between points 222 and 232 in diamond-drill hole No. 1, where there is a definite silicified zone similar to that adjoining the shaft ore-body. Another ore possibility is indicated by the sludge assays obtained by the management between footages 162 and 164 in the same hole. The latter coincides graphically with the downward projection of the shaft-vein on its apparent dip and strike. The deeper intersection is believed to bear a definite relationship to the shaft-vein by fault, bend, or offset, indicating at this horizon possible lateral extension to the east or a separate ore occurrence in a parallel fracture. Continuity of the ore-body is not apparent in the drift to the east of the shaft (formerly collar of winze) or point A on the 60-foot level, though erratic assays in the main crosscut, as shown at point B, might indicate its proximity. Mineralization in this location consists of parallel seams of pyrite in a sheeted zone of fractures striking north-easterly, with steep dips to the south-west. The main fracture tightens at both ends of the ore-body. It has already been noted that, although the mineralized fracture persisted in the raise for 15 feet above point A, there were no values of consequence. The 55-foot length of ore west of point A consists mainly of a sericite matrix with bunches of massive metallics and thin indefinite streaks of the chloritic material. The predominating sericite in this exposure is taken to indicate, as elsewhere, the end product of the mineralized fracture, so that the ore in the drift is apparently the top of the shaft ore-shoot, the length of which may be greater at lower horizons. It is equally possible that the ore-bodies will be found to occur as raking lenses, the major dimension being in vertical extent.

In the outward part of the main adit-level, between the portal and chainage 132, where short crosscuts have been driven to the north-east and south-west, numerous fractures are intersected in an area of partial silicification of tuffs grading from dense to granular fragmental material. These fractures belong to two series, one of which strikes north-westerly, with dips between 27 and 50 degrees to the north-east; the other series striking north-easterly, with steep dips, up to 75 degrees, to the south-west. The former are generally marked by gouge containing disseminations and bunches of pyrite and tourmaline, and the latter are filled with massive seams of the same minerals. Thorough sampling by the management of these and similar mineralized fractures at other points gave negative results. Interest is centred at present on the shaft ore-body, which occurs in a fracture of the north-easterly-striking system. E. E. Mason is mine superintendent, with R. H. Stewart and V. Dolmage acting in a consulting capacity.

In regard to the *Buzzer* claims, where sparse disseminations of chalcopyrite in quartz diorite are exposed on the southern side of the Taseko river, no further work of consequence has been done since conditions were described in Geological Survey of Canada Summary Report, Part A, 1928, and the Report of the Minister of Mines for 1931.

Black Sheep. This group consists of five mineral claims held by location, four of them being owned by E. Hansen and one claim, the *Golden No. 1*, by J. Mossie. The staked area is on the south-eastern side of Battlement creek, adjoining the *Taylor-Windfall* property to the north-east, and in the Clinton Mining Division. The *Black Sheep* claim is immediately north-east of the *Windfall* Crown-granted claim, Lot 2643, the adit described later being located on the steep bank sloping north-westerly to Battlement creek, about 200 feet from the boundary of the latter claim.

The general topography of the area and means of access have been described in the foregoing *Taylor-Windfall* report. The *Black Sheep* area is underlain by rocks of the Taseko

volcanics of Cretaceous age (Geological Survey of Canada Summary Report, Part A, 1928, "Gun Creek Map-area"). Rock-exposures, immediately adjoining fractures which have been prospected, consist of dense to porphyritic andesite, the filling of the fractures being composed of seams and streaks of tourmaline and pyrite, or the same minerals in disseminated form in gouge.

No economic mineralization had been encountered when the property was visited in August. The claims were staked following the discoveries made by E. J. Taylor on the adjoining property. Surface workings consisting of shallow excavations in the bank forming the south-eastern side of the creek are located at points about 500 feet apart.

The adit, at elevation 5,325, or 25 feet above the creek-level, was started in an outcrop of iron-stained decomposed andesite. It is driven first for 22.5 feet along a bearing of south 40 degrees east to where it intersects a fracture, marked by gouge, which strikes north 5 degrees east and dips at 65 degrees to the east. At this point, where a bend is made, the adit follows a vertical fracture, containing seams of tourmaline and pyrite, for 24 feet along a course of north 80 degrees east to the face. Two samples, taken at the latter point across 6 inches and 2 feet respectively, gave assays of a trace in gold and silver. About 500 feet farther up-stream a cut in the slope to the creek exposed an indefinite zone of fracturing striking north-easterly and dipping steeply to the south-east, in rusty decomposed fine-textured porphyritic rock.

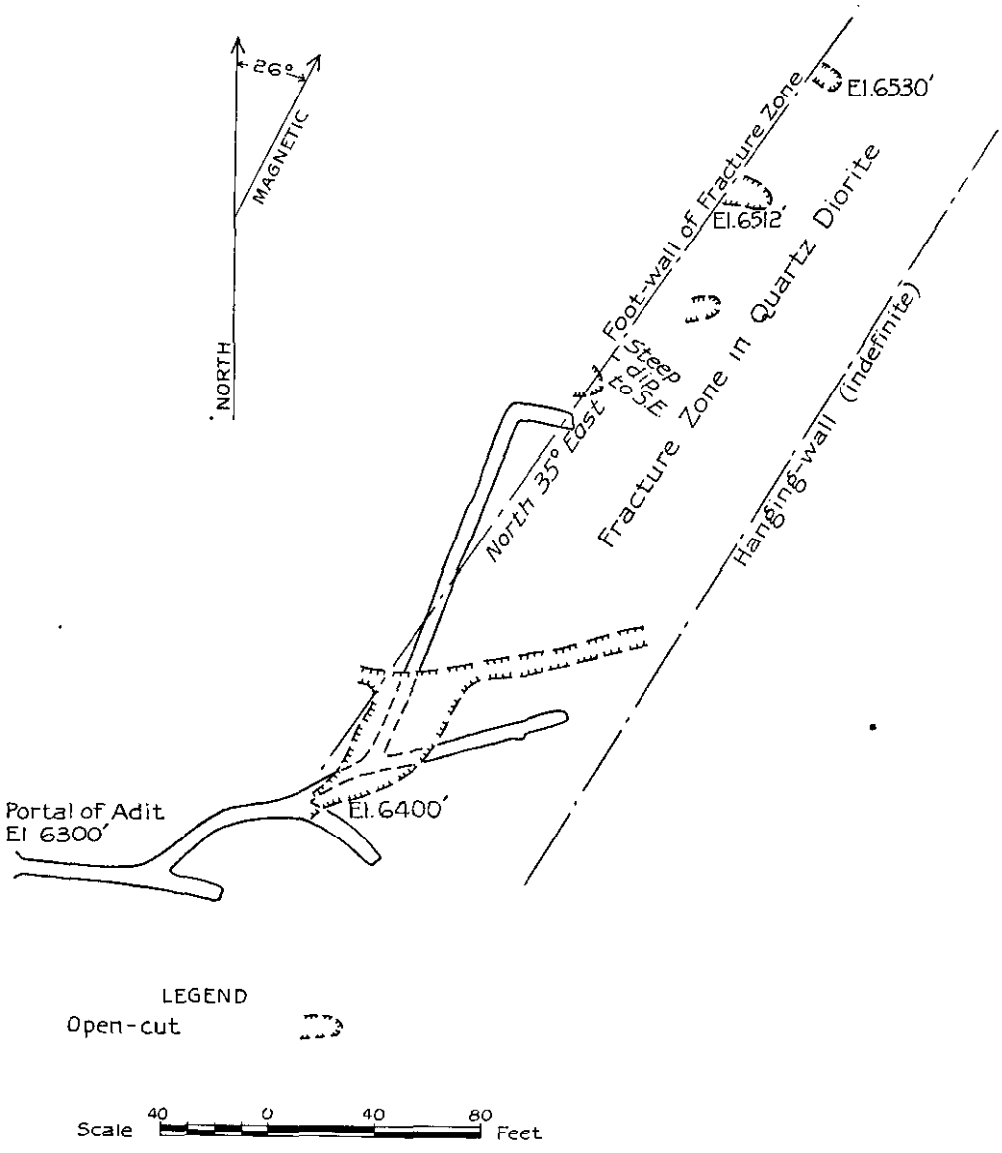
Taseko Motherlode Gold Mines, Ltd.

The property of this company, in the Clinton Mining Division, consists of the *Mohawk* and *Motherlode* groups, comprising eighteen mineral claims and fractions held by location. These holdings are situated to the south of Taseko river and to the east of Gibson (Granite) creek, or about 7¾ miles south-easterly from the south end of Taseko lake. The precise location of the *Mohawk* is shown on Fig. 5, "Gun Creek Area," Geological Survey of Canada Summary Report, Part A, 1928. The claims, at elevations between 6,000 and 8,000 feet, cover the spur formed by the west and north slopes of Motherlode mountain. Slopes to the creek and river are steep but generally uniform as compared with the relief across the valley to the north. The property is conveniently reached by a pack-trail which branches southerly from the main Taseko Lake trail, on the north side of the river-flats, from a point just west of the mouth of Gibson creek. The old pack-bridge across the river, now in precarious condition, is used as a foot-bridge and horses are taken over at a ford a short distance up-stream. The trail then crosses the flats on the southern side of the river to Cuthbert's camp, adjoining Gibson creek, which can be crossed either by a foot-bridge or a horse-ford. Between this point, elevation 4,950 feet, and the mine camp at about 6,315 feet elevation, the connecting switchback trail is on a steep but fair grade. The camp-site faces the Taseko river in an area of small second-growth near timber-line. Lower slopes towards the river are well wooded. The main workings are on the *Mohawk* group, 300 yards south-westerly from the camp and on the slope to Gibson creek.

The deposits occur in quartz diorite of the Coast Range batholith, its contact with the Mesozoic tuffs lying in the bottom of Taseko River valley 1 mile to the north. From what is known of the strike and dip of this contact it is considered probable that it extended to the vicinity of the *Taseko-Motherlode* deposits. On McClure mountain to the west the tuffs overlie the batholith at high elevations, extending for a distance of 2½ miles or more south of the Taseko river.

Mineralization occurs in wide zones of fracturing and shearing, the lower of which, on *Mohawk* ground, has been the more fully explored. In this case the quartz diorite is fairly fresh, showing comparatively slight alteration due to the mineralization. The width of this zone, about 85 feet at the south-western end, is 75 feet, or less, towards the north-east, due to the apparent convergence of the walls in the latter direction. These dip very steeply to the south-east. The foot-wall, which strikes north 35 degrees east, is the better marked, with a thick gouge in places, the hanging-wall being less definite. The workings examined are distributed over a length of 340 feet. Mineralization, in irregular patches, consists chiefly of chalcopyrite and pyrite sparsely disseminated or as scattered bunches of chalcopyrite associated with lesser amounts of pyrite. Accessory minerals include molybdenite, occasional sphalerite, and galena. Small amounts of tourmaline and rutile have been reported to be present in places. The gangue of the more concentrated mineralization is crushed, slightly silicified, and altered quartz diorite. In other areas there are zones of quartz veinlets, with

which molybdenite is frequently associated, or quartz crystals lining the cavities. Surface exposures have not undergone much oxidation and are generally limited to rusty-coloured areas, lightly stained with copper carbonates. Values of interest are principally in gold, with some silver and copper. The gold content appears to fluctuate largely in proportion to the



Taseko-Motherlode Gold Mines, Ltd. Sketch-plan of Mohawk Fracture Zone.

amount of chalcopyrite present. Picked samples in which this mineral is abundant and oxidized material show high assays in gold. General values are very low grade in certain wide sections on the surface and underground, which have not yet been correlated or proved to be continuous in length.

The property is mentioned in the Geological Survey Summary Reports, Parts A, 1924 and 1928, and in the Reports of the Minister of Mines for 1927, 1928, and 1934. In 1928 the Con-

solidated Mining and Smelting Company drove an adit partly crosscutting the zone at the south-west end. The property was acquired by the present company in 1933 and in the following year supplies were packed in, winter camps built, trails repaired, and development continued until early in 1935, when the connected bunk and cook house was demolished by a snowslide which killed the crew of seven men.

The surface workings, on very steep "bluffy" ground, consist of large open-cuts and stripping as shown on plan. Rusty altered igneous rock containing scattered sulphides and occasional copper-carbonate stains is exposed in the extensive stripping at 6,400 feet elevation (foot-wall) directly above the adit. This excavated area, 60 feet long and up to 27 feet wide, follows the foot-wall of the fractured zone, then turns and continues easterly as a trench up the steep slope for a length of 100 feet. The latter branch affords a section diagonal to the strike, and widths of mineralization must be reduced accordingly. The results of large sampling operations by R. H. Stewart showed gold values of 0.15 oz. per ton for the 60-foot section of the trench adjoining the foot-wall. To the north-east four open-cuts adjacent to the foot-wall showed gold values, in similar scattered irregular mineralization, of 0.12, 0.19, 0.145, and 0.08 oz. per ton across respective widths of 12, 15, 23, and 10 feet at chainages 130, 175, 225, and 280 feet measured from the long trench foot-wall intersection. The adit-workings at 6,300 feet elevation are irregular, as shown on plan. Of the total footage of 448 feet, about 203 feet penetrates the fractured zone partly exposed by the large surface excavation at the south-west end of the developed area. Mineralization underground, generally very scattered and indefinite, is comparatively concentrated in the 28-foot section adjoining the foot-wall in the 35-foot crosscut branch to the south-east, as shown on plan. The more obvious mineralization here consists of sparsely disseminated chalcopyrite and occasionally molybdenite in a gangue of partly decomposed, silicified rock. Measuring from the foot-wall, which at this point is marked by gouge 3 feet wide, a sample taken by R. H. Stewart across the first 16 feet assayed: Gold, 0.135 oz. per ton; silver, 1.4 oz. per ton; copper, 0.73 per cent. A sample taken by R. H. Stewart across the next 12 feet gave: Gold, 0.046 oz. per ton; silver, 1.4 oz. per ton; copper, 0.14 per cent. Lateral extension of the mineralized 28-foot section is not apparent in the next crosscut branch to the north-east, nor in that part of the foot-wall drift within the fractured zone. The latter, which represents the work done immediately before the accident which suspended operations, was not driven along the foot-wall as intended, its outer part being to the north-west and outside the zone of interest.

The face of the sharp bend driven east for 20 feet is close to the projected position of the foot-wall. Conditions therefore remain indefinite in regard to the possibility of developing large areas of low-grade mineralization which might be concentrated to an economic product, because work done has not yet demonstrated that values encountered in surface showings extend to depth for any considerable distance along the strike. The high gold values in specimen material, apparently associated chiefly with chalcopyrite, are of interest in connection with the possible discovery in the vicinity of valuable concentrations of sulphides. The wide *Motherlode* shear-zone, referred to in past reports, was not examined due to stormy weather and snow. This deposit, at about 7,400 feet elevation, is stated by R. H. Stewart to be approximately parallel, its width being difficult to determine due to the surface being badly broken up and largely covered with rock-slides. Sulphides are stated to be present in very small amounts, gold values varying from 0.03 to 0.08 oz. per ton.

Empress. This group of six claims held by location, owned by J. Cuthbert, E. J. Taylor, and associates, is situated below the *Mohawk* group of the *Taseko-Motherlode* property, across the lower part of Gibson (Granite) creek south of the Taseko river, and therefore in the Clinton Mining Division. A trail 1,500 feet in length connects the *Empress* workings at 5,150 feet elevation (highest point) with Cuthbert's camp, 4,950 feet elevation, on the western side of the creek. The prospected area is on flat, rolling, brushy ground east of the creek and on adjacent lower slopes of Motherlode mountain.

The streams mentioned are shown on Fig. 5, "Gun Creek Area," accompanying the Geological Survey of Canada Summary Report, Part A, 1928. Means of access have been described in the writer's preceding reports on properties in the same district. The contact between the Coast Range batholith and the Taseko volcanics crosses the ground in an easterly and westerly direction about half a mile south of the Taseko river, its approximate position being determinable by broken-up, loose fragments and masses of both formations. Near this

contact are boulders of mineralized granitic rock, some of which have been completely replaced by pyrite and magnetite, also loose fragments of leached, copper-stained silicified tuff, some areas of which show scattered pyrite. Occasional boulders of the latter formation contain scattered aggregates of massive pyrite, chalcopyrite, and bornite, with accompanying magnetite. As no appreciable area of definitely solid rock has been exposed, it is not possible to outline the geological conditions, beyond stating that a zone of contact-metamorphic mineralization is indicated by the shattered rocks which, in many places, appear to be not far removed from their original position and at certain points may be in situ. Gold colours were panned from decomposed silicified tuff at several points. Selected similar material taken by H. L. Batten gave an assay of: Gold, 0.12 oz. per ton. Specimens of copper-stained pyritic material assayed: Gold, 0.18 oz. per ton; and two selected samples of magnetite assayed: Gold, 0.28 and 0.12 oz. per ton respectively. The holdings are comparatively recent stakings, only shallow surface prospecting having been done. This consists of scattered cuts and excavations within an area of roughly 300 by 600 feet. Surface-stripping is almost prohibitive owing to the cemented gravel on bed-rock, formed through the deposition of limonite derived from pyritized tuff-beds. The resulting material is too hard to pick and is difficult to drill by hand. Conditions, while very indefinite, indicate an interesting contact-zone for systematic prospecting.

Spokane. This group, consisting of four mineral claims held by location, is owned by J. Cuthbert, C. Holbrook, and associates. The property, in the Clinton Mining Division, is situated at the head of McClure creek, 2½ miles south of the Taseko river or about 6 miles south-east of the south end of Taseko lake. The showings are situated on flat to gently sloping ground in a cirque above timber-line, elevations ranging from 6,500 to 6,700 feet. Adjoining the prospected area to the south and east are talus-slides and bluffs which, together with the steep slopes of McClure mountain to the west, form the boundaries of the basin. The *Spokane* group is reached by a good pack-trail from Cuthbert's camp, elevation 4,950 feet, adjoining Gibson (Granite) creek on the south side of Taseko river. General means of access and transportation conditions have been described in the foregoing *Taseko-Motherlode* and *Taylor-Windfall* reports.

The deposits occur in quartz diorite of the Coast Range batholith, about a quarter of a mile east of its contact with Mesozoic tuffs outcropping on McClure mountain (Geological Survey of Canada Summary Report, Part A, 1928). Mineralization, consisting chiefly of pyrite, with a fair percentage of chalcopyrite in places, is exposed in an irregularly shaped area roughly 500 feet long and from 200 to 300 feet in width. The trend of the mineralized zone is not definitely discernible, but one well-defined plane of fracturing (foot-wall of zone?) was noted, the strike of which was north 45 degrees east and the dip steep to the south-east. This would indicate a fractured zone of somewhat similar strike to the *Mohawk* zone on the *Taseko-Motherlode* property. Both the *Spokane* and *Mohawk* deposits are south-west of the copper mineralization in the batholithic rock on the *Buzzer* claims of the *Taylor-Windfall*, and while the three generally similar deposits are not necessarily in line, it seems that they follow a general system of north-easterly fracturing. The surface is much broken up and it is difficult to distinguish solid material from the large masses of loose rock. What appear to be solid outcrops among the residual debris consist largely of rusty, altered granitic rock containing irregular disseminations and patches of the sulphides. Mineralization is more intense where local fracturing is pronounced. Silicification is not much in evidence.

Judging from selected type samples the gold values do not appear to be associated with chalcopyrite as is apparently the case at the *Taseko-Motherlode*. Selected chalcopyrite with quartz crystals assayed: Gold, 0.02 oz. per ton; silver, 0.8 oz. per ton; copper, 13.5 per cent. Two other specimens of pyritic material assayed respectively: Gold, *nil;* silver, 6 oz. per ton; copper, 9 per cent.; and: Gold, trace; silver, 2 oz. per ton; copper, 8 per cent. The better gold values are contained in rusty, leached, copper-stained granitic rock, a selected sample of this character assaying: Gold, 0.76 oz. per ton. All samples quoted are from the surface, no underground work having been done.

The claims constituting the property were staked in 1922 and mentioned in the Report of the Minister of Mines for 1922 and for the years 1927 and 1928, when some trenching was done by the Consolidated Mining and Smelting Company. Since that time seasonal prospecting has been done to meet assessment requirements. Brief reports on the claims are also contained in Geological Survey of Canada Summary Reports, Parts A, for 1924 and 1928.

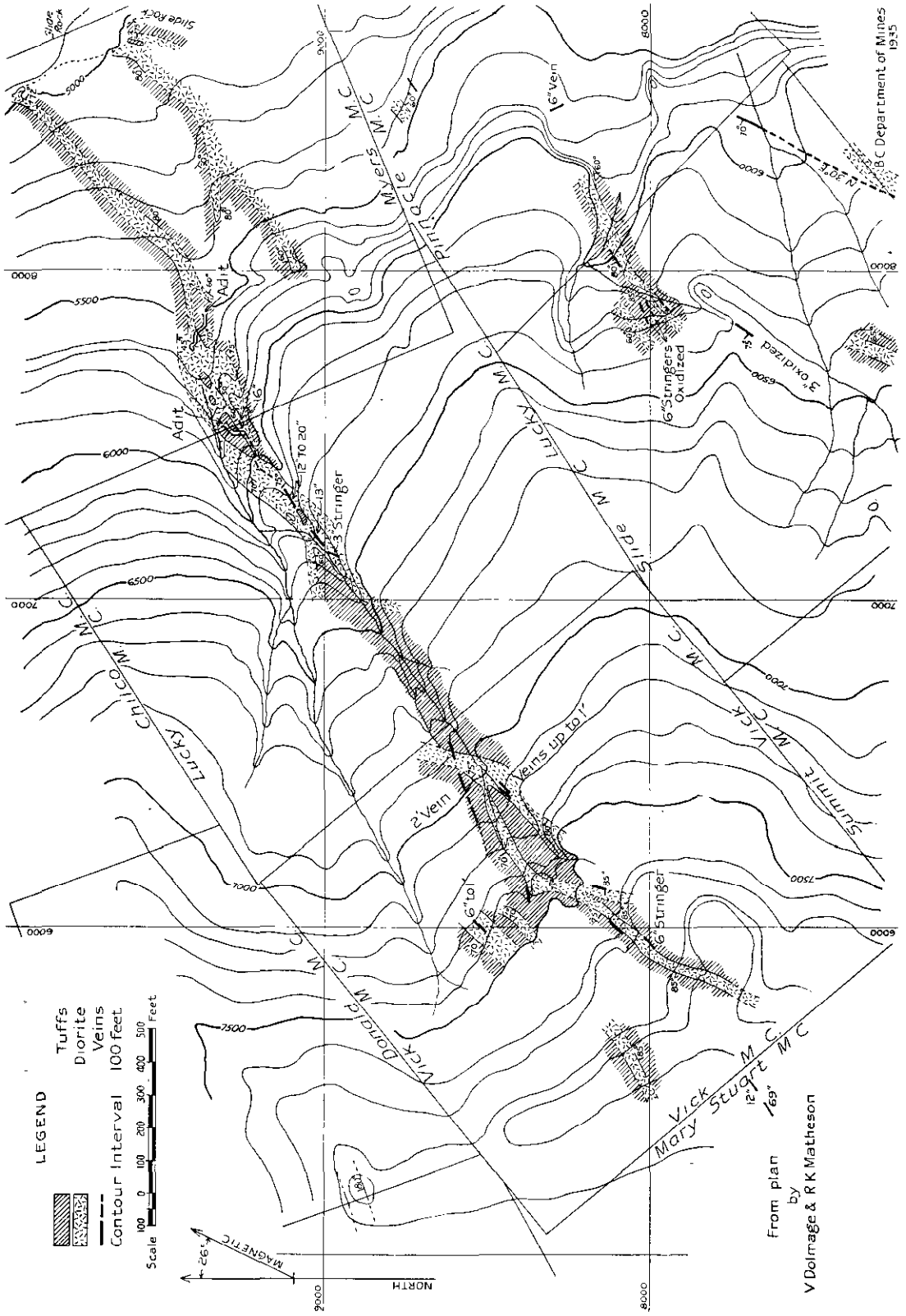
The surface workings, consisting of trenches and open-cuts, are shallow, the excavations generally having a depth of from 3 to 6 feet. The work is concentrated in an area about 300 feet long and 150 feet wide, in which relative elevations vary from 6,460 to 6,522 feet. The main trench system, comprising two parallel trenches approximately 60 feet apart running northerly and southerly, is roughly bisected by a small creek flowing easterly. The western trench, which branches 60 feet from the north end, is 240 feet long and the eastern trench is 200 feet in length. The mineralization in these and surrounding scattered trenches and cuts cannot be described in detail for practical purposes due to the broken oxidized surface and doubt as to which material is in place. The included loose masses are similarly mineralized and often show considerable copper-stain. The lowest and most definite exposure is in the bluffs 75 feet easterly from the northern end of the easterly trench and at an elevation of 6,460 feet. In this location, where there is an apparent foot-wall striking north 45 degrees east and dipping steeply to the south-east, the showing, 30 feet long and up to 10 feet high, consists of rusty, altered, copper-stained granitic rock. A selected sample of this material assayed: Gold, 0.76 oz. per ton; silver, 0.8 oz. per ton; copper, 2 per cent. About 100 feet southerly from the bluff-showing, adjoining the trail at the same elevation, stripping and cuts over a length of 50 feet expose scattered mineralization. The *Spokane* prospect has not yet reached the stage whereby areas of surface mineralization of definite dimensions and value could be delimited, more development being essential to prove continuity and the presence of average gold values below the zone of oxidation. Surface-stripping in the flat area is difficult and expensive. Further surface work could, however, be done to advantage on the bluff-showings and along the edge of the trail by trenching across the apparent north-easterly strike of the deposit, approaching the objective from the lower ground to the east of the trenched area.

Taseko River Area, North of Taseko Lake (Lower Taseko River).

Vick. This property, owned by C. M. Vick, consists of twenty-one mineral claims held by location, situated on the western side of the Taseko river at a point about half a mile northerly from the north end of Taseko lake, in the Clinton Mining Division. The claims cover the bare, precipitous, rocky ground rising immediately west of the river at 4,400 to 7,900 feet elevation, both altitudes being approximate. The mountain, backed by rugged peaks of the Coast range, marks an abrupt transition from the undulating low relief of the Interior plateaux which it faces to the north-east across the river. The property is reached from Hanceville, in the Chilcotin district, 60 miles westerly by motor-road from Williams Lake, on the Pacific Great Eastern Railway.

Improvements made in 1935 permit of truck-haulage in dry weather from Chilco Ranch to a distance of 27 miles towards the mine; then there are 13 miles of rough road and 15 miles of trail to the cable-crossing opposite the mine camp. The Taseko River valley, bordered by a series of gravel benches, sparsely wooded with jack-pine, offers easy facilities for road-construction, a little grading being necessary at a few points where excavation will be in gravel. From where the river is left to Chilco Ranch, including the 27-mile improved section, the ground is generally open, level, or rolling, being dotted with small shallow lakes, swampy depressions, and fairly dense patches of jack-pine. Rock-outcrops are quite rare, the whole area being used as pasturage for cattle. Roads are easy and cheap to construct if low-lying, muddy areas are avoided.

The geology of the district is shown on Publication 2063, "Chilco Lake and Vicinity," accompanying Geological Survey of Canada Summary Report, Part A, 1924. The formation in the immediate vicinity of the workings consists of andesites, tuffs, and massive flow-breccias. These strike northerly and southerly with flat dips into the hill to the west. Cutting the volcanic beds are south-westerly-trending diorite dykes which, from 20 to 100 feet wide or more, follow an irregular course and are split up into numerous branches. The main contact with the intruding Coast Range batholith lies 15 miles southerly at the south end of Taseko lake. The deposits occur as south-westerly-striking fissure-veins intimately associated with the dyke system, being either within the intrusive bodies or adjoining them. The vein-showings, on which most of the work has been done, strike up the mountain from south 50 degrees west to south 60 degrees west and dip at 75 degrees to the south-east. They occupy the bottom or sides of a steep, deeply incised, narrow gulch which corresponds with the general trend of the



Vick. Sketch-plan showing Vein-exposures and Geology.

principal dyke system as mapped by V. Dolmage and R. K. Matheson. Short vein sections, of generally similar attitude, are exposed at widely separated points through a vertical range of about 2,100 feet. Continuity of individual occurrences was difficult to trace, due to great lengths of the outcrop area being covered with loose rock and, in places, snow. The ground is also very precipitous. Mineralization in the surface showings, some of which are only partly exposed, generally consists of pyrite and chalcopyrite associated with quartz, in bands paralleling the walls of the fissures, the larger part of the filling being altered, and sometimes silicified rock. The sulphides are generally concentrated in streaks and narrow bands, of which there may be two or more in a section. Gold values are almost exclusively associated with the pyritic material, a selected specimen of which assayed: Gold, 9.34 oz. per ton; silver, 5.4 oz. per ton. Quartz, lacking sulphides, has little or no gold content. Except in such picked material, silver values are negligible. Assays show up to 3.5 per cent. copper, the general content being unimportant.

The claims forming the nucleus of the property were staked in 1933, more claims being added in 1934 and 1935. Underground work was initiated in 1935. Surface workings consist of open-cuts and stripping aggregating about 200 lineal feet. This work is localized at elevations 5,832, 6,142, and 7,900 feet, rusty streaks in places marking the apparent position of outcrops in the intervening spaces which, as stated previously, were largely covered. On the summit at 7,900 feet elevation are two widely spaced cuts. In the most south-westerly of these cuts the showing is 69 inches wide. The other cut shows a 12-inch width of quartz, containing streaks of sulphides, which assayed: Gold, 0.68 oz. per ton. At 6,142 feet elevation a similar showing, 12 inches wide, assayed: Gold, 1.10 oz. per ton. At 5,832 feet elevation a vein-exposure, 20 inches wide, is oxidized and decomposed. Just below this point there is a streak of massive sulphides on the foot-wall from which the selected sample, assaying 9.34 oz. gold per ton, was obtained. Adjoining this the vein is eroded and covered with slide-rock. At 5,795 feet elevation there is a showing 16 inches wide consisting of a 6-inch foot-wall streak which assayed: Gold, 5.52 oz. per ton; the adjoining 10 inches of quartz with sulphides assaying: Gold, 0.51 oz. per ton. Chalcopyrite is comparatively abundant here. Underground workings consist of two adits (*see* map), at elevations of 5,792 and 5,534 feet respectively. At the time of the writer's visit in August crosscutting by hand was proceeding on both levels. Owing to the slide-rock and great depth of snow in the gulch, it was necessary in both cases to make detours through the rock walls to get under the vein-outcrop. The upper adit had been driven 46 feet and the lower 65 feet. The vein was expected to be reached in short distances in both workings. In addition to the showings described, there are on the claims numerous widely separated similar occurrences naturally exposed on the bare ground as mapped by V. Dolmage and R. K. Matheson and shown on the accompanying illustration made available to the writer.

Viccal and Mary Stuart.

These groups, comprising nine mineral claims held by location and owned by E. A. Calep, C. M. Vick, and Mrs. Vick, are situated on or near Vick (Fish) creek, which joins the Taseko river about 10 miles below or northerly from the latter stream's exit from Taseko lake. The property is located 8 miles on a bearing of north 7 degrees east from the northern extremity of Taseko lake and about 4 miles east of the Taseko river, and is within the Clinton Mining Division.

Throughout most of its length Vick creek flows northerly roughly parallel to Taseko river and 3 to 4 miles to the east of it. Vick creek is not correctly shown on any available map of the district.

Calep's cabin at 4,800 feet elevation is about 10 miles up the creek from its confluence with the river. The local relief is characterized by rolling hills, up to 5,000 feet elevation, bordering the shallow, comparatively wide valley of Vick creek, which flows through open swampy areas and wild-hay meadows. The adjoining hills are fairly densely wooded, chiefly with " lodgepole " jack-pine.

The claims are easily reached by Indian pack-trails, one of which, about 16 miles in length, branches off the main trail (partly converted into a road) at a point about 37 miles south-west of Chilco Ranch near Hanceville. The geology of the area has not yet been mapped, the adjacent Chilcotin district being occupied chiefly by Tertiary lava-flows overlain by glacial till. Locally, rock-outcrops are rare and the mineralization exposed resulted from prospecting to find the source of " float." Trenching, localized at points about 1 mile apart, shows in one case pyrite in seams and disseminations in a dioritic dyke and in the other case similar

mineralization, but in a feldspar-porphyry dyke with chalcopyrite occasionally present with the pyrite. In the latter case gold values are apparently associated with the copper sulphide. A selected sample in which this mineral was present assayed: Gold, 0.54 oz. per ton; silver, 0.6 oz. per ton; copper, 2 per cent. Selected pyrite in the same vicinity gave a trace in gold and silver.

The feldspar-porphyry exposure is adjacent to a small stream flowing westerly into Vick creek, which it joins at about 200 yards above or south of Calep's cabin, the trail connecting the latter point with the workings being about 1¼ miles in length. In this locality trenches, from 6 to 8 feet deep, have been dug over an aggregate length of 240 feet. Of these, two trenches, together with the intervening bare outcrop, afford a 160-foot section across the strike, details being as follows: Chaining in feet southerly from the northern extremity, feldspar-porphyry dyke (striking north 80 degrees east) from 0 to 5; basalt mineralized with pyrite from 5 to 10; feldspar-porphyry dyke, silicified and altered in places, mineralized with disseminated pyrite and also seams of this mineral, accompanied occasionally with chalcopyrite, filling closely spaced fractures, from 10 to 83; pyritized basalt from 83 to 92; pyritized andesite from 92 to 148; and, finally, basalt from 148 to 160. Samples across definite widths failed to show any appreciable values, but selected chalcopyrite and pyrite from a seam in the feldspar porphyry gave the assay in gold of 0.54 oz. per ton as previously mentioned. Selected pyrite and pyritized rock showed no values. At chainage 8 a partly decomposed calcite stringer accompanied by ankerite and pyrite is partially exposed above water for a length of 10 feet. This varies from 8 to 14 inches in width, strikes north-easterly, and dips 65 degrees to the north-west. The same stringer, but 2 inches wide, is again exposed in a small trench 22 feet to the north-east. These showings, from which gold colours have been panned, are within the mineralized feldspar-porphyry area. In the other location, on the gentle slope east of Vick creek, north-east of Calep's cabin, trenches show pyrite in seams and disseminations in dioritic rock which trends from north 70 degrees east to north 80 degrees east. Selected pyritized rock carried only a trace in gold and silver.

Tatlayoko Lake Area.

Morris.

This property of the Bridge Island Golds, Limited, consists of the following Crown-granted claims: *Tatlico, Tyee, Isaac T., Spokane, Copper Dyke, Copper Dyke Extension,* and *Millsite.* The first six claims mentioned form a continuous group adjoining which, to the west and south, are ten surveyed claims, not Crown-granted, held by I. T. Morris and M. Sutton, who represent the major interest in the Tatlayoko Lake Gold Mines, Limited, which formerly owned the *Morris* mine. The property is situated south of the head of Matthew creek, 3 miles south-east of the south end of Tatlayoko lake, in the rugged mountainous area near the eastern boundary of the Nanaimo Mining Division. Matthew creek flows north-westerly to its junction with the Homathko river at a point about 2 miles below the lake. The base camp is situated on a creek below and 900 feet from the workings.

A power-site has been located at a point near the base camp where the creek flows through a very narrow, steep-walled gorge, in which it makes a sharp turn and falls in cascades through a height of 30 feet. Here a dam has been constructed and a 70-foot diversion-tunnel driven for a proposed small power-development. In and adjoining the valley of Matthew creek are fair stands of timber suitable for lumber, the forest generally extending up the mountain-sides to about 5,000 feet elevation, above which there are only scattered clumps of stunted mountain-hemlock. In parts of the timbered areas, swept by a forest fire of recent years, there are a great number of standing fire-killed trees. The claims cover the steep mountain-slopes facing the main valley occupied by the Homathko river and Tatlayoko lake to the west and north-west, elevations on the steep, rocky, and talus-strewn ground above timber-line ranging between 6,000 and 7,000 feet.

Access to the area is by motor-road, 169 miles from Williams Lake, on the Pacific Great Eastern Railway. Of this total distance, 145 miles extend westerly from the town mentioned to the junction with the branch, which is followed southerly for 24 miles to the wharf at the north end of Tatlayoko lake. In dry weather road conditions are good for the first 100 miles, as far as Redstone. In this section improvements made during the fall of 1935 included filling of muddy areas and grading. From Redstone to the lake the road was rough and in wet

seasons has at times been impassable. This portion, however, has been improved considerably by the repairs recently made. During periods of mining activity motor-boats and a scow have been operated between the landings, about 14 miles apart, at the north and south ends of the lake. An alternative route is provided by a pack-trail along the eastern side of the lake, horses being available locally. From the southern landing, elevation 2,717 feet (lake-level), a rough road, over which a light truck has been used, extends south-easterly for about 3½ miles to the *Morris* base camp at 2,850 feet elevation, which is connected by an old pack-trail, about 3 miles in length, with the mine camp at 6,050 feet elevation. In 1934 a 6-foot trail, intended for caterpillar-tractor haulage, about 6 miles in length, was built between the lower point and a point 500 feet vertically below the upper objective. The excessively steep grades of parts of this new trail prohibit its use for successful, continuous tractor-haulage. A better location could be obtained giving a uniform and reasonable grade between terminal points. Conditions, however, are well adapted for aerial-tram transportation to a strategic point in the valley below, if warranted by further development and solution of economic and metallurgical problems in connection with production.

In 1934 freighting costs between Williams Lake and Tatlayoko lake were 1.5 cents a pound and further costs of freighting on the lake and by the road to the base camp are reported to have been low. General communication facilities of the area are as follows: A stage carries mail on alternate Saturdays to Moore's ranch near the north end of Tatlayoko lake; the nearest telephone-station is at Graham's ranch and hostelry at Tatla lake, 29.7 miles from Moore's or 151.8 miles west of Williams Lake.

In regard to the geology of the area, the following is an extract from page 70, Geological Survey of Canada Summary Report, Part A, 1924:—

"The veins cut Triassic sediments, chiefly argillites and fine sandstones, but with one thin bed of fine cherty conglomerate. A short distance north-east of the veins is a stock of quartz diorite probably related to the Coast Range batholith, the edge of which is situated a few miles to the south. Many dykes cut the sediments and range in composition from diorite to basalt. Many, if not all, of them are younger than the veins, since they cut the veins or cut other dykes which cut the veins. One basalt dyke follows the main vein through its length, crossing it and recrossing it and holding included fragments of it."

In all cases seen the veins, if not in the dioritic rock, are not more than 400 feet from its nearest exposure. To be more explicit, several of the veins cut the quartz diorite, which, more extensive than originally supposed, trends north-easterly for a length of at least 800 feet and is reported to have been traced through several adjoining claims to the north-east. Its width was not definitely observed, but it is probably a large dyke or sill. The other vein occurrences are in the sediments, chiefly argillites, in a zone about 400 feet wide adjoining the igneous intrusive body to the north-west. The local attitude of the sediments is difficult to determine, the series being disturbed and intruded by a great profusion of dykes which follow no definite system of fracturing, but strike in various directions.

Prospecting has been generally confined to a zone 800 feet long measured north-easterly and south-westerly (roughly parallel to outcrops of the dioritic rock) and up to 1,000 feet in width. Within this area are exposed numerous veins, stringers, and lenses which are associated with fissures or fractures cutting the formation in various directions; i.e., northerly, north-easterly, and north-westerly. No definite system of fracturing was observed and strikes and dips vary very considerably. In several cases within the sedimentary formation veins follow one or both walls of dykes. The No. 1 (or *Morris*) vein is the best exposed, having been traced on the surface for a length of 850 feet through a vertical range of 450 feet, and followed underground for 280 feet from near the lower outcrop.

