Minister of Mines

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

For the Year Ended 31st December

1952

VICTORIA, B.C.
Printed by DON MCDIARMID, Printer to the Queen's Most Excellent Majesty
1953

BRITISH COLUMBIA DEPARTMENT OF MINES

VICTORIA, B.C.

Hon. R. E. SOMMERS, *Minister.*
JOHN F. WALKER, *Deputy Minister.*
H. C. HUGHES, *Chief Inspector of Mines.*
G. CAVE-BROWNE-CAVE, *Chief Analyst and Assayer.*
HARTLEY SARGENT, *Chief, Mineralogical Branch.*
P. J. MULCAHY, *Chief Gold Commissioner.*

To His Honour CLARENCE WALLACE, C.B.E.,
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 1952 is herewith respectfully submitted.

R. E. SOMMERS,
Minister of Mines.

Minister of Mines' Office,
May, 1953.

CONTENTS

ILLUSTRATIONS

PHOTOGRAPHS

DRAWINGS

ANNUAL REPORT OF THE MINISTER OF MINES, 1952

Introduction

A Report of the Minister of Mines of the Province of British Columbia has been published each year since 1874.

The Annual Report records the salient facts in the progress of the industry, also much detail about individual mining operations, including those undertaken in the search for, exploration of, and development of mineral deposits, as well as the actual winning of material from mineral deposits.

The Annual Report of the Minister of Mines now contains introductory sections dealing with Statistics and Departmental work, followed by sections dealing with Metal-mining (Lode); Placer-mining; Structural Materials and Industrial Minerals; Inspection of Lode Mines, Placer Mines, and Quarries; Coal-mining; and Inspection of Electrical Equipment and Installations at Mines and Quarries, each with its own table of contents.

An introductory review of the mining industry and notes at the first of several of the main sections deal generally with the industry or its principal subdivisions. Notes in the various sections deal briefly with the work done on individual properties during the year or describe a property in more complete detail, outlining the history of past work and the geological setting as well as describing the workings and the mineral deposits exposed in them. Some notes deal with areas rather than with a single mine or property.

The work of the branches of the Department is outlined briefly in the section headed " Departmental Work." This section is followed by notes dealing briefly with the work of the British Columbia or Federal Government services of particular interest to the mining industry of British Columbia. Information concerning mine operations and some of the activities of the Inspection Branch of the Department of Mines is contained in the section on " Inspection of Lode Mines, Placer Mines, and Quarries," early in the section on " Coal-mining " and in the section on " Inspection of Electrical Equipment and Installations at Mines and Quarries."

The section on " Statistics " begins with an outline of current and past practice in arriving at quantities and calculating the value of the various products.

Review of the Mining Industry in British Columbia, 1952

By Hartley Sargent

The mineral production of British Columbia had a value of $170,851,914 in 1952, some $4,800,000 less than in the record year 1951. The 1952 production brought the value of all mineral production to date to more than three billion sixty-two million dollars.

Metals contributed $147,799,865, industrial minerals, $2,182,864, structural materials $11,596,961, and coal $9,272,224 to the 1952 total. Increases over 1951 figures were recorded for the miscellaneous-metals and the structural-materials groups and decreases for principal metals and coal.

The prices for silver, lead, and zinc fell in the second quarter of the year and thereafter were at levels considerably below the 1951 average prices. The approximate price* for silver was 87 cents an ounce in the first week of 1952, 80.8 cents at the end of June, and 81 cents in the first week of 1953. At the same times the price for lead was 18.4, 15.5, and 14.1 cents a pound, and for zinc, 18.8, 14.6, and 12.6 cents a pound. The average prices for 1952, with 1951 averages in parentheses, were: Silver, 83.157 (94.55) cents an ounce; lead, 16.12 (18.4) cents a pound; and zinc, 15.87 (19.9) cents a pound. Duties on lead and zinc entering the United States were suspended on February 12th, 1952, but the duty of 1.0625 cents a pound of refined lead was reimposed on June 26th, and the duty of 0.7 cent a pound of refined zinc was reimposed on July 23rd. The price for copper increased in 1952. The average price for the year was 31.08 cents, compared with 27.7 cents for 1951. The 1952 average price for gold was $34.27 an ounce, compared with $36.85 an ounce in 1951. The difference in the price for gold reflects the fact that the United States dollar was at a premium in Canadian funds throughout 1951 and was at a discount throughout most of 1952. The discount on United States funds also affected the prices of all metals sold in the United States.

Silver, lead, and zinc were produced in greater quantity in 1952 than in 1951, the approximate increase being for silver 7 per cent, for lead 4 per cent, and for zinc 11 per cent of the 1951 output. However, the lower prices gave a reduced value to the 1952 production of each of these metals, and the sum of the three values in 1952 was $112,441,436, compared with $124,532,375 in 1951.

Although silver, lead, and zinc were produced in large quantities in 1952, silver-lead-zinc mining in British Columbia experienced a serious set-back. The sharp fall in prices and the discount on United States funds affected all producers, and restricted acceptance of concentrates at the Trail smelter affected those shipping to that smelter.

Since the end of World War II high prices have encouraged the production of silver, lead, and zinc. New or increased milling capacity has been provided in many parts of British Columbia. Much of the increased capacity became effective in 1951 or 1952. Production of lead and zinc has increased notably in the Atlin, Skeena, Omineca, Vancouver, Nelson, Slocan, Ainsworth, and Golden Mining Divisions. In addition to greatly increased supplies from customs shippers in British Columbia since World War II, the Trail smelter has received large quantities of lead ores and concentrates and of zinc concentrates from points outside British Columbia. Shipments have come from other parts of Canada, from the United States, and from other countries on or accessible to the Pacific Ocean. By 1951 importation of zinc concentrates from overseas had stopped, but importation of lead ores and concentrates continued. Before the end of 1951 producers in the coastal areas of British Columbia were shipping their zinc concentrates to foreign smelters.

* United States quotation converted to Canadian funds.

In 1952 the lead ores and concentrates and zinc concentrates offering exceeded the smelter capacity, and in the latter part of the year the capacity of the Trail smelter was reduced because of power shortage related to the low water-level in Kootenay Lake, resulting from the unusually dry year. As a consequence, British Columbia producers had to reduce their shipments to Trail. Lead ores and concentrates and zinc concentrates were shipped to foreign smelters in substantial volume, and concentrates were stockpiled at mines belonging to The Consolidated Mining and Smelting Company of Canada, Limited, and at some other mines. The great reduction in prices for lead and zinc was felt by all producers. Customs shippers, if their production exceeded the quantities of concentrates acceptable at the Trail smelter, faced inconvenience and increased costs in connection with part of their output. Production at numerous properties, including several with newly built mills, was reduced or suspended, but exploration and development were continued at several properties that had gone off production.

Lode-gold and placer-gold output declined in both quantity and value. The copper output was a little less in quantity but a full million dollars more in value than in 1951. Substantial production of tungsten and of iron in 1952 brought the miscellaneous-metals output to a value of $13,193,542, giving a total value of $147,304,933 to the metals produced by lode mines, compared with $154,624,192 in 1951.

The value of the industrial-minerals output for 1952 was about 12½ per cent less than in 1951. Most of the items listed were sold in smaller volume than in 1951. Sulphur sales in 1951 had included pyrite concentrates that had been accumulated over a period of several years at the Britannia mine. Britannia 1952 shipments of pyrite, although less than 1951 shipments, were well above pre-1951 figures. The beginning of asbestos production toward the end of the year is represented by asbestos valued at $23,000, produced by Cassiar Asbestos Corporation Limited at McDame Creek. The 1953 output will undoubtedly be materially greater. Use of sulphur in the manufacture of fertilizer is expected to increase with the production of ammonium-phosphate fertilizer in the plant being built at Kimberley.

An increase of almost $1,000,000 is shown for the structural-materials group. Cement shows a considerable increase over the 1951 figure; a more substantial increase is probable for 1953 as the capacity of the Bamberton plant has been increased. The new equipment, including a very large kiln, began operating in November, 1952, increasing the capacity from 1,500,000 to 2,000,000 barrels of cement a year.

Coal output in 1952 amounted to 1,426,496 tons, a considerable decline from the production of more than 2,000,000 tons a year in the period 1941 to 1944. The 1952 output is about equal to the yearly production in the mid-thirties and was nearly 10 per cent less than the 1951 output. Vancouver Island output was substantially less than that of 1951. The No. 10 mine at South Wellington was closed, indicating a permanent reduction in the output of the Nanaimo-Wellington area. Production in the Peace River and Telkwa areas, although small, was considerably greater than in 1951. Telkwa coal has found an important industrial market at the plant of Columbia Cellulose Company Limited near Prince Rupert. The Crow's Nest Pass Coal Company Limited completed another battery of Curran-Knowles by-product coke-ovens at Michel in October, 1952. All coke production is now in by-product ovens. The capacity of the plant is 540 tons of coke in twenty-four hours.

The number employed in all branches of the mining industry of British Columbia in 1952 was 18,257. Major expenditures by the industry include salaries and wages, $62,256,631; fuel and electricity, $10,131,272; process supplies, $27,024,500; freight and treatment on ores and concentrates of principal metals, $30,444,575; Federal taxes, $19,202,325; Provincial taxes, $1,824,221; municipal and other taxes, $1,135,952; levies for workmen's compensation, silicosis, and unemployment insurance, $2,075,491. These items amount to $154,094,967. Dividends paid in 1952 amount to $32,603,956.

Statistics

Mining statistics are collected and compiled and the statistical tables for this Report are prepared by the Bureau of Economics and Statistics, Department of Trade and Industry.