"Pay-streak" widths (i.e., excluding dyke-partings) are generally less than 2 feet in width, but swell locally up to 5 feet. In the No. 1 adit, developing the *Morris* vein, widths for sampling purposes varied from 0.5 to 4.8 feet, the average being 2.73 feet. Examination of typical vein-filling showed the following minerals in approximate order of abundance: Stibnite, arsenopyrite, and pyrite, accompanied by minor amounts of sphalerite and tetrahedrite. Stibnite is the most conspicuous sulphide, followed by arsenopyrite.

The gangue is chiefly quartz with altered crushed wall-rock and kaolinitic material, calcite also being present occasionally in small amounts.

Eighteen samples, including five check samples taken by the writer, over a length of 247 feet and a width of 2.73 feet in No. 1 adit (not a continuous section for tonnage-estimate purposes), averaged: Gold, 0.25 oz. per ton; silver, 3.1 oz. per ton. Somewhat higher values, however, can be obtained from certain sections of the above length sampled. Assays of the writer's samples of selected type material do not clearly indicate the minerals with which gold and silver are associated, although gold values to some extent appear to be related to arsenopyrite, as illustrated by the following samples:—(1.) Heavy sulphide consisting chiefly of stibnite and arsenopyrite with a little sphalerite assayed: Gold, 1 oz. per ton; silver, 22 oz. per ton. (2.) Sample containing 16.7 per cent. stibnite, with no appreciable arsenopyrite, gave only a trace in gold and silver. It is evident that there is no direct relationship between silver and stibnite, silver values, where appreciable, being attributed in part at least to the presence of tetrahedrite, which, in places, is intimately associated with the antimony sulphide. The better values in both gold and silver appear to be contained in sulphide masses, composed of several of the minerals specified.

In 1907 I. T. Morris, closely associated with the property ever since, with A. H. Sheppard, discovered vein-outcroppings on what is now the *Morris* mine ground, and six claims were staked. About 1909 the title to the claims was assigned to the Tatlayoko Gold Mines, Limited, and, following transportation improvements, underground work was initiated. The claims were Crown-granted in 1911 and the company continued active until 1912. The property was idle until about 1920, when the interest of Sheppard, now deceased, was acquired by M. Sutton. In 1921 a small sawmill was taken in and lumber sawn for camp buildings. A road was built from the south end of the lake to the power-plant site, which was partially developed as previously stated. The property is next mentioned in 1934, when an agreement was entered into with the Bridge Island Golds, Limited, this company assuming control of operations. The base camp was built and the 6-mile-long narrow-gauge road previously referred to was constructed. No mining of consequence has been done since about 1912. Past references to the property are contained in the Reports of the Minister of Mines for the years 1910, 1916, 1921, and 1934.

Surface workings are quite extensive and consist of a large amount of trenching along the outcrop of No. 1 vein, together with many scattered cuts and trenches exposing outcroppings of other veins, several of which are fairly well defined, and of stringers, or elongated lenses. The No. 1 vein has been traced by trenching and stripping, and natural exposures on bare rock, for a length of about 850 feet between elevations of 6,150 and 6,600 feet; these and other elevations specified being relative and based on aneroid readings. At the lower end the trenching and stripping is practically continuous for a length of 250 feet or up to about 6,400 feet in elevation. Above this point the outcrop is largely obscured by rock debris to where it is again definitely exposed between the 6,500- and 6,600-foot contours. The strike is southerly going up the bluffs and talus-slopes, whilst dips vary between 25 and 50 degrees to the east. The vein, cutting the argillites, follows one or both walls of a basaltic dyke which is from 2 to 6 feet wide or more.

The quartz-diorite contact lies about 200 feet to the east at the 6,150-foot contour and less than 50 feet away at the 6,500-foot contour. Above the latter point its position was not discernible. While partial or imperfect exposures do not permit a detailed description of lengths and widths throughout the outcrop area, mineralization, occurring over widths varying from 1 to 5 feet, is visible at numerous points. Stibnite and arsenopyrite are the principal sulphides, with yellow-green oxidation products, in a gangue of quartz and silicified crushed rock. Dyke and vein relationships are illustrated by sections at the 6,250- and 6,525-foot contours, where conditions are respectively: (1) From 3 to 5 feet of strong sulphide mineralization on the foot-wall side of the dyke, and (2) dyke 6 feet wide with similar mineralization 15 inches wide on the hanging-wall and from 12 to 18 inches wide on the foot-wall. While there are numerous vein-outcroppings, prospecting, here as elsewhere on the surface, is very incomplete, so that the tracing of a showing along one or the other side of the dyke is difficult or impracticable. At all points on the property vein material separates cleanly from the dykes. No. 1 adit, at 6,150 feet elevation, develops the ground below the vein-outcrop just described and is 360 feet in length. The crosscut approach is driven south 28 degrees east for 50 feet, then south 67 degrees east for 30 feet to where the vein is encountered and followed along its southerly strike to the face, dips being from 25 to 45 degrees to the east. The course of the

drift is irregular, so that the two "pay-streaks" on either side of the dyke, which is from 4 to 5 feet in width, are not fully exposed throughout. Chaining south from zero at the vein-intersection 80 feet in from the portal, the western or foot-wall "pay-streak" is fairly well exposed from 33 to 135 feet, through which better section five samples averaged:—Gold: 0.38 oz. per ton, and silver, 3.06 oz. per ton, across 3.5 feet. Just south of chainage 135 feet, this showing goes into the western wall, but is cut again at 225 feet, where the drift curves westerly and is exposed to the face at 247 feet. Three samples in this last section, 22 feet long, averaged: Gold, 0.18 oz. per ton, and silver, 1.5 oz. per ton, across 2.7 feet. The hanging-wall "pay-streak," mostly left in the wall of the drift or poorly exposed, shows up better towards the face, as at chainage 230 feet, where a sample across 1.5 feet gave: Gold, 0.30 oz. per ton; silver, 3 oz. per ton. A sample across 2 feet in the face at chainage 247 feet assayed: Gold, 0.14 oz. per ton; silver, 1.2 oz. per ton. Slashing and crosscutting are needed to properly expose both "pay-streaks" throughout the drift and test the continuity of mineralization. The foot-wall streak appears to be the more continuous, whereas the other one is possibly in the form of elongated lenses.

The portal of No. 2 adit is located 346 feet south 55 degrees west from No. 1 adit-portal. It is 258 feet long and was started on a narrow quartz vein in argillite, which, due to the precipitous character of the ground, cannot be traced for any considerable distance along the surface. As exposed in the adit the vein, mineralized with stibnite and arsenopyrite, is from 0.4 to 0.8 feet wide, striking south 35 degrees east, with a dip of from 40 to 65 degrees to the north-east. Chaining along the drift from the portal this vein is followed to 135 feet, where the adit changes direction and leaves it in the north-eastern wall, at which point there is only a fracture with no appreciable sulphide mineralization. Four samples in the 135-foot length averaged: Gold, 0.42 oz. per ton, and silver, 5.7 oz. per ton, across 0.6 foot. From 135 feet to 181 feet the adit follows a course of south 14 degrees east, crossing a basic dyke, between 136 and 140 feet, which paralleled the quartz vein in the first part of the adit. At 149 feet a fault, strike south 45 degrees east, dip 70 degrees to the north-east, was crossed. Just beyond the fault a vein, dipping flatly to the north-east and averaging 0.75 foot in width, is exposed along the western wall to another bend in the adit at 181 feet. Where the short vein-section is left it narrows down to a seam. From 181 feet the adit follows a bearing of south 51 degrees west to the face at 258 feet; this last 77 feet was intended to crosscut the ground below other veins showing on the surface. At 246 feet a well-mineralized stringer, up to 6 inches wide, is cut, its strike being south 50 degrees east and dip 55 degrees to the north-east. This is probably one of several similar south-easterly-striking stringers which outcrop on the precipitous ground above the inner end of the adit. In this locality, between the 6,175- and 6,400-foot contours, trenching over a length of 220 feet exposes a vein, strike south 35 degrees east, dip 50 degrees north-east, along one or both sides of a basic dyke, 4 to 5 feet wide, cutting the argillite. The usual mineralization, with quartz predominating, is from 1 to 2 feet wide. A selected sample gave: Gold, 0.8 oz. per ton; silver, 21 oz. per ton; stibnite, 25.3 per cent. Only a few of the other numerous, similarly mineralized outcroppings are described as follows: Trenching between the 6,350- and 6,400-foot contours, 100 feet east of the outcrop of No. 1 vein, exposes a vein in quartz diorite, striking a little east of south and dipping steeply to the east. A sample across 1.5 feet of rusty decomposed material, containing remnants of quartz with pyrite and arsenopyrite, assayed: Gold, 0.90 oz. per ton; silver, 22 oz. per ton. This vein has been traced for a length of 165 feet, but the cuts are partly caved, preventing thorough investigation. Between the 6,400- and 6,425-foot contours, and 35 feet east of the No. 1 vein-outcrop, cuts have been made in a stringer in quartz diorite varying from a few inches to 2 feet in width and striking due south, with a steep dip to the east. This is intensely oxidized quartz containing sulphide casts. Near the 6,600-foot contour, 710 feet distant along a bearing of south 22 degrees 15 minutes east from No. 1 adit-portal, an open-cut exposed an oxidized vein-outcrop striking south 40 degrees east and dipping steeply to the north-east. Selected, stained, sulphide remnants at this point assayed: Gold, 0.5 oz. per ton; silver, 17.2 oz. per ton. The wall-rock was not clearly exposed. At 6,275 feet elevation, in a steep-walled gulch, east of and 240 feet distant from No. 1 adit-portal, open-cuts expose the outcrop of a south-westerly-striking vein, 6 to 12 inches wide, containing abundant sulphides, chiefly stibnite. To the south-east of this are three widely spaced similar stringers, approximately parallel, extending to 6,400 feet elevation. The formation adjoining the four little vein-like occurrences is brown-

weathering argillite. Farther up the same gulch, 600 feet along a bearing south 81 degrees east from No. 1 adit and adjoining the 6,500-foot contour, mineralization in argillite has been traced, but not well exposed, for a length of 180 feet along the north-westerly contact of the quartz diorite which has an irregular trend, the local strike being about north 65 degrees east and dip 35 degrees to the south-east. In one part of the exposure, in which the hanging-wall fracture is well defined, 6- and 10-foot widths of mineralization are found at points 20 feet apart at the eastern and western extremities respectively, the central part being caved. Both sections specified contain irregular stringers and disseminations of antimonial and arsenical sulphides in silicified argillite, the 10-foot section showing the better concentration. Selected mixed sulphide material from the latter showing assayed: Gold, 1 oz. per ton; silver, 22 oz. per ton.

Summarizing conditions outlined in this report, mineralization of the character described is widespread. The work done, however, has been scattered and much prospecting remains to be done to trace the continuity of various surface showings and to test vein-intersections where larger bodies might occur. While high assays have been obtained in places as from surface showings, the general gold and silver content appears to be low. In view of the remote location of the property and the metallurgical problems presented by the refractory character of the mineralization, major tonnage would have to be developed before questions of production could be considered. It would be impracticable to ship concentrates; therefore some process would have to be devised whereby the gold and silver content could be reduced to a more concentrated shipping product.

Langara, Standard, Argo. These groups, comprising nineteen mineral claims held by location, are owned by J. I. Feeney and Dr. A. R. Thomson. They are situated in the vicinity of the South fork of Feeney (Ottarasko) river, about 12 miles north-westerly from the junction of the main stream with the Homathko river south of Tatlayoko lake, and in the Nanaimo Mining Division. Feeney (Ottarasko) river is shown in part on the B.C. Department of Lands Reference Map No. 32B. The staked area is situated on the steep slopes of mountains, being part of the Niut range, in which sharp peaks and ridges extend up to 10,000 feet above sea-level. Elevations on the claims range from 4,800 to 6,100 feet or more, all exposures being on steep side-hills. The valleys and lower slopes are well wooded with jack-pine, spruce, balsam, and fir, occasional spruce-trees being 3 to 4 feet in diameter. The smaller trees extend up to about 6,000 feet elevation. General transportation conditions have been described in the foregoing report on the *Morris* property. Feeney's camp, at 4,800 feet elevation, is reached by a trail, 8½ miles in length, which connects it with a cabin and landing on the west side of Tatlayoko lake (elevation 2,717 feet) near its southern end. The pack-trail, mostly on an easy grade, extends north-westerly from the lake towards the Feeney River valley, which is followed to its South fork, about 6½ miles from the lake. This creek is then followed southerly for 1½ miles to where it forks into what are locally known as Meadow and Clearwater creeks. The trail continues southerly to the camp, situated on a wooded flat adjoining the latter stream to the east. Branch trails, specified later, extend from the camp to the very widely separated groups of workings.

The local geology has not been mapped, but the formations are evidently part of the large area of Mesozoic rocks mapped to the east (Geological Survey Sum. Rep., Part A, 1924), the series having been described as consisting chiefly of andesite, basalt, and tuff, with shale, conglomerate, and limestone. Veins, and replacement deposits associated with fractured zones, occur in highly altered argillaceous and siliceous rocks in the vicinity of intrusive bodies of dioritic rock. The *Langara* veins are found chiefly in diorite. The intrusives are probably related to the granitic rocks of the Coast Range batholith, its main exposure being situated not far to the south. The character of the mineralization varies in different places, as will be specified under separate headings. Gold values are chiefly associated with arsenopyrite, which is found, to varying extent, in all the showings. Low silver values are also present. Outcroppings were first discovered by J. I. Feeney in 1911, the original claims being relocated and added to in connection with the present exploration, which was started in 1933.

Langara.—Showings in this section are situated on the steep side-hill, above and east of the camp, with which connection is made by switchback trail. The veins examined all cut diorite in the vicinity of its contact with metamorphosed argillaceous rocks. The mineralization observed consists of pyrite and arsenopyrite, in a gangue of quartz and

altered, sericitized wall-rock. The outcrop of the principal vein is exposed by surface cuts at elevations 5,770, 5,850, and 5,870 feet, throughout which section the slope of the ground is about 35 degrees. Below the lowest exposure conditions are obscured by slide-rock.

Above the highest point mentioned vein-outcrops can be seen continuing in the bluffs to higher elevations, but the precipitous character of the ground prevented close inspection. The strike is south 30 degrees east and dip varies from 50 to 70 degrees to the south-west. At 5,870 feet elevation the showing, 4 feet wide, consists of, from hanging- to foot-wall: First a 6-inch sulphide streak, chiefly arsenopyrite; then 1 foot of oxidized honeycombed quartz; then 23 inches of altered, rusty rock containing disseminated sulphides; and finally a 7-inch streak with scattered arsenopyrite. A sample across the complete section assayed: Gold, 0.18 oz. per ton; silver, 8.2 oz. per ton. At 5,850 feet elevation (portal of No. 1 adit) the showing consists of a width of 22 inches of sparsely mineralized iron-stained rock, including a decomposed rusty streak. At 5,770 feet elevation (portal of No. 2 adit) the outcrop consists of crushed, iron-stained rock, 4 to 5 feet wide, containing sparse mineralization. Both adits are drifts on the vein, the upper (or No. 1) being 22 feet long, including the open-rock approach. Conditions improve perceptibly going towards the face, at which point a sample taken across 5 feet assayed: Gold, 0.10 oz. per ton; silver, 3.4 oz. per ton; arsenic, 4 per cent. The lower (or No. 2) adit is 65 feet long. At 18 feet in from the portal a crosscut is driven 22 feet to the north-east. In the adit between these points there is scattered sulphide mineralization in crushed, iron-stained rock. Measuring from zero at the portal, a sample taken across 45 inches at 23 feet in, where mineralization is more pronounced, assayed: Gold, 0.16 oz. per ton; silver, 3.6 oz. per ton. From here to 55 feet sulphides are sparsely disseminated through the altered, rusty formation. At the latter point a sample was taken across 22 inches, the section containing much quartz with low sulphide content. This assayed: Gold, 0.09 oz. per ton; silver, 0.4 oz. per ton. Similar mineralization continues to the face, and a sample, taken across 42 inches at 60 feet in, assayed: Gold, 0.12 oz. per ton; silver, 1.8 oz. per ton. A grab sample from 10 to 12 tons at the portal of No. 2 adit assayed: Gold, 0.30 oz. per ton; silver, 3.5 oz. per ton. Adjoining the outcrop of this vein, at elevations of 6,005, 5,930, and 5,850 feet, there are other showings in cuts and natural exposures, containing quartz with varying amounts of the same sulphides and, in places, oxidized streaks varying in width from 9 inches to 24 inches, and striking south-easterly, which appear to be spurs or splits from the main vein.

Standard.—These showings are on the western side of the Clearwater Creek valley, about 1 mile, roughly estimated, along a bearing of south 70 degrees west from the *Langara* workings and at approximately similar elevations. The *Standard* is reached by a switchback trail about 1¼ miles in length from the centrally situated camp.

These mineral deposits, occurring as replacements of metamorphosed argillaceous rock, consist of masses and disseminations of arsenopyrite and pyrite in a gangue of quartz. The showings are associated with a zone of fracturing, strike south 20 degrees east (uphill); the adjoining formation, schistose in part, is fractured, folded, and contorted. The mineralized zone is exposed naturally and by cuts in the bluffs which start above a rock-strewn, gently sloping bench at about 5,820 feet elevation. At 5,940 feet elevation a chip sample across 6 feet assayed: Gold, 0.44 oz. per ton; silver, 0.6 oz. per ton; arsenic, 4.3 per cent.; and at 5,920 feet elevation a chip sample across 11 feet assayed: Gold, 0.36 oz. per ton; silver, trace; arsenic, 5.6 per cent. At 5,890 feet elevation work was proceeding by hand, three men being employed to crosscut the mineralized zone, which, below, is covered by a rock-slide. Above the upper showing sampled, mineralization is visible at points to 6,040 feet elevation or higher, but no work has been done in this section and the precipitous character of the ground prevents close inspection.

Argo.—These showings lie to the north-west of the *Standard* workings, at a distance roughly estimated at 3,000 feet, on the slope to Meadow creek, which is the westerly branch of the South fork of Feeney river. A trail, about 1½ miles in length, extending from the camp on Clearwater creek, circles the point between the two streams and climbs from Meadow Creek flats at 4,600 feet elevation to a point about 5,000 feet elevation or a little below the showings. These are exposed in and adjacent to the bed of a small creek which flows along the eastern wall of a rocky gulch.

Conditions are very indefinite as only a little superficial excavating has been done. The trend of the mineralized zone is marked by pronounced iron-stain which extends up the hill for a considerable distance. The approximate vertical eastern wall of the gulch, which may represent a plane of fracturing, trends a little east of south (uphill). The formation in which the deposits occur is a metamorphosed siliceous rock, apparently of sedimentary origin. At 5,350 feet elevation, where a shallow cut was made, there are sparse disseminations and streaks of sulphides without definite boundaries over a width of 8 feet or more. Scattered mineralization is also visible in the eastern wall of the gulch. Selected material shows the following minerals: *Galena, sphalerite, pyrite, pyrrhotite, chalcopyrite, and arsenopyrite, associated* with quartz and silicified country-rock. A chip sample across 8 feet assayed: Gold, 0.04 oz. per ton; silver, 1 oz. per ton; arsenic, *nil*. Another sample, taken in 1934 (Annual Report, 1934, page F 13), across a section 4 to 6 feet wide, where mineralization is more concentrated, assayed: Gold, 0.24 oz. per ton; silver, 0.15 oz. per ton; arsenic, 2 per cent. The sections sampled are part of a bare exposure 40 feet long, the outcrop at either end being covered with loose rock.

In the gulch below, at 5,250 feet elevation, an extensive mass of dioritic rock is exposed, the contact trending northerly. The form of the intrusive body was not ascertained.

On the *Mary* claim, about 2,000 feet north-westerly from the *Standard* workings, surface showings are exposed in shallow cuts on an open slide sloping 30 to 35 degrees to Meadow creek. These consist of a series of parallel southerly-striking (in uphill direction) mineralized fractures. The best exposure, 40 inches wide, is uncovered for a length of 10 feet. Mineralization consists of arsenopyrite in streaks and massive aggregates. A sample across the width specified assayed: Gold, 0.14 oz. per ton; silver, trace. Selected material in this vicinity contained 28.5 per cent. arsenic.

Summarizing general conditions and judging from the limited number of samples taken, the *Langara* showings, where arsenopyrite occurs in abundance with iron sulphides, contain fair gold values over substantial widths. Insufficient work has been done to indicate the possible extent of the mineralization. Material of the grade found at present would have to be improved or developed in very large quantities before production could be considered. This is necessary in view of the remote situation of the property. In spite of the fact that the metallurgy of the ore does not present a particularly difficult problem in regard to concentration, shipping products would probably have to be reduced to a much more concentrated or metallic form. In the case of the *Argo* a somewhat different type of mineralization is indicated, arsenic being present in very small amount in the present exposures. The pronounced oxidation, extending for a considerable distance along the gulch containing the showings, indicates interesting possibilities for the discovery of minable concentrations of mineralization. Concluding these remarks, there are several other places on the properties where oxidized streaks and zones can be seen, as on the precipitous slopes above the *Argo* location. In the general area staked, therefore, outcroppings and indications of mineralization are numerous, affording much scope for systematic prospecting.

Coquihalla Area.

Aurum. This property, in the Yale Mining Division, consists of the *Aurum Nos. 1* to *6*, *Idaho, Tramway,* and *Monitor* Crown-granted mineral claims, together with the *Annex*, held by location. It covers much of the ground originally occupied by the *Idaho* and *Snowstorm* groups. The consolidated properties, controlled by A. E. Raab, of Hope, are under option to the recently incorporated Cardinal Mining and Development Company, Limited.

The property is situated on the South fork of Ladner creek, 2¼ miles (camp) north-west of Verona (Aurum Siding), on the Kettle Valley Railway. The *Aurum* property lies on both sides of the small valley of the South fork of Ladner creek, the camp being on a bench 30 feet above and south-east of the stream. The workings are from 180 to 930 feet above the creek, or at elevations of 2,600 to 3,350 feet, and on the north-western side of it. The side-hill is well wooded and covered with overburden, slopes being generally uniform at angles of about 30 degrees towards the creek. The camp, at 2,450 feet elevation, is connected by a road, about 4⅛ miles in length, mostly on a well-surveyed grade, with the railway siding at about 1,350 feet elevation. The road has fallen into disuse in recent years.

The geology of the district has been described in the following publications of the Geological Survey of Canada: Summary Reports, 1919, Part B; 1920, Part A; Memoir 139, "Coquihalla River Area," published in 1924; and Summary Report, 1929, Part A.

Past references to the properties are contained in the Annual Reports of the Minister of Mines for the years 1922 and 1926 under the name of *Idaho*, and 1927 to 1932, inclusive, under the name of *Aurum*. The present group was consolidated in 1926 and was optioned to the Aurum Gold Mines, Limited, most of the development having been done by this company. Between 1930 and 1932, inclusive, 95 tons of ore was shipped from the *Aurum* mine, containing: Gold, 432 oz.; silver, 92 oz.

The older *Aurum* mine-workings, comprising Nos. 1, 2, 2A, 3, and 4 adits, at respective elevations of 2,920, 2,830, 2,790, 2,705, and 2,600 feet, aggregate about 2,500 lineal feet of work. This work consisted chiefly of drifting north-westerly on or adjacent to the talc-seam formed along the periphery of a serpentine-contact. Nos. 2, 2A, 3, and 4 adits are respectively in a south-easterly direction from No. 1 adit. Two small shoots of auriferous talc were stoped above the No. 1 level, and another small shoot (corresponding to the south-easterly shoot, near the portal in No. 1 adit) stoped above No. 2. There is also a small stope on the No. 3 level where some gold values were encountered in a siliceous zone. No stoping was done on the No. 4 level, the face of which is about vertically below the portal of No. 2A. Subsequent work in the mine is as follows: At 2,898 feet elevation or about 35 feet below No. 1 level, on the dip of the talc-seam, an adit 49 feet long has been driven to exploit the small area left between the portal ore-shoot on No. 1 level and the stope put up below it from No. 2 level. The new working shows talc in the face and adjoining hanging-wall, 24 inches wide. In No. 4 level, 20 feet back from the northern face, a winze, full of water when inspected, has been sunk about 5 feet adjoining a talc shear in greenstone near the contact with sediments. At the collar of the winze there is a showing of quartz mixed with calcite 6 to 9 inches wide, which apparently widens to about 18 inches below the water-level. Continuity of the showing, from which picked specimens have shown visible gold, is not apparent in the drift above the winze.

Superficial exploration in the Ladner Slate belt to the north-east of the north-westerly-trending serpentine-contact has exposed several parallel zones of quartz stringers or silicified zones in metamorphosed sediments and greenstones. In this type of deposit low gold values are associated with pyrite, and, in places, accompanied by arsenopyrite, the sulphides occurring as irregular disseminations or fine streaks through the rock formation in the vicinity of quartz stringers or silicified phases. The mineralization in general conforms to the attitude of the enclosing formation, prevailing strikes being westerly or a little north of west, with dips ranging from 40 to 80 degrees to the north. The better gold values are obtainable in areas of oxidation which, while intense in places, is shallow. The approximate position of the principal workings is described with reference to the portal of the No. 3 *Aurum* adit, which is the nearest of the old mine-workings and in general extends along the serpentine-contact.

From the point specified the *Queen* (formerly *McConnel*) trench (south-west end) is distant 530 feet along a bearing of north 5 degrees west, the elevation here being 2,885 feet. This trench, about 100 feet long, is dug approximately at right angles to the zone, which strikes about north 70 degrees west and dips from 70 to 80 degrees to the north-east. Towards the hanging-wall side the showing consists of a width of 20 feet of massive, greenish, altered rock containing widely separated quartz stringers paralleling the attitude of the formation, sulphide mineralization being very light. Adjoining this section on the foot-wall side there is a lens, 16 feet wide, of similar rock, largely composed of quartz. The exposures are generally fresh, with a little oxidation in places. A selected sample of pyritized silicified rock assayed: Gold, 0.03 oz. per ton; silver, trace. Just west of this trench and at 2,905 feet elevation a curving adit, with short branches, has been driven north-westerly for 60 feet. These workings expose quartz stringers at widely separated points, with no appreciable sulphide mineralization, in rock of similar character to that in the trench below. On the *Idaho* zone the highest point exposed is 1,350 feet distant measured along a bearing of north 25 degrees west from the portal of the No. 3 *Aurum* adit. The distance between the *Idaho* zone and the serpentine-contact, measured at right angles to the trend of the latter, is estimated at about 480 feet. Surface workings here, distributed over a length of 250 feet between elevations of 3,200 and 3,326 feet, consist of extensive stripping by ground-sluicing, together with open-cuts and a long trench. These indicate a shear-zone, striking north 85 degrees west, dip from 60 to 80 degrees northerly,

in dark slate and schist. The rocks, which are generally weathered, containing rusty seams and streaks, are in places decomposed and intensely oxidized. Where exposures are fairly fresh the mineralization, conforming in general with the structure of the enclosing strata, consists of quartz stringers and irregularly silicified areas with small amounts of pyrite and arsenopyrite, the sulphides impregnating the rock, but not the quartz to any noticeable extent. The area uncovered by ground-sluicing and open-cuts, over a length of 100 feet between elevations 3,330 and 3,266 feet, is of irregular outline up to 25 feet wide.

Chaining easterly down the slope from elevation 3,330, the showings are briefly as follows: At the top there is a width of 7.5 feet of soft, iron-stained decomposed rock and soil; at chainage 9, a width of 25 feet of highly altered sedimentary rock, with, in places, where silicification is more intense, as in the 6-foot central section, finely divided sulphides in bands paralleling the strike; between chainages 9 and 100, widths of from 5 to 11.5 feet of irregularly pyritized silicified rock with rusty zones and iron-stained, decomposed streaks. The following samples of fairly fresh pyritized, silicified rock were taken:—

Chainage from Elevation 3,330.	Description.	Gold.	Silver.
		Oz. per Ton.	Oz. per Ton.
20	Selected	0.01	Trace
44	Grab	0.01	Trace
85	Selected	0.26	0.15
89	Selected	0.18	Trace

These were taken to get an idea of values in primary material free from oxidation.

Fifty feet southerly from the upper part of the exposure described and opposite the section between chainages 8 and 52, an open-cut up to 17 feet wide exposes a rusty zone in schistose argillaceous rock. This working and a smaller cut 65 feet east of it (opposite chainage 117) indicate a zone of indefinite mineralization paralleling the main *Idaho* showings. Reverting to the latter, there is at chainage 195, and elevation 3,200 feet, a long trench across the strike of the zone. Here there is exposed a width up to 55 feet of rusty, decomposed, slaty rock and soil from which a selected sample of intensely oxidized material assayed: Gold, 1.10 oz. per ton; silver, 0.1 oz. per ton; and a sample across 6 feet, where oxidation was pronounced, gave: Gold, 0.52 oz. per ton; silver, 0.1 oz. per ton. At 3,172 feet elevation and just east of the trench there is a meandering adit, comprising 188 lineal feet of work. It crosscuts the mineralized zone in an irregular manner, but does not afford a proper section at right angles to the strike. Its main course is from south 70 degrees west to south 80 degrees west for 110 feet. At 30 feet in from the portal a branch extends north 65 degrees west for 30 feet, then turns north-east for 48 feet. The last-mentioned course, directly under the 55-foot trench, crosscuts the ground diagonally. Appreciable mineralization in the adit-workings is apparently limited to the 16- or 20-foot section adjoining the face in the last course mentioned, where there is scattered light sulphide mineralization with some irregular silicification. Fifty feet north of the adit-portal a trench at 3,170 feet elevation exposes rusty slates, this being outside the *Idaho* zone strike.

When the property was examined late in October, 1935, development had not reached the stage where tonnage estimates of specific value could be made. As the examination was curtailed by a snow-storm, only a few check samples could be taken by the writer, which showed variable gold values evidently present in patches in the *Idaho* showings, and higher assays from oxidized, decomposed, residual material as in the 55-foot trench. The zone is very imperfectly exposed in the superficial workings. Underground work, including drifting with crosscuts at regular intervals, followed by large sampling operations, will be necessary before average values in primary material can be gauged. Between the *Idaho* and *Queen (McConnel)* workings there are widely separated cuts and trenches indicating other rusty zones of quartz veinlets or silicified areas, but these are insufficiently exposed for detailed description or appraisal. There was no activity at the property when visited by the writer.

VANCOUVER ISLAND.

BY

J. S. STEVENSON.

The writer wishes to express his appreciation of the hearty co-operation rendered by mine officials and the various prospectors who gave freely of their time and hospitality during the examination of properties visited during the past season. Especial acknowledgment is made of the incomparable facilities offered by Dr. M. F. Bancroft and party, of the Geological Survey of Canada, while many of the properties on the west coast of the island were being examined.

ZEBALLOS RIVER SECTION.

This area is accessible by steamer from Victoria to Ceepeecee, and thence by launch for 12 miles to the head of Zeballos arm. From there good foot-trails lead to the properties up Zeballos river and tributary creeks. A report and geological map of the area by H. C. Gunning have been published by the Geological Survey of Canada in the Summary Report, 1932, Part II. A glance at the geological map indicates that at about 5 miles up the river a belt of Coast Range intrusives extends north-westward and south-eastward. Gunning calls this the Zeballos batholith. This granodiorite batholith is bordered on the north-east by volcanics and limestone, and on the south-west by volcanics only. Both the batholith and bordering volcanics have been fractured and some of the major fractures filled by gold-bearing quartz-sulphide veins. Of the active properties, the *Goldpeak* and *Goldfield* are being prospected and have produced small amounts of high-grade ore from quartz veins in granodiorite, and the *Van Isle* is driving an adit on a quartz-filled shear in porphyritic andesite.

For some years the presence of placer gold has been known along the Zeballos river and recently small operations by local prospectors have been attempted on the main Zeballos river, on the North fork and on a tributary creek of the main river. The presence of large boulders and the difficulty of handling them is one of the major problems affecting operation.

Goldpeak. The *Goldpeak* group comprises the following mineral claims staked in 1933: *Gold Peak, Gold Peak No. 2, Gold Peak No. 3, White Star, Blue Star, Green Star, Red Star;* and the *Gold Peak No. 4* staked in 1934. These claims are variously owned by Alfred Bird, Albert Bloom, John F. Donaldson, Joe Doyle, M. Francis (deceased), and C. W. Smith, most of whom reside in the vicinity of Zeballos arm and Ceepeecee.

The workings and camp of the *Goldpeak* group, on the north-east side of Spud Valley creek, about 1 mile up the creek from its junction with the Zeballos river, are situated at elevations ranging between 1,200 and 1,300 feet and are between 600 and 700 feet above the creek. The property is reached by a good foot-trail that first follows the north-west side of the Zeballos river for 4½ miles and then leads up the Spud Valley creek for 1½ miles to the camp. The present workings and camp are on a very steep, heavily wooded hillside, sloping at an angle of about 35 degrees south-westward into Spud Valley creek.

The property was worked by the owners, and between September, 1934, and June, 1935, approximately 15 tons of high-grade ore, obtained by hand-mining from the main open-cut, was back-packed to tide-water and shipped to the smelter. At the time of the writer's visit work had temporarily ceased.

Mineralization has resulted in the filling of fissures or joints in granodiorite by quartz, pyrite, galena, sphalerite, and arsenopyrite. These fissures, five of which have been so far uncovered, include several that are only ½ to 1 inch in width and possess frozen walls, and the main vein that varies from 4 to 6 inches in width and has a small amount of gouge on both walls. Shear-zones of varying degrees of intensity and of widths ranging from 6 inches to 2 feet usually accompany the quartz veins.

The workings comprise strippings and one large open-cut, from which the bulk of the ore shipments were made. The upper end of the open-cut is 120 feet south-east from the cabin. This cut, including two levels, a lower one 50 feet long and an upper one 19 feet above the lower and 30 feet long, and a stripping 40 feet long, has exposed the vein for a length of 120 feet. The vein ranges in width from 3 to 6 inches, strikes north 30 degrees east, and is for the most part vertical, but in some places dips 80 degrees south-east. The vein-filling consists of quartz and a considerable amount of pyrite, galena, sphalerite, and a little arsenopyrite. Where the

vein is widest the texture is drusy, and the quartz so well developed in crystals normal to the walls that a comb-texture is approached. The sulphides are concentrated in bands towards the walls of the fissure.

A sample taken in the lower level across 4 inches of rusty quartz containing only small amounts of sulphides assayed: Gold, 1.10 oz. per ton; silver, 0.1 oz. per ton. A sample taken in the upper level across 4 inches of vein-matter containing comb quartz and larger amounts of sulphides assayed: Gold, 14.74 oz. per ton; silver, 5.6 oz. per ton.

The rock formation is granodiorite which in the open-cut has been cut by a feldspar-porphyry dyke. The granodiorite has been fractured by joints in three directions, very markedly in planes striking north 65 degrees east and dipping from 85 degrees north to vertical, less prominently in planes striking north 15 degrees west and dipping 80 degrees north-east, and haphazardly in planes approaching the horizontal. A very interesting feature of the granite is the perfect leaching of the dark minerals for 2 inches and less on either side of the vein. The feldspar-porphyry dyke is exposed on the north-west wall of the open-cut on both levels. It strikes north 37 degrees east and dips 80 degrees south-east. Near the entrance to the lower level of the cut the dyke is completely in granodiorite, but farther in, and also in the upper level, the vein forms the south-east wall. It appears that the vein-fissure, striking from south-west towards the dyke, was deflected by it and follows the wall of the dyke.

From a point 35 feet south from the cabin a narrow, frozen quartz vein has been stripped south-westward for 119 feet on a 30-degree slope. The quartz is in disconnected lenses in sheared granodiorite. The shear averages 6 inches in width, in which, although in one place the lens is 6 inches wide, the average width is 1 inch. Pyrite and arsenopyrite accompany the quartz. Near the top of the stripping the vein branches into two stringers, from the northerly strand of which 2½ tons of ore is reported to have been shipped. A short stripping 200 feet north-east from the cabin exposes the apparent continuation of this vein. Adjacent to the north-west side of the trail and 130 feet north-westward from the cabin, a small cut exposes 28 feet of a narrow quartz vein and a 2-foot feldspar-porphyry dyke. The fissuring and the vein do not extend beyond the dyke. A stripping, the upper end of which is 60 feet north-west from the cabin, has exposed a zone 3 feet wide and 57 feet long that consists of irregular and indefinite shearing in weathered granite. The zone contains scattered, small quartz-lenses that contain a little pyrite, arsenopyrite, and galena. A stripping about 100 feet north-eastward up the hill from the last exposes a similar zone of fissuring and discontinuous quartz-lenses. However, the fissuring and contained lenses die out towards the top of the stripping. About 1,500 feet south-east along the hillside from the *Goldpeak* cabin, some strippings have exposed a zone of sheared granodiorite from 2 to 4 feet wide over a length of 125 feet that strikes about north 35 degrees east and is nearly vertical. This zone contains discontinuous lenses of quartz up to 2 inches wide and small amounts of pyrite, arsenopyrite, and galena.

Goldfield. The *Goldfield* mineral claim was staked in June, 1935, and is owned by Sam Knutsen, of Ceepeecee. The workings on this property, at an elevation of 2,300 feet on the crest of the ridge between Spud Valley and Gold Valley creeks, are about three-quarters of a mile south-east from the *Goldpeak* workings and a foot-trail connects the two operations. In the immediate vicinity steep, wooded slopes and numerous rock bluffs are characteristic of the ridge. At the time of the writer's visit the owner and a small crew of men were engaged in building a cabin, and until then no ore had been shipped. The workings consisted of two small open-cuts, both on the north-east side of the hill. One is 5 feet and the other 90 feet down the slope from the crest on the same fissured zone, which strikes north 60 degrees east and dips from steeply north-west to vertical.

The mineralization has resulted in the partial filling of a wide fissured zone by quartz, accompanied by pyrite, a little sphalerite and free gold. The zone averages 3 feet in width and contains leached and decomposed granodiorite and lenticular quartz-sulphide lenses, all bordered by gouge-walls. The leaching of the granodiorite has been very pronounced, but does not extend more than a few inches from the walls of the zone. The quartz-lenses vary from 4 inches up to 12 inches in width and narrow and widen within short distances.

The quartz is well crystallized and in some of the narrower veinlets within the zone a marked comb-structure is evident. The sulphides are coarse, well crystallized, and tend to be on the walls of the quartz veinlets or lenses. There has been oxidation close to the surface,

but the faces of the open-cuts show much unoxidized pyrite. The rock formation is granodiorite. A sample taken in the upper cut across 12 inches of vuggy quartz and sulphides assayed: Gold, 7.32 oz. per ton; silver, 2.6 oz. per ton. A sample taken in the lower cut across 9 inches of rusty quartz, but containing a smaller amount of sulphides, assayed: Gold, 5.40 oz. per ton; silver, 2 oz. per ton.

Van Isle.

The *Van Isle* group includes seven mineral claims—namely, the *Van Isle No. 1, Van Isle No. 2, Blue Ox No. 1, Blue Ox No. 2, Wolverine, Pedro,* and *Silver Bear*—all of which were staked in 1933. They are owned by Ray A. Pitrie and associates, but are under bond to the Nootka Gold Mining Syndicate, of Victoria. The property, on the south-east side of Zeballos river, in the vicinity of a small creek named Van Isle that flows into the Zeballos river about 3½ miles from the mouth of the latter, is reached by a foot-trail that follows the south-east side of the river for 3½ miles to the camp on Van Isle creek. The main workings, a quarter of a mile up the creek from the camp at an elevation of 600 feet, consist of open-cutting started preparatory to driving an adit in a bluff on the north-east wall of this canyon and of stripping up this bluff for about 100 feet along the vein. At the time of the writer's visit a small crew of men was engaged in driving the adit.

A fissured zone, strike north 45 degrees east and dip 80 degrees north-west, in porphyritic andesite has been mineralized by quartz, pyrite, pyrrhotite, galena, and sphalerite. This fissured zone of crushed andesite, where examined, is 3 feet wide and contains quartz-sulphide veins that range in widths from 2 to 12 inches. The quartz is milky and is massive, not crustiform; pyrite, the most abundant sulphide, is fine-grained and is usually in bands parallel to the walls of the vein; pyrrhotite and sphalerite are disseminated in small amounts amongst the pyrite. A grab sample taken in the open-cut from part of a quartz vein 3 inches wide, and containing a little pyrite, assayed: Gold, 0.90 oz. per ton; silver, 0.10 oz. per ton.