In the 1951 Report, extensive rearrangements of tables and of their order were made. The tables in the present Report closely parallel those presented in Reports for years preceding 1951, but additional details have been incorporated, and the present order is considered to make more apparent the relationship between summary tables and the tables giving the details summarized. In the summary tables, quantities as well as values are given for principal products, and the group, miscellaneous metals, has been separated from industrial minerals; full details are given for each year of the latest ten-year period. More complete figures for coal production and for the manufacture of coke and other by-products are presented. The production figures for individual lode-metal mines are now shown in Table XV. The relationship of the present tables to those used in Reports preceding 1951 is shown on page 15.

METHOD OF COMPUTING PRODUCTION

The tables of statistics recording the mineral production of the Province for each year are compiled from certified returns made by the operators of mines, augmented by some data obtained from the Royal Canadian Mint (Assay Office) and from the operators of customs smelters. The value of each mineral product, in Canadian funds, is calculated at the average price for the year (*see* below). The quantities of metals are net after making deductions for losses in smelting and refining.

Prior to 1925 the average prices for gold and copper are true average prices, but, as a means of correcting for losses in smelting and refining, the prices of other metals were taken at the following percentages of the year's average price for the metal: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent. For 1925 and subsequent years the value has been calculated using the true average price and the net metal contents. The procedures adopted for the 1925 Report are still used essentially unchanged, but new tables have been added from time to time.

Beginning with the Annual Report for 1948, production figures,* given in notes dealing with individual lode-mining operations, are the assay contents of the products shipped (ore, concentrates, or bullion), no deductions being made for losses in smelting and refining. In previous Annual Reports the production figures given for individual properties are net, after deductions for smelting and refining losses, in accordance with the procedures adopted by the Dominion Bureau of Statistics and the co-operating Provincial Departments of Mines.

METALS

Placer Gold

The data on placer-gold production were very largely obtained from the Gold Commissioners until 1925. The value of placer gold in dollars is now obtained from returns received annually from the operators. At the old standard price, $20.67 per ounce of fine gold, $17 was regarded as a close approximation of the average value per ounce of crude placer gold produced in British Columbia. Dividing the production reported in dollars by 17 gave the equivalent in crude ounces. The average value $17 per ounce is equivalent to a fineness of 822½. Beginning with 1932 the average value per crude ounce has been based on the same fineness but has recognized the varying price of gold. The average price per ounce of crude placer gold for each year is listed on page 16.

* Now included in Table XV.

Lode Metals, Gross and Net Contents

The gross contents are the gold and silver contents of bullion and for ores and concentrates the total assay contents, obtained by multiplying the assay by the weight. The quantities for gold, silver, copper, lead, and zinc in Table XV and in "Notes on Metal Mines" are gross.

Calculations of the value of production are based on the total assay content for gold and on net content for the other principal metals. These are: in lead ores and concentrates and zinc concentrates, for silver 98 per cent, lead 95 per cent, and zinc 85 per cent of the total assay content; and in copper concentrates, 95 per cent of the silver and the total assay content of copper less 10 pounds per ton of concentrates. Quantities for silver, lead, zinc, and copper in Tables I to VIII, inclusive, are net.

Average Metal Prices

In the interests of uniformity the Statistical Bureaux of the Provinces and the Dominion Bureau of Statistics used the same average metal prices in valuing mineral production. Up to and including the year 1939 the prices used in evaluating metal and mineral production were:—

Gold and silver: The average United States prices for the year, as quoted in the Engineering and Mining Journal, converted into Canadian funds at the average exchange rate.

Copper, lead, and zinc: The average London Metal Market prices for the year converted into Canadian funds at the average exchange rate. Until 1932 the New York price for copper was used.

Suspension of trading on the London Metal Exchange in September, 1939, and the controls of metals during the war years necessitated changes from the procedures which had been followed.

The method of arriving at the price for gold continued unchanged, but the prices for the metals controlled were those set by the Canadian Metals Controller. In 1945 the controls were largely removed from sales but not from prices. Control of metal prices ended on June 6th, 1947. For 1945 and subsequent years the prices are those computed by the Dominion Bureau of Statistics, using information supplied by the principal Canadian refiners of silver and the base metals.

In the period 1945–47 the prices received for silver, lead, and zinc sold for use in Canada were substantially less than the prices received for these metals exported to the United States. The prices for silver in 1945 and 1946 and for copper, lead, and zinc in 1946 and 1947 are weighted averages, taking into consideration sales in Canada at the ceiling prices and sales abroad at New York prices converted into Canadian funds.

Prices are now arrived at by the methods that were in effect prior to World War II.

Fuel

In 1926 a change was made in computing coal and coke statistics. The practice in former years had been to list as coke production only the coke made in bee-hive ovens, the coal used in making it not being listed; coke 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 both the coal and the coke production figures were incomplete. Starting with the 1926 Annual Report, the standard practice of the Bureau of Statistics, Ottawa, was 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 the data are of interest to the mining industry, Table X is included in the Report to show the total coke produced in the Province, together with by-products, and the values given by the producers. The pre-1926 data have now been reworked and brought into conformity with current practice. Consequently, Table IX lists the full quantity of coal produced and its value as coal, and these figures are incorporated in Table I, that is, in the total gross mine production for the Province. Table X gives the complete data for coke, gas, and by-products manufacture for the period 1895 to 1925, and for each year subsequent to 1925.

Up to and including the year 1947, production was recorded in long tons (2,240 pounds). Beginning in 1948, production is given in short tons (2,000 pounds). The quantity of coal produced in the preceding years has been recalculated in short tons. Prices per short ton that give the value previously published when quantities were expressed in long tons, and the price per short ton, for 1948 and for each subsequent year, are shown on page 16.

Statistical Tables

(List showing relationship of present to pre-1951 tables.)

AVERAGE PRICES USED IN VALUING PROVINCIAL PRODUCTION OF GOLD, SILVER, COPPER, LEAD, ZINC, AND COAL

Year	Gold,[1] Crude, Oz.	Gold, Fine, Oz.	Silver, Fine, Oz.	Copper, Lb.	Lead, Lb.	Zinc, Lb.	Coal, Short Ton
	$	$	Cents	Cents	Cents	Cents	$
1901	17.00	20.67	56.002 N.Y.	16.11 N.Y.	2.577 N.Y.	....	2.679
1902	....	....	49.55 ,,	11.70 ,,	3.66 ,,	....	....
1903	....	....	50.78 ,,	13.24 ,,	3.81 ,,	....	....
1904	....	....	53.36 ,,	12.82 ,,	3.88 ,,	....	....
1905	....	....	51.33 ,,	15.59 ,,	4.24 ,,	....	....
1906	....	....	63.45 ,,	19.28 ,,	4.81 ,,	....	....
1907	....	....	62.06 ,,	20.00 ,,	4.80 ,,	....	3.125
1908	....	....	50.22 ,,	13.20 ,,	3.78 ,,	....	....
1909	....	....	48.93 ,,	12.98 ,,	3.85 ,,	....	....
1910	....	....	50.812 ,,	12.738 ,,	4.00 ,,	4.60 E. St. L.	....
1911	....	....	50.64 ,,	12.38 ,,	3.98 ,,	4.90 ,,	....
1912	....	....	57.79 ,,	16.341 ,,	4.024 ,,	5.90 ,,	....
1913	....	....	56.80 ,,	15.27 ,,	3.93 ,,	4.80 ,,	....
1914	....	....	52.10 ,,	13 60 ,,	3.50 ,,	4.40 ,,	....
1915	....	....	47.20 ,,	17.28 ,,	4.17 ,,	11.25 ,,	....
1916	....	....	62.38 ,,	27.202 ,,	6.172 ,,	10.88 ,,	....
1917	....	....	77.35 ,,	27.18 ,,	7.91 ,,	7.566 ,,	....
1918	....	....	91.93 ,,	24.63 ,,	6.67 ,,	6.94 ,,	4.464
1919	....	....	105.57 ,,	18.70 ,,	5 19 ,,	6.24 ,,	....
1920	....	....	95.80 ,,	17.45 ,,	7.16 ,,	6.52 ,,	....
1921	....	....	59.52 ,,	12.50 ,,	4.09 ,,	3.95 ,,	....
1922	....	....	64.14 ,,	13.38 ,,	5.16 ,,	4.86 ,,	....
1923	....	....	61.63 ,,	14.42 ,,	6.54 ,,	5.62 ,,	....
1924	....	....	63.442 ,,	13.02 ,,	7.287 ,,	5.39 ,,	....
1925	....	....	69.065 ,,	14.042 ,,	7.848 Lond.	7.892 Lond.	....
1926	....	....	62.107 ,,	13.795 ,,	6.751 ,,	7.409 ,,	....
1927	....	....	56.37 ,,	12.92 ,,	5.256 ,,	6.194 ,,	....
1928	....	....	58.176 ,,	14.570 ,,	4.575 ,,	5.493 ,,	....
1929	....	....	52.993 ,,	18.107 ,,	5.050 ,,	5.385 ,,	....
1930	....	....	38.154 ,,	12.982 ,,	3.927 ,,	3.599 ,,	....
1931	....	....	28.700 ,,	8.116 ,,	2.710 ,,	2.554 ,,	4.018
1932	19.30	23.47	31.671 ,,	6.380 Lond.	2.113 ,,	2.405 ,,	3.795
1933	23.02	28.60	37.832 ,,	7.454 ,,	2.391 ,,	3.210 ,,	....
1934	28.37	34 50	47.461 ,,	7.419 ,,	2.436 ,,	3.044 ,,	....
1935	28.94	35.19	64.790 ,,	7.795 ,,	3.133 ,,	3.099 ,,	....
1936	28.81	35.03	45.127 ,,	9.477 ,,	3.913 ,,	3.315 ,,	....
1937	28.77	34.99	44.881 ,,	13.078 ,,	5.110 ,,	4.902 ,,	....
1938	28.93	35.18	43.477 ,,	9 972 ,,	3.344 ,,	3.073 ,,	....
1939	29.72	36.14	40.488 ,,	10.092 ,,	3.169 ,,	3.069 ,,	....
1940	31.66	38.50	38.249 ,,	10.086 ,,	3.362 ,,	3.411 ,,	....
1941	31.66	38.50	38.261 ,,	10.086 ,,	3.362 ,,	3.411 ,,	....
1942	31.66	38.50	41.166 ,,	10.086 ,,	3.362 ,,	3.411 ,,	....
1943	31.66	38.50	45.254 ,,	11.75 ,,	3.754 ,,	4.000 ,,	....
1944	31.66	38.50	43.000 ,,	12.000 ,,	4.500 ,,	4.300 ,,	....
1945	31.66	38.50	47 000 ,,	12.550 ,,	5.000 ,,	6.440 ,,	....
1946	30.22	36.75	83.650 ,,	12.80 ,,	6.750 ,,	7.810 ,,	....
1947	28.78	35.00	72.000 ,,	20.39 ,,	13.670 ,,	11.230 ,,	4.464
1948	28.78	35.00	75.000 Mont.	22.35 U.S.	18.040 ,,	13.930 ,,	6.000
1949	*29.60*	*36.00*	*74.250 U.S.*	19.973 ,,	*15.800 U.S.*	*13.247 U.S.*	6.500
1950	31.29	38.05	80.635 ,,	23.428 ,,	14.454 ,,	15.075 ,,	6.500
1951	30.30	36.85	94.55 ,,	27.70 ,,	18.4 ,,	19.9 ,,	6.500
1952	**28.18**	**34.27**	**83.157 ,,**	**31.079 ,,**	**16.121 ,,**	**15.874 ,,**	**6.500**