Herbert Arm Section.

The properties in this section are grouped near the head of Herbert arm. They are reached by Canadian Pacific steamers from Victoria to Ahousat and then by launch for 12 miles to the head of Herbert arm.

Gold-bearing quartz veins, both of the replacement and fissure type, occur in extrusive and intrusive greenstones that have been cut by acid intrusives. These include feldspar porphyry, quartz porphyry, and a highly altered light-coloured granite or alaskite. The veins are later than any of these. Quartz is the predominant vein-filling and sulphides, including pyrite, chalcopyrite, and galena, are present, but seldom in large amounts.

Abco.

Abco Mines, Limited (N.P.L.), is stated to own twenty-two mineral claims and fractions, held by location, near the head of Herbert arm. The property is reached by 1¼ miles of truck-road from the head of the arm to the lower camp. The showings and surface workings are on the steep southerly slopes of Big Boy mountain. The hillside, covered by a heavy growth of large timber, is very steep; rock bluffs are not numerous.

Mineralization has resulted in the filling of many small fractures in greenstone by quartz and carbonates and, in one instance, the formation of three lenticular quartz veins in a zone of strong shearing 4 feet wide. The showings occur in the canyonous bed of a creek that descends the mountain-side in a southerly course 2,200 feet to its junction with Cotter creek near the lower camp. The rocks exposed in the creek-bed comprise a variety of greenstones and feldspar-porphyry dykes. The predominant greenstone is a fine-grained dacite (quartz andesite), with the exception of an amygdaloidal variety found near the *Joan* and *Kermode* showings. The feldspar-porphyry dykes, recognized by their light greenish-grey weathering surfaces, occur in the vicinity of the *Joan* and *Cotter* showings and in both cases antedate the quartz veins.

The Abco Mines, Limited, was formed in September, 1934, to take over the *Mary McQuilton* property from the Waverly Tangier Mines, Limited, J. L. Gibson, J. H. Livesley, and W. Kermode. Since that time the new company has erected several camp buildings, built a road from the beach to the lower camp, and an aerial tram that is operated by a gasoline-engine-driven hoist.

The only previous reference to the property is in the Annual Report of the Minister of Mines for 1933, under the name of *Mary McQuilton* group of twelve claims.

Hand-mining operations have been confined to obtaining high-grade ore from the *Mary McQuilton* vein. At the time of the writer's visit 23 tons were about to be shipped to the Tacoma smelter.

The various showings will be described consecutively as they occur down the hillside from the most important vein, the *Mary McQuilton*. This vein is at an elevation of 2,550 feet. Trenching and open-cutting had exposed a definite shear-zone 4 feet in width, with an average strike of north 45 degrees east and a dip of 50 degrees north-west over an exposed length of 30 feet. This shear-zone contains three very similar and lenticular quartz-calcite veins that vary in width from thin ⅛-inch stringers to lenses 6 inches in width. The quartz and calcite in the thicker lenses is mottled grey and white in colour and is cut by numerous curving fractures, many of which contain very fine-grained pyrite. Coarse-grained pyrite and chalcopyrite occur as small clusters here and there in the quartz and calcite.

Three samples, each across 4 inches of mineralized quartz from the veins, averaged: Gold, 3.46 oz. per ton; silver, 1.43 oz. per ton.

A bulk sample taken across the shear-zone, where 4 feet wide at the east end, and one that omitted all quartz veins, did not contain any gold or silver content.

The rock formation in the immediate vicinity is massive dacite (quartz andesite). This, however, has been crushed to an incoherent mass in the shear-zone.

The *Joan* vein, at an elevation of 2,500 feet, is 200 feet south-east from the *Mary McQuilton*. The showing consists of a reticulating quartz vein that varies from 6 to 2 inches in width over the exposed length of 6 feet. The quartz is vuggy and sulphides are absent. The rock formation is amygdaloidal greenstone that has been cut by a greyish weathering feldspar-porphyry dyke 1½ feet wide. The dyke is cut by the vein.

The *Livesley* showing is in the same gulch as the *Mary McQuilton* vein, but below it and at an elevation of 2,375 feet. The main showing is on the east wall of the gulch and consists of a lenticular quartz vein that strikes from north 25 to north 45 degrees east, dips 30 degrees north-west, and varies in width from 8 to 2 inches over a continuous exposed length of 12 feet. The walls are tight; no faulting or gouge is evident, although a dense andesite dyke cut by the vein has been badly shattered. This vein appears to continue westward into the gulch, but it narrows perceptibly. Pyrite, chalcopyrite, and galena accompany the quartz.

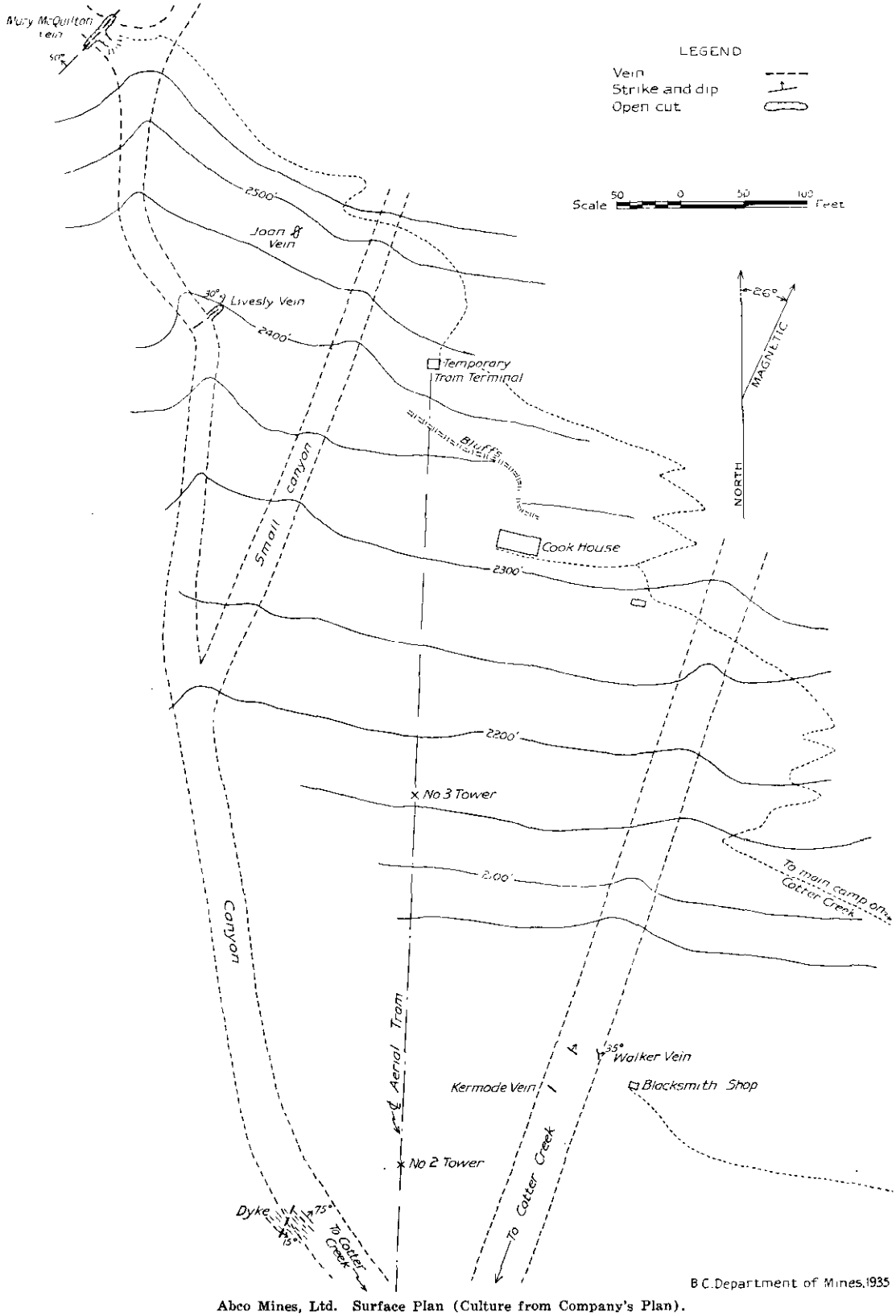
Massive dacite (quartz andesite) has, on the east side of the vein, been cut by a badly fractured andesite dyke 10 feet wide. The vein cuts the dyke.

The *Cotter* vein is in the same gulch as the *Livesley* and *Mary McQuilton*, but at a lower elevation of 1,800 feet. The main showing is in the bed of the gulch, where a vertical 17-foot feldspar-porphyry dyke has been cut by a flat fault and the fault discontinuously filled by a narrow quartz vein 2 inches and less in width. This vein for the most part is free from sulphides except in one place, where it contains abundant pyrite, chalcopyrite, and galena. This concentration occurs at the intersection of the fault-plane and the plane of contact between the north-east wall of the dyke and the surrounding andesite. The dyke strikes north 45 degrees west and dips 75 degrees north-east, and the fault-plane strikes north 25 degrees east and dips 15 degrees south-easterly, displacing the dyke by 7 feet.

The *Walker* showing is in a tributary gulch west of the main one, and is 250 feet north-west of the *Cotter* vein at an elevation of 1,950 feet. The best showing, a quartz vein that strikes north and dips 35 degrees east, is continuous for 15 feet and reaches a maximum width of 4 inches. On the south end it disappears in rubble, and on the north end the only evidence of it is a mass of reticulating quartz veinlets. Two small sections of quartz veinlets have been discovered on the north-west side of the creek. Pyrite, chalcopyrite, and a little galena accompany the quartz. The rock formation is andesite, but this contains considerable carbonate in the vicinity of the quartz veinlets.

The *Kermode* showing is immediately below the *Walker* and at an elevation of 1,900 feet. Here an exposed face 4 feet square shows numerous veinlets both of quartz and of ankerite carbonate in amygdaloidal greenstone. Small amounts of galena accompany the quartz.

The *Gibson* showing is in the main gulch at an elevation of 1,450 feet and below the area included by the accompanying plan. It comprises three areas, about 15 feet apart, of quartz-calcite veinlets. The lowest and most noticeable is a zone from 8 to 10 inches wide that contains numerous reticulating quartz veinlets and includes fragments of rock. There are no visible



Abco Mines, Ltd. Surface Plan (Culture from Company's Plan).

sulphides. The rock formation is quartz andesite and contains ankerite carbonate and in places some epidote.

Big Boy.

The *Big Boy* group is owned by Herbert Arm Gold Mines, Limited, and comprises the following mineral claims: *Big Boy Nos. 1* to *8*, inclusive, and *Big Boy Fractions Nos. 1* to *4*, inclusive. The *Big Boy* group is located on the steep, westerly slopes of Big Boy mountain at the head of Herbert arm. These slopes are very steep, but are interrupted at an elevation of about 500 feet by a low "hog-back," on the top of which are the main surface showings. The hillside is characterized by steep forested slopes, bluffs, and talus.

The deposit consists of quartz veins and veinlets that contain sulphides and gold in widely varying amounts. There are two vein-types: First, the single, lens-like quartz vein up to 8 inches wide and containing noticeable sulphides, chiefly galena, chalcopyrite, and pyrite, which is exemplified by the river adit; and, secondly, the composite vein system of numerous 2-inch (and less) wide veinlets, striking approximately parallel over widths varying from 2 to 9 feet; with one exception these consist of practically barren, vuggy quartz. This is the habit of the veins in the main surface showings.

The rocks include a variety of greenstones that are intruded by large dykes of quartz porphyry and alaskite, a type of granite that lacks dark minerals. The greenstones include andesites that are cut by highly altered diabase and feldspar-porphyry dykes.

The claims in the *Big Boy* group were staked in April, May, and July of 1933 by C. C. Binns, R. P. Duncan, and J. L. Gibson. The Big Boy Syndicate, under the direction of A. C. Wright, acquired the group from the co-stakers on October 27th, 1933. On April 14th, 1934, the Herbert Arm Gold Mines, Limited, was incorporated as a private company and acquired the property from the Big Boy Syndicate. Herbert Arm Gold Mines, Limited, is the present owner and operator, with head office at 1011 Rogers Building, Vancouver.

A short account of the property was published in the Annual Report of the British Columbia Minister of Mines for 1933.

The main surface showings are at an elevation of approximately 500 feet and are about 1,300 feet easterly from the river adit. They occur in a zone 380 feet long which has been partly explored by five small strippings across and along the vein, the aggregate vein-lengths thus exposed amounting to only about 35 feet of the 380 feet. With the exception of the most southerly, all the vein-exposures are along the base of a discontinuous bluff, 15 to 20 feet high, which trends southerly; the veins have an average dip of 25 degrees into this bluff and an average strike of north 20 degrees west.

The quartz occurs herein as a composite system of veins, individually varying from ¼ to 2 inches in width, over a total width of from 2 to 9 feet. They carry no sulphides other than a little chalcopyrite and galena. There is one exception, however, where a 4-foot stripping has exposed a quartz vein 4 inches wide containing an abundance of galena and chalcopyrite.

The vein-walls are tight, irregular, and sinuous, characteristic of replacement-veins. Small amounts of wall-rock mineralization were evidenced by the presence of pyrite in the andesitic rocks. The veins are later than any of the enclosing rocks. No post-vein intrusions were seen.

The individual strippings will be described consecutively from the north end of the showings southward:—

No. 1: Here a stripping, 18 feet long, exposes a composite system of small quartz veins (maximum width of any one vein being 2 inches) over a width of 2 feet and continuing for the length stripped. The walls of the veins are tight and sinuous; no gouge is present. The texture of the quartz tends to be banded and vuggy, quartz crystals lining small ¼-inch vugs along the central parts of the vein. The quartz is milky, has been only slightly stained by iron, and contains no sulphides other than occasional chalcopyrite grains.

This stripping is along quartz porphyry. Some 5 feet south beyond the end of the stripping there is a 5-foot dyke of andesitic rock, cutting the quartz porphyry with a strike of north 35 degrees west and dip 80 degrees north-east.

No. 2: This stripping is 20 feet southerly from No. 1, is 4 feet long, and exposes a composite system of small 2-inch quartz veins that occur over a width of 2 feet. In appearance and sulphide content the quartz is similar to that in No. 1 stripping.

The foot-wall rock as exposed is brecciated andesite cemented by chlorite and watery quartz; the hanging-wall is fine-grained unbrecciated andesite. Five feet south of the stripping there is altered feldspar porphyry of undetermined extent.

No. 3 is a 2-foot stripping 30 feet southerly from No. 2, on narrow quartz veinlets similar to those in No. 2 stripping. The formation is andesite.

No. 4 stripping, 20 feet southerly from No. 3, exposes a lens of quartz, with a maximum width of 4 inches along 2 feet of exposure. This quartz differs from that described above in so far as it is not vuggy and contains considerable amounts of chalcopyrite and galena. The sulphides are fine-grained and they noticeably occur as irregular veinlets completely surrounding quartz grains, and not as large segregations of sulphides. A 4-inch chip sample across quartz carrying heavy galena and chalcopyrite assayed: Gold, 12.40 oz. per ton; silver, 11 oz. per ton.

Fifteen feet north of the stripping the formation is feldspar porphyry; then south from this there is 4 feet of andesite; then the beginning of a zone of light-coloured, altered granite, which is 56 feet wide; this is bounded on the south end of the bluff by andesite.

No. 5 stripping, 230 feet southerly from No. 4, shows an isolated outcrop 9 by 9 feet in area, at the base of which some digging has been done. The occurrence is a stockwork, 9 feet wide, of approximately twenty-five veinlets, the widths of individual veinlets varying from 3 inches to ¼ inch. The quartz is white, vuggy, and shows occasional slight iron-staining; the outcrop as a whole is not rusty. Mineralization other than by quartz is scarce; there are small amounts of chalcopyrite and galena. A 55-inch chip sample across quartz veins and rock assayed: Gold, 0.32 oz. per ton; silver, 0.6 oz. per ton. The average strike of the veins here is north 20 degrees west, the dip 25 degrees south-west.

The formation, although it is leached and silicified, appears to be granite. The face of a low bluff 15 feet to the west consists of granite.

No. 6 stripping, approximately 150 feet easterly from No. 2, uncovers a small outcrop of decomposed greenstone which contains a network of narrow barren quartz veinlets over a width of 2 feet.

In addition to the above, there are two other showings of minor importance up the Moyeha river.

On the *Big Boy No. 8* claim, and 40 feet in elevation up the slope from the east side of the river, there is a showing along the base of a bluff 15 to 25 feet high. The exposure is a narrow shear 120 feet long running down the hillside, containing small, disconnected lenses of quartz along this length. The upper lens is 20 feet long, varies in width from 5 inches to 1 inch, and carries very little mineralization other than quartz. There is, noticeably, ¼ inch of well-defined gouge on the hanging-wall. The middle lens consists of 18 inches of quartz, only 2 inches wide, and carrying no sulphides. The lowest lens consists of 12 inches of quartz, ½ inch wide, and contains no sulphides. The shear-zone cuts dense andesite.

Farther up the river, on the east bank and approximately 150 feet easterly from the post on the north-west corner of *Big Boy No. 8* claim, there is a small showing in the face of a bluff 25 feet high. Here there is a cleft with an average width of 14 inches, which has been formed by three parallel shears, each containing on the average 2 inches of crushed rock. In the shear-zone and 10 feet above the base of the bluff there is 3 feet of sinuous quartz vein averaging 2 inches in width and carrying a little chalcopyrite. The shear at the base of the cliff is covered by debris, but here the vein is reported to be 4 inches wide and to carry free gold.

The river adit, on the east bank of the Moyeha river, has been driven for 32 feet at south 52 degrees east, for 14 feet at north 80 degrees east, and for 17 feet at south 52 degrees east, or a total length of 63 feet, of which 60 feet is on a quartz vein.

The vein is lens-like in structure, varying from 8 inches to 1 inch in width, with an average strike of north 40 degrees west and a dip of 35 degrees south-west. Inside the portal the vein branches into a hanging-wall and a foot-wall vein; but 24 feet in from the portal they join and continue as one vein which varies in width from ½ to 4 inches; the maximum separation of the split is 2 feet. Two feet from the face the vein pinches and a thin gouge-slip continues into the face. On the north-east wall and 18 feet from the face the vein, here 2 inches wide, has been cut by a vertical fault. This contains very badly crushed rock, but very little gouge over a width of 2 to 3 inches. The fault continues along the back to the face, where it narrows to seams over a width of 2 inches containing a pinching 2-inch lens of pure white

quartz. The quartz of the main vein is milky, somewhat vuggy, and contains small amounts of chalcopyrite, galena, and free gold. A 6-inch chip sample across quartz moderately mineralized by galena and chalcopyrite assayed: Gold, 1.50 oz. per ton; silver, 0.5 oz. per ton.

The rock formation is a very platy porphyritic andesite. It is to be noted that the attitude of the jointing in the andesite is the same as that of the quartz vein—namely, north 40 degrees west and dip 35 degrees south-west.

Moyeha. This group, comprising eight mineral claims staked in 1933 and 1934, and owned by H. E. Dendoff, Wm. P. Duncan, and associates, is situated on the lower slopes of the large mountain which is westward across the Moyeha river from Big Boy mountain at the head of Herbert arm. The mountain-side is steep and bluffs are numerous, but good foot-trails lead up to the various showings, which are at elevations from 410 to 1,140 feet.

The showings consist of quartz veins and veinlets which carry sulphides and gold in widely varying amounts. The veins vary in width from narrow stringers 1 inch wide to lenses 8 inches wide and to "blowouts," or zones, consisting of numerous narrow, interlacing veinlets of quartz which occur over widths of rock up to 2½ feet.

The rocks are andesitic volcanics which have been intruded by masses of quartz porphyry.

There are six showings of quartz veins and associated sulphides on the property. Five of them, which will be described first, on the south side of a creek which flows easterly into Moyeha river, are at elevations that range from 940 to 1,140 feet above sea-level. The sixth showing, or "*Moyeha* rich lead," north of the above creek and on the slope which goes immediately down to the Moyeha river, is between elevations of 390 to 410 feet. The showings will be described consecutively as they occur on the trail up from the beach past the *Tyee* workings.

No. 1 showing, on the trail which leads up from near the mouth of the Moyeha river, is about 200 feet north-west of the last showing on the *Tyee* property. Here, on the *Moyeha* ground, blasting and trenching have exposed a zone 11 feet wide, strike north 30 degrees west, dip 65 degrees south-west, which contains much oxidized and decomposed rock. In this width there are many narrow ½-inch veinlets of quartz which strike with the zone.

At the north-east end of the trench there is a gouge-seam 6 inches wide which contains blue clay, a little quartz and pyrite. About 25 feet north-west along the strike there is a 2-foot exposure of silicified rock which contains finely disseminated pyrite.

No. 2, the largest exposure, locally known as the "top lens of the canyon lead," at an elevation of 3,100 feet, is about an eighth of a mile north-west from the No. 1 showing. Here a strong quartz vein has been well exposed by trenching and stripping over a total length of 75 feet on a 35-degree slope. The vein, pinching and swelling from 2 to 8 inches, has an average width of 5 inches. The average strike is north 80 degrees west and the average dip 60 degrees south. The vein material is quartz, much of which is vuggy, chalcopyrite, and both coarse and fine pyrite. A 5-inch sample of quartz carrying pyrite and chalcopyrite assayed: Gold, 0.70 oz. per ton; silver, 0.30 oz. per ton. The wall-rock is mineralized with fine pyrite within a distance of 2 feet from the vein.

The formation consists of dense andesite into which dykes of quartz porphyry have been intruded. The result is that there are alternating areas of andesite and quartz porphyry along the strike of the vein. In the immediate vicinity of the vein the rock, both andesite and quartz porphyry, has been silicified by quartz veinlets and silica and mineralized by fine pyrite.

The next showing, No. 3, known as the "bottom or foot-wall lens of the canyon lead," is in the creek on its south side.

The exposure consists of a few narrow lenses of quartz, only 1 inch wide, contained in a strong shear 6 to 12 inches wide, which lies between a foot-wall of andesite and a hanging-wall of quartz porphyry. On either side of the zone there is much crushed rock, silicification, and a little fine pyrite mineralization. The zone strikes south 30 degrees east and dips 65 degrees to the south-west.

No. 4 showing, elevation 1,130 feet, locally known as "the middle lens," on the south-east side of the creek and almost 100 feet above it, consists of three exposures of quartz over a length of 40 feet. The quartz is present in ½- to ¼-inch stringers over widths of 6 inches to 3 feet.

The rock enclosing these stringers is a medium-grained andesite, silicified and finely mineralized with pyrite. The zone strikes south 45 degrees east and dips 50 degrees north-east.

No. 5 showing, on the south-east side of the creek and about 25 feet above it at an elevation of 1,140 feet, is a continuation of No. 4. The exposure discloses a zone 2½ feet wide which contains narrow stringers of quartz and finely disseminated pyrite in quartz porphyry. This zone may be traced for 15 feet along the strike.

Approximately 200 feet up the canyon from No. 5 showing there is a 40-foot bluff beneath a waterfall. In the face of this there are three narrow fissures up to 4 inches wide carrying quartz. Both quartz and wall-rock contain finely disseminated pyrite.

No. 6 showing, the "*Moyeha* rich lead," is on the easterly slope of the mountain immediately above the Moyeha river and at an elevation of 410 feet. The vein is accessible for 40 feet, beyond which it continues for 250 feet or more in a series of bluffs up the mountain-side. It strikes north 80 degrees east and dips 38 degrees south, and varies in width from 6 to 2 inches, with an average width of 3 inches. The vein-filling is quartz, much of which is drusy, and a little chalcopyrite, pyrite, and galena; free gold is reported. With the exception of ½ inch of gouge here and there, the vein is frozen to the walls. A 3-inch sample of typical quartz from the vein assayed: Gold, 0.86 oz. per ton; silver, 0.8 oz. per ton.

The rock formation is massive, very fine-grained, highly altered andesite which has amygdaloidal phases.

In elevation 30 feet below the main showings a trench has been made in the debris at the base of the bluff which exposes a quartz vein 2 inches wide over a length of 6 inches. The nature of the vein and rock is similar to that of the showing above.

Tyee. The *Tyee* property comprises eight mineral claims owned by J. L. Gibson, R. W. Grisdale, E. W. and R. C. Bolden, all held by location. The *Tyee* claims staked in 1933, and the *Heather* claims in 1934, are situated on the slopes of the mountain that lies westerly across the Moyeha river from Big Boy mountain. The showings, of which there are two, are immediately south-east from the upper group of showings on the *Moyeha* property and are reached by the trail that leads up from the beach to the latter showings.

The first trench from the beach is at an elevation of 850 feet. Surface-blasting has exposed three parallel fissures filled by quartz and pyrite that strike south 45 degrees east and dip 45 degrees south-west. The foot-wall vein, 8 inches in width, is the widest and contains a considerable amount of pyrite. The foot-wall of this vein cutting quartz porphyry is bordered by 2 inches of gouge.

The second trench is 95 feet north-west from the first. The mineralization and vein-structure are very similar to that in the first. In a vertical face exposed by blasting there are numerous small tight quartz veins over a width of 2½ feet, the individual veins varying in width from ¼ to 2 inches. There is also a foot-wall seam of gouge that is 6 inches thick and contains abundant pyrite. A bulk sample of this material assayed: Gold, 4 oz. per ton; silver, 0.4 oz. per ton.

Kennedy (Elk) River Section.

This area is reached by a 30-mile water route from Tofino via Kenn falls, Kennedy lake, and Kennedy (Elk) river to the *Leora* mine, situated about 1½ miles up the river from its mouth. Although considerable interest was shown and work done in the area in the late nineties when the *Rose Marie* property operated a 4-stamp mill for a couple of seasons, the only properties upon which any recent work has been done are the *Leora* and the *Tommy K.* group, owned by the Kennedy Lake Gold Mines, Limited.

Leora. The *Leora* group comprises the following mineral claims: *Leora, Leora No. 1,* and *Leora No. 3.* They were staked in 1902 and 1903 and are owned by W. W. Gibson, of San Francisco. The property is on the east side of Kennedy (Elk) river, about 1½ miles from its mouth. The workings and camps are a quarter of a mile in an easterly direction from the river landing at the base of a mountain-slope that rises from the valley of Kennedy river, and well above the level of high water in the river. The valley and mountain-slopes in the vicinity are well timbered; large red cedars predominate.

Mineralization on the *Leora* has resulted in quartz that partly fills strong fissures in andesitic greenstone. Abundant pyrite with a little sphalerite, chalcopyrite, and ankeritic carbonate accompany the quartz. The presence of much gouge and several branch fissures indicate considerable faulting. The greenstone is traversed by serpentine dykes that range from a few inches up to several feet in width; the dykes antedate the fissures. Exploration-work consists of two adits, one 80 feet in elevation above the other, driven on different fissures, and two shafts, one quite old and one started in 1931; both shafts were, however, inaccessible at the time of examination.

The *Leora* has been worked intermittently since 1902 and small shipments of ore usually made each time. It is estimated that between 1902 and 1914 about 422 tons of ore was shipped. In 1911 a tramway 1,500 feet long was built from the mouth of the adit to Kennedy river; however, this has long since gone. The present owner, W. W. Gibson, bonded the property in 1914, started a new shaft, did considerable stoping, and ran 100 tons of ore through a small mill of his own design. Since 1931 he has started another new shaft about 100 feet north-west from and above the lower adit, and is reported to have done considerable lateral work from it. At the time of the writer's visit no work was being done.

A complete examination of the lower adit was prevented by a dam backing up water at 106 feet from the portal. Over this distance the adit has been driven at south 79 degrees east on the fissure which dips 60 degrees north. Two short drifts on branch fissures have been driven at points 50 feet from the portal at south 45 degrees west for 10 feet, and 72 feet from the portal at south 45 degrees west for 12 feet.

From the portal to 30 feet the vein has been underhand-stoped for an unknown distance and stoped above to the surface. At 70 feet a small winze was sunk; at present this is filled with water, but the following quotation from the Report of the Minister of Mines for 1912, page 195, describes the winze: ". . . A winze has been sunk 40 feet at an incline of 60 degrees. At the bottom of the winze there is 60 feet of drifting on the vein, which swells at one point to 2 feet wide, but at the face is only 6 inches."

The fissure followed by the main adit is filled in some sections by ribbon-quartz up to 8 inches wide, and in others by gouge and only small amounts of quartz, and in some by gouge alone. From 0 to 20 feet the vein contains ribbon-quartz that averages 8 inches in width; from 72 to 80 feet it contains an 8-inch width of quartz that contains abundant pyrite and just beyond the dam a lens of milky quartz 10 inches wide. Elsewhere the fissure is filled either by gouge, in one place 4 inches thick, or by a mixture of gouge, country-rock, and small stringers of quartz. The first cross-working, 50 feet from the portal, has been driven on a short, sinuous quartz vein that strikes north 38 degrees east and dips 55 degrees north-west. The vein is 4 inches wide and contains quartz with considerable pyrite and some sphalerite between frozen walls. The second cross-working from the portal has been driven on a strong fissure striking north 70 degrees east and dipping 65 degrees north, which branches from the main adit fissure at 72 feet. This branch fissure is filled with 1 to 2 inches of gouge to within 2 feet of the face, where 6 inches of quartz comes in but soon pinches to 1 inch. The adit is driven in andesitic greenstones cut by a basic dyke between 70 and 78 feet that is largely altered to a chocolate-coloured serpentine. Both the dyke and greenstone have been badly shattered so that the tracing of the contact is difficult, but it appears to strike south 5 degrees east and to dip 75 degrees west. The dyke is older than both main and branch fissures at this place.

The upper adit is 200 feet north-east from the lower. It is 47 feet long, having been driven 32 feet at south 64 degrees east and 15 feet at north 73 degrees east. The adit follows a shear-zone, strike south 60 degrees east, dip 70 degrees north-west, for 34 feet and then turns and follows a narrowing branch fissure to the face, which strikes north 75 degrees east and dips 75 degrees north. On the north wall of the adit near the face a small fissure strikes south 55 degrees east and dips 65 degrees north-east. These fissures vary from 1 to 2 inches in width and are usually filled with gouge, but for 6 feet from the portal and at 40 feet there are lenses of quartz carrying only small amounts of pyrite. It is probable that the fissures in this upper adit represent hanging-wall branches from the much larger break in the lower adit.

The rock-types in the adit are serpentine and andesitic greenstone. The serpentine has resulted from the alteration of a basic dyke that strikes approximately south 40 degrees east and is nearly vertical. At the portal the dyke is on both walls of the adit, but at 18 feet the

north-east wall of the dyke has disappeared in the south-west wall of the adit. In the immediate vicinity of the fissure the serpentine has been bleached from its original purple colour to a very light grey. A second serpentine dyke that is only 6 inches wide cuts the andesite a few feet south of the portal. This dyke, strike south 50 degrees east, dip 83 degrees north-east, is a continuation of one that outcrops lower down the creek that flows past the portal of both the upper and lower adits. In some places these occurrences of serpentine possess very dense selvages where in contact with the greenstone; this, in addition to their dyke-like habit, supports the view that the serpentine on the *Leora* represents dykes that have been serpentinized.

The old shaft is 40 feet north-west of the lower adit and at the same elevation. The new shaft is 100 feet north-west from this adit and is 50 feet above it, and has evidently been sunk to intersect the hanging-wall of the vein as exposed in the lower adit.

Tommy K.

The *Tommy K.* group includes the following mineral claims: *Hidden Treasure, Tommy K., Kennedy, Young Pat, Waterfall, Big Boy,* and *Dorothy.* They were staked in 1933 and 1934 and are owned by a private company, the Kennedy Lake Gold Mines, Limited, of which T. O. MacKay, 1214 Broad Street, Victoria, is secretary. The workings and camp are about 4 miles up Kennedy (Elk) river from its mouth and a quarter of a mile east from the river. A good foot-trail leads from the *Leora* to the *Tommy K.* The group covers an area that is characterized by steep wooded slopes and low rock bluffs. An intermittent creek follows a canyonous course interrupted by waterfalls from the upper workings to the camp, from which it flows along a gentle gradient to Kennedy river.

Narrow, tight fractures in andesite breccia have been filled by quartz accompanied by small amounts of calcite, pyrite, chalcopyrite, and pyrrhotite. The breccia has been cut by altered quartz-diabase dykes and a few less altered aplite dykes.

The surface workings consist of open-cuts and trenches on several different veins. At a place 1,400 feet up the creek from the camp and 480 feet above it in elevation, an open-cut has been blasted in the south wall of the canyon on the so-called *Hidden Treasure* vein. This vein has been exposed for 15 feet in the floor of the cut and for approximately 100 feet up the rock bluff. The average width of the vein is 6 inches, but the habit is lens-like. The vein-filling is quartz, carbonate, and small amounts of disseminated pyrite. Mineralization has resulted in the lenticular filling of one major and several minor fractures by quartz, grey calcite, a little pyrite and chalcopyrite. The zone strikes south 30 degrees east and dips 75 degrees north-east. The minerals occur in lenses that vary in width from 1 to 8 inches and in narrow veinlets that vary from 1/16 to 1 inch in width. A sample taken across 8 inches of quartz showing a little chalcopyrite and pyrite assayed: Gold, 1.20 oz. per ton; silver, 0.20 oz. per ton. The rock formation is an andesite breccia that consists of very angular light-green fragments up to 3 inches in maximum diameter, set in a fine-grained dark-green chloritic matrix.

A trench that is approximately 1,200 feet west from the *Hidden Treasure* vein and 150 feet east from the blacksmith-shop shows a narrow vein that strikes north 60 degrees east and dips 64 degrees north-west over 17 feet of exposed length. The vein is 2 to 3 inches wide and consists of ribbon-quartz, with a little pyrite, chalcopyrite, and pyrrhotite filling a parallel walled fracture in andesite breccia. On the foot-wall there is ½ to 1 inch of gouge, but the hanging-wall is a clean slip surface. A bulk sample across 3 inches of vein-matter in the north-east end of the trench assayed: Gold, 0.48 oz. per ton; silver, 1.4 oz. per ton. A rock-cut has been started at a place 50 feet north-westerly down the slope from the last trench, the objective of which is to intersect the vein at a greater depth.

There are surface showings on the property of several small, frozen quartz-calcite veinlets that vary from 1 to 2 inches in width and contain small amounts of pyrite, chalcopyrite, and pyrrhotite. With the exception of two showings up the creek that strike east, these all strike in a north-easterly direction. Beneath the large falls in the creek a strong fissure, strike east, contains 2 inches of bluish gouge, but no mineralization is now evident. A composite sample was taken of three small veins from ½ to 2 inches wide that may be the continuation of the 2- to 3-inch vein described above. This sample contained quartz with small amounts of pyrite, chalcopyrite, and pyrrhotite, and assayed: Gold, 0.48 oz. per ton; silver, 1.4 oz. per ton.

ALBERNI CANAL.

W.W.W. The *W.W.W.* mine, at present owned by the Franklin River (British Columbia) Gold Mines, Limited, of 402 Pender Street West, Vancouver, includes the following Crown-granted claims: *W.W.W. Nos. 1, 2, 3,* and *4*. The claims are situated on the south bank of Corrigan (Granite) creek, about 10 miles south-east of Alberni canal. The three adits on the property are at elevations of 2,100, 1,960, and 1,825 feet; the camp is at 2,040 feet. A pack-horse or "go-devil" trail leads from the camp down a steep side-hill and over a flat to Corrigan (Granite) creek, crosses to the north side of the creek, and follows this side down to the end of the Bloedel, Stewart & Welch logging-railway some 4 miles distant. This railway follows Corrigan creek and the Franklin river for 6 miles to Alberni canal. At present the logging company affords the mining company rail transportation to the end of its line. The camp and workings are situated on a steep, heavily timbered side-hill which rises from a flat, wooded tract in the valley of Corrigan (Granite) creek.

There are three veins on the property, each of which has been developed separately by an adit. The two upper veins, which will be referred to as No. 1 and No. 2, corresponding to the number of the adit driven on them, strike south-westerly and dip on an average of 45 degrees to the south-east. They fill fissures and consist of ribbon-quartz, pockets of pyrite, some galena and sphalerite, and, where widest, contain unreplaced fragments of wall-rock; narrow seams of gouge are usually present on the walls. The lowest vein, No. 3 in No. 3 adit, is quite flat, but where first encountered in the adit it strikes south 80 degrees east and dips north. The fissure-filling is mostly gouge and decomposed rock, but one and sometimes two narrow quartz veins occur near one or both of the walls. These quartz veins contain no sulphides.

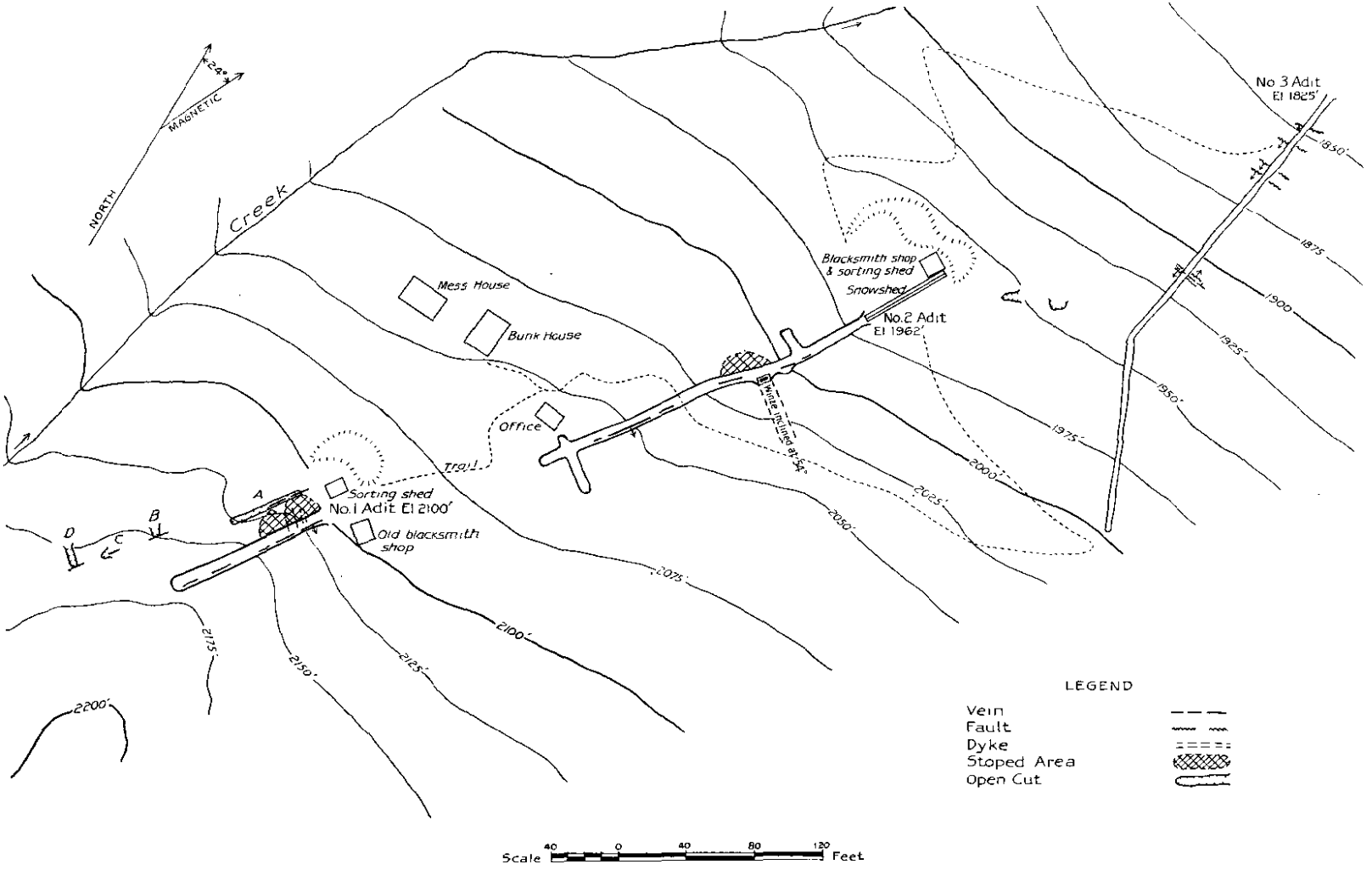
A complex group of igneous rocks is exposed in the various workings. Tongues of granodiorite alternate with masses of hybrid diorite and both types have been cut by basic feldspar dykes, which are older than the veins. Although no cross-faulting of the vein-fissures was observed, it was noticed that faulting with movement had definitely occurred in No. 2 fissure. The present investigation did not disclose any relationship between the structure of the veins and the type of rock traversed.