[1] Unrefined placer gold, average price per ounce, is taken as $17 divided by $20.67 times the price of an ounce of fine gold.

Prices for fine gold are the Canadian Mint buying prices. Prices for other metals are those of the markets indicated, converted in Canadian funds. The abbreviations are: Mont.=Montreal; N.Y.=New York; Lond.=London; E. St. L. =East St. Louis; and U.S.=United States.

Prior to 1925 the prices for gold and copper are true average prices, but the prices of other metals were taken at the following percentages of the year's average price for the metal: Silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent.

For coal *see* last paragraph under "Fuel," page 16.

The bases for the prices listed are discussed in detail on pages 13 and 14.

Table I.—Total Mine Production for All Years Up to and Including 1952

	Total Quantity	Total Value	Quantity, 1952	Value, 1952
		$		$
Gold—placer crude, oz.	5,162,900	94,904,908	17,554	494,756
lode fine, oz.	13,966,733	395,194,293	251,393	8,615,238
Silver oz.	360,187,790	203,239,923	8,796,720	7,315,088
Copper lb.	2,691,985,251	404,502,402	42,005,512	13,054,893
Lead lb.	10,787,621,241	665,774,474	284,949,396	45,936,692
Zinc lb.	7,858,281,405	544,913,456	372,871,717	59,189,656
Miscellaneous metals		60,206,584		13,193,542
Industrial minerals[1]		30,499,218		2,182,864
Sundry miscellaneous metals and minerals (1896–1926)		5,878,783		
Structural materials		159,233,304		11,596,961
Coal[2] tons	132,492,372	497,761,156	1,426,496	9,272,224
Totals		3,062,108,501		170,851,914

[1] Includes sulphur: 1916–52—2,493,366 tons, value $23,423,953; 1952—182,627 tons, value $1,745,258.
[2] Coal includes coal used in making coke.

Table II.—Production for Each Year from 1836 to 1952, Inclusive

1836–95 (incl.)	$93,862,373	1925	$61,492,242
1896	7,507,956	1926	67,188,842
1897	10,455,268	1927	60,729,358
1898	10,906,861	1928	65,372,583
1899	12,429,707	1929	68,245,443
1900	16,344,751	1930	55,391,993
1901	19,671,572	1931	34,883,181
1902	17,486,550	1932	28,798,406
1903	17,495,954	1933	32,602,672
1904	18,977,359	1934	42,305,297
1905	22,461,325	1935	48,821,239
1906	24,980,546	1936	54,081,967
1907	25,882,560	1937	74,475,902
1908	23,851,277	1938	64,485,551
1909	24,443,025	1939	65,681,547
1910	26,377,066	1940	75,701,145
1911	23,499,072	1941	78,479,719
1912	32,440,800	1942	75,551,093
1913	30,296,398	1943	65,892,395
1914	26,388,825	1944	54,923,813
1915	29,447,508	1945	63,343,949
1916	42,290,462	1946	71,807,951
1917	37,010,392	1947	113,221,254
1918	41,782,474	1948	152,524,752
1919	33,296,313	1949	133,012,968
1920	35,543,084	1950	148,196,010
1921	28,066,641	1951	175,677,429
1922	35,162,843	1952	170,851,914
1923	41,304,320		
1924	48,704,604	Total	$3,062,108,501