The *W.W.W.* claims were staked in 1898 and 1899 and Crown-granted in December, 1899, as the *W.W.W. Nos. 1, 2, 3,* and *4* claims. The property has been owned by many interests and worked intermittently up to the present. By 1899 an adit had been driven on the vein, and by 1921 the upper or No. 1 adit had been driven 72 feet, the intermediate or No. 2 adit 117 feet, and a winze sunk from this adit. Between 1921 and 1930 but little work was done on the property. In 1930, A. James, of Vancouver, acquired ownership and optioned the property to Vancouver interests, the outcome of which was the ownership by the present Vancouver company. Since 1932, No. 1 adit has been extended to 95 feet, No. 2 adit to 215 feet, and a new low adit, No. 3, started and driven 308 feet. Previous to 1932 access to the property was by pack-horse trail for the full distance of 10 miles from Alberni canal; but since then the company has had the privilege of rail transportation on the Bloedel, Stewart & Welch logging-railway. This railway is still under construction, but at the time of writing steel had been laid for about 6 miles from Alberni canal.

Up until May, 1935, small shipments of ore had been made from the upper adits by the present company; since May, however, work has been temporarily suspended on the property.

The most complete recent description is to be found in the Annual Report for 1921; other accounts may be found in the Annual Reports for 1902, 1922, 1927, 1928, 1930, 1932, and 1933, and in Bulletin No. 1, 1932. A mineralogical study of the veins is contained in a paper entitled "The Mineralogy of the W.W.W. Veins," by H. V. Warren and J. M. Cummings, published in "The Miner" for October, 1935.

On the surface the upper vein is exposed by four open-cuts and by an outcrop in a small creek. Two trenches across the strike of the vein were filled with debris at the time of the writer's visit and no bed-rock was exposed. The aggregate length of exposed vein in these cuts and the outcrop is 55 feet over the total length of 300 feet along the strike.



W.W.W. Mine. Plan of Workings (after Company's Plan).

In the descriptions to follow the open-cuts will be referred to alphabetically, beginning from the nearest to No. 1 adit and going south-westerly along the vein, strike north 30 degrees east, dip 45 degrees east.

Open-cut A exposes No. 1 vein for 25 feet. The vein material consists of 2 to 6 inches of ribbon-quartz that is frozen to the walls and some disseminated pyrite, the oxidation of which gives the outcrop a slight rusty colour. The rocks include granodiorite and diorite.

Open-cut B is 5 feet long and is driven across the strike of the vein, which it exposes for 3 feet along the strike. The vein consists of two narrow, lenticular quartz stringers and very little sulphide. Leached wall-rock extends between the veins and for at least 6 feet in the hanging-wall side; other rock is covered by debris. The rock formation, where relatively unaltered, is granodiorite and diorite.

Open-cut C is a short, 5-foot trench along the strike of No. 1 vein. Combined stripping and trenching have exposed the vein for 20 feet along the strike. In this place a zone, 2 feet in width, of brecciated, leached, and somewhat chloritized granodiorite and diorite contains from one to three 2-inch frozen quartz veinlets and pyrite that is both disseminated and in narrow veinlets. The rock alterations are less intense away from the vein.

Open-cut D, 15 feet long, is excavated across the strike of the No. 1 vein and exposes an 8-inch frozen quartz vein over a length of 10 inches. The wall-rock, visible only in the hanging-wall, is granodiorite.

Open-cuts E and F were filled by debris at the time of examination.

The outcrop in the bed of a creek that flows north is about 165 feet south-west of open-cut D. This outcrop exposes 8 to 10 inches of frozen quartz over a length of 4 feet. The formation is a basic feldspar dyke which has been leached and altered in the vicinity of the vein.

No. 1 adit, at an elevation of 2,100 feet and some 75 feet above the main camp, has been driven its full length of 95 feet south-westerly along the No. 1 vein. In this adit the vein strikes north 35 degrees east and dips 45 degrees south-east. The vein-fissure is lenticular and varies in width from 10 inches to a narrow slip. The filling is chiefly ribbon-quartz, but short, wider sections of the vein contain an abundance of pyrite accompanied by smaller amounts of galena and sphalerite. Ribbon-structure is characteristic of the vein-filling; where quartz is most abundant this structure is displayed as a series of parallel black slips; where sulphides are also abundant the structure is manifested as curving and intersecting slips that produce an "en echelon" arrangement of quartz-sulphide lenses. The vein-walls are usually clean-cut and coated with about ½ inch of clay gouge. For 35 feet from the portal the vein has been stoped to a maximum distance of 15 feet up the dip. In the back of this stope the vein is 4 inches wide and contains abundant pyrite and galena and minor amounts of quartz. It attains its maximum widths of 4 to 10 inches at 0 to 25 feet, 55 to 65 feet, and 85 to 90 feet, measured from the portal. Towards and in the face it splits to a few lean quartz veinlets that are ½ to 2 inches in width. Where the sulphides are heaviest the values are highest. A sample at 20 feet from the portal and in the back of the stope taken across 4 inches of heavy pyrite and galena and small amounts of quartz assayed: Gold, 6 oz. per ton; silver, 4 oz. per ton. The formation in No. 1 adit is chiefly diorite, but granodiorite is present for 25 feet from the portal, from 55 to 60 feet, and again at 75 feet. The face of the drift is in a fine-grained diorite. Fifteen feet from the portal the granodiorite is cut by a black, fine-grained feldspar dyke 2 feet wide; and 3 feet farther along by a dyke of similar composition that is very dense in texture at the immediate contact, but becomes medium-grained away from it.

No. 2 adit, at an elevation of 1,960 feet and 138 feet below No. 1 adit, is 215 feet long, and from a point 25 feet in it has been driven south-westerly on No. 2 vein. The secondary workings in the adit comprise a crosscut at 45 feet from the portal that has been driven north-westward for 18 feet; a winze at 70 feet sunk on the vein at 54 degrees south-east, from 65 to 95 feet a stope driven for 15 feet up the dip, and at 195 feet a crosscut driven 28 feet south-eastward and 10 feet north-westward.

No. 2 vein represents for the most part a filled fissure of varying widths: but where widest there has been some replacement of the wall-rock. The average width of the vein is about 8 inches, with extremes from that of a narrow slip to a lenticular section 2½ feet wide. The vein has been followed for 160 feet.

The vein-section from 55 to 65 feet contains 8 to 10 inches of ribbon-quartz and considerable pyrite. At 80 and 120 feet it consists of two wide sections of quartz that carry but little pyrite. Between 135 and 165 feet the vein is lenticular, attaining a maximum width of 2½ feet, and consists of lenticular veinlets of quartz, abundant sulphides, and unreplaced fragments of wall-rock. Beyond this place the vein pinches to a tight seam at 180 feet and from here to the face neither the vein nor any evidence of the fissure can be recognized.

Faulting has occurred within the vein, but whether it is post-mineral or pre-mineral could not be determined. The best evidence of this faulting is at a place 150 feet from the portal, where the vein-section includes some granodiorite that has been dragged past a section of a basic dyke in the foot-wall. In addition to the main vein there are some 1- to 2-inch tight, sinuous quartz veinlets that strike about east and dip in various directions.

A 10-inch sample taken at a place 155 feet from the portal and across 10 inches of heavy sulphide ore, containing a small amount of quartz, assayed: Gold, 7.30 oz. per ton; silver, 5.30 oz. per ton.

Both diorite and granodiorite occur in No. 2 adit, but diorite is the more abundant. The granodiorite occurs as small tongues a few feet wide in the diorite at various places, the largest section of granodiorite being one that extends for 12 feet from the face of the longest crosscut in the working. At 150 feet from the portal a dense, black feldspar dyke cuts the granodiorite, but is itself cut by the vein-fissure and displaced an unknown amount.

No. 3 adit, 137 feet below No. 2, at an elevation of 1,825 feet, is 308 feet long and has been driven at south 5 degrees west for 190 feet and then at south 25 degrees east for 118 feet to the face. There are no other workings from this adit. This adit follows No. 3 vein, but not the downward extension of either No. 1 or No. 2 veins. It follows a flat, irregular combined vein and fault-zone that is unlike Nos. 1 and 2 veins in attitude, structure, and vein-filling. No. 3 vein appears at 135 feet from the portal, where it commences with a strike of south 82 degrees east and a dip of 50 degrees north. At 155 feet the strike is the same, but the dip has flattened to 25 degrees north, and within 10 feet the dip is quite flat, and from this point to the face of the adit it undulates to within a few degrees from the horizontal. The vein-matter consists of one and sometimes two narrow quartz veinlets which are commonly in the hanging- and foot-wall of a highly crushed zone that includes much gouge and decomposed wall-rock. The veins average 2 inches in width, although at 276 feet from the portal the quartz has widened to a short lens 2 feet wide. The thickness of the gouge and intermixed, decomposed rock varies from 2 to 12 inches. Sulphide minerals are not visible, but some areas of gouge and decomposed rock are quite rusty, which suggests the oxidation of small amounts of disseminated sulphides. A group of four small faults occurs between 20 and 65 feet from the portal. The strikes of these range from north 72 to north 82 degrees east and the dips from 70 to 85 degrees south. These faults contain 1 to 2 inches of gouge and narrow 1-inch quartz veinlets. At 148 feet from the portal a 2-inch vein of ribboned quartz, strike south 85 degrees east, dip 35 degrees south, has been cut off by the main vein-fault; the displacement could not be determined. A sample at 222 feet across 14 inches of rusty gouge and decomposed rock, including 2 inches of quartz, assayed: Gold, 1.30 oz. per ton; silver, 0.90 oz. per ton.

The rock-types are diorite and granodiorite, the former being more abundant. There are short, small sections of granodiorite as follows at the portal: From 65 to 80 feet; at 165 feet; from 180 to 195 feet; from 255 to 265 feet; and from 270 feet to the face.

Cowichan Lake.

El Capitan.

The *El Capitan* group, comprising the following mineral claims: *El Capitan*, *El Capitan Nos. 2*, *3*, and *4*, and the *Chico*, is owned by a syndicate of Duncan people, including E. F. Miller, K. F. Duncan, and G. Lomas, and is at present under option to G. Lomas and D. Powell, of Duncan. The workings are situated on either side of the mountainous divide between the headwaters of Cottonwood creek and the Chemainus river, between altitudes of 4,550 and 4,750 feet, the lowest part of the divide in the immediate vicinity being at an altitude of some 4,780 feet.

At present the property is reached by foot-trail over, first, 5¼ miles of an abandoned logging-railway that begins 1 mile west of Youbou, on Cowichan lake, and then by 3½ miles of good trail to the cabin and workings. Until a year ago it was possible to travel the first

6¼ miles of the route by automobile, but recent fires and floods have destroyed some of the trestles on the old logging-road.

The cabin is situated on the shore of a small cirque lake and the workings are on the mountain-slopes above it. One adit, No. 3, is on the steep side of the cirque and 500 feet above the lake; the others, Nos. 1 and 2, are over the divide and on the steep slope into the Chemainus valley. The hillsides below the cabin are steep but well covered with evergreen timber.

The predominant rock formation in the adits and the surrounding hillsides is a dark-green porphyritic andesite that contains phenocrysts of plagioclase feldspars up to 3 millimetres in length set in a fine-grained ground-mass. A second rock-type is a porphyritic hornblende-andesite dyke that contains black crystals of hornblende up to 3 millimetres in length set in a fine-grained ground-mass that is greenish-grey in colour. This dyke is 15 feet wide and from No. 2 adit up the easterly slope, over the summit and down the other or westerly side, it strikes north 80 degrees west. On the easterly slope of the hill the dyke dips steeply south, but on the westerly slope the dip begins to change through vertical to steeply north. The third rock-type is a medium-grained diorite that is in contact with the porphyritic andesite some 150 feet below No. 2 adit.

A strong easterly-striking fissure-zone follows the south wall of the dyke in Nos. 1 and 2 adits. The material in this fissure has been highly oxidized so that only complex oxidation products of iron and copper remain. There is very little quartz anywhere in the zone. Faulting across and along the shear has been very extensive and gouge-filled faults are common.

The *El Capitan* claim was staked in 1925, the others in 1927 and 1928, and up to date most of the work has been done on the original claim. Previous to 1927 the work consisted mostly of small amounts of stripping, but in that year the upper adit, No. 1, was driven 50 feet. In 1928 No. 2 adit was started 55 feet lower in elevation than No. 1 and driven to its present length of 100 feet on the same vein or shear. But little further mining was done on the property until 1932, when late in that year Messrs. Lomas and Powell leased the property and began to drive a new adit, No. 3, on the west side of the divide and much lower than those on the east side. They drove this adit with the hope of encountering the vein found in Nos. 1 and 2 adits. Since that time about 200 feet of work has been done in No. 3 adit, but the vein has not as yet been encountered. Descriptions of the property may be found in the Annual Reports from 1927 to 1933, inclusive, and in Bulletin No. 1, 1932.

No. 1 adit, at an altitude of 4,750 feet and some 30 feet below the lowest part of the divide, is 50 feet long and has been driven westward along a shear-zone that strikes north 80 degrees west and dips steeply, about 80 degrees, south. The shear varies considerably in width and for 10 feet from the portal it averages 2½ feet; then for 20 feet it widens and averages 4 feet and then narrows to 6 inches. At 30 feet a branch shear 8 inches wide leads south from the main shear and follows the south wall of the adit to the face. The main shear contains very little quartz; the vein-matter is chiefly gouge and crushed rock that is mixed with loose aggregates of iron and copper oxidation products. In places these are rhythmically banded so that 1/16 inch of malachite alternates with 1/16 inch of unidentified iron and copper hydroxides. A sample from the shear taken across 10 inches of rusty vein-matter assayed: Gold, 0.90 oz. per ton; silver, 1.1 oz. per ton.

The south wall of the adit is porphyritic andesite; the north wall is chiefly vein-matter; near the portal it is timbered. However, the hornblende dyke outcrops immediately north of the timbering at the portal and presumably forms the north wall of the vein in this adit.

No. 2 adit, 95 feet long, is 50 feet below No. 1 in a direction of north 85 degrees east from it. It has been driven at south 87 degrees west for 42 feet, at south 64 degrees west for 25 feet, and north 80 degrees west for 28 feet. At 90 feet a short crosscut 11 feet long has been driven south 20 degrees west. The adit follows the south wall of the hornblende dyke described previously. However, for a distance of 67 feet from the portal there has been considerable faulting both across and along the contact of this dyke and the andesite. The resultant displacement of the dyke by these faults is towards the south as one goes west, the adit following a sinuous course which trends southerly for 67 feet. However, from 67 feet to the face the north wall of the adit is along the clean, unfaulted part of the south side of the dyke, which here strikes south 80 degrees east and is vertical.

One vein is 1 to 2 inches wide and fills a fault that follows the south wall of the dyke from 67 feet to the face; the vein-matter consists of decomposed oxidized matter and gouge. At 80 feet a branch fissure leads to the south-west across the drift and into the west wall of the crosscut; in places this contains gouge and oxidized matter up to a width of 10 inches. A second vein enters the south wall of the adit at 67 feet for 5 feet, disappears into the wall and is again present in the face of the crosscut; this vein contains 2 inches of oxidized matter and also considerable chalcopyrite. As in the upper adit, very little quartz is present in any of the veins. On the south wall of the adit and in the crosscut the rock is dark-green porphyritic andesite; on the north wall it is the hornblende andesite of the dyke.

No. 3 adit, on the westerly slope of the divide and at an altitude of 4,550 feet, is situated about 380 feet in a direction of north 80 degrees west from that of No. 1 adit. No. 3 adit, driven eastward for 70 feet, follows a well-defined wall that dips 55 degrees north; then turns north for 36 feet through porphyritic andesite that contains thin seams of pyrite and calcite. However, 20 feet south from the face of this crosscut the working follows a strong fault at north 85 degrees east for 70 feet to the face. This fault, strike north 85 degrees east and dip 52 degrees south, contains from 6 to 12 inches of clay gouge and at one place 53 feet from the face there is a little rusty gouge; the remainder is free from oxidation products. This is in distinct contrast to the abundant oxidized material in the shear-zone in Nos. 1 and 2 adits. The rock along this section is all badly fractured into small blocky fragments, but it does not contain fault-seams. A sample taken across 4 inches of rusty gouge and 8 inches of grey gouge in this drift showed only traces of gold and silver, and one taken across the face for 54 inches showed no gold or silver. The rock is typical porphyritic andesite.

Numerous small quartz veinlets that contain chalcopyrite and pyrite fill fissures or joints in the andesites of the surrounding hillsides. Several of these veinlets have been partly prospected by small surface-stripping, but nothing of importance has been found. One fissure of a maximum width of 14 inches that occurs on the west side of the summit and below No. 3 adit contains abundant arsenopyrite and is accompanied by some shearing and a little gouge. Where the fissure is cleanest the strike is north 65 degrees east and the dip 80 degrees south. Mineralization has resulted in thin ½-inch curving veinlets of quartz and in masses of arsenopyrite that are frequently frozen to the walls of the shear.

Vicinity of Ucluelet.

Toquart. The *Toquart* group, comprising four mineral claims—namely, the *Toquart Nos. 1* to *4*, inclusive, all staked in 1933 and owned by T. Tugwell and the Hillier Bros., of Ucluelet—is situated on the north-east side of Lucky creek, and about 2¼ miles up the creek from Toquart harbour on Barkley sound. The workings are between altitudes of 250 and 400 feet.

A quartz vein that strikes north has been stripped at intervals along the strike, so that over a total slope distance of 375 feet the sections of the vein thus exposed aggregate 100 feet in length. The quartz vein attains a maximum width of 6 inches, but as it is of the replacement-type the main vein is quite variable in width and often bordered by a zone of country-rock 2 feet or less in width that is interlaced by numerous sinuous quartz veinlets.

Mineralization has been slight and has resulted in the deposition of small amounts of pyrite and free gold in the quartz and country-rock. Near the south end of the stripping a short adit has been driven for 30 feet at 20 degrees on a part of the vein, which, however, pinches towards the face. In the vicinity of the quartz vein the main country-rock is andesitic greenstone, but this has been cut by two dykes of unknown width, one a light-grey quartz porphyry and the other a dark-green, dense feldspar porphyry.

Faith. The *Faith* and *Doris* mineral claims extend inland from a part of the beach that is about 2 miles south-east from the Japanese village opposite Spring cove, Ucluelet. They are owned by W. E. Saggers and A. E. Jacobs, of Ucluelet, and were staked in September, 1934. The mineral-showings occur here and there over a 100-foot stretch of beach and consist of pyrite both in 1/16-inch quartz veinlets and also scattered in widely spaced curving joint-planes. The rock is massive and highly altered, so that now, chemically at least, it is a dolomitized limestone. This rock contains numerous

angular blocks of black chert that range from 4 to 10 feet across and a few areas of graphitic slate of similar shape and size. A sample of heavy pyrite taken at the intersection of two shears assayed: Gold, 0.11 oz. per ton; silver, trace.

PROGRESS NOTES.

LODE-GOLD DEPOSITS.

BY

B. T. O'GRADY.

BRIDGE RIVER CAMP, LILLOOET MINING DIVISION.

Pioneer Gold Mines of B.C., Ltd.—The following notes summarize development-work accomplished during 1935: No. 2 shaft was sunk 794 feet from a depth of 2,519 to 3,313 feet. Stations were cut at 125-foot intervals down to the twenty-sixth level, which, at 3,216 feet below the shaft-collar, is the lowest level. Since the completion of sinking, in October, 1935, to the end of the year an aggregate length of 1,010 feet of crosscutting had been done from the shaft down from Nos. 15 to 22 levels, inclusive, and a total of 147 feet of drifting on the main vein on Nos. 15, 16, and 17 levels; also a start was made on a transfer raise from No. 17 level. Above No. 14 level 6,831 feet of drifting, 1,340 feet of crosscutting, and 1,461 feet of raising were done. Total development-work for the year, in all parts of the property, consisted of 6,978 feet of drifting, 2,350 feet of crosscutting, 1,510 feet of raising, and 794 feet of shaft-sinking. Total ore delivered to the mill amounted to 135,781 tons.

Bralorne Mines, Ltd., and Bradian Mines, Ltd.—A consolidation of these companies was effected in July, 1935, the combined operations being subsequently conducted under the name and direction of the Bralorne Mines, Limited. Salient features of development-work done during 1935 are as follows: During the year the *Ida May* and *Blackbird* veins were opened on No. 6 level from the *Empire* shaft. The *Ida May* vein was also opened on the No. 10 level from the *Coronation* shaft 550 feet down the dip from No. 6 level from the *Empire* shaft. The *Blackbird* vein was cut in the *Empire* crosscut from No. 8 level of the *King* mine (main haulage-level). During the year 145,113 tons of ore was milled. Total amount of development-work done is as follows: Crosscuts and drifts, 11,552 feet; shaft-sinking, 184 feet; winzes and raises, 763 feet; diamond-drilling, 2,961 feet. In connection with the *Bralorne* townsite adjoining the mine camp, forty-five new cottages were built and other improvements made.

Pacific Eastern Gold, Ltd.—The 2½-compartment shaft started in December, 1934, was sunk to a depth of 542 feet from a point 540 feet in from the portal of the adit, 634 feet long, at 4,110 feet elevation. At the 520-foot level in the shaft a crosscut has been driven south-westerly for 1,700 feet to expose a cross-section of the ground below the Cadwallader Creek valley. Previously three diamond-drill holes, aggregating 1,985 feet, were put down to determine the boundaries of the rock formations.

B.R.X. Gold Mines, Ltd.—No further work was done in the *California* workings. Development has all been in the *Arizona* section, the portal of the new adit-crosscut, at 2,330 feet elevation, being situated 230 feet east of the Hurley river and about 6,750 feet north-westerly from the northern extremity of the lowest (or No. 6) *California* level, at 3,005 feet elevation. When the property was visited early in November, 1935, this "L.O.X." crosscut was driven 1,895 feet south-easterly from the portal. At a point 50 feet from the face, drifting in both directions was being done along a strong shear striking about north 23 degrees west and dipping at about 50 degrees to the south-west. The northern drift was driven 265 feet and the southern drift 230 feet. Associated with the shearing were scattered, irregular showings of quartz, occasionally containing fine bands of pyrite-arsenopyrite mineralization. At 950 feet in from the portal of the "L.O.X." crosscut, a drift had been run 230 feet south-easterly along a minor shear accompanied by indefinite quartz stringers.

Wayside Consolidated Gold Mines, Ltd.—The old mill on this property was operated on a 20-ton basis until the middle of May, when work was suspended on account of the labour strike. In July construction started on the new 100-ton mill. Underground work, which was limited, chiefly consisted of preparing the mine for production. In connection with the new mill an additional power plant was provided which involved construction of a storage-dam and laying

4,800 feet of 12-inch pipe on Fergusson (Sucker) creek. The two water-power units, across the Bridge River valley from the mine, together supply about 610 horse-power. The new 100-ton reduction plant, which was brought into production towards the end of the year, includes a 20- by 6-foot Hardinge-Hadsel mill in closed circuit with a Dorr classifier, the product going over three 4- by 12-foot corduroy tables. From these the concentrate is treated by barrel amalgamation and the tailing by four 36-inch Fagegren flotation-cells, from which the concentrate is treated by cyanidation comprising standard units.

Congress Gold Mines, Ltd.—Work was continued by this company until May 7th, 1935. Subsequently, between July and October, operations were conducted under the direction of Howard James for Victor Spencer and associates, who held the property (excluding five claims) under option. The following work was done during this latter three-month period: The No. 2 level north drift was extended from 224 to 335 feet; No. 3 level north drift was advanced from 126 to 524 feet and the south drift from 6 to 39 feet. A raise was continued through from No. 2 to No. 1 level. In addition, a considerable amount of stripping and open-cutting was done, together was 321 feet of diamond-drilling. This work was suspended on October 7th, when the compressor plant was severely damaged by fire.

Minto Gold Mines, Ltd.—Development-work at this property was very limited. The river adit, or lowest level, was extended beyond the main fault and the vein drifted on for a short distance. Underground work chiefly consisted of stoping to supply the mill, which was operated throughout 1935 on a basis of from 60 to 70 tons a day. Changes in the flow-sheet have resulted in higher gold-recovery.

Federal Gold Mines, Ltd.—At this property, adjoining the *Minto* holdings, development-work done during 1935 included driving Nos. 1 and 3 adits at elevations of about 140 and 800 feet respectively below the surface showings. The No. 1 level is 190 feet and the No. 3 1,150 feet long. More recent work consists of the extension of No. 2 adit for a short distance at an elevation of about 300 feet below the surface showings.

Olympic Gold Mines, Ltd.—Exploratory work on the *Alta No. 1* claim, adjoining the southern side of Bridge river, approximately opposite the *Minto* mine property, consisted of drifting and crosscutting in two adits, at elevations of 2,020 and 2,161 feet respectively, which correspond to the Leckie and Magee workings referred to on page F 31, Report of Minister of Mines for 1934. When seasonal work was discontinued total footages in the lower adit comprised 470 feet and in the upper adit 280 feet. A Sullivan 2-drill, motor-driven compressor was in use, exploration being conducted under the technical direction of H. L. Batten.

Senator Gold Mines, Ltd.—At this property, which adjoins the holdings of the Olympic Gold Mines, Limited, to the south-west, surface work of an exploratory nature was done during the open season under the technical direction of H. L. Batten.

Gun Lake Section.

Pilot Gold Mines, Ltd.—Exploratory development-work was continued during 1935, the scope of operations having been reduced at the end of July and work suspended when the area was visited in November. To the end of July the total amount of underground work accomplished since operations started was 5,600 feet, the greater part of which is on the No. 1 level, with a small amount of work on the No. 2 level.

Tuscarora Gold Mines, Ltd.—At the property of this company, situated between Bridge river and Gun lake, work was resumed in November, 1935, when a small crew started driving an adit at an elevation of 500 feet below the surface showings. Work was done by hand with T. B. Lewis in charge.

Little Gem.—At this group, situated 1 mile south-west of Gun creek, it is reported that three men were employed during the summer season.

South Bridge River.

Alexander Holdings.—At this property on Tommy creek from three to seven men were employed during the open season. Camps were established, trails built, and a considerable amount of open-cutting done to trace the vein-outcrop.

Lillooet Area, Clinton Mining Division.

Grange Mines, Ltd.—(Reports of the Minister of Mines for 1928 to 1934, inclusive.) The small mill was shut down on August 10th, 1935, when the crew was reduced, five men being employed under Angus McPherson late in September. The No. 6 level south-east drift was then being advanced. Work done during 1935 up to the time specified included: Sinking a winze 120 feet (100 feet vertical) from No. 6 to No. 7 level; 260 feet of drifting, 52 feet of crosscutting, and 50 feet of raising on the No. 7 level; a raise from No. 6 level to No. 5 level, from which raise stoping was done over a length of 50 feet and a maximum height of 10 feet from a sub-level to the south-east; another raise put up 45 feet above the No. 6 level, from which a small amount of stoping was done over a length of 35 feet.

Deadman River Section, Ashcroft Mining Division.

Hamilton Creek Gold Mines, Ltd.—Work at this property was resumed in the fall of 1935. J. B. Harstone is in charge.

Telluric.—On this property in the same area a limited amount of underground work has been done.

Prospecting activities have also been carried on in the Vidette area.

Coast Area.

Britannia Mining and Smelting Co., Ltd.—The *Britannia* mine, located on Howe Sound, operated continuously during the year. Officials were C. P. Browning, general manager; C. V. Brennan, assistant general manager; C. P. Charlton, secretary-treasurer; A. C. Munro, general superintendent of mills; and C. G. Dobson, mine superintendent. As in the previous year, a great part of the tonnage was mined from the *East Bluff* section by the low-cost *Britannia* method of powder-blast mining. This production represented 72 per cent. of the total, with *Victoria, West Bluff*, and *Fairview* mines producing the balance.

A total of 817,250 tons was mined and milled. Total production was 14,306,105 lb. of copper, 11,649 oz. of gold, and 71,357 oz. of silver. The pyrite-concentrate production amounted to 39,582 tons, and the zinc-concentrate production totalled 3,191 tons, yielding 3,606,436 lb. of zinc.

Development-work totalled 9,541 feet, or 1.81 miles, and was made up as follows: Drifts, 4,170 feet; crosscuts, 1,560 feet; raises, 2,450 feet; powder-blast development of all sorts amounted to 1,282 feet; and the *Victoria* No. 2 shaft was sunk 79 feet to a point 58 feet below the 3,350 station.

Early in 1935 the 4,100 haulage-adit, a 12- by 10-foot opening which will develop the property about 200 feet above sea-level, was recommenced, and at the end of the year had attained a length of 8,784 feet. At the year end 668 men were employed.

Hercules Consolidated Mining, Smelting, and Power Corporation, Ltd.—This company continued work until the end of March, 1935. In July some further work was done by the Santiago Mines, Limited, under a lease agreement.

Loughborough Gold Mines, Ltd.—C. M. Ladd, representing this private company with property on Loughborough inlet, reports that from six to eight men were employed during part of the year. Work done includes construction of a wharf and building of a section of caterpillar-tractor road. A shipment of 49 tons of ore was made. The property was formerly known as the Golden Gate Mines, Limited.

Stave Lake Area.*

Machynlleth-Voel.—The *Machynlleth-Voel* group includes six mineral claims—namely, *Machynlleth, Machynlleth No. 3, Machynlleth No. 5, Voel, Voel No. 8*, and *Voel No. 9;* of these, the *Voel* and *Machynlleth* claims were staked in 1931 and 1934 respectively and the remainder in 1935. They are owned by John T. Williams and associates, of Webster's Corners.

Access in part is by 10 miles of dirt automobile-road north-eastward from Haney and then by three-quarters of a mile of abandoned flume-line to the showing. The main showing is in the bed of a creek in which the rock has been washed clean by waters in freshet. Minerali-

* Report by J. S. Stevenson.

zation has resulted in the distribution of pyrite and a little quartz along joints and in discontinuous shears in intrusive rocks that consist predominantly of hybrid diorites, but small areas of granodiorite, fine pegmatite, and aplite are also present.

A short trench has been dug and a small shaft, filled with water at the time of examination, sunk on a fan-shaped and discontinuous shear 6 inches wide that carries pyrite in places. A small bulk sample from a seam that carried 2 inches of massive pyrite assayed: Gold, 5.44 oz. per ton; silver, 1 oz. per ton. Two small trenches have been excavated and blasted at two places on two different shears about 200 feet north-east of the creek. A short trench and an adit 8 feet long have been started and abandoned on different shears about 200 feet north-east of the creek. There is very little mineral in any of these shears.

MISCELLANEOUS DEPOSITS.

Texas Creek.

British Molybdenite Production, Ltd.—The property of this private company of Vancouver is at the head of Texas creek, which flows into the Fraser river south of Lillooet. Seasonal work done is reported to have consisted of surface prospecting by open-cuts and some construction on a road. A reference to a molybdenite deposit in this vicinity is contained in the Report of the Minister of Mines for 1916 under *Index* mineral claim.

*Geiler.**—This group, consisting of the *Copper Hill, Geiler*, and *Donihuill* claims on Quadra island, is held by T. Noble and associates, of Quathiaski Cove. (*See* Memoir No. 23, by D. D. Cairnes, Geological Survey of Canada, 1913, and Geology of the Coast and Islands, by J. A. Bancroft, 1911.) Since 1913 a considerable amount of open-cutting has been done on the *Geiler* shear-zone in andesite over a 1,300-foot length. The property is being actively prospected at the present time.

B.C. Nickel Mines, Ltd.—Development-work consisted of 6,300 feet of workings driven in the vicinity of No. 1 tunnel and 760 feet of raising. The latter is part of a programme whereby five raises will be put up 300 feet each above No. 1 tunnel, from which a thorough diamond-drill campaign will be undertaken. During the year 56,000 feet of diamond-drilling was done, of which 47,000 feet was driven from No. 1 tunnel, 8,000 feet from No. 2 adit, and 1,000 feet from the surface, to explore areas indicated by magnetometer survey.

Coquihalla Area.

Home Gold Mining Co., Ltd.—At the property of this company, in the Yale Mining Division, development-work done during 1935 mainly consisted of putting up a raise from the No. 4 to the No. 3 adit, together with some drifting on the latter level. Small lots of crude ore and concentrates were shipped, the latter being derived from the small mill which was operated for sixty-five shifts between April and July. Eight men were employed when the property was visited in October.

* By P. B. Freeland.

PART G.
INSPECTION OF MINES.

BY

JAMES DICKSON.

The Province is divided into five Inspection Districts, as follows:—

Inspection District.	Mining Divisions in District.
Coast	Quatsino, Clayoquot, Alberni, Victoria, Vancouver, New Westminster, Yale, and Nanaimo Mining Divisions.
Northern Interior	Lillooet, Ashcroft, Clinton, Quesnel, Cariboo, and Peace River Mining Divisions, and those portions of the Liard and Omineca Mining Divisions east of the 124th degree of longitude.
Interior	Similkameen, Osoyoos, Nicola, Vernon, and Kamloops Mining Divisions.
East Kootenay and Boundary	Greenwood, Grand Forks, Trail Creek, Nelson, Slocan City, Slocan, Arrow Lake, Ainsworth, Lardeau, Revelstoke, Fort Steele, Windermere, and Golden Mining Divisions.
Northern	Queen Charlotte Islands, Bella Coola, Stikine, Nass River, Portland Canal, Skeena, and Atlin Mining Divisions, and those portions of Liard and Omineca Mining Divisions west of the 124th degree of longitude.

The Inspectors inspect the coal mines, metalliferous mines, and quarries in their respective districts.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

James Dickson	Chairman, Victoria.
James Strang	Secretary, Victoria.
H. E. Miard	Member, Fernie.

Messrs. Strang and Miard and the Inspector of Mines of the district in which an examination is being held form the Board for granting certificates of competency to coal-miners.

An Inspector of Mines is empowered to grant provisional certificates to miners for a period not exceeding sixty days between regular examinations.

INSTRUCTORS, MINE-RESCUE STATIONS.

J. D. Stewart	Nanaimo Station.
Jas. L. Brown	Cumberland Station.
Alfred Gould	Princeton Station.
John T. Puckey	Fernie Station.

J. D. Stewart, Instructor, resigned at the end of 1935 and was succeeded by Richard Nichol.

PRODUCTION.

The total tonnage produced by the coal mines of the Province for the year ended December, 1935, was 1,187,968 tons, being a decrease of 159,122 tons or 11.07 per cent. under the production of 1934.

The Coast District, which includes Vancouver Island, Nicola-Princeton District, and the Northern District produced 780,585 tons, an increase of 61,387 tons or 8.5 per cent. over 1934.

Vancouver Island collieries produced 630,213 tons, an increase of 55,705 tons or 9.6 per cent. over 1934. The Northern District produced 3,426 tons. The Nicola-Princeton District produced 147,219 tons, an increase of 5,533 tons or 3.9 per cent. over 1934. The East Kootenay District produced 407,110 tons, a decrease of 220,509 tons or 35.1 per cent. under 1934, this decrease being entirely due to Corbin Colliery closing down.

The following table shows the output and *per capita* production daily and for the year of the various mines:—

Colliery and Mine.	Gross Tons of Coal mined during Year.	Days worked.	Total No. of Employees.	Tons of Coal mined per Employee daily.	Tons of Coal mined per Employee for Year.	No. of Employees Underground.	Tons of Coal mined per Underground Employee daily.	Tons of Coal mined per Underground Employee for Year.
Western Fuel Colliery, Nanaimo	357,454	250	868	1.65	412	580	2.46	616
No. 5 mine, South Wellington	51,648	103	250	2.00	207	200	2.50	258
Comox Colliery	207,117	254	480	1.69	431	376	2.16	551
Lantzville Colliery	7,688	258	23	1.29	334	18	1.65	427
Fiddick mine	3,164	271	12	0.97	263	10	1.16	316
Ida Clara Colliery (Richardson)	1,903	318	9	0.66	211	5	1.19	380
Biggs' mine	145	27	4	1.33	36	4	1.33	36
Jingle Pot mine	56	91	4	0.15	14	2	0.30	28
Chambers' mine	1,038	223	4	1.16	259	3	1.55	346
Middlesboro Colliery	25,617	176	109	1.33	235	75	1.93	341
Coalmont Colliery	83,770	236	200	1.77	419	132	2.68	634
Tulameen Collieries, Ltd.	8,573	61	80	1.75	107	57	2.46	150
Pleasant Valley Colliery	5,704	260	24	0.89	233	12	1.82	475
Blue Flame Colliery	22,099	273	56	1.44	394	34	2.37	649
Black Diamond Colliery (Bromley Vale)	786	51	12	1.27	65	8	1.92	98
Lind Colliery	186	.....	2	.....	93	2	.....	93
Hat Creek Colliery	484	91	2	2.66	242	2	2.66	242
Bulkley Valley Colliery	3,160	140	9	2.50	351	7	3.22	451
Aveling Colliery	266	65	4	1.01	66	4	1.01	66
Coal Creek Colliery	86,879	147	154	3.83	564	120	4.92	724
Michel Colliery	310,258	211	388	3.78	799	308	4.77	1,007
Corbin Colliery	9,973	15	277	2.40	36	186	3.53	53

Collieries of Vancouver Island Inspection District.

The output of Vancouver Island collieries was 630,213 tons. Of this amount, 53,025 tons or 8.4 per cent. was lost in preparation for the market, 73,226 tons or 11.6 per cent. was consumed by producing companies as fuel, and 516,407 tons was sold in the competitive market; 12,737 tons of this was taken from stock, thus 80 per cent. of the output was sold. Of the amount sold in the competitive markets, 485,303 tons or about 94 per cent. was sold in Canada and 31,104 tons or 6 per cent. was sold in the United States.

Collieries of Nicola-Princeton Inspection District.

Of the gross output of 147,219 tons produced by the collieries of the Nicola-Princeton District, 21,832 tons or 14.8 per cent. was consumed by the producing companies as fuel, 82 tons was lost in washing, and 123,524 tons or 83.9 per cent. was sold in the competitive markets in Canada.

Collieries of the East Kootenay Inspection District.

The output of the collieries of the East Kootenay District was 407,110 tons. Of this amount, 8,651 tons or 2.1 per cent. was lost in preparation for the market, 4,527 tons or 1.1 per cent. was consumed as fuel, 37,178 tons or 9.1 per cent. was used in making coke, and 361,291 tons was sold in the competitive markets; 4,799 tons of this was taken from stock, thus 87.7 per cent. of the output was sold.

Of the amount sold in the competitive markets, 338,200 tons or 93.6 per cent. was sold in Canada and 23,091 tons or 6.4 per cent. was sold in the United States.

COLLIERIES OF BRITISH COLUMBIA—PRODUCTION, 1935.

MINE.	SOLD.			Total Sales.	Lost in Washing.	Used in making Coke.	Used under Companies' Boilers, etc.	Total for Colliery Use.	STOCKS.		DIFFERENCE.		Output for the Year 1935.
	In Canada.	In U.S.A.	Elsewhere						First of Year.	Last of Year.	Added to.	Taken from.	
Vancouver Island District.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Canadian Collieries (D.), Ltd.—													
South Wellington, No. 5 mine	38,863	900		39,763	10,707		2,908	13,615	1,730			1,730	51,648
Comox Colliery	190,561	5,891		196,452	6,255		4,118	10,373	2,354	2,646	292		207,117
Western Fuel Corp. of Canada, Ltd.—													
No. 1 mine	242,668	24,313		266,981	36,063		65,417	101,480	25,245	14,238		11,007	357,454
Lantzville Colliery	6,905			6,905			783	783					7,688
Fiddick mine	3,164			3,164									3,164
Ida Clara Colliery (Richardson)	1,903			1,903									1,903
Jingle Pot mine	56			56									56
Biggs' mine	145			145									145
Chambers' mine (Old Extension No. 1)	1,038			1,038									1,038
Totals, Vancouver Island District	485,303	31,104		516,407	53,025		73,226	126,251	29,329	16,884	292	12,737	630,213
Nicola-Princeton District.													
Middlesboro Collieries, Ltd.	21,368			21,368			4,017	4,017	143	375	232		25,617
Coalmont Collieries, Ltd.	71,609			71,609			12,161	12,161					83,770
Tulameen Collieries, Ltd.	7,288			7,288	82		1,654	1,736	487	36		451	8,573
Pleasant Valley Colliery	4,328			4,328			1,376	1,376					5,704
Blue Flame Colliery	17,635			17,635			2,544	2,544		1,920	1,920		22,099
Black Diamond Colliery (Bromley Vale)	706			706			80	80					786
Lind Coal Mine	186			186									186
Hat Creek Colliery	404			404						80	80		484
Totals, Nicola-Princeton District	123,524			123,524	82		21,832	21,914	630	2,411	2,232	451	147,219
Northern District.													
Bulkley Valley Colliery	3,160			3,160									3,160
Aveling Colliery	266			266									266
Totals, Northern District	3,426			3,426									3,426
Grand totals, Coast District	612,253	31,104		643,357	53,107		95,058	148,165	29,959	19,295	2,524	13,188	780,858
East Kootenay District.													
Crow's Nest Pass Coal Co., Ltd.—													
Coal Creek Colliery	63,042	20,615		83,657			2,960	2,960	256	518	262		86,879
Michel Colliery	266,218	1,737		267,955	7,535	37,178		44,713	2,679	269		2,410	310,258
Corbin Collieries, Ltd.	8,940	739		9,679	1,116		1,567	2,683	31,311	28,922		2,389	9,973
Totals, East Kootenay District	338,200	23,091		361,291	8,651	37,178	4,527	50,356	34,246	29,709	262	4,799	407,110
Coal.													
Grand totals for Province	950,453	54,195		1,004,648	61,758	37,178	99,585	198,521	64,205	49,004	2,786	17,987	1,187,968
Coke.													
Crow's Nest Pass Coal Co., Ltd.—													
Michel Colliery	8,812	15,563		24,375					503	294		209	24,166
Total coke for Province	8,812	15,563		24,375					503	294		209	24,166

The following table shows the *per capita* production of the various districts for the past five years. Similar figures for the years prior to 1929 are shown in previous Annual Reports.

Output and Per Capita Production in Various Districts.

Year.	District.	Gross Tons of Coal mined during Year.	Total No. of Employees at Producing Collieries.	Tons of Coal mined per Employee for Year.	No. of Men employed Underground in Producing Collieries.	Tons of Coal mined per Underground Employee for Year.
1931	East Kootenay District	661,426	1,211	546	909	727
	Coast District	1,046,164	2,871	364	2,048	510
	Whole Province	1,707,590	4,082	419	2,957	577
1932	East Kootenay District	587,875	1,001	587	752	781
	Coast District	947,100	2,607	363	1,876	504
	Whole Province	1,534,975	3,608	425	2,628	584
1933	East Kootenay District	477,677	698	684	522	915
	Coast District	787,069	2,396	328	1,719	457
	Whole Province	1,264,746	3,094	408	2,241	564
1934	East Kootenay District	627,619	754	832	551	1,139
	Coast District	719,471	2,139	336	1,499	480
	Whole Province	1,347,090	2,893	465	2,050	657
1935	East Kootenay District	407,110	819	497	614	663
	Coast District	780,858	2,152	363	1,531	510
	Whole Province	1,187,968	2,971	399	2,145	554

The following table shows the production and distribution of coal by the various collieries and districts compiled from returns furnished by the owners:—

Collieries of British Columbia—Men employed, 1935.

Mine.	White Men.																		Indians.			Japanese and Chinese.									Total Men employed.		
	Supervision and Clerical.			Miners.			Helpers.			Labourers.			Mechanics and Skilled Labour.			Boys.			Labourers.			Miners.			Helpers.			Labourers.					
	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.
Vancouver Island District.																																	
Canadian Collieries (D.), Ltd.—																																	
South Wellington, No. 5 mine	10	2	12	138	..	138	..	..	..	43	18	61	9	9	18	..	21	21	..	..	..	..	..	..	..	..	..	..	..	..	200	50	250
Comox Colliery	18	11	29	106	..	106	38	..	38	27	23	50	167	45	212	20	7	27	..	..	..	..	..	..	..	..	..	..	18	18	376	104	480
Western Fuel Corp. of Canada, Ltd.—																																	
No. 1 and Reserve mines	30	28	58	189	..	189	..	..	..	229	103	332	93	69	162	39	31	70	..	..	..	..	..	..	..	..	..	..	57	57	580	288	868
Lantzville Colliery	2	..	2	14	..	14	..	..	..	2	1	3	..	3	3	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	18	5	23
Fiddick mine	..	..	..	4	..	4	4	..	4	2	..	2	..	..	..	..	2	2	..	..	..	..	..	..	..	..	..	..	..	..	10	2	12
Ida Clara Colliery (Richardson)	..	..	..	5	..	5	..	..	..	..	2	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	5	4	9
Jingle Pot mine	..	..	..	4	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	4
Biggs' mine	..	..	..	2	..	2	..	..	..	..	2	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	4
Chambers' mine (Old Extension No. 1)	..	..	..	2	..	2	1	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	1	4
Totals, Vancouver Island District	60	41	101	464	..	464	43	..	43	303	150	453	269	126	395	59	61	120	..	..	..	..	..	..	..	..	..	..	78	78	1198	456	1654
Nicola-Princeton District.																																	
Middlesboro Colliery, Ltd.	5	1	6	40	..	40	13	..	13	17	11	28	..	12	12	..	10	10	..	..	..	..	..	..	..	..	..	..	..	..	75	34	109
Coalmont Collieries, Ltd.	9	11	20	70	..	70	..	..	..	8	22	30	38	34	72	7	..	7	..	..	..	..	..	..	..	..	..	..	1	1	132	68	200
Tulameen Collieries, Ltd.	4	1	5	17	..	17	23	..	23	..	8	8	13	14	27	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	57	23	80
Pleasant Valley Colliery	3	1	4	7	..	7	1	..	1	1	7	8	..	4	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12	12	24
Blue Flame Colliery	3	1	4	18	..	18	8	..	8	5	15	20	..	6	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	34	22	56
Black Diamond Colliery (Bromley Vale)	1	..	1	3	..	3	4	..	4	..	4	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	4	12
Lind Coal Mine	1	..	1	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	2
Hat Creek Colliery	..	..	..	1	..	1	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	2
Totals, Nicola-Princeton District	26	15	41	157	..	157	50	..	50	31	67	98	51	70	121	7	10	17	..	..	..	..	..	..	..	..	..	..	1	1	322	163	485
Northern District.																																	
Bulkley Valley Colliery	1	..	1	3	..	3	3	..	3	..	1	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	2	9
Aveling Colliery	1	..	1	2	..	2	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	4
Totals, Northern District	2	..	2	5	..	5	3	..	3	1	1	2	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11	2	13
Grand totals, Coast District	88	56	144	626	..	626	96	..	96	335	218	553	320	197	517	66	71	137	..	..	..	..	..	..	..	..	..	..	79	79	1531	621	2152
East Kootenay District.																																	
Crow's Nest Pass Coal Co., Ltd.—																																	
Coal Creek Colliery	5	2	7	75	..	75	..	..	..	5	4	9	33	27	60	2	1	3	..	..	..	..	..	..	..	..	..	..	..	..	120	34	154
Michel Colliery	14	8	22	178	..	178	4	..	4	25	16	41	87	56	143	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	308	80	388
Corbin Collieries, Ltd.	11	10	21	112	..	112	..	..	..	28	41	69	35	36	71	..	4	4	..	..	..	..	..	..	..	..	..	..	..	..	186	91	277
Totals, East Kootenay District	30	20	50	365	..	365	4	..	4	58	61	119	155	119	274	2	5	7	..	..	..	..	..	..	..	..	..	..	..	..	614	205	819
Grand totals for Province	118	76	194	991	..	991	100	..	100	393	279	672	475	316	791	68	76	144	..	..	..	..	..	..	..	..	..	..	79	79	2145	826	2971

Note.—U=Underground; A=Above ground; T=Total.

LABOUR AND EMPLOYMENT.

During 1935, 2,971 persons were employed in and about the coal mines of the Province, an increase of 2.7 per cent. compared with 1934.

Taking the average of all the mines in Vancouver Island District, about 35 per cent. of the working-days was lost through lack of trade. In the Nicola-Princeton District the different collieries worked on an average about 60 per cent. of the working-days. In the East Kootenay District the average for the year was about 59 per cent. of the working-days. This did not include the Corbin Collieries, which closed down early in the year due to the strike.

The table on page 5 shows the number of persons ordinarily employed in and about the mines, distinguishing the persons and different classes employed underground and above ground, compiled from returns furnished by the owners.

FUEL-OIL COMPETITION.

During 1935 the imports of crude oil for refining in British Columbia totalled 176,361,544 gallons, and from this 41,398,324 gallons of gasoline and 98,972,387 gallons of fuel-oil was produced and sold in British Columbia.

In addition to above, 18,389,862 gallons of fuel-oil was imported, free of duty, for ships' stores, and 15,250,493 gallons of fuel-oil was imported for general use; the import value of above oils was $6,352,140.

COMPETITION OF COAL PRODUCED OUTSIDE BRITISH COLUMBIA.

During 1935 the importation of coal from the United States into British Columbia consisted of 32 tons of anthracite, 2,556 tons of bituminous coal, and 4,649 tons of lignite.

Imports of coal from Great Britain consisted of 836 tons of anthracite and 1,848 tons of bituminous coal.

The following table shows the amount of Alberta coal brought into British Columbia during past years:—

Year.	Short Tons.	Year.	Short Tons.
1925	117,037	1931	193,060
1926	127,858	1932	136,188
1927	187,023	1933	119,026
1928	262,198	1934	123,968
1929	247,060	1935	221,758
1930	227,385		

The total tonnage of coal brought into British Columbia during 1935 was 231,679 tons.

HYDRO-ELECTRIC DEVELOPMENT.

At the end of 1935 the hydro-electric horse-power in use amounted to 728,000 horse-power. The steadily increasing development of hydro-installations in British Columbia is shown in the following table:—

Year.	Horse-power developed by Hydro-electric Plants.	Year.	Horse-power developed by Hydro-electric Plants.
1900	9,366	1926	460,562
1905	29,334	1927	473,142
1910	64,474	1928	523,902
1915	254,065	1929	559,792
1920	309,185	1930	630,792
1921	309,762	1931	655,992
1922	329,057	1932	713,792
1923	355,718	1933	717,602
1924	355,718	1934	726,000
1925	414,702	1935	728,000

For the purpose of comparison it may be stated that one developed horse-power per year is equivalent to the power value of 6 tons of coal.

ACCIDENTS IN AND AROUND COAL MINES.

During 1935, 2,971 persons were employed in and round coal mines. Five fatal accidents occurred during the year, as compared with six for 1934.

The ratio of fatal accidents per 1,000 persons employed was 1.67, as compared with 2.07 in 1934. In 1933 the ratio was 0.97; in 1932, 2.21; in 1931, 1.22; in 1930, 11.62; in 1929, 2.38; in 1928, 2.64; in 1927, 2.10; and in 1926, 1.88; the average for the ten-year period being 3.03.

The number of fatal accidents per 1,000,000 tons produced during 1935 was 4.21; during 1934 the figure was 4.45; in 1933, 2.37; in 1932, 5.21; in 1931, 2.81; in 1930, 28.64; in 1929, 5.33; in 1928, 5.54; in 1927, 4.48; and in 1926, 4.3; the average for the ten-year period being 6.92 per 1,000,000 tons of coal mined.

The following table shows the collieries at which the fatal accidents occurred during 1935 and comparative figures for 1934:—

Name of Company.	Name of Colliery.	1935.	1934.
Canadian Collieries (D.), Ltd.	Comox	3	1
Canadian Collieries (D.), Ltd.	South Wellington	....	1
Western Fuel Corporation, Ltd.	No. 1 mine	1	....
Tulameen Collieries, Ltd.	No. 2 mine	1	....
Crow's Nest Pass Coal Co., Ltd.	Coal Creek	....	1
Crow's Nest Pass Coal Co., Ltd.	Michel	....	3
Totals		5	6

The following table shows the various causes of fatal accidents and their percentage of the whole, with corresponding figures for 1934:—

Cause.	1935.		1934.	
	No.	Per Cent.	No.	Per Cent.
By falls of roof and coal	....	.....	4	66.70
By mine-cars and haulage	3	60.00	2	33.30
By carbon-monoxide poisoning	1	20.00	....	.....
Miscellaneous	1	20.00	....	.....
Totals	5	100.00	6	100.00

The following table shows the number of tons of coal mined for each fatal accident in their respective classes in the years 1935 and 1934:—

Cause.	1935.		1934.	
	No. of Fatal Accidents.	No. of Tons of Coal mined per Fatal Accident.	No. of Fatal Accidents.	No. of Tons of Coal mined per Fatal Accident..
By falls of roof and coal	....	.....	4	336,772
By mine-cars and haulage	3	399,322	2	673,545
By carbon-monoxide poisoning	1	1,187,968	....	.....
Miscellaneous	1	1,187,968	....	.....
Totals	5	237,593	6	224,545

The number of tons mined per fatal accident during 1935 was 237,593 tons, compared with 224,545 tons for 1934. The average for the ten-year period was 144,463 tons.

The following table shows the fatalities from various causes in coal mines during the year 1935, compared with 1934, according to Inspection Districts:—

District.	Number of Deaths from Accidents.				Total.	
	Falls of Roof and Coal.	Mine-cars and Haulage.	Carbon-monoxide Poisoning.	Miscellaneous.	1935.	1934.
Vancouver Island	....	2	1	1	4	2
Nicola-Princeton	....	1	....	....	1	....
East Kootenay	....	....	....	....	....	4
Northern	....	....	....	....	....	....
Province (1935)	....	3	1	1	5	....
Province (1934)	....	....	....	....	....	6

District.	Accident Death-rate.			
	Per 1,000 Persons employed.		Per 1,000,000 Tons of Coal mined.	
	1935.	1934.	1935.	1934.
Vancouver Island	2.42	1.73	6.31	3.48
Nicola-Princeton	2.06	.....	6.79	.....
East Kootenay	.....	7.27	.....	6.37
Northern	.....	.....	.....	.....
Province (1935)	1.67	.....	4.21	.....
Province (1934)	.....	2.07	.....	4.45

The following table shows the ratio of accidents per 1,000 employees and per 1,000,000 tons of coal mined in the Coast and East Kootenay Inspection Districts for the ten-year period ended December 31st, 1935:—

District.	No. of Fatalities.	Accident Death-rate.	
		Per 1,000 Employees.	Per 1,000,000 Tons of Coal mined.
Coast	99	3.25	8.68
East Kootenay	29	2.46	4.08
Totals for Province	128	3.03	6.92

The details regarding the occurrences of the fatal accidents in coal mines during 1935 are as follows:—

The fatal accident to Thomas Robertson, rope-rider, No. 5 mine, Comox Colliery, on January 25th was due to being crushed by a stringer 16 feet long and approximately 15 inches in diameter which deceased and another man were loading on a trip of empty mine-cars; one end of the stringer was placed on the mine-cars and Robertson was holding the other end when his foot slipped on a rail and he fell; the timber rolled on him and crushed his head, killing him instantly.

The fatal accident to Yukutoro Kawaguchi, Japanese miner, No. 4 mine, Comox Colliery, on January 25th was due to deceased being crushed between a loaded car and a post; deceased was taking the loaded car from his working-place to the parting and was caught against a post that had been recently placed to reinforce the original timber.

The fatal accident to James Walker, mechanic, No. 4 mine, Comox Colliery, on January 28th was due to deceased being struck by a runaway trip of five loaded cars; while the trip of cars was being hoisted the rope slipped on the drum and gave some slack rope. The first

three cars of the trip were over the knuckle on to the level landing and the two last cars were still on the slope at this moment, and when the rope slackened the rope-rider accidentally pulled the clevis-pin and the trip ran back down the slope, where it caused injuries to Walker from which he died February 9th.

The fatal accident to William Strang, overman, No. 2 mine, Tulameen Coal Mines, Limited, in February was due to deceased being crushed between a loaded trip, on which he was riding, and the timbers in the Main slope of the mine; he died shortly after being taken from the mine.

The fatal accident to Lewis Houston, miner, No. 1 mine, Western Fuel Corporation of Canada, Limited, Nanaimo, on December 22nd was due to carbon-monoxide poisoning. Deceased and three other miners started work at 11 p.m. on the 21st on the Diagonal slope, where the few remaining pillars in this area were being extracted.

About 3 a.m. on the morning of the 22nd Houston complained to the other men of being ill and stopped work for a little time, then had lunch with the other men and later resumed work, but again felt ill; he sat down until the other men finished work about 6 a.m. and started to go home with them, but experienced difficulty in walking.

The others assisted him to a point about 1,200 feet from the working-place, at which point he collapsed and lost consciousness. Artificial respiration was immediately applied, but Houston did not respond to this treatment and he was hurried to the surface, where medical treatment failed to revive him and he was pronounced dead at 7 a.m.

The area where Houston worked is adjacent to an extensive exhausted and abandoned area in which many fires have occurred in past years, but there were no known fires in the immediate vicinity and it was impossible to determine whether the carbon monoxide came from some of these older fire areas or from a new and more recent heating. The other men who worked with Houston said they did not connect Houston's illness with the possibility of carbon monoxide in the air, as they felt no ill effects until the end of the shift, when one of them stated that he noticed that his legs appeared to feel somewhat weak.

Air samples were taken in the place about one hour after Houston died, and later in the day tests were made by means of the carbon-monoxide detector and by canaries; both of these tests gave negative results, but the air samples taken earlier showed small percentages of carbon monoxide. The barometric pressure was low on the night of the 21st and began rising on the morning of the 22nd, with the probability that this change of pressure first caused a flow of gases from the gob and then reversed the process.

This whole area was sealed off immediately the presence of carbon monoxide was reported.

EXPLOSIVES.

The following table shows the quantity of explosives used in coal mines during 1935, together with the number of shots fired, tons of coal produced per pound of explosive used, and the average pounds of explosive per shot fired (these quantities include all explosives used for breaking coal and for rock-work in coal mines):—

VANCOUVER ISLAND DISTRICT.

Colliery.	Quantity of Explosive used in Pounds.	Tonnage for Mine.	Total No. of Shots fired.	Tons of Coal per Pound of Explosive used.	Average Pounds of Explosive per Shot fired.
Western Fuel Colliery, Nanaimo	122,913	357,454	189,039	2.91	0.65
No. 5 mine, South Wellington	11,400	51,648	14,250	4.53	0.80
Comox Colliery	57,507	207,117	88,871	3.42	0.64
Lantzville Colliery	5,600	7,688	7,250	1.37	0.77
Fiddick mine	3,500	3,164	6,450	0.90	0.54
Ida Clara Colliery (Richardson)	850	1,903	1,450	2.23	0.58
Biggs' mine	100	145	150	1.45	0.66
Jingle Pot mine	80	56	200	0.70	0.40
Chambers' mine	700	1,038	1,100	1.48	0.63
Totals for district	202,650	630,213	308,760	3.12	0.65

Nicola-Princeton District.

Colliery.	Quantity of Explosive used in Pounds.	Tonnage for Mine.	Total No. of Shots fired.	Tons of Coal per Pound of Explosive used.	Average Pounds of Explosive per Shot fired.
Middlesboro Collieries	5,220	25,617	9,310	4.90	0.56
Coalmont Collieries	19,155	83,770	32,500	4.37	0.59
Tulameen Coal Mines, Ltd.	2,350	8,573	3,360	3.64	0.70
Pleasant Valley Colliery	1,560	5,704	3,857	3.65	0.40
Blue Flame Colliery	7,100	22,099	12,728	3.11	0.56
Black Diamond Colliery	100	786	200	7.86	0.50
Lind Colliery	150	183	300	1.24	0.50
Hat Creek Colliery	100	484	160	4.84	0.62
Totals for district	35,735	147,219	62,415	4.12	0.57

Northern District.

Bulkley Valley Colliery	1,800	3,160	3,000	1.76	0.60
Aveling Colliery	125	266	260	2.12	0.48
Totals for district	1,925	3,426	3,260	1.77	0.59

East Kootenay District.

Coal Creek Colliery	61	86,879	97	1,424.24	0.62
Michel Colliery	37,445	310,258	58,112	8.28	0.64
Corbin Colliery	1,827	9,973	2,092	5.45	0.87
Totals for district	39,336	407,110	60,201	10.34	0.65
Totals for Province	279,643	1,187,968	434,636	4.24	0.64

Quantities of Different Explosives used.

	Lb.
Monobel of different grades	208,942
Permissible rock-powder	70,704
Total	279,646

The following is a list of explosives permitted for use in coal mines by the Honourable the Minister of Mines under the provisions of section 101, General Rule 11, clause (2), "Coal-mines Regulation Act":—

Polar Monobel No. 4.
Polar Monobel No. 6.
Polar Monobel No. 12.
Polar Monobel No. 14.
Polar CXL-ite No. 2.

MACHINE-MINED COAL.

During the year 1935 mining-machines produced approximately 723,529 tons of coal, or 60.9 per cent. of the total.

The following table gives the district, number of machines, how driven, and type of machine used:—

District.	Number driven by		Type of Machine used.							
	Electricity.	Compressed Air.	Mavor and Coulson.	Anderson Boyes.	Hardy.	Siskol.	Sullivan.	Pickwick.	Pneumatic Pick.	Ingersoll-Rand.
Vancouver Island	1	74	6	8	4	17	3	1	36	....
Nicola-Princeton	....	24	....	....	2	11	....	....	....	11
East Kootenay	....	57	1	2	27	....	....	....	27	....
Totals	1	155	7	10	33	28	3	1	63	11

SAFETY-LAMPS.

There were 2,647 safety-lamps in use in the coal mines of the Province. Of this number, 217 were flame safety-lamps of the Wolf type and 2,430 were electric lamps of various makes, as follows: Edison, 2,363; Wolf electric, 67.

The following table shows the distribution of lamps by district, method of locking, and illuminant used:—

VANCOUVER ISLAND DISTRICT.

Colliery and Mine.	Method of Locking.		Illuminant used.	
	Magnetic Lock.	Screw or Automatic Clip.	Naphtha Gasoline.	Electricity.
Western Fuel Colliery, Nanaimo	56	696	56	696
South Wellington, No. 5 mine	12	204	12	204
Comox Colliery	28	355	28	355
Lantzville Colliery	2	21	2	21
Fiddick mine	6	10	6	10
Ida Clara Colliery	2	18	2	18
Biggs' mine	1	3	1	3
Jingle Pot mine	.....	2	2	.....
Chambers' mine	1	6	1	6
Totals for district	108	1,315	110	1,313

NICOLA-PRINCETON DISTRICT.

Middlesboro Colliery	9	75	9	75
Coalmont Colliery	89	80	10	159
Tulameen Colliery	4	124	4	124
Pleasant Valley Colliery	4	25	4	25
Blue Flame Colliery	2	67	2	67
Black Diamond Colliery	1	7	1	7
Lind Colliery	1	2	1	2
Hat Creek Colliery	1	8	1	8
Totals for district	111	388	32	477

NORTHERN DISTRICT.

Bulkley Valley Colliery	2	18	2	18
Aveling Colliery	4	.....	4	.....
Totals for district	6	18	6	18

EAST KOOTENAY DISTRICT.

Coal Creek Colliery	7	120	7	120
Michel Colliery	360	20	40	340
Corbin Colliery	22	172	22	172
Totals for district	389	312	69	632
Totals for Province	614	2,033	217	2,430

APPROVED SAFETY-LAMPS, ELECTRIC AND FLAME.

A list of the approved safety-lamps, both electric and flame, was published in the 1930 Annual Report. The following lamps, all electric, are now also approved:—

No. 8.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 18 of the United States Bureau of Mines. The only

bulb approved for use in this lamp carries the symbol BM-18 and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

No. 9.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 18F of the United States Bureau of Mines. This model of Edison lamp in reality represents an extension of the lamp approval given under Approval No. 18. The only bulb approved for use with this lamp carries the symbol BM-18F and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

No. 10.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 18H of the United States Bureau of Mines. This lamp represents an extension of the No. 18 approval of the United States Bureau of Mines. The only bulb approved for use with this lamp carries the symbol BM-18H and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

No. 11.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 24 of the United States Bureau of Mines. The only bulb approved for use with this lamp carries the symbol BM-24 and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio. This lamp is known as the Edison Model J lamp.

No. 12.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 25 of the United States Bureau of Mines. The only bulb approved for use with this lamp carries the symbol BM-25 and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio. This lamp is known as the Edison Model K lamp.

(Unless otherwise specified, all lamps are cap-lamps.)

NOTE.—*While the use of flame safety-lamps is permitted, it is the policy of the Department of Mines to encourage the use of approved electric safety-lamps for all persons underground in the coal mines, except such flame-lamps as may be required by the officials of the mines in the carrying-out of their duty and in such cases as it is considered advisable to provide flame safety-lamps in addition to the electric safety-lamps.*

ELECTRICITY.

Electricity is used for various purposes on the surface at nine mines and underground at four mines. The purpose for which it was used, together with the amount of horse-power in each instance, is shown in the following table:—

Above ground— Nature of its Use.	Aggregate H.P.
Winding or hoisting	797
Ventilation	680
Haulage	493
Coal-washing	1,502
Miscellaneous	1,917
Total horse-power	5,389
Underground—	
Haulage	1,765
Pumping	1,075
Coal-cutting	30
Miscellaneous	915
Total horse-power	3,785
Total horse-power above and under ground	9,174

Of the above amount, approximately 1,709 horse-power was operated as direct current and 7,465 horse-power as alternating current.

VENTILATION.

The District Inspectors' reports give details regarding the ventilation in the splits and main returns of the various mines. In some instances requests had to be made during the year for increased quantities on the splits and in some cases for further splitting to reduce the total amount of gas in the air in certain splits and also to obviate the necessity for high air velocities.

In No. 5 mine, Comox Colliery, it has been found that two operating machine walls is the practical maximum for one air split. On the whole, the ventilation of the mines was well maintained during the year.

Use of the Burrell Gas Indicator.

The Burrell Gas Indicator was used throughout the mines of the Province, immediately determining the methane content where the percentage was too small to be detected by means of the flame safety-lamp.

Mine-air Samples.

Mine-air sampling was carried out as usual during the year and 232 samples were collected in the various coal mines of the Province; of this number, sixteen were spoiled in transit and accidents in the laboratory. While samples were taken in all the mines at intervals, this method is carried out most intensively in the mines of the Crowsnest Pass District and No. 5 mine, Comox Colliery, where the gas-inflow is much higher than in other mining districts of the Province. In Vancouver Island and also the Crowsnest Pass Districts a large number of samples were taken in old workings and near the seat of fires. Analyses of mine-air samples taken throughout the coal mines of the Province during 1935 are on file in the office of the Chief Inspector of Mines and copies will be furnished to any one interested.

INSPECTION COMMITTEES.

At practically all the mines throughout the Province inspection committees appointed by the workmen under General Rule 37, section 101, "Coal-mines Regulation Act," were in operation throughout the year; one exception was No. 5 mine, Comox Colliery, where the men allowed this inspection to lapse for two months. As required by above rule, the Chief Inspector of Mines appointed an inspection committee to function until such time as the men employed in the mine appointed a committee of their own choosing; this was done shortly after the above appointment.

COAL-DUST.

Sampling of dust was well maintained during the year and a total of 950 samples were analysed at the different mines, and where the analyses showed that the incombustible content of the dust sampled in any mine was only 50 per cent. immediate steps were taken to see that the mine or part of the mine was re-rock dusted.

DANGEROUS OCCURRENCES.

During the year the following dangerous occurrences, in addition to those causing injuries, were reported:—

On February 1st spontaneous heating was discovered in No. 11 West section, No. 4 mine, Coalmont Collieries; this was in an area that had already been sealed off for some time and the roof over one of the concrete seals had caved sufficiently to permit access of air to the sealed-off area; the seal was repaired and no further trouble was experienced.

On March 1st spontaneous combustion occurred in the Blue Flame mine; this was in loose coal alongside a fault-line; the heated material was loaded out.

On March 3rd a severe "bump" occurred in No. 1 East mine, Coal Creek Colliery, and wrecked 250 feet of the main haulage-tunnel and the adjacent workings in No. 16 East slope; there were no men in the mine at this time.

On March 20th, in No. 1 mine, Western Fuel Corporation of Canada, Limited, Nanaimo, a section of the shaft-lining about 70 feet from the surface collapsed and fell to the bottom of the shaft; no person was injured.

On April 9th spontaneous combustion was discovered in No. 2 West district, Reserve mine; the affected area was immediately sealed off.

On April 5th, at No. 4 mine, Corbin Colliery, an underground fire burned out through the 300-foot level and destroyed the mine-fan and fan-house; this occurred during a suspension of work due to a strike; there were no men in the mine at this time.

On April 9th, at No. 1 shaft, Western Fuel Corporation of Canada, Limited, one of the descending cages struck the shaft-bottom at high speed and was damaged; this was due to an error on the part of the hoistman; no person was injured.

On May 26th, at 6 p.m., a severe "bump" occurred in No. 1 East mine, Coal Creek Colliery, and damaged 400 feet in one of the roadways in No. 19 East slope; one fireboss was in the mine at the time and he was uninjured.

On May 27th, at 10.45 p.m., a severe "bump" occurred in No. 1 East mine, Coal Creek Colliery, and did considerable damage in the workings off No. 19 East slope; this was apparently a continuation of the "bump" of the previous day reported above.

On August 6th spontaneous heating was discovered in the heading section, Blue Flame mine; this occurred in the vicinity of a faulted area and was sealed off; no further trouble resulted.

On August 28th spontaneous combustion was discovered in Jackson's Panel area, No. 1 mine, Western Fuel Corporation of Canada, Limited; this area had already been suspected as likely to develop heating and the seals were ready for closing when required.

On September 12th, in No. 1 shaft, Western Fuel Corporation of Canada, Limited, an overwind occurred and the automatic overwind device functioned perfectly; there were no persons on the cage and there was very little damage.

On November 5th, at No. 1 shaft, Western Fuel Corporation of Canada, Limited, the main drive-shaft of the hoist broke while hoisting; no damage resulted other than suspension of operations for some days.

On December 5th spontaneous combustion was discovered in No. 6 incline, Pleasant Valley mine; this area was at once sealed off.

On December 7th spontaneous combustion was discovered in No. 7 heading, Pleasant Valley mine; this was a blind heading of some 75 feet in length; the heated material was safely loaded out.

On December 22nd spontaneous combustion developed in the Diagonal slope area, No. 1 mine, Western Fuel Corporation of Canada, Limited, and produced sufficient carbon monoxide to cause death to one miner; this area was sealed off.

PROSECUTIONS.

During 1935 there were three prosecutions made for infractions of the "Coal-mines Regulation Act," as follows:—

Date.	Colliery.	Occupation of Defendant.	Offence charged.	Judgment.
June 11	Canadian Collieries (D.), Ltd.	Fireboss	Failed to observe General Rule 12, subsection 1 (*a*), *re* loading more than one shot at a time	Fined $10 and costs.
June 11	Canadian Collieries (D.), Ltd.	Fireboss	Failed to observe General Rule 12, subsection 1 (*b*), *re* firing shot while face is in dusty condition	Fined $5 and costs.
Sept. 10	Crow's Nest Pass Coal Co., Ltd., No. 1 mine, Michel	Miner	Failed to observe General Rule 9 *re* having matches in his possession	Fined $5 and costs.

GOVERNMENT RESCUE-STATIONS.

The Department of Mines has four mine-rescue stations in different parts of the Province and centrally located in the mining districts—namely, at Nanaimo, Cumberland, Princeton,

and Fernie. During the year many requests were received from medical men for oxygen and the inhalators for use in emergencies, and immediate service was rendered in every case. In the larger coal-mining districts of Crowsnest, Cumberland, and Nanaimo experienced teams maintain a regular schedule of training throughout the year and so keep ready for any emergency calls.

The preliminary training course consists of twelve two-hour lessons in the actual use of oxygen apparatus and Burrell all-service gas-masks in an irrespirable atmosphere and instruction on the approved method of dealing with mine fires and recovery-work. The training itself is strenuous work, and all candidates have to undergo a special physical examination before starting training and must be under 34 years of age.

During the year, in addition to the regular teams in training, six new men took the full training and were granted certificates of competency:—

Cert. No.	Name.	Where trained.	Cert. No.	Name.	Where trained.
853	Earl J. Colthrope	Kimberley.	856	Paul M. Riedel	Kimberley.
854	Robert J. Davidson	Kimberley.	857	Harold C. Shaw	Kimberley.
855	James E. Mills	Kimberley.	858	Tilmer M. Waterland	Prince Rupert.

SUPERVISION OF COAL MINES.

During the year twenty coal companies operated twenty-two collieries, with thirty mines, employing 2,145 men underground. In the supervision of underground employees there were nine managers, one safety engineer, fifteen overmen, seventy-nine firebosses and shotlighters, a total of 114, or one official for every nineteen persons employed underground.

"COAL SALES ACT."

During the year a considerable number of inspections were made under the "Coal Sales Act" to see that the sale of coal was in accordance with the provisions of the Act; the number of complaints received during the year was less than in previous years. All complaints were investigated and were found to rise from small sales by coal-peddlers who go into this business incidentally during the winter and have no established business.

It is difficult in most cases to contact the vendor in such cases and the general public would ensure getting the particular coal they order if they did business only with reputable coal-dealers.

There were no prosecutions during the year.

List of Registered Names of British Columbia Coals, approved by the Chief Inspector of Mines, in accordance with the Provisions of the "Coal Sales Act."

Registered Names of Coal.	Colliery and District.	Producing Company.
Comox	Nos. 4 and 5 mines, Comox Colliery (Cumberland)	Canadian Collieries (D.), Ltd.
Old Wellington	No. 9 mine (Wellington)	Canadian Collieries (D.), Ltd.
Ladysmith-Wellington	No. 5 mine (South Wellington)	Canadian Collieries (D.), Ltd.
Ladysmith-Extension	No. 8 mine (Extension)	Canadian Collieries (D.), Ltd.
Hi-Carbon	Mixture of Canadian Collieries' coal and B.C. Electric coke	Canadian Collieries (D.), Ltd.
Nanaimo-Douglas	No. 1 mine, Upper seam (Nanaimo)	Western Fuel Corporation of Canada, Ltd.
Nanaimo	No. 1 mine, Lower seam (Nanaimo)	Ditto.
Nanaimo Reserve	Reserve mine (Nanaimo)	,,
Nanaimo-Wellington	Blend of No. 1 mine, Nanaimo, and No. 5 mine, South Wellington	,,
Mabury-Northfield	(Recovered from surface dump) (Wellington)	Mabury Engineering Corporation, Ltd.
Wellington South, Ida Clara	Ida Clara No. 1 (South Wellington)	Richardson Bros., Ltd.
Cassidy-Wellington	Cassidy Colliery (Cassidy)	Granby Consolidated M.S. & P. Co., Ltd.
Lantzville-Wellington	Lantzville (Lantzville)	Lantzville Collieries, Ltd.
Biggs-Wellington	Biggs' mine (Wellington)	Biggs' mine.
Fiddick-Douglas	Fiddick mine (South Wellington)	Fiddick mine.
Little Ash-Wellington	Little Ash mine (Wellington)	Little Ash mine.
Jingle Pot	Jingle Pot (East Wellington)	Jingle Pot Colliery, Ltd.
Old Adit, Wellington	Old Adit (Wellington)	Old Adit Colliery (C. Stronach).
Chambers-Extension	Chambers (Extension)	R. H. Chambers.
Bromley Vale, Princeton	Bromley Vale (Princeton)	Bromley Vale Colliery, Ltd.
Middlesboro	Middlesboro (Merritt)	Middlesboro Collieries, Ltd.
Nicola Sunshine	Sunshine (Merritt)	Sunshine Coal Co., Ltd.
Coalmont	Coalmont (Coalmont)	Coalmont Collieries, Ltd.
Princeton Blue Flame	Blue Flame (Princeton)	W. R. Wilson Mining & Investment Co.
Tulameen Coal, Princeton	Tulameen (Princeton)	Tulameen Coal Mines, Ltd.
Diamond, Princeton District, B.C.	Diamond (Princeton)	Pleasant Valley Mining Co., Ltd.
Sunrise, Princeton District, B.C.	Sunrise (Princeton)	Pleasant Valley Mining Co., Ltd.
Pleasant Valley, Princeton District, B.C.	Diamond and Sunrise blended (Princeton)	Pleasant Valley Mining Co., Ltd.
North Thompson Gem	North Thompson (North Thompson)	North Thompson Colliery, Ltd.
Red Triangle, Princeton Quality	Red Triangle (Princeton)	Red Triangle Coal Co., Ltd.
Princeton-King	King (Princeton)	King Colliery, Ltd.
Hat Creek	Hat Creek (Lillooet)	Canada Coal & Development Co., Ltd.
Princeton-Black Diamond	Black Diamond (Princeton)	Black Diamond Collieries, Ltd.
Bulkley Valley	Bulkley Valley (Telkwa)	Bulkley Valley Colliery, Ltd.
Aveling	Aveling (Telkwa)	Aveling Colliery.
Crow's Nest, Coal Creek	Coal Creek (Coal Creek)	Crow's Nest Pass Coal Co., Ltd.
Crow's Nest, Michel	Michel (Michel)	Crow's Nest Pass Coal Co., Ltd.
Corbin Washed	Corbin (Corbin)	Corbin Collieries, Ltd.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

FIRST-, SECOND-, AND THIRD-CLASS CERTIFICATES AND MINE-SURVEYORS' CERTIFICATES.

BY

JAMES STRANG.

The Board of Examiners, which was formed on July 10th, 1919, now consists of James Dickson, Chief Inspector of Mines, Chairman; Henry E. Miard, member; and James Strang, member and Secretary to the Board. The meetings of the Board are held in the office of the Mines Department, Victoria. Examinations are held in accordance with the amended rules made by the Provincial Board of Examiners and approved by the Minister of Mines on September 28th, 1929. Two examinations were held in 1935. The first was held on May 15th, 16th, and 17th, and the second on November 20th, 21st, and 22nd. The total number of candidates at the examinations were as follows: For First-class Certificates, 1 (1 failed); for Second-class Certificates, 1 (1 passed); for Third-class Certificates, 11 (3 passed and 8 failed); for Mine-surveyor's certificate, none.

The following is a list of the candidates who successfully passed in the various classes:—

Second-class Certificate.—William H. Adams.

Third-class Certificates.—Thomas O. Heyes, Andrew Dunn, and Abel E. Hampton.

EXAMINATIONS FOR CERTIFICATES OF COMPETENCY AS COAL-MINERS.

In addition to the examination and certificates already specified as coming under the Board of Examiners, the Act further provides that every coal-miner shall be the holder of a certificate of competency as such. By " miner " is meant any person employed underground in any coal mine to cut, shear, break, or loosen coal from the solid, whether by hand or machinery.