TABLE III.—QUANTITY AND VALUE OF MINE PRODUCTS FOR YEARS 1943 TO 1952

Description	1943		1944		1945		1946		1947	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Principal Metals		$		$		$		$		$
Gold—placer, crude oz.	14,600	462,270	11,433	361,977	12,589	398,591	15,729	475,361	6,969	200,585
,, lode, fine oz.	224,403	8,639,516	186,632	7,185,332	175,373	6,751,860	117,612	4,322,241	243,282	8,514,870
Silver oz.	8,526,310	3,858,496	5,705,334	2,453,293	6,157,307	2,893,934	6,365,761	5,324,959	5,707,691	4,109,538
Copper lb.	42,307,510	4,971,132	36,300,589	4,356,070	25,852,366	3,244,472	17,500,538	2,240,070	41,783,921	8,519,741
Lead lb.	405,285,476	15,214,417	294,797,469	13,265,886	353,497,689	17,674,884	347,990,146	23,489,335	306,400,709	41,884,977
Zinc lb.	335,137,014	13,405,481	280,356,477	12,055,328	301,737,902	19,431,921	270,718,128	21,143,086	268,450,926	30,147,039
Totals		46,551,312		39,677,886		50,395,662		56,995,052		93,376,750
Miscellaneous Metals										
Antimony lb.	1,114,166	189,408	1,937,933	281,000	1,679,878	292,635	642,145	96,322	1,150,463	384,255
Bismuth lb.	407,597	562,484	123,875	154,844	189,815	260,047	234,020	327,628	284,357	560,183
Cadmium lb.	613,339	705,780	365,112	401,623	510,432	505,328	632,539	771,698	547,248	941,266
Indium oz.										
Mercury lb.	1,690,540	4,559,200	735,908	1,210,375						
Platinum oz.	7	270							1	59
Tin lb.	776,937	450,623	516,626	299,643	849,983	484,490	874,186	480,802	714,198	517,794
Tungsten (WO_3) lb.	521,524	702,385	271,765	236,788	366	331			496,023	680,792
Totals		7,170,150		2,584,273		1,542,831		1,676,450		3,084,349
Industrial Minerals										
Arsenious oxide lb.	2,772,023	27,721								
Barite tons	1,924	15,834	12,373	48,007	31,155	45,780	2,728	19,000	2,875	26,650
Diatomite tons	40	128	7	190	22	498	40	1,027	59	1,472
Flux (quartz, limestone) tons	78,713	140,299	63,443	100,283	45,221	70,266	55,732	71,531	102,918	174,655
Granules (slate and rock) tons	664	11,711	949	17,903	969	16,272	1,116	19,917	1,156	19,686
Gypsum and products tons	27,853	142,176	26,442	103,937	23,718	127,434	40,900	318,500	67,112	523,298
Iron oxides tons	403	4,836	482	8,200	397	1,985	427	2,135	58	464
Mica lb.	650,000	3,245	924,000	15,382	1,284,000	17,136	1,616,000	23,420	1,808,000	24,240
Sodium carbonate lb.	427	4,697	43	473	286	3,146	210	2,310	163	1,793
Sulphur tons	104,599	1,039,108	113,374	1,123,868	127,653	1,267,350	126,622	1,258,576	157,161	1,503,714
Totals		1,389,755		1,418,243		1,549,867		1,716,416		2,275,972
Structural Materials										
Brick—common No.	2,736,792	55,508	2,038,193	40,936	3,092,000	80,556	3,300,000	94,000	4,318,000	122,660
,, face, paving, sewer No.	695,064	21,825	1,182,784	41,495	1,319,743	49,814	2,077,683	84,353	1,232,812	64,849
,, firebrick, blocks		227,594		181,199		217,275		283,317		389,899
Clays tons	706	9,706	3,706	17,283	510	7,899	601	8,241	11,428	9,675
Structural tile, hollow blocks		27,617		26,527		70,376		105,194		158,276
Drain-tile, sewer-pipe, flue-linings		153,153		165,905		205,883		263,864		361,975
Pottery—glazed or unglazed		2,917				3,245		2,811		3,476
Other clay products		5,485		3,444		2,632		3,611		9,332
Cement		1,146,865		1,085,918		1,182,297		1,739,966		1,896,772
Lime and limestone tons	128,469	340,988	147,444	421,648	162,334	522,692	159,493	642,912	151,671	714,126
Rubble, riprap, crushed rock tons	108,122	100,996	44,423	40,926	71,949	65,194	154,164	158,446	222,044	216,873
Sand and gravel		890,058		935,370		865,557		1,713,138		1,828,919
Stone tons	3,084	56,436	2,009	64,794	4,284	127,809	4,354	99,710	19,835	119,971
Totals		3,039,148		3,025,445		3,401,229		5,199,563		5,896,803
Fuel										
Coal tons	2,040,253	7,742,030	2,165,676	8,217,966	1,700,914	6,454,360	1,639,277	6,220,470	1,923,573	8,587,380
Provincial totals		65,892,395		54,923,813		63,343,949		71,807,951		113,221,254