The work of the Board of Examiners in examining candidates has been carried out in all the mining districts and at intervals of not less than sixty days as required by the amendment to the Act.

No certificate has been granted in any case where the candidate failed to satisfy the Board as to his general fitness, experience in a coal mine, and a working knowledge of the English language. During 1935 examinations have been held in the various coal-mining districts of the Province. Fifty-eight candidates presented themselves for examination, fifty passed and eight failed to qualify. The failures may be classified as follows: Insufficient knowledge of English, 1; special rules, 1; mine gases, 1; general mining practice, 5. In addition to the certificates granted above, a number of duplicates were issued to coal-miners who had lost their original certificates.

The Board of Examiners desires to thank the different coal-mining companies for the use of their premises for holding these examinations.

The Inspector of Mines in each district has the authority, under the amendment (1919) to the " Coal-mines Regulation Act," to grant, after a satisfactory examination, a provisional certificate of competency as a coal-miner to applicants, which entitles the holder to follow the occupation of a coal-miner for a period not exceeding sixty days or until the date of the next regular examination before the Board.

GOVERNMENT MINE-RESCUE STATIONS.

NANAIMO.

BY

JOHN D. STEWART.

(Resigned at the end of the year and was succeeded by RICHARD NICHOL.)

The equipment maintained at this station consists of six sets of the McCaa two-hour oxygen apparatus; six sets of the Gibbs two-hour oxygen apparatus; twelve sets of the Burrell all-service gas-masks; one H.H. inhalator and seventy self-rescuers, together with adequate supplies to keep the above equipment in service.

During the year three trained teams from the Western Fuel Corporation of Canada, Limited, carried on regular practice-training at this station. There were no emergency calls for the rescue apparatus, but the oxygen inhalator was called for several times and there were fifteen emergency calls for oxygen from the Nanaimo and Ladysmith Hospitals and from medical practitioners; these calls were responded to at once.

CUMBERLAND.

BY

JAMES L. BROWN.

The equipment at this station consists of eleven sets of the McCaa two-hour oxygen apparatus; twelve sets of the Burrell all-service gas-masks; twenty self-rescuers and one H.H. inhalator, together with adequate supplies to maintain the above equipment in service.

There were no emergency calls during the year, but twenty-four trained men maintained regular practice-training throughout the year and three teams from this district took part in the annual competition held at Nanaimo in June.

PRINCETON.

BY

ALFRED GOULD.

The equipment maintained at this station consists of eleven sets of the McCaa two-hour oxygen apparatus; twelve sets of the Burrell all-service gas-masks; seventeen self-rescuers and one H.H. inhalator; also a sufficient stock of supplies.

With the revival of mining in the winter seven formerly trained men from the Blue Flame mine started practice-training and three new men started the full training.

There were two emergency calls during the year—one from Coalmont Collieries, Limited, where six McCaa machines were sent for work in dealing with an underground fire in No. 4 mine, and one call from Pleasant Valley Colliery for the Burrell all-service gas-masks for use in sealing off a heated area. In both instances the equipment was dispatched promptly and the work done successfully.

FERNIE.

BY

JOHN T. PUCKEY.

The equipment at this station consists of eleven sets of the McCaa two-hour oxygen apparatus; twelve sets of the Burrell all-service gas-masks; thirty-eight self-rescuers; and adequate supplies are maintained to keep the above in service. All equipment is kept ready for any emergency.

During 1935 trained teams from Coal Creek and Fernie took practice-training at the station and a new team of rescue-men from Kimberley completed their training here; members of the local Fire Brigade also underwent some practice-training in the smoke-chamber.

There were no emergency calls during the year.

INSPECTION OF COAL MINES.

VANCOUVER ISLAND INSPECTION DISTRICT.

BY

GEO. O'BRIEN.

Western Fuel Corporation of Canada, Ltd. J. A. Boyd, President, Montreal, Que.; Lieut.-Col. C. W. Villiers, Vice-President, Nanaimo, B.C.; P. S. Fagan, Secretary-Treasurer, Nanaimo, B.C.; John Hunt, General Superintendent, Nanaimo, B.C. This company operated the Nanaimo Colliery and the Reserve mine during the year.

Nanaimo Colliery.—Arthur Newbury, Mine Manager; T. J. Wood, Overman, North Side; John Sutherland, Overman, South Side.

No. 1 mine was in operation 250 days during the year and the average daily output was 1,257 tons. This average is higher than the average for 1934. The output is from the North and South sides of the mine in the proportion of about 40 per cent. and 60 per cent. respectively.

The average number of men of all classes employed underground daily is 525 for the twenty-four-hour period. On the surface there are approximately 265 men employed daily, including pit-head, power plants, washery plant, wharves, machine-shops, colliery railway, office staff, and engineering staff. There are twenty-six certificated officials employed daily in the supervision of mining operations, or one mine official for every twenty workmen and for every 50 tons of coal produced.

The sizes of coal prepared for the market are lump, nut, pea, and slack, and at times there is a demand by customers for various combinations of these sizes which is readily prepared for them.

Descriptions of the power plant, equipment, and workings are given in the Annual Reports for 1930, 1931, and 1934.

Every effort appears to be made to keep the accident-rate down to the minimum, but one fatal accident occurred due to carbon-monoxide poisoning as a result of inhaling fumes from a spontaneous-combustion area. There were also seven non-fatal accidents during the year, two of which were caused by mine-cars and haulage, one by a fall of coal, two by falls of rock, and two on the surface from miscellaneous causes. Investigation of these accidents proved that a number of them could have been avoided if ordinary care had been taken.

The ventilation of the mine was kept up to a fairly high standard during the year and very little inflammable gas or gas-caps were found in the live workings.

Precautions against the menace of coal-dust were efficiently carried out during the year, especially at the discharge end of conveyors, where considerable dust is made by the coal being discharged into the mine-cars from the conveyors. Haulage-roads and face-lines were well taken care of and 38,500 lb. of rock-dust was used in the reduction of the coal-dust menace. Regular sampling of the mine-dust was carried out during the year and analyses of the samples showed the dust to be well within the Regulations for Precautions against Mine-dust.

Regular sampling of the mine-air was also carried out during the year, samples being taken in every split and return airways. Through the courtesy of the Department of Mines at Ottawa the samples were analysed and returns of all analyses were sent to this office regularly. As a result a fairly complete check of the chemical and technical condition of the mine-air generally is on record. Only in one instance did the analysis of the mine-air in one small section of the mine prove to be dangerous, resulting in the fatal accident aforementioned.

Regular inspections were made by the miners' " gas committee " as provided for in General Rule 37. This committee very kindly furnished copies of the several inspections made during the year.

Report-books as required by the " Coal-mines Regulation Act " are kept at the mine, and were regularly examined and found to conform to the regulations.

In the South side of the mine 2,500 feet of workings were driven in rock for the purpose of improving haulage and ventilation. In the North side of the mine a vertical shaft was sunk from the Newcastle seam to the Douglas seam, a distance of 70 feet, for ventilation purposes.

Reserve Mine, Nanaimo.—W. H. Moore, Mine Manager; A. W. Courtney, Overman. This mine is situated in the Cranberry district, about 5 miles south of the City of Nanaimo. The

coal-seam is reached by two shafts at a depth of approximately 1,000 feet and the Douglas seam is the only seam in operation. The mine was idle the first three months of the year, reopened in April, and worked until the end of July; then closed for three months, reopened in the month of November, and worked fairly steadily for the rest of the year. Considerable prospecting was done during the time the mine was closed and several hundred feet of rock-workings were driven for this purpose.

The mine was in actual operation, producing coal 103 days during the year, and the average daily output was 420 tons. The average number of men employed underground daily is 145 for the twenty-four-hour period and approximately thirty-five men are employed daily on the surface. There are ten certificated mine officials employed daily in the supervision of mining operations, or one official for every fifteen workmen and for every 42 tons of coal produced. No coal-mining machines are used in this mine as the output is chiefly extraction of pillars, though there is some solid work now being opened up in what is known as No. 2 slant in No. 2 West district. The output is all shipped over the company's railway to Nanaimo.

There were no fatal accidents at this mine during the period of operation and only one serious non-fatal accident occurred during the year, which was caused by a fall of rock.

The ventilation of the mine was kept up to a fairly high standard, but there is one section of the mine known as No. 5 West which gives considerable trouble, due to outflow of methane gas from an abandoned section of old workings where the pillars have been drawn and the area more or less caved and inaccessible. This area is on the rise side of the present live workings and the outflow of methane is very noticeable during barometric variations.

Most of the mine-workings and haulage-roads are naturally damp and are fairly free from coal-dust. Regular sampling of the mine-dust was carried out and the analyses showed the dust to be well within the Regulations for Precautions against Dangerous Mine-dust.

Regular sampling of the mine-air was also carried out, samples being taken in all splits and return airways.

Report-books as required by the "Coal-mines Regulation Act" are kept at the mine, and were regularly examined and found to conform to the regulations.

Canadian Collieries (Dunsmuir), Ltd. Head Office, Montreal, Que. J. A. Boyd, President, Montreal, Que.; Lieut.-Col. C. W. Villiers, General Manager, Nanaimo, B.C.; P. S. Fagan, Assistant Secretary, Nanaimo, B.C.; John Hunt, General Superintendent, Nanaimo, B.C. The mines operated by this company during the year were No. 4 mine and No. 5 mine, Comox Colliery, Cumberland, and No. 5 mine and the Alexandra mine, South Wellington Colliery, South Wellington.

The Comox Colliery is situated in the Comox district, about 12 miles from the shipping-point at Union Bay, which is reached by the company's railway and most of the output is shipped from this point.

No. 4 Mine, Comox Colliery.—J. S. Williams, Mine Manager. This mine was closed down permanently at the end of January, 1935. Just prior to the closing-down of the mine a large inflow of water entered the mine due to the great storm of January 21st and successive days. There was only a few months' work to be done in the mine, however, before the permanent closing of the mine and the cost of dewatering and repairing did not justify the outlay.

There was one serious accident reported from this mine during the period of operation which resulted fatally; the injured man died sixteen days after being injured. The accident was caused by mine-cars and haulage.

No. 5 Mine, Comox Colliery.—Robert Laird, Mine Manager; J. S. Williams, Overman, West Side; Samuel Jones, Overman, East Side. The coal-seam is reached by a shaft 280 feet in depth and the seam now being worked is known as the No. 2 seam. All the workings in this mine are to the dip of the shaft and are reached by four slopes driven from the level of the Upper or No. 1 seam. The face of the Main slope at the time of writing is about 1¼ miles from the shaft-bottom.

Most of the operations in this mine is the long-wall system, though there are two sections of development-work carried on in the solid for development purposes only. The long-wall faces average about 300 feet in length and are all equipped with conveyors of the Meco type driven by compressed air. The coal is machine-mined by compressed-air-driven mining-machines of the Anderson-Boyes type, the depth of undercut averaging about 6 feet. The machine-cutting is done in the rock-bands in the seam where possible or in the under-clays

just below the seam. The advantage gained by this method is that practically all the coal in the seam is recovered and the additional advantage of the rock-dusting effect eliminating to a great extent the danger from coal-dust where explosives are used.

No. 5 mine was in operation 254 days during the year. There was a short suspension of operations during the month of August due to a labour dispute. The average daily output is about 800 tons and the average number of men of all classes employed underground daily is about 350 during the twenty-four-hour period. There are approximately thirty-six men employed on the surface. There are sixteen certificated mine officials employed daily in the supervision of mining operations, or one mine official for every twenty-two men and for every 50 tons of coal produced.

The No. 2 seam is known to give off large quantities of methane gas and extreme safety precautions are necessary in the safe operation of this mine. Explosive gas has been found a number of times during inspections, especially after severe roof-breaks which are more or less characteristic in long-wall operations. Explosive gas has also been found at the faces of advance workings which are carried forward in the solid and in the vicinity of faults. Under these conditions all workmen are withdrawn at once and the affected areas fenced off until the gas has been removed and reported safe.

The general outflow of methane is increasing as all the return airways are showing an increase in the gas content of the return air. The face-lines are generally free from explosive gas but have to be carefully watched at all times. An experiment is now being tried in the form of mechanical detection of methane. Two Ringrose gas-detectors have been installed for this purpose. The mechanical effect of these detectors is to switch on a red light when the withdrawal point has been reached. Most of the gas-outflow is coming from the gob (or waste) areas and is conducted direct to the return airways. The last sample of air taken in the main return in December had a gas content of 1.5 per cent., which is a considerable increase. More air is required to dilute the gas, and to accomplish this much larger airways are required as the velocities in the present airways have about reached the limit. Taking the last reading in December for example, there was 170,000 cubic feet of air per minute passing in the main return carrying 1.5 per cent. methane. Using these figures as a general indication of the amount of methane given off in twenty-four hours shows that approximately three and three-quarter million cubic feet is carried out of the mine each day. This is an abnormal outflow and requires extraordinary precautions.

Precautions against the menace of coal-dust are carried out by means of rock-dusting and water-sprinkling. In connection with the rock-dusting of the mine during the year, 65,000 lineal feet of roadways were treated, and as the average perimeter of the roadways is 40 feet, a total of 2,600,000 square feet of ground was covered. The amount of rock-dust used was 317,400 lb. On the main haulage-slope a sprinkling system has been installed for the entire length of 6,000 feet. This line can be used either for sprinkling or for rock-dusting the slope from time to time. A sprinkling system has also been installed on every siding where trips are gathered for the main slope haulage, and all trips are sprinkled before being sent up the slope to prevent the deposit of coal-dust from the moving trips. The delivery ends of all conveyors are also equipped with sprinklers to prevent the deposit of coal-dust while the coal is being discharged into mine-cars.

In connection with the improvement and enlarging of airways for ventilation purposes, some 400 feet of 7- by 12-foot rock-workings have been driven and 1,200 feet of the main airways have been enlarged to 7 by 12 feet. This work is being continued.

During the year there were two accidents that resulted fatally and seven serious non-fatal accidents. The two fatal accidents were caused by mine-cars and haulage; four of the non-fatal serious accidents were also caused by mine-cars and haulage, one by a fall of coal, one by a fall of rock, and one on the surface caused by railway-cars. Investigation of these accidents proved that some of them could easily have been avoided if ordinary precautions had been taken. This is very regrettable as compensation for an injury does not begin to compensate for the suffering caused in many cases. Greater efforts and co-operation by all concerned is necessary if the accident-rate is to be kept to the lowest possible minimum.

South Wellington Colliery.—Wm. Wilson, Mine Manager; Joseph Wilson, Overman. This colliery was permanently abandoned in the month of May after five months' operation during the year. An output of 51,646 tons was produced in 103 working-days.

A large number of the men thrown out of employment by the closing-down of this colliery were re-employed at the Reserve mine, Nanaimo.

Lantzville Collieries, Ltd.

No. 1 Mine, Lantzville.—John Michek, Overman. This colliery is situated on the shore of Nanoose bay, in the strait of Georgia, about 9 miles north of the City of Nanaimo. The mine is entered by means of a slope 270 feet long, dipping landwards at an angle of 30 degrees. The Wellington seam is operated on a semi-long-wall system and is hand-mined. In this particular area the seam is thin, averaging about 2½ feet in thickness, but of excellent quality.

The mine worked 258 days during the year and produced 7,688 tons. There are twenty men employed underground and the employees operate the mine on a co-operative basis.

The ventilation, which is produced by mechanical means, was very much improved during the year by the installation of a larger fan. No explosive gas or gas-caps were found in this mine at the time of inspections during the year. No accidents were reported during 1935.

Biggs' Mine.

James Biggs, Operator. This mine is situated about 1 mile from the town of Wellington and about 7 miles north of the City of Nanaimo. The Wellington seam is operated. Very little work was done during the year, the output being 145 tons and only twenty-five days worked. The mine was closed down in October and was still closed at the end of the year.

Jingle Pot Mine.

Alex. McLachlan and Associates, Operators; Alex. McLachlan, Overman. This mine is situated on the site of the original Jingle Pot mine at East Wellington, about 3 miles from the City of Nanaimo. The present operation, which is not very large, consists of the recovery of pillars left by the former operators. The mine is reached by a good road and the small output produced is sold locally. The mine did not operate very steadily during the year, a total of ninety-one days being worked and 61 tons of coal produced.

The ventilation, which is produced by natural means, was fairly good and no explosive gas or gas-caps were found during the period of operation. No accidents were reported during 1935.

Fiddick Mine.

Richard Fiddick, Sr., Operator; Wm. Roper, Overman. This mine is situated on the site of the former operations of the Pacific Coast Coal Company, near the South Wellington Station of the Esquimalt & Nanaimo Railway. The Douglas seam is operated and the work consists of the recovery of pillars left by the former operators. The mine worked fairly steadily during the year, a total of 271 days being worked and 3,549 tons of coal produced, some of which is sold locally and the remainder shipped to Victoria and Vancouver.

The ventilation, which is produced by natural means, was good and no explosive gas or gas-caps were found during inspections throughout the year. A new prospect has been driven on the opposite side of the valley at about the same elevation as the seam in the Tunnel mine. No accidents were reported during 1935.

Richardson Bros.' Mine.

Richardson Bros., Operators; Daniel Caldwell and John Unsworth, Firebosses. This mine is situated on the site of the former operations of the Pacific Coast Coal Company, close to the Fiddick mine near the station of the Esquimalt & Nanaimo Railway at South Wellington. It is a small operation and consists of the recovery of pillars left by the former operators. The mine worked fairly steadily during the year, a total of 318 days being worked and 2,101 tons of coal produced. The mine is reached by a good road and most of the output is sold locally, though some of it is shipped to Victoria.

The ventilation is produced by natural means and is ample for this small operation. No explosive gas or gas-caps were found during inspections throughout the year. No accidents were reported during 1935.

Chambers' Mine.

Ralph H. Chambers, Operator and Fireboss. This mine is situated on the site formerly operated by the Dunsmuir interests many years ago at Extension and consists of the recovery of pillars left by the former operators. The Wellington seam is worked and is reached by a good road known as the Nanaimo Lakes road. The location of the mine is about 7 miles from the City of Nanaimo and the output is hauled by truck and sold locally. The mine worked fairly steadily during the year, a total of 223 days being worked and 1,151 tons of coal produced. The ventilation is produced by

natural means and is found to be ample for this small operation. No explosive gas or gas-caps were found during inspections. No accidents were reported in 1935.

Cowie's Prospect. Cowie and Associates, Operators. This prospect is situated in the Cranberry district and the area between South Wellington and Extension was being prospected. During 1935 very little work was done due to lack of finances.

Westwood's Prospect. Ira Westwood, Operator. This prospect is situated near the site of the Jingle Pot mine and a short slope was driven down on the coal-measures. A raise was driven to the surface for ventilation purposes. Prospecting was discontinued when the rainy season set in as the mine was making considerable water, with no equipment to handle the inflow. It is expected to carry on the prospecting in 1936.

Renney's Prospect. Renney and Associates, Operators. This prospect is situated about midway between the old Wakesiah mine and the Jingle Pot mine. A short slope was driven and some machinery installed, but for some reason prospecting was suddenly discontinued and the slope filled up with water. It was still closed down at the end of the year.

All workmen in the coal mines of Vancouver island are equipped with electric cap-lamps, chiefly of the Edison type. All firebosses and shotlighters are equipped with flame safety-lamps of the Wolf type for gas-testing purposes. All shot-firing is done electrically by shot-firing battery and cable under the supervision of certificated mine officials and permitted explosives only are used.

All serious accidents were investigated and those terminating fatally were specially investigated and the inquests attended. In this connection the writer wishes to thank the Coroners in the Nanaimo and Cumberland districts for their courtesy in permitting him to question all the witnesses in connection with the fatal accidents to determine, if possible, the underlying cause of the accidents. Let the writer at this point impress upon all concerned, mine officials and workmen, the necessity of further education along the lines of " safety first," for until such time that all become safety-minded, accidents that might have been prevented will continue to occur. Coal-mining is a hazardous occupation under the best conditions, but if all concerned will make a serious and sincere attempt to reduce the accident-rate good results will be obtained. In conclusion, the writer wishes to thank all who gave their co-operation in the combat to reduce preventable accidents and trusts that 1936 will prove that the accident-rate can be reduced.

NICOLA-PRINCETON INSPECTION DISTRICT.

BY

JOHN G. BIGGS.

The following coal companies operated in this district during 1935: Coalmont Collieries, Limited; Middlesboro Collieries, Limited; Wilson Mining and Investment Company, Limited (Blue Flame Colliery); Pleasant Valley Mining Company, Limited; Bromley Vale Mining Company; Tulameen Coal Mines, Limited; the Red Triangle Coal Company; and Oscar Lind and Associates. The Oscar Lind coal operation, situated on the " Allison flats " in Princeton, is a new discovery and started operations in a very small way during the autumn.

There was one fatal accident in the coal mines during the year, and five accidents of a serious nature—one each at Blue Flame and Tulameen mines and three at Coalmont Collieries, Limited.

All underground employees are equipped with electric safety cap-lamps and the firebosses use the Wolf flame safety-lamp for gas-testing purposes.

Ventilation was generally satisfactory at the different mines in this district during the year and they were fairly free from methane, with the result that on only one occasion was gas detected by the flame safety-lamp.

Air samples were taken at the different coal operations and mailed to the Department of Mines at Ottawa for analysis; most of those samples being taken for the purpose of determining the nature of the atmosphere in sealed-off areas and in recovery-work.

Coalmont Collieries, Ltd. Blake M. Wilson, President, Vancouver, B.C.; General J. W. Stewart, Vice-President, Vancouver, B.C.; A. H. Douglas, Secretary, Vancouver, B.C.; D. McLeod, Treasurer, Vancouver, B.C.; Geo. Murray, Superintendent, Blakeburn, B.C. (This plant has been described in previous reports.) This is the largest colliery in the district and is situated 12 miles west of Princeton. The power plant, screens, and mine-yard are situated at Coalmont and are served by a spur off the Kettle Valley Railway; mining operations are conducted at Blakeburn, 3 miles distant and 1,700 feet higher in elevation. An aerial tramway 2½ miles in length is used for transporting the coal from the mines to the tipple at Coalmont. The No. 3 mine, or the Wilson tunnel, which was commenced in 1920, and was the most important operation at this colliery, was exhausted and abandoned during the year; operations at present are confined to Nos. 4 and 5 mines.

No. 4 Mine.—James Littler, Overman; Robert Murray, Frank Bond, Thomas Smith, and Thomas Bryden, Firebosses. This mine, the most important operation of the Coalmont Collieries, is situated 5,400 feet north of the entrance to the old No. 3 mine and is reached by a light electric railway.

The measures have a general pitch north of 25 degrees and are developed on a modification of the "panel system," with faulted and broken areas used as the barriers. During the year 1932 spontaneous heating was found to have developed in the pillar section between the Nos. 12 and 15 West levels, and as a result it was found necessary to withdraw the material and flood this area. Since that time most of the coal produced has been recovered from the pillar areas on each side of the Main slope above the water-level. The mine has now been dewatered below No. 15 level and preparations are being made to recover the coal in this section.

Ventilation is produced by an electric-driven 84-inch double-inlet belt-driven Sirocco reversible mine-fan operated by a 75-horse-power constant-speed motor situated near the return above No. 1 tunnel. During the last inspection ventilation measured showed 20,000 cubic feet of air per minute passing into this mine for the use of thirty-eight men. The brattice and stoppings were in good order, the working-places and roads were well timbered, in fairly good condition, and treated with inert dust. Analysis of the dust showed it to be in accordance with the requirements of the Coal-dust Regulations.

No. 5 Mine.—William G. Brown, Wilfred Valentine, and Robert Barrass, Firebosses. The entrance to this mine is situated 2,800 feet north and at an elevation of 252 feet above the portal of the No. 4 mine. The coal is transported over a surface incline to a siding situated near the No. 4 mine; here the mine-cars are again collected in trips and hauled by means of an electric motor to the top terminal of the aerial tramway. There has been a little lateral work done in this mine and development was largely confined to the driving of a pair of 20-degree slopes from the surface to a total distance of 2,600 feet, at which point the seam deteriorated; pillars were developed on either side of the slope at the lower levels.

Ventilation is produced by a small force-fan situated near the portal of the counter-slope. The general ventilation of the mine is very good and free from any trace of methane. The working-places were well timbered. The roads were well timbered, in fairly good condition, and, being naturally wet, free from coal-dust.

A well-appointed surgery and first-aid room is maintained at Blakeburn, and at all times under the supervision of a first-aid man, who is in attendance to render any service that may be required. A doctor also resides at the camp and is in daily attendance at the office. A mine-rescue station, with smoke-room, is also provided at the camp and is equipped with Gibbs self-breathing apparatus, Burrell all-service gas-masks, inhalator, charging-pump, and other equipment necessary for mine-rescue work.

Middlesboro Collieries, Ltd. E. W. Hamber, President, Vancouver, B.C.; Thos. Sanderson, Secretary, Vancouver, B.C.; Robert Fairfoull, Superintendent, Merritt, B.C. (This plant has been fully described in previous reports.) This colliery is situated 1 mile west of Merritt and is connected with a branch line from the Kettle Valley Railway. The whole of the surface plant is located in the valley and the mining operations are located 300 feet above and 3,000 feet south of the mine-tipple. The seams are generally at a high angle of inclination and have been subjected to a great deal of crushing and faulting.

No. 3 North Mine.—Alex. McDiarmid Allen, Overman; Garnet S. Corbett, Fireboss. This mine is very small and the work consists of extracting all available pillars, with an average

employment of seven men. The ventilation is natural and fairly good and the mine free from any trace of methane. The working-places are well timbered. The roads are well timbered, in fairly good condition, and analysis of material taken from the same showed them to be in accordance with the requirements of the Coal-dust Regulations.

No. 2 South Mine.—James Fairfoull, Overman; Leslie Dickie, Thomas Rowbottom, and William Ewart, Firebosses. This is the most important operation of the Middlesboro Collieries. It is situated about 1,500 feet south of the top terminal of the surface incline and is developed by an adit-level that follows the strike of the seam from the surface outcrop for a distance of 4,000 feet; the seam has an average thickness of 8 feet and lies at a high angle of inclination. The workings down the dip from the Main level are operated by slopes, while the operations above the Main level are developed by headings driven through to the surface. The working-places are well timbered. The roads are well timbered, in good condition, and, being naturally wet, are free from dangerous coal-dust. An average of forty-five men are employed in this mine.

The coal is mined by machines of the post-puncher type and, being of a friable nature, very little explosive is used; compressed air is the only power used for haulage and pumps. General and special rules are well posted at this mine and no serious accidents have been reported during the year.

Tulameen Collieries, Ltd.

L. M. Diether, President, Vancouver, B.C.; L. P. Smith, Vice-President, Vancouver, B.C.; E. R. Gordon, Secretary, Vancouver, B.C.; A. C. R. Yuill, Consulting Engineer, Vancouver, B.C.; Thomas M. Wilson, Superintendent, Princeton, B.C. This mine is situated on the west side of the Tulameen river some 2 miles from Princeton and is connected to the Kettle Valley Railway by a half-mile spur; there was no change in the surface plant during 1935.

No. 2 Mine.—David Francis, Frank Lester, and W. T. Jones, Firebosses. The surface plant is situated on the river-flats and the mining operations were developed by a 20-degree Main slope, with the necessary counter-airway driven in the measures above, which intersects the coal-seam 600 feet from the portal and 160 feet below the elevation of the river; from this point the Main level follows the contour of the seam, and as the area below the Main level has been depleted this has been allowed to fill with water.

Operations were suspended during the month of February, the mine allowed to fill with water, and no further work was done until the autumn, when arrangements were again made to place this mine into operation. This recovery-work commenced during the early part of September, but due to the inflow of water and extremely heavy caving of the underground roadways the ventilation had not been restored at the end of the year. Sixty-five men were employed at the end of the year.

Pleasant Valley Mining Co., Ltd.

W. R. Wilson, President, Vancouver, B.C.; R. R. Wilson, Vice-President, Vancouver, B.C.; Miss M. Duncan, Secretary-Treasurer, Vancouver, B.C.; Thos. Cunliffe, Superintendent, Princeton, B.C. This colliery is situated on the south side of the Tulameen river 2 miles west of Princeton; the power and cleaning plant being located on the river-flats.

No. 2 Mine.—Thomas Cunliffe, Overman. The portal of this mine is located 1,700 feet west of the mine-tipple and at the same elevation; the main development-levels have been driven 4,000 feet from the portal and at the end of the year were in good coal approximately 9 feet thick and on an angle of 25 degrees.

Ventilation is produced naturally by a heading from the Main level to the surface and was found to be fairly good, well conducted around the working-faces, and free from methane; the working-places were well timbered. The roads were well timbered, in fairly good condition, and, being naturally wet, were free from dangerous coal-dust. There were five men employed during the year.

Wilson Mining and Investment Co., Ltd.

W. R. Wilson, President, Vancouver, B.C.; H. P. Wilson, Vice-President, Fernie, B.C.; J. S. Irvine, Secretary, Fernie, B.C.; Miss M. Duncan, Assistant Secretary-Treasurer, Vancouver, B.C.; John Gillham, Superintendent, Princeton, B.C.

Blue Flame Mine.—Arthur Hilton, Ernest Ward, and John Yards, Firebosses. This mine is situated about 10 miles west of Princeton and was the most important producer in the area

during 1935. The coal is hauled by motor-truck from the mine to the loading-chutes near Princeton.

A very fine grade of domestic coal is produced and during the year an active programme of development was carried out in a new area to the east of the former workings. Ventilation is produced by a 4-foot-diameter direct-driven enclosed-type ventilating-fan situated near the entrance to the counter-slope, and during the last visit of inspection ventilation measured 1,000 cubic feet of air per minute passing into the mine for the use of twenty-seven men. The working-places were well timbered. The roads were also well timbered, in good condition, and analysis of material taken from same showed them to be in accordance with the requirements of the Coal-dust Regulations. This mine is very free from methane and no gas has been reported during the year.

A number of the married employees reside at the mine, where a school is provided for the children; a dining-room and bunk-houses are provided for the single men, while a number of the employees reside in Princeton and travel to and from the mine by automobiles. There were ninety men on the pay-roll at this mine at the end of the year.

Red Triangle Coal Co. William Forsyth, Shiftboss. This mine is situated 2 miles east of Princeton and is known as the Old United Empire property. During 1932 a crosscut was driven in the measures and intersected two seams of coal in which some development was carried out, but the coal was found to be of inferior quality and work was suspended. During 1935 further prospecting was carried out in another part of the seam, but work was again abandoned before the end of the year.

Oscar Lind Mine. This is a newly discovered area of the No. 1 seam of the Princeton district found to outcrop near the Tulameen river on what is generally known as the "Allison flats" near Princeton. The river-flats are fairly wide at this point and the seam, exposed several hundred feet back from the river, has a general pitch of 20 degrees towards it. The operations are confined to the upper section of the seam, which is found to be 7 feet in thickness of a fine clean domestic coal with a good shale roof. The future success of the development will greatly depend upon the successful handling of the water situation. A small screening plant has been installed near the portal to the slope and horse-haulage is being used at the present time. There are two men employed underground and the small amount of coal produced is sold to the local market and hauled by trucks. Edison electric head-lamps are used by the employees underground and a flame safety-lamp for the purpose of inspection. The mine is in good condition and at the present time there is no power-installation.

Bromley Vale Mine. V. C. White, Secretary-Treasurer, Vancouver, B.C.; Thomas Lloyd, Manager, Princeton, B.C. This mine is situated on Bromley creek, 5 miles west of Princeton, and is reached by a branch road from the Hope–Princeton highway. The coal is hauled by motor-trucks from the mine bunkers to loading-chutes located on a spur of the Kettle Valley Railway near the east end of the railway-tunnel at Princeton.

The seam is 6 feet thick and is developed by a pair of parallel adit-levels which are driven several hundred feet to faulted ground, at which point extraction of the pillars between the levels commenced; the mine was operated intermittently during the year and work was again suspended in December.

The mine is well ventilated, free from methane, and the working-places and roads are well timbered, in good condition, and, being naturally wet, were free from coal-dust. There has been no change made in the power plant during the year, which has been described in previous Annual Reports.

Canada Coal Development Co., Ltd.* L. D. Leonard, Manager and Director, Ashcroft, B.C.; Roy Blakemore, Fireboss. This company's Hat Creek mine was worked intermittently during the year and only a few men were employed; conditions were generally satisfactory.

* Report by Thos. R. Jackson.

NORTHERN INSPECTION DISTRICT.

BY

CHARLES GRAHAM.

Bulkley Valley Colliery. F. M. Dockrill, Operator; Edward E. Hughes, Overman. This mine is located on Goat creek, 7 miles from Telkwa, to which point the coal is hauled by motor-trucks and shipped on the Canadian National Railway; the market is very limited and chiefly domestic. The Main slopes have been extended, a second level turned off, and pillar-extraction has been started in No. 1 level. The ventilation is natural and frequent openings to the surface provide adequate ventilation; no inflammable gas has been detected on any inspection and the mine is free from coal-dust. Electric cap-lamps have been introduced at the mine, replacing the Wolf flame safety-lamps formerly in use.

Skeena Development Syndicate. Asa Robinson, Fireboss. This is an organization of local men who have taken a lease on the Aveling property on the Telkwa river. The mine was ready for winter production when a heavy storm in October, resulting in the rapid rise of the Telkwa river, washed out the bridge leading to the mine. As a result operations have been suspended and cannot be resumed until the bridge is rebuilt.

Northwest Anthracite Syndicate. Thos. Campbell, Superintendent. Work has been carried on intermittently on a crosscut adit with the object of intersecting the various seams outcropping on the mountain, but this objective has not yet been reached; no work has been done since October and the date of resumption is uncertain.

EAST KOOTENAY INSPECTION DISTRICT.

BY

JOHN MACDONALD.

Three collieries, comprising seven mines, were operated during 1935—namely, Coal Creek and Michel, owned and operated by the Crow's Nest Pass Coal Company, Limited, with head office in Fernie; and Corbin Colliery, owned and operated by Corbin Collieries, Limited, with head office in Vancouver.

Michel is the only colliery to show an improvement over last year with a 6-per-cent. increase in production. Coal Creek output decreased 5 per cent., while that of Corbin was practically negligible when compared with previous years, as this colliery only operated for a period of fifteen days in January, when active production was suspended on account of labour troubles, which ultimately resulted in the mines being closed indefinitely.

The decrease in output for the district as a whole was 36.8 per cent., the loss of the normal Corbin output being responsible for this heavy falling-off in production.

It is gratifying to be able to report that all mines in the district operated during the year without a fatal accident.

VENTILATION.

General conditions in this respect have been fairly good throughout the year and are given in greater detail at a later stage in this report. Sixty-two samples of mine-air were sent to the Department of Mines at Ottawa for analysis, thirty-nine being sent from Coal Creek Colliery, seventeen from Michel, and six from Corbin. In accordance with the practice of the last two years, the majority of these were taken in and around old abandoned workings for the purpose of keeping a close check on any changes taking place therein.

REGULATIONS FOR PRECAUTIONS AGAINST COAL-DUST.

With very few exceptions, all roadways requiring treatment for dust have been kept in good shape generally, and in all cases where the attention of the management was directed to any additional treatment necessary, this was usually attended to without loss of time. Crushed limestone-dust is the medium generally used to offset the danger of coal-dust and is also used extensively around the edges of old gobs and extracted areas. Six hundred and eighty-three samples of dust were taken in accordance with the Coal-dust Regulations, all of which

were in keeping with the standard set by Regulation No. 4. In cases where samples are found to be under the standard, further treatment is given and other samples taken.

INSPECTION ON BEHALF OF WORKMEN.

This inspection has been made regularly at all mines in the district, and it is very gratifying to report that the various committees have shown splendid co-operation in the work of encouraging safety-first methods in and around the mines. No complaints in regard to working conditions were received from any of the inspection committees. Searches for matches or other articles prohibited by General Rule 9 were made regularly, one contravention being discovered where a workman was found with matches in his possession. This man pleaded guilty and was convicted for this offence.

EXPLOSIVES.

Explosives are used generally at Michel to loosen the undermined coal; none being used for this purpose at Coal Creek. General Rules 11 and 12 regarding the handling and use of explosives have been well complied with in general. Full details of the amount of explosives used and number of shots fired are given in the regular returns under this heading.

COAL-CUTTING MACHINERY.

Coal-cutting machines are being operated satisfactorily on the long-wall faces in the "B" seam district of No. 1 mine, Michel Colliery; in addition to the above, a large number of machines of the percussive type are used extensively in many districts in this colliery, the greater portion of the output being produced by means of the agencies mentioned above. Full particulars of the tonnage produced by machinery is given in the annual returns under this heading.

BRIEF DETAILS *RE* OPERATING COLLIERIES.

At all the collieries operating in the East Kootenay Inspection District the Edison electric cap safety-lamp is used exclusively by the workmen, while Wolf safety-lamps are used by the officials and bratticemen for testing purposes, all lamps being cleaned and repaired in well-equipped lamp-rooms located in a central position at each colliery; Burrell gas-detectors are provided at all the mines and readings taken regularly in the return air-currents. Copies of the "Coal-mines Regulation Act" and special rules are posted up at each mine and all report-books required to be kept at the mines have been examined regularly.

Following is a brief summary of conditions prevailing in the mines during 1935:—

Crow's Nest Pass Coal Co., Ltd. W. R. Wilson, President, Fernie, B.C.; A. H. MacNeill, K.C., Vice-President, Vancouver, B.C.; J. S. Irvine, Secretary, Fernie, B.C.; A. A. Klauer, Treasurer, Fernie, B.C.; B. Caufield, Superintendent, Michel, B.C.; E. Morrison, Superintendent, Coal Creek, B.C.; H. P. Wilson, General Manager, Fernie, B.C. The above company operated, during 1935, Coal Creek and Michel Collieries on the western slope of the Rocky mountains in East Kootenay Inspection District. Coal Creek Colliery is situated at Coal Creek, about 5 miles from Fernie. Railway connections from the colliery are made with the Canadian Pacific Railway and the Great Northern Railway at Fernie, over the Morrissey, Fernie & Michel Railway. Michel Colliery is situated on both sides of Michel creek, about 24 miles in a north-easterly direction from Fernie.

Coal Creek Colliery.—E. Morrison, Manager. As in 1934, No. 1 East was the only mine operated during the year, although in the latter part of the summer some prospecting was done on the mountain in the vicinity of No. 1 South with a view to opening another mine should business conditions warrant such action.

A general description of the surface plant and system of haulage in and around the mines has been given in previous Annual Reports. A change in the method of working was made in the latter part of the year by the introduction of several "Meco" and "Mavor & Coulson" shaking conveyors underground. Where rooms were formerly driven in series of three with a large barrier-pillar left between each set of rooms, the new system projected for the conveyors provides for levels being driven off the main inclines every 210 or 280 feet and then rooms driven to the rise off these levels on 70-foot centres, conveyors being used in these rooms instead of the horse-haulage formerly in use.

A new storage building for rock-dust has been built in a more convenient position in the colliery yard, which will greatly facilitate the unloading of the dust from the railway-cars and also for reloading into the mine-cars for use underground.

No. 1 East Mine.—J. Caufield, Overman. This mine operates the eastern portion of No. 1 seam and is ventilated by an electrically driven 11- by 7½-foot Sorocco fan, which, running at a speed of 174 r.p.m., produced an average quantity of 137,860 cubic feet of air a minute, under a water-gauge of 3.5 inches. Ventilation is divided into three splits; the quantity passing in each at the last inspection measured as follows:—

No. 1 split: 15,000 cubic feet of air a minute for the use of forty men and seven horses. Burrell gas-detector, out for repairs. Safety-lamp indicated 1 per cent. methane.

No. 2 split: 24,500 cubic feet of air a minute for the use of twenty-five men and three horses; Burrell gas-detector, 0.9 per cent. methane.

No. 3 split: 7,800 cubic feet of air a minute for the use of thirteen men and two horses. Burrell gas-detector, 0.8 per cent. methane.