Description	1948		1949		1950		1951		1952	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Principal Metals		$		$		$		$		$
Gold—placer, crude ... oz.	20,332	585,200	17,886	529,524	19,134	598,717	23,691	717,911	17,554	494,756
„ lode, fine ... oz.	286,230	10,018,050	288,396	10,382,256	283,983	10,805,553	261,274	9,627,947	251,393	8,615.238
Silver ... oz.	6,718,122	5,038,592	7,636,053	5,669,769	9,507,225	7,666,151	8,215,884	7,768,118	8,796,720	7.315,088
Copper ... lb.	43,025,388	9,616,174	54,856,808	10,956,550	42,212,133	9,889,458	43,249,658	11,980,155	42,005,512	13,054,893
Lead ... lb.	332,996,351	60,072,542	263,580,549	41,645,726	307,122,803	44,391,530	273,456,604	50,316,015	284,949,396	45,936.692
Zinc ... lb.	296,012,941	41,234,603	276,324,451	36,604,700	324,263,778	48,882,765	333,910,764	66,448,242	372,871,717	59,189,656
Totals ...		126,565,161		105,788,525		122,234,174		146,858,388		134,606,323
Miscellaneous Metals										
Antimony ... lb.	310,062	113,173	158,288	61,020	643,540	216,229	1,310,836	622,647	2,333,239	1,028,025
Bismuth ... lb.	222,000	444,000	102,913	210,972	162,616	369,138	191,471	451,872	142,246	312,941
Cadmium ... lb.	617,226	1,126,437	665,449	1,364,170	650,540	1,535,274	1,164,933	3,122,021	726,172	1,561,270
Indium ... oz.			689	1,550	4,952	12,132	582	1,368	404	889
Iron ore ... tons	679	3,735	5,472	27,579			113,535	790,000	900,481	5,474,924
Platinum ... oz.	242	21,175	99	7,468	111	9,239	22	2,085	2	176
Tin ... lb.	691,332	688,567	619,117	633,047	796,403	828,259	346,718	495,807	212,113	250,293
Tungsten (WO_3) ... lb.	1,409,297	1.409,297			281,160	281,160			1,434,640	4,565,024
Totals ...		3,806,384		2,305,806		3,251,431		5,485,800		13,193,542
Industrial Minerals										
Asbestos ...										23,000
Barite ... tons	1,632	16,317	1,314	13,145	1,440	17,284	1,248	16,224	848	13,408
Diatomite ... tons	24	817	36	963	4	108	8	223	12	240
Flux (quartz, limestone) ... tons	83,389	248,977	108,531	213,773	144,325	268,411	144,235	292,100	55,588	141,478
Granules (slate and rock) ... tons	4,958	68,937	5,941	79,661	7,886	104,590	5,727	73,767	1,610	21,026
Gypsum and products ... tons	77,055	546,707	98,977	616,490	92,882	620,108	124,729	263,072	91,112	235,453
Iron oxides ... tons	3,386	30,472	2,752	23,301						
Mica ... lb.	894,000	9,494	578,000	5,675	456,000	5,533	606,000	7,462	314,000	3,001
Sodium carbonate ... tons			47	517						
Sulphur ... tons	144,448	1,409,156	160,435	1,546,798	143,343	1,421,806	194,874	1,840,992	182,627	1,745,258
Totals ...		2,330,877		2,500,323		2,437,840		2,493,840		2,182,864
Structural Materials										
Brick—common ... No.	3,810,000	111,300	3,220,000	95,075	3,980,500	117,770	1,353,000	41,820	830,815	28,248
„ face, paving, sewer ... No.	2,584,752	129,268	509,560	24,793	974,380	52,823	3,127,888	153,575	2,566,540	121,254
„ firebrick, blocks ...		392,458		135,391		282,962		380,742		435,681
Clays ... tons	5,673	32,922	6,500	22,339	6,706	32,264	14,786	60,255	11,483	51,797
Structural tile, hollow blocks ...		116,513		145,512		191,016		171,481		60,273
Drain-tile, sewer-pipe, flue-linings ...		597,541		265,098		428,418		410,206		468,110
Pottery—glazed or unglazed ...		5,138		5,176		5,860		4,695		6,536
Other clay products ...		9,611		9,676		11,335		10,393		11.296
Cement ...		2,441,304		3,029,425		3,088,296		3,311,439		3,603.273
Lime and limestone ... tons	209,453	1,177,632	179,400	1,295,087	221,454	1,133,776	241,723	1,251,327	321,710	1,552,772
Rubble, riprap, crushed rock ... tons	896,780	839,780	1,112,272	916,841	1,164,049	990.257	972,178	1,145,072	739,504	982,792
Sand and gravel ...		3,060,535		3,967,132		3,723,487		3,355,693		3,839,965
Stone ... tons	3,579	54,220	2,287	44,345	26,758	188,675	4,837	309,350	122,308	434.964
Totals ...		8,968,222		9,955,890		10,246,939		10.606.048		11,596,961
Fuel										
Coal ... tons	1,809,018	10,854,108	1,917,296	12,462,424	1,542,404	10,025,626	1,574,362	10,233,353	1,426,496	9,272,224
Provincial totals ...		152,524,752		133,012,968		148,196,010		175,677.429		170,851,914