Main return: 138,600 cubic feet of air a minute for the use of seventy-eight men and twelve horses. Safety-lamp indicated 0.5 per cent. methane.

Explosive gas has been found occasionally in the course of inspection, mostly in cavities in the roof and at the face of the conveyor-places, as these roadways travel faster than under the old system and require closer attention in the matter of keeping the brattice up to the face. Burrell readings taken in the return air-currents have varied from 0.6 per cent. methane in the No. 1 split to 1.5 per cent. in No. 2 split. Roadways and timbering have been kept in a fairly satisfactory condition and generally well treated with rock-dust, all roadways and working-places being treated regularly with crushed limestone-dust where required. Three hundred and twenty-nine samples of dust were taken in accordance with Regulation No. 4 of the Coal-dust Regulations, all of which were above the standard set by the above regulation.

As a result of two heavy " bumps " that occurred in the Nos. 19 and 20 East slope districts on May 26th and 27th, a decision was reached to abandon this part of the mine and concentrate all operations on the West side, where more favourable conditions are anticipated in this respect.

Michel Colliery.—B. Caufield, Manager; C. Stubbs, Acting-Manager. This colliery is situated on Michel creek, 24 miles north-east of Fernie, on the Canadian Pacific Railway. A general description of the method of working, system of haulage in and around the mines, and surface plant has been given in previous Annual Reports.

No. 3 Mine.—Robt. McFegan, Overman. This mine operates the upper No. 3 seam and is ventilated by an electrically driven 12- by 6-foot Sullivan fan, which, running at a speed of 240 r.p.m., produced an average quantity of 137,750 cubic feet of air a minute, under a water-gauge of 3.1 inches. Ventilation is divided into three splits; the quantity passing in each at the last inspection measuring as follows:—

No. 1 split: 15,400 cubic feet of air a minute for the use of fifty men and seven horses. Safety-lamp indicated a trace of methane.

No. 2 split: 10,000 cubic feet of air a minute for the use of thirty-three men and four horses. Safety-lamp indicated a trace of methane.

No. 3 split: 5,000 cubic feet of air a minute for the use of three men and one horse. Safety-lamp, *nil.*

Main return: 31,200 cubic feet of air a minute for the use of eighty-five men and twelve horses. Safety-lamp indicated a trace of methane.

This mine has been found clear of explosive gas during the course of inspection, while Burrell gas-detector and safety-lamp readings taken regularly in the return air-currents have varied from *nil* in the No. 3 split to 0.5 per cent. methane in the main return airway. Roadways and timbering have been kept in good shape and generally well treated for coal-dust. Where necessary, all roadways and working-places are treated regularly with crushed limestone-dust. One hundred and seventy-four samples of dust were taken in accordance with Regulation No. 4 of the Coal-dust Regulations, all of which were above the standard set by the above regulation.

No. 1 Mine.—C. Stubbs and W. McKay, Overmen; R. B. Bonar, Acting-Overman. This mine is reached by a crosscut from the upper No. 3 seam of No. 3 mine, which intersects Nos. 2, 1, " A," and " B " seams; Nos. 1 and " B " only being operated at present. This mine

is ventilated by No. 3 mine fan. Ventilation is divided into two splits; the quantity passing in each at the last inspection measuring as follows:—

No. 1 seam, return: 28,000 cubic feet of air a minute for the use of thirty-five men and four horses. Safety-lamp indicated a slight trace of methane.

" B " seam, return: 15,000 cubic feet of air a minute for the use of fifty-five men and five horses. Burrell gas-detector, 0.7 per cent. methane.

Main return: 63,000 cubic feet of air a minute for the use of ninety men and nine horses. Safety-lamp, 0.4 per cent. methane.

Main return (all mines): 130,000 cubic feet of air a minute for the use of 175 men and twenty horses. Safety-lamp, 0.4 per cent. methane.

Explosive gas was found once in each district of this mine during the course of inspection, while Burrell gas-detector and safety-lamp readings taken regularly in the return air-currents have varied from a slight trace of methane in the No. 1 seam district to 1 per cent. in the " B " seam district. Roadways and timbering have been kept in good shape generally and well treated for coal-dust. One hundred and eighty samples of dust were taken in accordance with Regulation No. 4 of the Coal-dust Regulations, all of which were in keeping with the standard set by the above regulation.

No. 3 East Mine.—J. Henney, Shiftboss. Operations in this mine have been confined to repairing main roadways and stoppings in the fire area adjacent to the main return airway. It has not been necessary to operate the fan during the year as the natural ventilation was ample for all requirements.

Corbin Collieries, Ltd. Austin Corbin, President, Spokane, Wash.; E. J. Roberts and J. M. Fitzpatrick, Vice-Presidents, Spokane, Wash.; A. M. Allen, Secretary-Treasurer, Spokane, Wash.; E. L. Warburton, Manager, Corbin, B.C.

Corbin Colliery.—E. L. Warburton, Manager; F. W. Reger, Assistant Manager. This operation is situated 14 miles from McGillivray Junction on the Crowsnest branch of the Canadian Pacific Railway, to which it is connected by a branch line, called the Eastern British Columbia Railway. This colliery consists of four mines—Nos. 3, 4, 5, and 6 West. Nos. 4 and 6 West mines were the principal producers, but were in operation for a period of fifteen days only in the beginning of January, when all work was suspended as the result of a strike order going into effect on January 20th. No. 3 mine or " big showing " was operated for twenty days in September, when some 200 tons of loose coal was gathered off the benches to supply fuel for the hotel, school, hospital, and officials.

During the interval between January 20th and May 21st, the underground officials were engaged in repairing main roads and airways and patrolling the fire areas in No. 4 mine. As the company was unable to renew existing contracts, a decision was reached to close the mines indefinitely and a start was made at the end of April to erect permanent seals at No. 4 and West No. 6 mines, these being completed on May 21st. Since the latter date three men only have been retained on the pay-roll, two acting as watchmen and one in charge of the colliery office. At the moment of writing there is apparently little hope of work being resumed at this colliery for some time to come.

INSPECTION OF QUARRIES.

BY

JAMES STRANG.

VANCOUVER MINING DIVISION.

Coast Quarries, Ltd.—At Granite Falls, Burrard inlet, a granite-quarry is operated by this company, the stone being used for general construction-work. Work here during 1935 has been very irregular, the number of men employed varying from ten to two. The regulations, generally, have been fairly well observed and no accidents of a serious nature have occurred. Thomas Burrows is in charge of operations.

Kilgard Red-shale Quarry.—This quarry is the property of the Clayburn Company and is worked in conjunction with their clay mines. No material has been taken from the quarry this year.

Deeks Sand and Gravel Pit.—T. O. Burgess, superintendent. Four to five men are employed at this plant. It is a hydraulic operation, electrical power being used for the mechanical operations of the plant. Condition of machinery, fencing, and other equipment was generally in fair condition.

Cascade Sand and Gravel Quarry.—A. Ellis, superintendent. Five men are employed here. This plant operated on part time during the year. The sand and gravel is recovered from the bed of Seymour creek by a large power-shovel. The condition of the plant is only fair. General repairs to equipment are necessary.

B.C. Sand and Gravel Quarry.—North Vancouver; William Monks, foreman. This quarry operated very little during 1935. Condition of the plant was good.

Hillside Sand and Gravel Quarry.—West Howe sound. This plant did not operate during 1935.

NEW WESTMINSTER MINING DIVISION.

Gilley Bros.' Quarry.—Situated at Silver valley, on the Pitt river. The plant for crushing and screening the stone from the quarry is built on the banks of the Pitt river; the rock being loaded in scows for shipment and used in general construction-work. About twenty-one men are employed, although work has been very irregular during the year. The plant is kept in good condition and the regulations well observed.

Maryhill Sand and Gravel Pit.—Operated by Gilley Bros., Limited; is situated on the banks of the Fraser and employs on an average about fifteen men. The screening and loading plant is operated electrically, a power-shovel and conveyor-belt being used in the gravel-pit. The entire plant is kept in good condition and the regulations carefully observed.

VICTORIA MINING DIVISION.

B.C. Cement Co., Ltd.—The main plant of this company is situated at Bamberton, where there are two limestone-quarries and a cement plant. Work has not been steady throughout the year due to lack of orders for cement. The number of men in the quarries varies from twenty-three to six and in the mill from twenty-three to seventy-five. Both officials and men here are keenly alive to safety measures. Accident-prevention is discussed at safety meetings and first-aid classes are well attended. The regulations for quarries are strictly observed.

Pioneer Sand and Gravel Co., Ltd.—Situated at Albert head. Very little work has been done here during 1935.

Producers Sand and Gravel Co.—Situated at Royal bay. This plant has been idle the greater part of the year.

NANAIMO MINING DIVISION.

Pacific Lime Co.—Situated at Blubber bay, Texada island. This plant, a description of which has appeared in previous reports, has operated throughout the year. The number of men employed in the quarry operations averages around twenty; the total number in the plant varying from sixty to forty-eight. General conditions are good, the regulations being fairly well observed.

B.C. Cement Co., Ltd.—This company's quarry is situated on the opposite shore of Blubber bay from the Pacific Lime Company; the limestone being shipped by scows to the cement-works at Bamberton. The average number of men employed is about seven. This plant is kept in good condition and the regulations are well observed.

Vananda Quarry.—A limestone-quarry operated by F. J. Beale, and supplying limestone to the various pulp and paper mills and crushed limestone to the coal mines on Vancouver island. The average number of men employed is around twenty. General conditions are fairly good.

Vancouver Granite Co.—Operates a granite-quarry at Nelson island and produces a fine dimension stone. Work has been intermittent throughout the year. When operating about twelve men are employed. A fatal accident occurred here on April 8th to Mangus Lombnes, a report of which appears elsewhere.

NANAIMO MINING DIVISION.

BY

GEO. O'BRIEN.

McDonald Cut-stone Operators.—This quarry is situated on Gabriola island. It was inspected during the year and found to be in a satisfactory working condition. Stones for pulp-grinding are cut *in situ* by a large boring and cutting tool and then detached by a small charge of gunpowder; the stones are 5 feet in diameter, have a 3-foot grinding-face, and are fully dressed before leaving the quarry. Only a few men were employed and the quarry operated intermittently during the year.

KAMLOOPS MINING DIVISION.

BY

JOHN G. BIGGS.

Falkland Quarries.—Operated by the Canadian Gypsum and Alabastine Company. This quarry was inspected during the year and found to be in a satisfactory working condition. Twelve men were employed and the material produced shipped by rail to the company's plant at New Westminster.

BELLA COOLA MINING DIVISION.

BY

CHARLES GRAHAM.

Koeye River Quarry.—P. Christensen, operator. This quarry, situated 7 miles south of Namu, was inspected during the year and found to be in a satisfactory condition. Five men were employed and the limestone produced was shipped to the Pacific Paper Mills at Ocean Falls.

INSPECTION OF METALLIFEROUS MINES.

BY

JAMES DICKSON.

In March, 1935, the then existing "Metalliferous Mines Regulation Act" and the "Quarries Regulation Act" were rescinded, and the present "Metalliferous Mines Regulation Act" was passed by the Legislature and came into force on March 23rd, 1935.

The new "Metalliferous Mines Regulation Act" covers the operations of metalliferous mines, concentrators, smelters, and quarries, and brought the regulations governing same into more detailed recognition of the inherent risks of present-day mining methods and the practical means of securing the safety of those employed.

Among the outstanding features of this new Act the following may be noted:—

Any unusual occurrence of overwinding, breakage of hoisting-ropes, inrush of water, fire, premature or unexpected explosions must be reported by mine operators whether or not any person is injured thereby.

The regulations *re* surveys and plans of underground workings are more stringent.

At all mines where over fifty persons are employed it is required that special rules be established for the conduct of persons acting in the management of the mine and the persons employed in and about the same as, under the particular state and circumstances of the mine, may appear best calculated to prevent dangerous accidents and to provide for the safety and proper discipline of the persons employed in and about the mine.

The special rules, when agreed to by the management and the men employed and approved by the Minister of Mines, become part of the Act.

The general rules are embodied in section 38 of the Act and provide for the following outstanding points:—

Only experienced men who are over 22 years of age and certified by a medical practitioner to be in good health shall be permitted to hoist or lower persons in a shaft:
Satisfactory ventilation and fans:
Prohibits the use of internal-combustion engines underground:
Provides for more stringent precautions against fire underground and on the surface:
Provides for second exits from mines when the developments stated have been reached:
Provides for the installation of properly equipped refuge-chambers on the order of the Chief Inspector:
Provides for the connection of adjacent mines in the interests of safety on the approval of the Minister of Mines:
Provides for mine-rescue apparatus at mines on the order of the Chief Inspector and the establishment of mine-rescue stations:
Provides that first-aid supplies shall be maintained at mines:
Provides for dust-control in mines and crushers:
Provides for sanitary conveniences underground:
Provides for bathing and dressing facilities where over ten men are employed:
Provides for proper manways and ladder-ways underground:
Provides for proper hoisting and shaft equipment:
Provides that hoisting-ropes where men are handled must not be used for more than two years and be tested every six months, and that such hoisting-ropes must have a static factor of safety of ten or over:
Provides for the proper installation of electrical cables and equipment underground.

Copies of the new "Metalliferous Mines Regulation Act" were mailed to all mine operators in the Province.

PRODUCTION.

The output from the metalliferous mines for 1935 was 4,916,147 tons, a decrease of 171,187 tons from the tonnage of 1934. This tonnage was produced from 177 mines, of which seventy-two produced 100 tons or more.

FATAL ACCIDENTS IN METALLIFEROUS MINES (INCLUDING UNDERGROUND PLACER MINES).

There were fifteen fatal accidents in and about the metalliferous mines in 1935, being a decrease of seven from the figures for 1934. This does not include the seven men lost in the snowslide at the *Taseko-Motherlode* bunk-house.

There were 4,237 persons employed under and above ground in the metalliferous lode mines in 1935. The ratio of fatal accidents per 1,000 persons employed was 3.54, compared with 4.86 in 1934. The ratio for the last ten-year period was 3.27.

The tonnage mined per fatal accident during 1935 was 327,743 tons, compared with 231,242 tons during 1934. The tonnage mined per fatal accident for the last ten-year period was 420,291 tons.

The following table shows the mines at which fatal accidents occurred during 1935, and comparative figures for 1934:—

Mining Division.	Mine.	No. of Accidents.	
		1935.	1934.
Vancouver	Britannia	1	4
Phillips Arm	Alexandria	....	1
Lillooet	Bralorne	....	2
Lillooet	Bradian	1	....
Lillooet	Pioneer	1	2
Lillooet	Pilot Gold	2	....
Kamloops	Homestake	1	....
Cariboo	Island Mountain	2	....
Omineca	Vital	....	2
Atlin	Clydesdale Lease	1	....
Nass River	Bonanza	2	....
Nass River	Hidden Creek	....	4
Vernon	Pre Cambrian	....	1
Trail Creek	Josie No. 1	....	1
Nelson	Nugget	1	....
Nelson	Reno Gold	2	....
Nelson	Gold King Claim	1	....
Osoyoos	Morning Star	....	1
Osoyoos	Twin Lakes	....	1
Fort Steele	Sullivan	....	3
Totals		15	22

The following table shows the cause, the percentage to the whole of the fatal accidents, with comparative figures for 1934:—

Causes.	1935.		1934.	
	No.	Percentage.	No.	Percentage.
By blasting	4	26.64	1	4.54
By falling down chutes or shafts	2	13.33	7	31.82
Haulage	2	13.33	4	18.18
By falls of ground	6	40.00	7	31.82
By carbon-monoxide poisoning	1	6.67	....	.....
Miscellaneous	....	.....	3	13.64
Totals	15	100.00	22	100.00

ACCIDENTS IN METALLIFEROUS MINES.

The fatal accident which occurred to Shirley Alliston, brakeman, *Britannia* mine, on January 21st was due to deceased being caught and squeezed between the descending door

and the end wall of a side-dumping car; this type of car is dumped by means of compressed air and the control-valve was on the opposite side of the car from where deceased was injured. There were no witnesses to this accident.

The fatal accident which occurred to Michael Busen, miner, *Bonanza* mine, on February 13th was due to a fall of ground from the back in an open stope on which deceased was drilling a large boulder for block-holing. This place had been blasted at noon on the 12th and Busen had barred down immediately after, and again barred down on the morning of the 13th before starting to drill. A carbide flood-light was in use in this stope.

The fatal accident to Harry Dreger, miner, and Albert Quickfall, mucker, *Island Mountain* mine, on February 14th was due to blasting; the deceased had spit a round of shots and had delayed too long after starting to spit and failed to get clear. The place was wet and this probably caused a loss of time in completing the spitting of the round. Had the deceased used a spitter of reasonable length and left the face when the spitter was exhausted this accident would have been averted.

The fatal accident to Nels Johnson, miner, and Otto Stoesser, mucker, *Pilot* gold mine, on March 15th was due to blasting; the place was wet and probably due to this the men were delayed in completing the spitting of the round. As in the accident at the *Island Mountain* mine, the use of a spitter of reasonable length would have averted this accident. From the investigation into this accident it would appear that two spitters had been used; if used consecutively, these spitters had a greater total length than the fuse in the cut holes.

The fatal accident to John Sajatovich, chuteman, *Bonanza* mine, on March 28th was due to a runaway car on the underground main haulage-incline to the surface; a descending empty car had been arrested by some means and became detached from the rope; the empty car apparently released itself and ran down the slope and struck deceased at the station below. An ordinary open hook was in use for attaching the car to the haulage-rope; only safety-hooks are now permitted by the new "Metalliferous Mines Regulation Act."

The fatal accident to Oscar Edstrom, miner, and Niels Anderson, nipper, *Reno* gold mine, on April 23rd was due to a fall of ground which sluffed off from a pillar above; both men died shortly after being taken from the mine.

The fatal accident to Winthroe W. Young, pumpman, *Bradian* No. 2 shaft, on May 22nd was due to the shaft cross-head dropping some 60 feet and striking deceased or the bucket in which he was ascending the shaft at the time; a few minutes prior to the accident deceased had descended the shaft to attend to a pump at the bottom, and before descending had told the hoistman to close the safety-doors immediately the bucket had cleared the doors as there were some repairmen working above. Apparently the hoistman had closed the safety-doors sufficiently soon to arrest the cross-head, which remained suspended at this point, until deceased went to the shaft-bottom and again ascended the shaft; when the bucket reached a point about 60 feet from the top of the shaft the hoistman opened the safety-doors to permit the passage of the bucket, and this allowed the cross-head to drop, with fatal results to Young. The new "Metalliferous Mines Regulation Act" requires that all cross-heads be provided with a safety locking-device, so that the cross-head and bucket cannot be accidentally separated while in the shaft. The management was prosecuted for the contravention of General Rule 87, but the charge was dismissed.

The fatal accident to Gus Hantual, miner, *Pioneer* gold mine, on June 10th was due to deceased being crushed by a slab of rock from the hanging-wall in his working-place. This slab projected about 2 feet above the loose ore resulting from the previous blasting, and Hantula and another miner tried to bar the slab out, but were unable to do so and left it; a short time afterwards he removed some of the loose ore at this point to make sufficient height to set up his machine. The slab fell out when he removed the ore and crushed his hips against the foot-wall. Hantual was taken by airplane to the Vancouver General Hospital, where he died six days later.

The fatal accident to Evan Williams, miner, *Buchanan* placer mine, Atlin, on June 27th was due to a fall of ground at the face of a drift. Deceased and partner were engaged in driving lagging over a false set of timber at the face when a cave occurred which caused the collapse of the false set and the two adjacent permanent sets; Williams was buried in the debris and was dead when recovered.

The fatal accident to Henry J. Brauer, *Gold King* mine, Nelson, on July 12th was due to carbon-monoxide poisoning from the exhaust of a small gasoline-engine in the shaft. Deceased and another man were engaged, on separate shifts, in dewatering this shaft by means of a small pump driven by a 1½-horse-power gasoline-engine. The shaft had been dewatered to a point 50 feet from the surface, at which point a short drift had been driven and the engine and pump were installed at this point. Deceased had gone on shift about 10 p.m. and apparently experienced trouble with the engine, as this was partly dismantled when Brauer was found dead in the drift the following morning. It was later learned that deceased had been previously affected by gases in this shaft and had required help to reach the surface. Deceased and partner were part owners. The management was prosecuted and convicted for contravention of General Rule 6, which states that " No internal-combustion engine shall be installed or operated underground in any mine."

The fatal accident to Alfred Joseph Hebert, miner, *Kamloops Homestake* mine, on October 30th was due to a fall of ground; deceased was barring down at the time and probably, due to an error of judgment, stood on the lower side of the material he was barring down. Apparently more material was brought down than deceased anticipated and he was unable to get clear.

The fatal accident to Joseph Nicholson, foreman, *Nugget* mine, Reno Gold Mines, Limited, on December 3rd was due to deceased falling down a raise a distance of 200 feet; this mine was being reopened after standing idle since 1921. Supplies were lowered through this raise by means of a small bucket and a hemp rope and at the time of the accident a miner was climbing down the raise; deceased had leaned over a fence, 41 inches high, at the top of the raise to see whether the miner had arrived at the bottom before allowing the bucket to be put in motion. Nicholson apparently overbalanced and fell down the raise.

In addition to above accidents in mines, seven men—H. Gustensen, Eric G. Carlson, Hans Pederson, R. J. Bacon, W. G. Nelson, Chris Christensen, and R. Stewart—were killed by a snowslide near the *Taseko-Motherlode* mine. Apparently this snowslide occurred about January 7th and probably at night, as all the men were in the bunk-house at the time of the slide; the bunk-house was at an elevation of 1,000 feet below the mine and was reached by a zigzag trail about 1½ miles long.

DANGEROUS OCCURRENCES.

On April 22nd, while the brakes of the main hoist, No. 3 shaft, *Pioneer* mine, were being tested, the safety-dogs on the cage were unexpectedly brought into action and the cage was arrested. When the hoist was started a considerable amount of the hoisting-rope was paid out before the above occurrence was discovered. The hoisting-rope became badly " kinked " and was immediately replaced by a new rope.

On May 22nd, in No. 2 shaft, *Bradian* mine, a loose cross-head had been arrested by the safety-doors on a descending trip of the bucket; when the bucket was being raised and the safety-doors were opened the cross-head dropped 60 feet to the bucket and killed a man.

On June 1st, in the *Pioneer* mine, a miner was slightly burned by a small inflammation of methane gas. This occurrence is reported elsewhere in this report.

In No. 1 shaft, Sheep Creek Consolidated Gold mine, the king-pin of the coupling between the hoisting-rope and skip sheared through and allowed the skip to fall to the bottom of the shaft. This pin had been in use only eighty-three days and was evidently of defective material; no person was injured.

On July 5th an overwind occurred at No. 2 shaft, *Pioneer* mine, during sinking operations; no one was injured, although the sinking crew was in the shaft-bottom at the time. This occurrence was due to an error on the part of the hoistman.

On August 5th, at the *Reward* mine shaft, Cottonwood, two miners were badly burned by gasoline when taking a supply from a 40-gallon drum at night when presumably a naked light was in the vicinity.

On December 9th, at the Pacific Eastern Gold mine, methane gas was ignited at the face of the main drift; no person was injured. This occurrence is reported elsewhere in this report.

On December 22nd an air-blast occurred at the *Premier* mine due to workings above No. 2 level caving to the surface; one man was knocked down by the blast and was immediately afterwards slightly injured by a mine-car which had been set in motion by the air-blast.

OCCURRENCE OF METHANE AT PIONEER GOLD MINES, LTD., AND PACIFIC EASTERN GOLD MINES, LTD., BRIDGE RIVER.

The occurrence of methane in the *Pioneer* mine has been demonstrated on several occasions in the past few years by ignitions of this gas at the face of some of the upper levels and in raises, and in one or two instances slight burns were sustained by the men who inadvertently lit the gas. The total inflow of gas has so far been very small, but there is a danger of the gas accumulating in any abandoned dead-end workings.

In one case two pipemen went up a raise that had not been operated for some days and ignited gas about 60 feet from the top; both men were slightly burned. In another instance a miner was slightly burned in a raise shortly after the shiftboss had inspected same with an open light.

Following the above ignitions, the Inspector of Mines supplied flame safety-lamps for the purpose of testing any places where the presence of methane may be suspected.

In the Pacific Eastern Gold Mines, Limited, methane was encountered on December 9th at the face of the main drift being driven from the bottom of the shaft. The face was being drilled when a heavy feeder of water was met, and as the mine-pumps were already taxed to deal with the mine-water, drilling was suspended to permit a survey of conditions, and on the following day, when the face was being examined, it was found that the flow of water from the drill-holes had appreciably lessened, but gas was ignited at the collar of the holes; the burning gas was extinguished and the ventilation of the drift augmented and the air tested by means of a flame safety-lamp, but by this time no indications of gas were found on the lamp. All naked lights were removed and the round completed by electric light; when the round was completed there was no trace of gas and the carbide lights were again used, but before the holes were loaded gas was again ignited at the collar of several holes.

The naked lights were again withdrawn and the round blasted electrically; it was found that the gas had apparently come from a small mud-filled fracture which the drift intersected; samples taken here later showed 0.43 per cent. methane at this point and 0.03 per cent. methane at the face after the drift had been advanced a short distance. Instructions were given to use the flame safety-lamp for inspection after any temporary shut-down of operations.

Slight traces of methane have been noted in air samples of the *Bralorne* mine; so that this gas has been found at different points along some 4 miles in this area.

PROSECUTIONS.

During 1935 there were seven prosecutions made for infractions of the "Metalliferous Mines Regulation Act" and special rules, as follows:—

Date.	Mine.	Occupation of Defendant.	Offence charged.	Judgment.
Jan. 28	Pacific Eastern Gold Mines, Ltd.	Manager	Failed to observe General Rule 87 *re* safety cross-head	Case dismissed. Court ruled there had not been sufficient time to comply.
Jan. 28	Bradian Mines, Ltd.	Manager	Failed to observe General Rule 87 *re* safety cross-head	Case dismissed. Court ruled there had not been sufficient time to comply.
April 9	Granby Consolidated M.S. & P. Co., Anyox	Miner	Riding on loaded ore-skip in violation of General Rule 95 (*b*)	Fined $10 and costs.
April 9	Ditto	Hoistman	Hoisting a man on loaded ore-skip in violation of General Rule 95 (*b*)	Fined $10 and costs.
April 9	,,	Miner	Running a rock-drill without using the water provided to allay dust in violation of General Rule 79 (*b*)	Fined $10 and costs.
Aug. 5	Reward Mining Co., Ltd.	Manager	Contravention of General Rule 5 by having an internal-combustion engine underground	Fined $20 and costs.
Oct. 30	Gold King Mineral Claim	Owner	Contravention of General Rule 5 by having an internal-combustion engine underground	Suspended sentence.

EXPLOSIVES USED IN MINING.

During 1935 slightly over 9,000,000 lb. of explosives were used in mining in British Columbia and approximately 4,023,000 shots were fired, of which 693,000 were fired by electrical means and 100,300 by delay methods; 18,700,000 feet of safety-fuse was used with above explosives.

It is noted that there is a gradual increase in the number of shots fired by electricity from year to year.

AIR-SAMPLING.

Many air samples were taken in the metalliferous mines to determine the condition of the air, and much of the sampling was for the purpose of establishing the effect of blasting in producing noxious gases at the faces of the longer workings.

In those samples where small percentages of carbon monoxide were found steps were taken to have the ventilation augmented or a change made in the blasting-time.

Much assistance was received from the Dominion Department of Mines during the year in the analyses of air samples and in advice on problems arising in connection with the air in mines, and this help is gratefully acknowledged.

DUST AND VENTILATION.

During 1935 many tests were made to determine the dust content of the air in mines and mills in different parts of British Columbia; by dust, reference is made to particles of material 10 microns or less in diameter (1 micron is $\frac{1}{25000}$ of 1 inch).

The tests showed that, with a few exceptions, there is much dust in the air underground, these exceptions being in those mines and parts of mines where the ventilating efficiency is much above the average.

Tests made in the vicinity of drilling operations and immediately after blasting showed a dust content of from 6,000,000 to 15,000,000 particles of dust per cubic foot of air, and many tests showed a still higher dust content; the higher dust contents were generally found in long workings where the ventilation is produced by "booster" fans and limited in quantity, but high dust counts were also found in many stoping operations and in the vicinity of ore-transfer chutes.

Tests made in drifts for several hours after blasting showed very little reduction in the dust content, and one series of tests in an 800-foot drift showed over 8,000,000 particles of dust nine hours after blasting; no work of any kind had been done in this drift between blasting and the tests. A series of tests made in one of the main levels of a large mine where 32,000 cubic feet of air was passing per minute showed over 4,000,000 particles of dust per cubic foot of air; these tests were made at a considerable distance from any dust-producing operations and to the ordinary senses the air appeared to be free from dust or smoke.

Many other tests taken in air that showed no visible signs of dust actually showed very high dust contents.

In a stope where several drills were running thirty tests taken at one-minute intervals showed over 8,000,000 particles of dust per cubic foot of air, and a simultaneous test extending over the half-hour interval showed that very little, if any, of the fine dust settled to the floor of the stope during this period.

The tests generally establish the fact that once fine dust is discharged into the mine-air there is very little tendency towards a later separation of the dust and air while in the mine, and certainly not while the ordinary operations of the mine are being carried on.

In very few of the long prospecting and development workings where the ventilation is dependent on "booster" fans is there a sufficient volume of air in circulation to replace the atmosphere once in a working-shift, and in many cases the same applies to some more advanced operations.

The ventilation of the mines is generally very satisfactory in so far as the supply of sufficient oxygen for the respiration of the men is concerned, but, with the exceptions previously mentioned, it falls far short of being efficient in quickly removing dust-laden air from the mines.

At present all drilling is carried on with the application of water and at all the larger mines water sprays are in use in bulldoze chambers and at ore-transfer chutes, and it is common practice to spray all blasted material as soon as the faces can be reached in efforts

to reduce the amount of dust produced. The foregoing tests show that these precautions are not sufficient to reduce the dust content of mine-air to a desirable minimum, and the only practical means available at present in attaining this minimum is by providing a sufficient volume of constantly maintained ventilation to reduce the dust content per unit volume of air. Where a mine is entirely dependent on the natural ventilation produced due to the difference of elevation between the different mine openings and variations of temperature, there are seasonal, and often daily, changes in the direction and volume of air-flow, with consequent baffling currents and periods when there is practically no definite air-flow either into or out of the mine, and during such periods any dust-producing operations are simply augmenting the dust content of the still air.

This report does not deal with the nature of the dusts found in the different mines and the degree of danger presented by the different dusts, as at the present time eminent research-workers are not in agreement regarding which dust or dusts constitute the greatest danger to the respiratory organs of miners; but it is beyond doubt that no dust can be helpful, and that the only practical means so far developed to efficiently deal with the dust-hazard is a sufficient current of air to dilute and remove such dust as speedily as possible.

That such means of reducing the dust-hazard are both practicable and inexpensive is evidenced by the installation, during 1935, at one of the largest mines in the Province of a modern high-speed fan capable of passing 100,000 cubic feet of air per minute through the mine, which was already well ventilated according to current standards; this fan was installed at a cost of less than $8,000 and has definitely reduced the dust content in the general air in this mine. Further details of this fan is given in the Inspector's report of the *Sullivan* mine.

Other progressive mine operators are giving considerable attention to the value of augmented ventilation as a means of directly reducing the dust-hazard, and it is confidently expected that fan-produced ventilation constantly maintained will be a standard feature at all the larger metalliferous mines in the near future.

FIRST-AID AND SAFETY WORK.

First-aid classes were carried on at all the larger mining operations during 1935, and in addition to these qualified first-aid men who kept up their training and practice many new men were attracted to this work. In most cases these classes were organized in close co-operation with safety committees, and this combination tends not only towards ensuring immediate help for those injured in the industry, but makes all concerned more safety-conscious.

In addition to the safety committees and first-aid work formerly organized and maintained at Britannia, Kimberley, Fernie, Michel, Vancouver Island, and other mining centres, this work advanced during the year, and at many of the more isolated mines safety committees or first-aid work has become firmly established; these include Premier, Big Missouri, Pioneer, Bralorne, Minto, Cariboo Gold Quartz, and Reno mines.

These safety committees function in different ways, as at some of the larger mines meetings are held in regular form and a record kept of the matters discussed and recommendations made, while at the smaller mines the meetings and discussions are quite informal; at all meetings those attending are encouraged to raise any points leading to greater safety in mining.

Many practical recommendations result from these safety committees on details that may escape the notice of those charged with maintaining safe conditions in mines, and when it is realized that details often provide the final link to complete the circumstances that produce an accident the value of the work of such safety committees will be understood.

Some of these meetings are held as the men come off shift, so that both shifts can attend, while at Britannia mine a safety meeting is held underground in each section of the mine every two weeks, and all men employed in the section are required to attend to hear or take part in safety discussions.

The safety committee is the best safety educative system that has been evolved, as the general body of the men can be directly reached and interested on the safety methods of carrying out their daily work.

Of the fifteen fatal accidents described earlier in this report, it may be noted that none of these fatalities resulted from abnormal conditions or dangers, but rather from errors of

judgment and failure to observe practical safety precautions such as all safety committees inculcate.

It is hoped that during 1936 safety committees will be organized at those mines where the value of this work has not yet been realized.

HEALTH AND WELFARE.

The application of the X-ray as a means of determining the condition of the lungs of underground workers was greatly extended during the year, and at some of the larger mines all applicants for underground work are so examined before being employed; in addition, all underground employees at Britannia, Kimberley, Pioneer, Bralorne, and Cariboo Gold Quartz mines were examined by means of the X-ray during 1935, and it is probable that such an examination will be made yearly. The men generally welcomed this examination. With the exception of the Cariboo Gold Quartz mine, there are X-ray installations at the above mines.

At the Kimberley mine of the Consolidated Mining and Smelting Company of Canada a modern solarium was installed during 1935 after a representative committee of the men was appointed to visit the Bunker Hill mine at Kellog, Idaho, where a solarium was already in use, and on the recommendations of the committee the above company built the solarium at Kimberley.

The solarium consists of a cabinet 8.6 feet wide, 8 feet high, and 12 feet long, and is finished in aluminium colour to provide the proper light diffusion, and is equipped with a conveyor on which those taking the treatment travel through the cabinet; the conveyor-speed is controlled to suit the length of exposure required by different individuals.

The conveyor is driven by a ¾-horse-power motor through a Tex-rope drive to a variable-speed Reeves transmission which is direct-connected by a flexible coupling to Work gear-speed reducer; the drive from the speed-reducer to the conveyor consists of roller chains and sprockets.

The control cabinet is constructed of sheet steel and houses all the switches for controlling each individual lamp, voltmeters, motor-starting switch, fan-switches, speed-control, and tachometer.

The equipment of the solarium cabinet consists of six 110-volt quartz mercury vapour lamps (three lamps mounted on each side of the conveyor) arranged to give equal radiation; each lamp is provided with an automatic starter, separate voltage regulator and voltmeter; these lamps are air-cooled and automatically started by a preheater and relay cut-out. As soon as the arc is established the relay automatically cuts out the heater.

The lamps operate at approximately 75 volts direct current, and it is important that each burner be kept absolutely clean, as any dirt or finger-prints would be etched into the quartz and could not be removed.

During the time that the solarium has been in use 92 per cent. of the men at the mine have taken regular treatments, while advantages of the installation are also enjoyed by the mill crew, school-children, and the general public in the community, all treatments being given free of charge by the company.

It is stated that a one-minute treatment of these ultra-violet rays is equal in effect to eight hours' sunshine, and those using the solarium regularly report a marked decrease in colds and minor winter ailments.

The total cost of the solarium was $15,000.

QUARRIES.

There was considerable increased activity in quarrying and in sand and gravel production during 1935 as compared with 1934, and this was reflected by the greater number of men employed. There were 536 men employed in quarries and sand-pits, as compared with 377 men in 1934, and there were 270 men employed in processing plants in 1935, as compared with 187 men in 1934.

There was one fatal accident in quarries during the year; this was largely due to the deceased block-holing with an air-drill with his back to the broken material on the quarry-face. A small slide of material occurred and he could not see it or hear it because of the noise of the drill.

Orders were issued prohibiting men from drilling with their back to potentially dangerous ground.

LILLOOET MINING DIVISION.

BY

THOMAS R. JACKSON.

Pioneer Mine.—Operated by the Pioneer Gold Mines of B.C., Limited. H. T. James, general manager; E. F. Emmons, mine manager; Paul Schultz, mill superintendent. For information *re* power and mill plant, bunk-house, hospital, etc., *see* former reports.

No. 2 shaft has been sunk to a depth of 3,313 feet. During the year the following work was done: Drifting, 6,978 feet; crosscutting, 2,350 feet; raising, 1,510 feet; and sinking, 794 feet.

Ventilation of the mine is accomplished by natural means and the use of fans where necessary. There is a good natural current of air prevailing and on the fourteenth level it remained fairly constant between 13,000 and 14,000 cubic feet per minute. On account of the depth the temperature of the air in the levels below the fourteenth level increases and ranges from 60 to 84 degrees towards the shaft-bottom. The temperature will be greatly reduced when all the new lower levels are connected. The writer has advocated to the management the use of an efficient fan in view of the deep workings. One fatal and several serious accidents occurred during the year; these were all investigated. A number of mine-air samples were taken in the worst-conditioned places, and the analysis showed that some of the places contained air that had to be improved if work was to be continued. Several committees are functioning along welfare, safety-first, and co-operative lines and take up the different points of interest with the management. There were 280 men on the pay-roll at the end of the year.

The writer found the provisions of the "Metalliferous Mines Regulation Act" consistently adhered to.

Arizona Mine.—Operated by the B.R.X. (1935) Consolidated Mines, Limited. E. R. Shepherd, general manager. The main adit was driven 1,840 feet from the portal and drifts several hundred feet north and south from this point. At the end of the year a winze was being sunk in the north drift. An Ingersoll-Rand 500-cubic-foot-per-minute compressor is being installed to augment the present power-installation. Ventilation is maintained by an electric-driven fan situated at the mine portal and was found to be satisfactory throughout the year; air samples taken at the working-faces were also found to be satisfactory. Twenty-six men were employed during the year; the company bunk-house was not in service and men arranged for housing accommodation privately. General conditions were found to be good on the different inspections and there were no serious accidents; minor accidents were treated by the first-aid man on the premises. Accident-prevention measures are ably maintained, the "Metalliferous Mines Regulation Act" being well observed.

Bralorne Mine.—Operated by the Bralorne Mines, Limited. Richard Bosustow, general manager; Fred E. Gray, general superintendent; Ted Chenoweth, mine manager; Don Mathieson, assistant mine manager. For information *re* power and mill plant, bunk-house, hospital, etc., *see* former reports.

During the year a total of 19,556 feet of exploration and development work was driven in the *Bralorne* mines (including the *Bradian*), besides 688 feet of raises, 127 feet of shaft, and 168 feet of winzes. A winze was started from the 1,100 to the 1,200 level; King No. 2 shaft was started from the 1,100 level down and at the end of the year was almost down to the 1,200 level. A crosscut was started from the King mine on the 800 level to connect with the Empire shaft and it was driven 2,849 feet during the year. The Empire shaft was equipped with a new double-drum electric hoist and cages. An electric triplex pump was placed on the 600 level for pumping the water from the Empire workings. No major changes were made in the mill or power plant, although another 926-cubic-foot-per-minute air-compressor was installed in the Empire (Bradian) compressor plant. A new school-house was built and the teaching staff increased to two. Forty-one new modern houses were constructed for the

employees and a regulation-sized hockey-rink was built for recreation. Safety-first committees were organized in both mine and mill and regular monthly meetings are held at which conditions affecting safety are discussed. There is also a co-operative committee composed chiefly of underground men. The business of this unit is to bring to the notice of the officials of the company any complaints so that they can be adjusted amicably. The mine is ventilated by natural means augmented by fans where necessary. At the last measurement there was 25,000 cubic feet of air per minute passing into the main adit. There was 10,000 cubic feet of air per minute passing through the eleventh level. A large number of mine-air samples were taken during the year, and with the exception of a few of them the analysis showed the air composition to be in compliance with the Act. One fatal and several serious accidents occurred during the year. Accident-prevention measures are diligently applied both by employees and officials and a keen interest was displayed in first-aid work. Three hundred and twenty men were employed. The provisions of the "Metalliferous Mines Regulation Act" were well observed throughout the year.

Wayside Mine.—Operated by the Wayside Consolidated Gold Mines, Limited. P. E. Ritchie, managing director; J. A. McKenzie, mine manager; E. Lovitt, engineer; O. Matthews, mill superintendent. Mine ventilation is natural and at the present time quite adequate for all mining purposes. The winze-workings will be ventilated by means of a fan. Accident-prevention measures are well attended to and a first-aid attendant and qualified doctor render the necessary care and treatment to the injured. One serious accident occurred during the year. There were forty men employed between surface and underground workings, and some temporary improvements were carried out on the housing accommodation of the mine employees and office staff, pending the construction of a modern bunk-house. A 100-ton mill was erected during the latter part of the year. The "Metalliferous Mines Regulation Act" was found to be fully observed.

Pacific Eastern Mine.—Operated by the Pacific Eastern Gold Mines, Limited. Charles R. Cox, superintendent. Development at the end of the year consisted of 634 feet of adit-level leading to the hoist-room and rope raise, ore-pocket and shaft-station, situated 550 feet from the portal. The sinking programme necessitated a 3-compartment shaft 542 feet deep, with a 12,000-cubic-foot sump, a pumping-station at the 370-foot level, and a main crosscutting-station at the 520-foot level. The crosscut from this station had advanced to 853 feet at the end of the year. The power ventilation consists of a 720-cubic-foot Gardner-Denver compressor operated by a 100-horse-power synchronous motor, and the usual blacksmith-shop equipment, including an Ingersoll-Rand "C" sharpener. Ventilation is provided by a 1,600-cubic-foot Sirocco fan and 3,000 feet of 12½-inch diameter fan-pipe. Hoisting is by a Mead-Morrison double-drum hoist, handling two 1-ton automatic dump-buckets. Pumping from the 370 station is by a 500-gallon Pomona pump and from the bottom by a 75-gallon electric centrifugal pump. All power is provided by the B.C. Electric Company and the drifts are lighted throughout. Satisfactory camp accommodation is provided for forty men and there is a qualified first-aid man at the mine; there were several serious accidents in the shaft-sinking operations but no fatalities. There was an occurrence of methane gas underground in December; details of this are given elsewhere. General conditions were found to be satisfactory throughout the year and in compliance with the "Metalliferous Mines Regulation Act."

The following mines were regularly inspected during the year: Bonanza Cache Gold Mines, Limited, Lillooet; Mix Gold Mines, Limited; Pilot Gold Mines, Limited; Congress Gold Mines, Limited; Federal Gold Mines, Limited; and the Olympic Gold Mines, Limited. The above are all adit operations and conditions were generally found to be satisfactory during the year. In the *Pilot* mine there was a double blasting fatality which is given in detail elsewhere in this report.

Minto.—Operated by the Minto Gold Mines, Limited, Bridge River. Warren Davidson, superintendent; Chris. Madson, mill superintendent. This mine was operated throughout the year. Diesel engines supply the power necessary for compressed air and electric lighting. The underground workings are not extensive and the ventilation is by natural means; several mine-air samples were taken in the course of the year and the analyses of the samples showed the underground air to be satisfactory. The camp accommodations are modern and satisfactory and the underground operations were found to be in good condition at the different

inspections throughout the year. There were two serious and several minor accidents, all of which were investigated.

CARIBOO MINING DIVISION.

BY

THOS. R. JACKSON.

Cariboo Gold Quartz Mine.—Operated by the Cariboo Gold Quartz Mining Company, Limited, Wells. R. R. Rose, managing director; R. E. Vear, mine superintendent; J. D. Boulding, mill superintendent; and P. Johnson, master mechanic. This property is situated at Wells, on the north-east end of Jack of Clubs lake, at an elevation of 4,000 feet. There are 130 men employed underground and seventy-five men on the surface. Accommodation is provided for single men in the bunk-houses at the mine, while twenty-six married men and families live in company-owned houses on Wells townsite.

The 1,500-foot adit-level is the main haulage-level and the mine is worked on the 1,400-, 1,300-, 1,200-, 1,100-, and 1,000-foot levels above and on the 1,600- and 1,700-foot levels below it. Nos. 2 and 3 shafts were sunk below the 1,500-foot level during the year. Natural ventilation is utilized between the 1,500- and 1,000-foot levels, while fans supply fresh air to the main adit-face, 1,600- and 1,700-foot levels, and to other drifts where necessary. The main adit was 4,335 feet in length at the end of December.

During the year the mill was enlarged to treat 150 tons of ore per day. The dry was extended to give more accommodation and a new powder-magazine was built. Twenty-four new houses were built in Wells for married employees and a completely equipped nine-bed hospital was erected. One 75-k.v.a. generator was added to the power-house equipment during the year. There were two serious but no fatal accidents. A qualified first-aid man treats all accidents immediately and all employees are provided with small first-aid kits which they are required to keep in their immediate possession. The hospital is fully modern in construction and equipment and is supported financially by the company and the employees. Conditions were found to be fully in accordance with the requirements of the "Metalliferous Mines Regulation Act."

Island Mountain Mine.—Operated by the Island Mountain Mines, Limited. M. D. Banghart, general manager; R. Shraeder, mill superintendent. This mine is situated on the Quesnel–Barkerville highway opposite the Cariboo Gold Quartz mine. Two bunk-houses and a dining-room provide adequate accommodation for the crew of 100 men. Ventilation is both natural and mechanical. The lower levels are well connected to the upper levels by raises and manways. Two fatal accidents occurred during the year; these are dealt with elsewhere in this report. Recreational facilities are provided in the bunk-house adjacent to the dining-hall, and there are two qualified first-aid men employed at the property. A number of mine-air samples were taken in places that were suspected to contain less than the required quantity of oxygen, but the samples showed by analysis that the composition of the air was quite satisfactory. The "Metalliferous Mines Regulation Act" was fully observed.

Consolidated Gold Alluvials of B.C., Ltd.—This company operates at Wingdam, with D. Campbell-Mackenzie as general manager; Leroy Cokely, assistant superintendent; and T. W. Scott, mine manager. This property is operated from three shafts known as No. 1, Melvin, and Sanderson. No. 1 shaft is kept clear of water and is regarded at present more as a proposed second outlet and ventilation medium to the Melvin shaft than as a main unit.

In the Sanderson shaft-workings the Inspection Branch ordered a second exit to be provided and this is now completed; during the year this shaft was altered to provide for two hoisting compartments instead of the single compartment that has been in use for many years, and this has very materially increased the hoisting capacity. The main power plant consists of modern Diesel units which replaced the power units destroyed by fire during the year. Modern accommodation is provided for the employees, who numbered 153 at the end of the year. Considerable attention was given by officials and employees to first-aid work and accident-prevention methods, and at the different visits of inspection the provisions of the "Metalliferous Mines Regulation Act" were found to be well observed and any points raised were remedied at once.

The following mines were regularly inspected during the year: Quesnelle Quartz, Hixon creek; Reward Gold Mining Company, Cottonwood; and Richfield Cariboo Gold Mining Company, Barkerville; the above mines were operated only during part of the year. In general the above operations were found to be in satisfactory working condition and any points that did not fully comply with the regulations of the "Metalliferous Mines Regulation Act" were remedied.

ASHCROFT MINING DIVISION.

BY

THOS. R. JACKSON.

Vidette Mine.—Operated by the Vidette Gold Mines, Limited, with Gordon F. Dickson as managing director; Richard Avison, mine manager; and L. E. Marston, mill superintendent. There is a comfortable bunk-house capable of accommodating fifty men and two other buildings are fitted up for the men who are on the graveyard shift. There was one serious accident due to a fall of ground. The general conditions were found to comply with the "Metalliferous Mines Regulation Act."

The following mines were regularly inspected during the year: Martel Gold Mines, Limited, Gladwin; Savona Gold Mines, Limited; Hamilton Creek Gold Mines, Limited, and Telluric Gold Mines, Limited, at Vidette lake; and Pavilion Gold Mines, Limited, Moran; the above mines were operated only during part of the year. In general, operations were found to be in satisfactory working condition and any points that did not fully comply with the regulations of the "Metalliferous Mines Regulation Act" were remedied.

PLACER OPERATIONS.

The following placer operations were inspected during the year: Gaugler placers; and Cumings & Campbell, Limited, placers at Gladwin; Alberta Pacific Oil Company and Baird placers at Lillooet; Lowhee and Sang Dang placer at Wells; Slade Cariboo placers at Wingdam; Placers Engineers at Keithley; Bullion Placers, Limited, at Likely; Hixon Creek placers, Hixon. There were 150 men employed at the above placers, the Bullion and Hixon operations being the largest, with forty and twenty-four employees respectively. General conditions were found to be satisfactory during the year and all recommendations made in the interests of safety were given immediate effect.

SOUTHERN COAST INSPECTION DISTRICT.

BY

JAMES STRANG.

VANCOUVER MINING DIVISION.

Fifteen operations were visited at various times throughout the year; the total number of men in and around the mines averaging about 750. The need for more efficient systems of ventilation is being stressed at all the mines. Generally the main levels are well ventilated, but in many cases the working-places, although fairly well ventilated, do not have sufficient air travelling to carry away quickly the fine dust raised by blasting and mucking. In some of the mines dust samples have been taken under varying conditions in drifts, crosscuts, winzes, and raises, and much information has been gained as to the need for carrying greater quantities of air directly to the working-faces.

The condition of manways and ladders was generally good and where any improvements were necessary there was no hesitation in carrying them out. The explosive in general use is Polar Forcite. Blasting is done by fuse, but in shaft-sinking and in some raises and winzes it is done by electric detonators.

Only one fatal accident occurred in the district, a report of which was submitted to the Chief Inspector; but quite a number of lost-time injuries occurred which could have been avoided had ordinary precautions been taken and a more general use made of gloves, safety-shoes, and goggles.

Britannia Mining & Smelting Co., Ltd.—C. P. Browning, general manager, Britannia Beach; C. V. Brennan, assistant general manager; C. G. Dobson, mine superintendent; G. C. Lipsey, assistant mine superintendent; and N. D. Bothwell, safety engineer. A greater number of men were employed than in 1934.

In the *East Bluff* mine the ore is broken by the Britannia method of powder-blast mining, the ore being drawn through the various chambers on the 1,200-foot level. Preparations for mining are being made between the 1,400- and 1,200-foot levels. Ten bulldoze chambers have been built on the 1,400-foot level and it is the intention of the company to install a larger fan on this level to deal with the smoke and dust from the chambers. In the *West Bluff* section production is chiefly from the pillar stopes; the ventilation here is good.

In the *Victoria* mine, where the square-set or rill method is used, timbering is well done and ventilation is good. The stopes are all tightly filled with glacial material drawn from two glory-holes. This method, besides supporting the workings, helps to keep the air-current well up to the working-faces.

At the *Victoria* shaft a larger hoist-motor was installed, thereby increasing the hoisting efficiency. Work was resumed on the 4,100 adit this year, an advance of 1,269 feet being made. This will eventually be the main haulage-level for the whole operation. Two exhaust-fans with 20-inch air-lines keep a fair current of air at the face.

It is pleasing to note that the interest in first-aid work is unabated. Forty-one men received various grades of awards from the St. John Ambulance Association and in the last three months five instructors have held classes for men, women, boys, and girls at different times.

Education in safety methods has been stressed in all departments. A few of the improvements this year are: Storage-battery tail and head lights for the *Victoria* shift train which illuminates the ground 100 feet ahead of the car; an effective dust-settler is being developed for bulldoze chambers; improvements in the design and clearance of mine transfer chutes; brackets for the *Victoria* cages which makes for safer handling of drill-steel; a study of various types of safety-toed rubbers for possible adoption underground.

Although the number of severe accidents has not been large, there is room for improvement in the general accident-rate. This can be helped considerably by encouraging the use of goggles, gloves, and safety-shoes in various classes of work.

This year the mill came under the inspection of the Inspector of Mines and general conditions were found to be good. Alterations and improvements include, at the Beach, a splendid new bunk-house and dry-house. The bunk-house has sound-proof walls and rooms contain two beds with individual dressers and clothes-closets.

B.C. Nickel Mines, Ltd.—The property of this company is situated near Choate and is under the supervision of C. B. North. Inspections were made throughout the year and general conditions were found to be good. Ventilation generally was good and where timbering was necessary it was well done. Good first-aid equipment is kept at the mine and a competent first-aid man is employed.

Clayburn Co., Ltd.—The fireclay mines of this company are situated at Kilgard and work has been very irregular throughout the year. General conditions in the mines were found to be good. Timbering was good and the ventilation was ample for the number of men employed.

Siwash Creek Placer Mine.—This mine is situated near Yale. A visit was made to the property when it was reported that a blasting accident had occurred. Three men were working here. Two men were injured in an accident reported to have been due to a premature explosion. This accident was investigated and fully reported to the Chief Inspector. General conditions were found to be fairly good.

The properties of the Ashloo Gold Syndicate, Loughborough Gold Mines, and Gem Gold Mines were inspected and conditions found to be satisfactory. Ideal Gold and Nickel Mines, Limited, worked for a time during the year.

ALBERNI AND NANAIMO MINING DIVISIONS.

General conditions were found to be satisfactory at the properties of the following companies inspected in 1934: Vancouver Island Gold Mines, Limited; Hercules Consolidated Mining and Smelting Company; Shoal Bay Gold Mining Syndicate (*White Pine* mine); Northern Mining and Milling Company (*Thurlow* gold mine). A good first-aid room with

complete equipment was built at the beach camp of Hercules Consolidated Mining and Smelting Company.

CLAYOQUOT MINING DIVISION.

Working conditions were found to be good at Abco Mines, Limited, *Big Boy* mine, and Ormond Mines, Limited.

NANAIMO MINING DIVISION.

*Tyee Mine.**—This property, owned by the Tyee Consolidated Mining Company, Limited, is situated on Mount Sicker near Duncan. The only work done during the year was the cleaning-out of the No. 3 adit on the *Lenora* claim and the retimbering of the upper section of the shaft on the *Tyee* claim. Work was discontinued in July. The management was notified that the upper part of the *Tyee* workings must be dewatered before any advance of the *Lenora* workings can be permitted.

*Georgina Gold Claim.**—J. T. Williams and associates are developing this claim, situated on Nanoose creek, about 18 miles north of the city of Nanaimo. A small shaft was sunk on the property on the side of the creek to a depth of about 35 feet on the pitch of the vein and drifting from it was carried under and across the course of the creek. The work done was entirely of a prospecting nature and as such was found to be in a satisfactory condition.

NICOLA-PRINCETON INSPECTION DISTRICT.

BY

JOHN G. BIGGS.

Twenty different mining developments in this district were inspected several times during the year. One fatal and three serious accidents occurred in this district.

KAMLOOPS MINING DIVISION.

Kamloops Homestake.—Operated by the Kamloops Homestake Mines, Limited. Angus McLeod, manager. The hanging-wall in this property is a talc-schist that requires very careful timbering to protect the mine, and during the year this and other matters pertaining to safety were found to be well attended to. Thirty-nine men were employed here at the time of the writer's last inspection. A 50-ton mill and necessary camp buildings were built.

OSOYOOS MINING DIVISION.

Nickel Plate.—Operated by the Kelowna Exploration Company, Limited. W. C. Douglass, manager. An electric hoisting unit was installed on the main slope and it is supplied with 440 volts from a bank of transformers near the hoist-station, the power being carried underground at high tension. Early in the year connection was made with the power-supply of the West Kootenay Power Company and the hydro-electric installation owned by the mining company was shut down. A new pipe-line has been laid up 20-Mile creek and provides an ample supply of water to the Nickel Plate and Hedley Mascot mills. The surface incline has been tracked with 30-lb. steel and new haulage-ropes were installed to handle the 5-ton-capacity skips; on this installation the use of friction-brakes has been discarded and control is now by motor-driven drums. The mine, tram, and mill were found to be in satisfactory condition and the provisions of the "Metalliferous Mines Regulation Act" fully observed. One hundred and ninety-five men were employed at the end of the year.

Hedley Mascot.—Operated by the Hedley Mascot Mining Company, Hedley. W. R. Lindsay, manager. Transportation between the mine and mill is by a Quad aerial tram on which skips of 2.5-ton capacity run on double-track cables of 1⅝-inch diameter, which are supported by six towers spaced over the 4,700-foot length of the tramway, which is at an angle of 40 degrees. The traction-rope is ⅞-inch diameter and is controlled by a 75-horse-power motor and friction-brakes. A camp has been established near the mine and provides satisfactory accommodation for the forty men employed; the camp is heated efficiently by an "Iron Fireman" installation. A mill of approximately 150 tons capacity was nearing completion

* By George O'Brien.

at the end of the year. The requirements of the "Metalliferous Mines Regulation Act" were found to be observed.

The *Windpass* mine was inspected and conditions were generally found to be satisfactory.

The following properties were examined and working conditions found to be satisfactory: Nicola Mines and Metals, Limited, in the Nicola Mining Division; Hedley Amalgamated, Gold Mountain, and Hedley Sterling in the Osoyoos Mining Division; Lakeview-Dividend, *Morning Star, Susie, Grandoro,* and Mak Siccar in the Osoyoos Mining Division.

NORTHERN INSPECTION DISTRICT.

BY

CHARLES GRAHAM.

ATLIN MINING DIVISION.

Two visits were made to the Atlin district during the year on account of the number of underground placer operations. Of the thirty-three separate producing properties, twenty-eight are, with one exception, small underground operations employing from two to seven men. Most of the operations in the district are on Spruce creek. With the exception of the Columbia Development Company, all of the operations on this creek are underground. The Columbia Development Company operates two steam-shovels, a second shovel having been taken in during the year.

Colpe Mining Co., Ltd.—This is the largest underground operation and has worked continuously during the year. The second exit ordered at this mine has been completed and, in addition to providing a second means of exit, also greatly improved the ventilation. Conditions here on the last inspection were good. Twenty-nine men were employed on two shifts.

All the other underground operations were inspected on both visits.

The greatest danger on this creek is in the lack of secondary exits to provide means of escape and insufficient ventilation. Recommendations were made with the view to remedy these conditions.

Air samples were taken in three of the small operations, all of which showed deficiency in oxygen and excess in black-damp.

Timbering generally was well done and kept up sufficiently close to the face.

One fatal accident occurred in the Buchanan and Cummings lease, in which a miner was killed by a cave-in. Apparently a small sluff or run of ground had been following the drift from some distance. This had not been blocked above the lagging, leaving a space of from 2 to 3 feet open above the timbers. When the cave occurred at the face, it broke down the false set and two main sets closest to the face. A miner was caught in the cave-in and instantly killed.

This practice of neglecting to block up ground that has a tendency to run is a bad one. The attention of those engaged in the district has been drawn to it.

The cost of timber is extremely high, low-grade spruce and pine only being available.

Other placer operations on Otter, Boulder, McKee, Ruby, Pine, Gold Run, Birch, and Wright creeks and O'Donnel river were inspected.

None of the lode operations in the district operated during the year.

About forty-five men, whites and Indians, were employed on Squaw creek during the summer, principally on individual operations. The Gold Run Exploration Company, the only company operating, employed twelve men.

Whitewater, Tulsequah River.—This property was operated by the E. C. Congdon interests, of Duluth, Minn. At the time of inspection the installation of a fan was recommended to improve the ventilation. Operations were suspended for the winter.

Prospecting operations were carried out in the McDame and Tibbett Creek areas in the Liard Mining Division.

NASS RIVER MINING DIVISION.

Granby Consolidated Mining, Smelting, and Power Company, Ltd.—Operations at the *Hidden Creek, Bonanza,* and *Granby Point* mines of this company ceased on July 31st. All plant and equipment was withdrawn from the underground workings and the mines abandoned.

In the Alice Arm area the *Esperanza* was reopened and a 25-ton mill constructed. The *Dolly Varden* was worked under lease.

PORTLAND CANAL MINING DIVISION.

Premier Gold Mining Co., Ltd.—B. F. Smith, general manager, and J. G. Pearcey, mine superintendent. Conditions generally were found to be good on the various inspections made.

The first District First Aid Competition in the Northern District for the Department of Mines Cup was held at Premier on May 23rd, four teams competing—Anyox, Premier Mine, Premier Mill, and Big Missouri. The Anyox team, captained by Sam Reid, was declared the winner after a very close contest. The meet was very successful, the presence of the Anyox team greatly assisting to that end. The competition has done a great deal to stimulate interest in first aid in the district.

Big Missouri.—Five thousand nine hundred and four feet of underground workings were driven during the year. Conditions generally were good at the time of inspection.

Diamond-drilling was done on the *Hercules* and *Salmon Gold*, and prospecting on the *Unicorn, Troy, Spider*, and several other small properties in the Salmon River area.

The *Dunwell, Ben Ali, United Empire, Excelsior, L. and L.*, and *Black Hills* were worked part of the year, and a little work was done on the *Glacier Gulch, George Enterprise, Sunbeam, Lakeview, Portland Canal, Roosevelt, L.L. and H.*, and *Lucky Date* properties in the Bear River section.

Helena Gold Mines, Limited, did some work on their Georgia River property.

QUEEN CHARLOTTE MINING DIVISION.

The old shaft-workings of the *Sunrise* property on Graham island were tapped by an adit and drained.

SKEENA MINING DIVISION.

The *Surf Point* mine on Porcher island was operated throughout the year and conditions on inspection were found to be good.

The *Surf Inlet* mine on Princess Royal island was under development during the year.

OMINECA MINING DIVISION.

No underground work was done on the *Dardanelles* group of Omineca Gold Quartz, Limited, on Copper creek. The *Columario* near Usk was closed down in June. Conditions were found to be good at the property of Nicholson Creek Mining Company.

The *Mamie, Rio Grande*, and *Glacier Gulch* properties in the Smithers section were under development.

Prospecting only was done on properties in the Telkwa, Houston, and Topley sections.

In the Aiken Lake area Consolidated Mining and Smelting Company drove about 1,000 feet of workings during the year.

Northern Ventures abandoned underground operations on Vital creek and are arranging to commence hydraulic operations.

Germansen Creek Placers, Limited, on Germansen creek, Consolidated Mining and Smelting Company on Slate creek, and Omineca Placers, Limited, on Manson creek operated during the season.

Several individuals worked underground on Lost creek.

WEST KOOTENAY AND BOUNDARY INSPECTION DISTRICT.

BY

H. E. MIARD.

This district includes the Nelson, Trail Creek, Ainsworth, Slocan City, Slocan, Lardeau, Revelstoke, Arrow Lakes, Grand Forks, and Greenwood Mining Divisions. During 1935 considerable activity prevailed in the gold-mining section of the inspectorate, particularly in the Nelson and Trail Creek Mining Divisions, while but a very moderate improvement could be observed in the silver-lead-zinc belt, the most important development in the latter part of the district being the reopening of the *Mammoth* mine at Silverton, which has been operated con-

tinuously since the month of May. A steady and reasonable price for silver would do much towards rejuvenating the industry in at least four of the mining divisions previously enumerated.

In the course of regular inspections eighty-four underground operations were visited. Of these, twenty-six had been abandoned at the end of the year, for an indefinite period in a few instances, but, in the majority of cases, for the winter season only. Work on the Rossland leases has been proceeding on a much reduced scale and in a desultory manner since the month of August. In the early part of the year these operations gave employment to more than 250 men.

During the year 279 certificates of competency as blaster were granted under the provisions of the "Metalliferous Mines Regulation Act." Of these, twenty-seven were issued as substitutes, while the scope of thirty-two was restricted to hand-steel operations and ten more covered incidental blasting and transportation of explosives only.

The ventilation of underground workings continued to claim its share of attention, and, while undeniable progress can be recorded, it must be admitted that better conditions should exist in some cases in this respect. The ominous prominence assumed by the dust problem within recent years accentuates the desirability of keener interest being taken everywhere in this supremely important matter. While general metal-mining technique has taken gigantic steps forward during the past two or three decades, the ventilation of drifts and stopes is still but too often abandoned to the whims of uncontrollable natural agencies. Satisfactory results are obtained at some operations from skilfully conducted air-currents moving under the influence of differences in temperature only, but in other cases the need for properly managed ventilation induced by mechanical means is becoming constantly more evident.

Samples of mine-air were taken and sent to Ottawa for analysis, when doubts were entertained regarding the efficiency of the ventilation. Naturally, a few of these samples disclosed conditions which were not exactly what they should have been, although only two contained more than 0.01 per cent. of carbon monoxide (0.02 and 0.03 respectively). A minute quantity of it was found in two other samples, while the presence of traces of a different inflammable gas, supposed to be hydrogen in two instances and definitely identified as such in two other cases, was also recognized. The lowest percentage of oxygen found was 20.51 and the highest carbon-dioxide content of any sample was 0.5 per cent., both accompanying the maximum ratio of combustible gases recorded. As, normally, the appearance of carbon monoxide and hydrogen in the atmosphere of a metalliferous mine denotes incomplete removal of powder-fumes, the presence, or absence, of even a mere trace of these gases in the air some time after blasting may be taken as an idea of efficiency as far as the ventilation is concerned.

Where stoping by the shrinkage method is in vogue, it is occasionally found that, in order to meet the demands of the mill, ore has been drawn to such an extent that the surface of the broken rock stands at an inconvenient distance from the back. When this happens, one of the advantages of the shrinkage method is lost, with the result that the conditions prevailing resemble those accompanying ordinary overhand stoping and must be met in the same way. The managements of all operations at which such a state of affairs could be brought about were advised that, whenever the surface of the broken ore stands more than 10 feet away from the back, substantial platforms must be erected to permit the carrying-out of drilling and blasting operations under safe and convenient conditions until the surface of the broken rock has been brought up again within a reasonable distance from the solid ore.

With the shrinkage method, the final drawing of stopes may present greater risks than their advancement, this depending largely upon the nature of the ground, the width of the vein, and the length of time during which the broken rock has remained partly undisturbed. Careful scaling is indispensable as the broken ore goes down, and timbering is often necessary. The difficulties presented by the drawing operation and the possibility of accidents depend largely upon the distance between levels and, generally, increase in direct ratio thereto. Very good reasons may be advanced in support of the contention that this distance should never exceed 125 feet.

The new "Metalliferous Mines Regulation Act" prescribes a definite course of action on many points which the legislation that it superseded, on March 23rd, 1935, left undecided. However, one of the immediate and highly beneficial effects of this enactment was the fact that it was read more attentively than the old Act had ever been, and brought to the attention of

the operators a number of important features of the latter, carried into its successor, to which seldom more than a passing thought had been bestowed in the past. At the smaller operations some difficulty is experienced in obtaining satisfactory compliance with the provisions of General Rule 76 (*a*), as far as having clear and explicit details of the daily examination of the workings entered in the report-book is concerned. This of course is no new experience, for it was but seldom that one found a small mine at which the demands of former General Rule 16 were strictly complied with in this respect. Special rules have been instituted at seven of the larger operations, in accordance with the requirements of section 29 of the new "Metalliferous Mines Regulation Act."

Ninety-seven accidents were reported during the year. Of these, three were fatal, involving the loss of four lives, thirty-one were serious, and sixty-three slight. The fatal accidents are described in detail in another section of this report. One, claiming two victims, was due to a fall of rock in a stope; another resulted from carbon-monoxide poisoning; while in the third case a man fell into a raise the top of which was adequately protected. Among the other mishaps recorded, many were clearly avoidable and would not have occurred had appropriate precautions been taken, often by the man injured. The wearing of gloves, goggles, and hard-toed boots, when clearly indicated, would undoubtedly shorten the list of minor accidents considerably.

Three blasting accidents were investigated (one having actually taken place in 1934). As results of these inquiries, Certificate of Competency as Blaster No. 7221 was cancelled, and Certificates of the same class Nos. 7315, 583, 7230, and 10490 were suspended, each for a period of three months. With our present knowledge of the matter, the high quality of all blasting supplies in use, and the very precise regulations governing the handling of explosives, accidents of this source should be a thing of the past. When such mishaps occur they may almost invariably be ascribed to carelessness.

During the summer well-attended first-aid classes were conducted by Dr. N. E. Morrison, of Salmo, in the Sheep Creek section of the Nelson Mining Division. The isolated situation of the majority of the metalliferous mines, coupled with the comparatively small number of men employed at each separate operation, complicates the work of disseminating knowledge of this all-important subject, and ambulance classes can be held only at the cost of considerable inconvenience to the lecturer and, at times, to those attending.

There was one prosecution instituted under section 44 of the "Metalliferous Mines Regulation Act," this arising out of a breach of General Rule 5, and a conviction was obtained.

The only dangerous occurrence reported was the failure of a skip-coupling in a shaft. No personal injuries resulted and the material damage done was limited to the destruction of the skip.

It would not be possible to describe the conditions prevailing at each individual operation without exceeding considerably the space that can be allowed to this report. However, it may be stated that a large number of the properties enumerated in the following list are old operations, reopened after being abandoned for many years in some instances, and presenting all the difficulties that can normally be expected in such circumstances, this fact being particularly noticeable in the case of mines worked by leasing miners whose financial situation does not permit the undertaking of extensive repairs.

NELSON MINING DIVISION.

The following properties were operated throughout the year: The *Reno, Queen, Kootenay Belle, Gold Belt, Salmo-Malartic, Second Relief,* and *Arlington,* in the Salmo district; the *Yankee Girl, Ymir Centre Star,* and *Goodenough,* at Ymir; and the *Granite-Poorman,* at Blewett, near Nelson. At the *Wilcox, Ymir, Porto-Rico,* and *Ymir Dundee,* ore was mined and either milled or shipped during the summer, while development-work was carried on for several months at the *Bunker Hill, Nugget, Golden Fawn, Blackcock, Gold Cup, Howard, Gold Fern, Wisconsin,* and *Bayonne* mines, still continuing at the three operations first mentioned, while a little was done also at the *Tamarack* and the *Perrier.* Late in the year two new operations were started—the *Ore Hill,* in the Salmo district, and the *Creston Hill,* near Kitchener. Small groups of lessees worked at the *Venus,* near Nelson; the *Emerald,* at Salmo; and the *Keystone,* near Erie; but these properties were not visited.

The Consolidated Mining and Smelting Company of Canada, Limited, employed a crew of seven men for several months in development-work at the Kootenay Lake limestone-quarry, near Procter.

Mills were operated at the *Reno, Queen, Kootenay Belle, Second Relief, Yankee Girl, Wilcox, Granite-Poorman,* and by the Ymir Consolidated Gold Mines, Limited.

TRAIL CREEK MINING DIVISION.

Considerable activity prevailed on the Rossland leases until restrictions had to be placed upon the volume of the monthly shipments to the Trail smelter. The following properties were inspected during the year: The *Le Roi, Black Bear, Josie No. 1, Josie No. 2, Annie, Centre Star, Iron Mask, War Eagle, Poorman, Idaho No. 1, Idaho No. 2,* and *Iron Horse,* all owned by the Consolidated Mining and Smelting Company of Canada, Limited, and operated by lessees; the *Evening Star, Columbia Kootenay, O.K.,* and *Gold Drop,* also worked by leasing miners for some time; the *San Francisco,* on which little was done beyond repairing the lower adit; the *I.X.L.* and the *Velvet-Portland.* At the last-named property activities during the summer were practically limited to milling ore previously mined, very little underground work being done, with the result that the list of repairs somewhat overdue grew to an uncomfortable length, but is now receiving much-needed attention. A few lessees worked also for some time at the *Jumbo* and *Morning Star,* but these small properties were not visited. The *Velvet* mill was the only one operated in the Division, beside that of the Consolidated Mining and Smelting Company at Trail.

AINSWORTH MINING DIVISION.

The two major operations in the Ainsworth Mining Division were the *Utica* and the *Whitewater Deep.* At the former, development-work continued until the early part of November, when the camp was closed for the winter, while, at the latter, underground operations were carried on with a small crew and the mill treated mostly low-grade ore brought over from the *Rambler* dumps.

SLOCAN CITY MINING DIVISION.

There was very little activity in this part of the district. Small crews were employed at the *Ottawa,* and for a short time during the summer at the *Chapleau.* Four lessees worked at the *Meteor* during the greater part of the year.

SLOCAN MINING DIVISION.

The most important operation in this Division is the *Mammoth* at Silverton, which employed about ninety men at the mine and mill ever since operations were resumed in May. Other properties visited were the *Bosun, Highland Chief, Victor, Black Colt,* and *Noble Five,* the latter having been operated only during the summer and early fall. Small crews were employed also at the *Palmita,* the *Molly Hughes,* and for a short time at the *McAllister,* while four leasing miners worked at the *Standard.* Only the *Mammoth* and *Noble Five* operated mills in the Division during the year.

LARDEAU MINING DIVISION.

The only properties operated in this Division during 1935 were that of the Meridian Mining Company, Limited (*Criterion* and *Eva*), and the *Teddy Glacier,* at which exploratory work was definitely abandoned early in September. The *Gold Finch* was also visited in view of a possible resumption of operations rumoured at the time. The only mill operated was that of the Meridian Mining Company, Limited.

REVELSTOKE MINING DIVISION.

There was very little activity in this part of the district. Development-work proceeded throughout the year at the *Allco Silver,* and a small crew was employed for a short time in prospecting operations on the *Mastodon* group.

ARROW LAKES AND GRAND FORKS MINING DIVISIONS.

There was very little activity in the Arrow Lakes Mining Division beyond prospecting and a few leasing operations worked on a very small scale. In the Grand Forks Mining Division

the *Yankee Boy* was operated throughout the year and the *Union* during the summer only. At the latter property, only the minor part of the material treated at the mill was obtained underground, where only a very small crew was employed. Calgary interests began operations at the *Molly Gibson*, near Paulson, during the fall, and the Consolidated Mining and Smelting Company of Canada, Limited, operated a limestone-quarry at Fife until late in the year.

GREENWOOD MINING DIVISION.

In the vicinity of Greenwood the *Dentonia* was operated continuously, while small crews were employed at the *North Star*, *Bay*, *Skylark*, *No. 7*, *Elkhorn*, and on the *Rainbow* group during part of the year. Operations were suspended at the *Providence* early in May. At Beaverdell, the *Bell*, *Highland Lass*, *Sally*, *Wellington*, *Bounty*, *Revenge*, and *Tiger* worked throughout the year. Exploratory and development work were carried on at different periods and during various lengths of time at the *Rambler*, *Black Diamond*, *Buster-Alaska*, *Sweet Mary*, and *Olympic*, and a small group of lessees worked at the *Carmi*. The only mill operated in the Division during the year was that of the Dentonia Mines, Limited.

The writer desires to express appreciation of the co-operation of the different managements of the operations mentioned in this report in all matters and recommendations pertaining to the advancement of mine safety.

EAST KOOTENAY INSPECTION DISTRICT.

BY

JOHN MACDONALD.

Thirteen properties were visited during the course of inspection; of these, the *Sullivan* mine at Kimberley and the *Monarch* mine at Field are the most important and were inspected regularly, while less frequent visits were made to the smaller operations. At a few of the smaller mines it was found necessary to direct the attention of the officials to certain matters not strictly in accordance with the requirements of the "Metalliferous Mines Regulation Act." In this connection, however, operators and managers as a rule displayed a readiness to co-operate in the matter of complying with the regulations and the adoption of safety-first methods in and around the mines.

All serious accidents reported to our office were immediately investigated and reported in detail; it is a pleasure to be able to record that no fatalities occurred around any of the mines in this district during 1935.

FORT STEELE MINING DIVISION.

Sullivan.—Owned and operated by the Consolidated Mining and Smelting Company of Canada, Limited. General superintendent, A. B. Ritchie; mine superintendent, W. Lindsay; and safety engineer, J. M. Wolverton. After a long and successful career in charge of the Consolidated Mining and Smelting Company's operations at Kimberley, Mr. Montgomery was transferred in May to take charge of certain of the company's Eastern properties, being succeeded at Kimberley by A. B. Ritchie.

Under the direct supervision of Grant Henderson, ventilation engineer, the ventilation of the *Sullivan* mine in general has been maintained at a high standard, an important step in this direction being the installation on the surface at No. 11 shaft of a Jeffrey 8-foot-diameter, 2-stage aerovane fan, operating at a speed of 575 r.p.m., and producing an average quantity of 92,000 cubic feet of air a minute, under a water-gauge of 2.25 inches. At the No. 9 shaft, also on the surface, a 5- by 2½-foot Jeffrey fan is operating steadily at a speed of 275 r.p.m. and producing an average quantity of 62,000 cubic feet of air a minute, under a water-gauge of 1.2 inches. In addition to the above permanent installations, several smaller fans are in constant use as boosters underground; ventilation in general being good all over the mine.

The dust problem is receiving very close attention at this mine, and atomizers, water sprays, and water curtains are installed and operated in stopes, ore-pockets, loading-chutes, and many of the main roads in an effort to combat this hazard. In all drifts, after blasting, the muck-pile and walls are thoroughly wetted, and this operation is repeated as often as may

be considered necessary while the muck-pile is being moved. All plugging and block-holing is done by means of wet pluggers, fifty of these machines being in use.

The Edison K-type electric cap safety-lamp is now used exclusively by the workmen, 500 of these lamps being put into use on October 1st, while, in addition, a total of sixty flood-lights are used in the various stopes; this type of lamp is also used by the barmen. The work of accident-prevention receives the most careful attention of the general superintendent and all members of his staff by their attendance at all safety committee meetings, where a free and full discussion is invited on all matters pertaining to the safety of the workmen employed in each department in or around the mine. To provide adequate accommodation for the increased force of men employed a new dry has been erected on the site occupied by the former change-room; this building is of two-story construction, is fire-proof throughout, and equipped with lockers to accommodate a crew of 1,000 men. During the year a modern solarium was installed, details of which are given elsewhere.

Throughout the year general conditions in this mine were found to be very satisfactory and the requirements of the "Metalliferous Mines Regulation Act" fully observed.

Visits of inspection were made to the following properties, where general conditions were found fairly satisfactory: B.C. Cariboo Goldfields *Midway* mine at Aldridge; *Ewen* and *Oscarson* claims; C. Olson claim; C. Ofnar claim; Roberts and Steuart claim; the four latter being underground placer operations in the vicinity of Moyie River falls. In the Perry Creek locality the following properties were inspected at different times: Perry Creek Gold Mines, Limited; the Sawmill Creek mine of the Kimberley Goldfields Consolidated; the *Birdie L.* mine, which is operated by R. L. Bird and associates; and the *North Star* placer mine, operated by D. A. McIntosh and associates.

WINDERMERE MINING DIVISION.

Excelda Mine.—Owned and operated by Thunderbird Mines, Limited. J. P. Farnham, general manager. A crew of fifteen men was steadily engaged during the summer months. The surface plant consists of a 2-stage, Gardner-Denver compressor, driven by a Hercules gasoline-engine, and is located in a central position on the property at an elevation of 8,510 feet above sea-level. At all visits of inspection, working and living conditions were found to be very good and the requirements of the "Metalliferous Mines Regulation Act" well attended to. Operations at this mine were suspended for the season in November and are expected to resume in May of next year.

GOLDEN MINING DIVISION.

Monarch and Kicking Horse.—Owned and operated by Base Metals Mining Corporation, Limited. J. T. Emmons, general manager; Thos. Oxley, mine superintendent. After being closed down from the middle of February until June 1st, during which interval general repairs were attended to, the mill resumed operations and worked steadily until December 14th, on which date it was again closed down pending further development being carried on at both mines. Working and living conditions were found to be good at all inspections and the requirements of the "Metalliferous Mines Regulation Act" well complied with.

The writer thanks the officials of the different companies for their co-operation in dealing with the different points raised during the year.

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