TABLE IV.—MINERAL PRODUCTION VALUE, 1895–1952

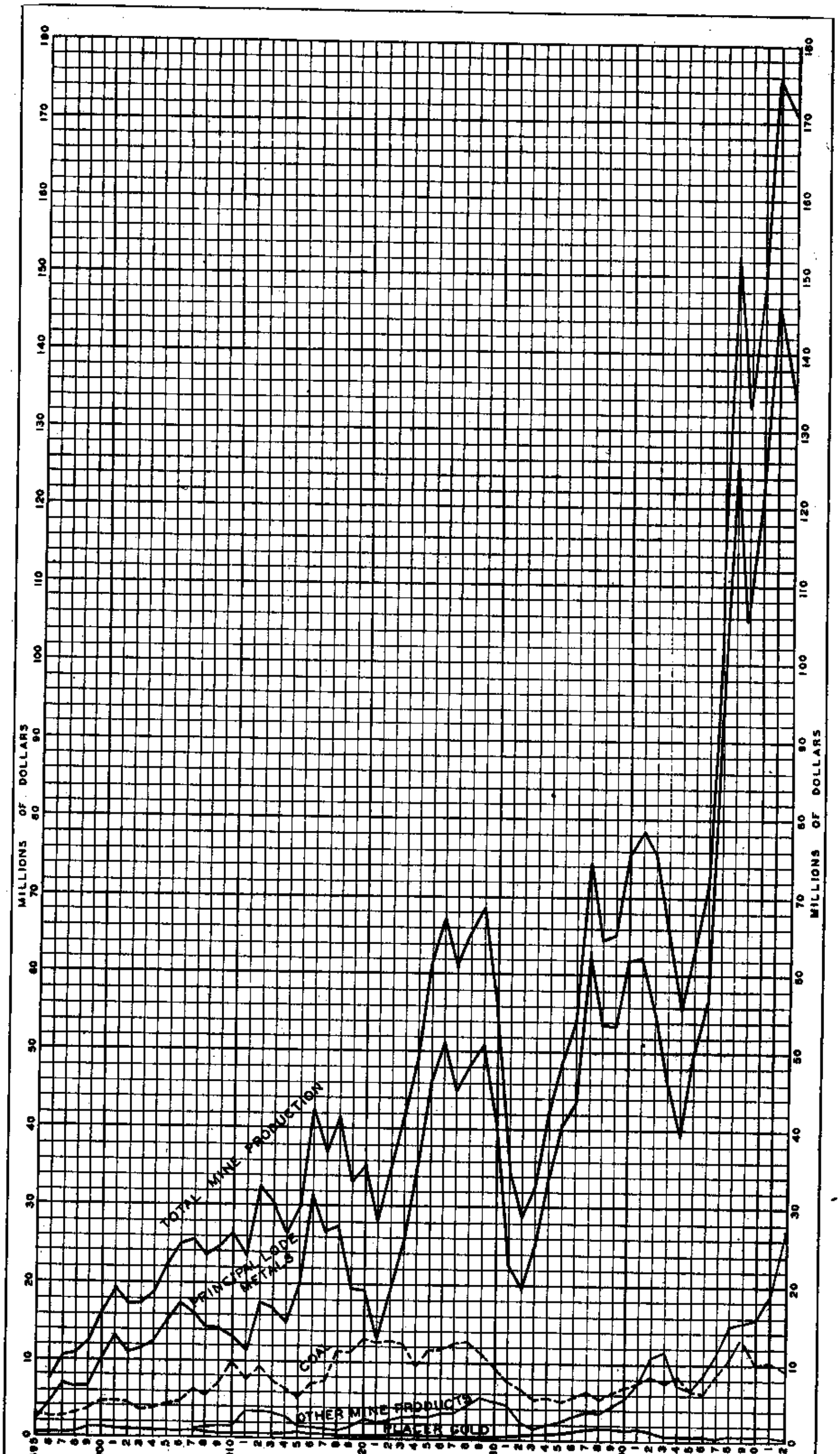


TABLE V.—LODE-MINE PRODUCTS, 1913–52

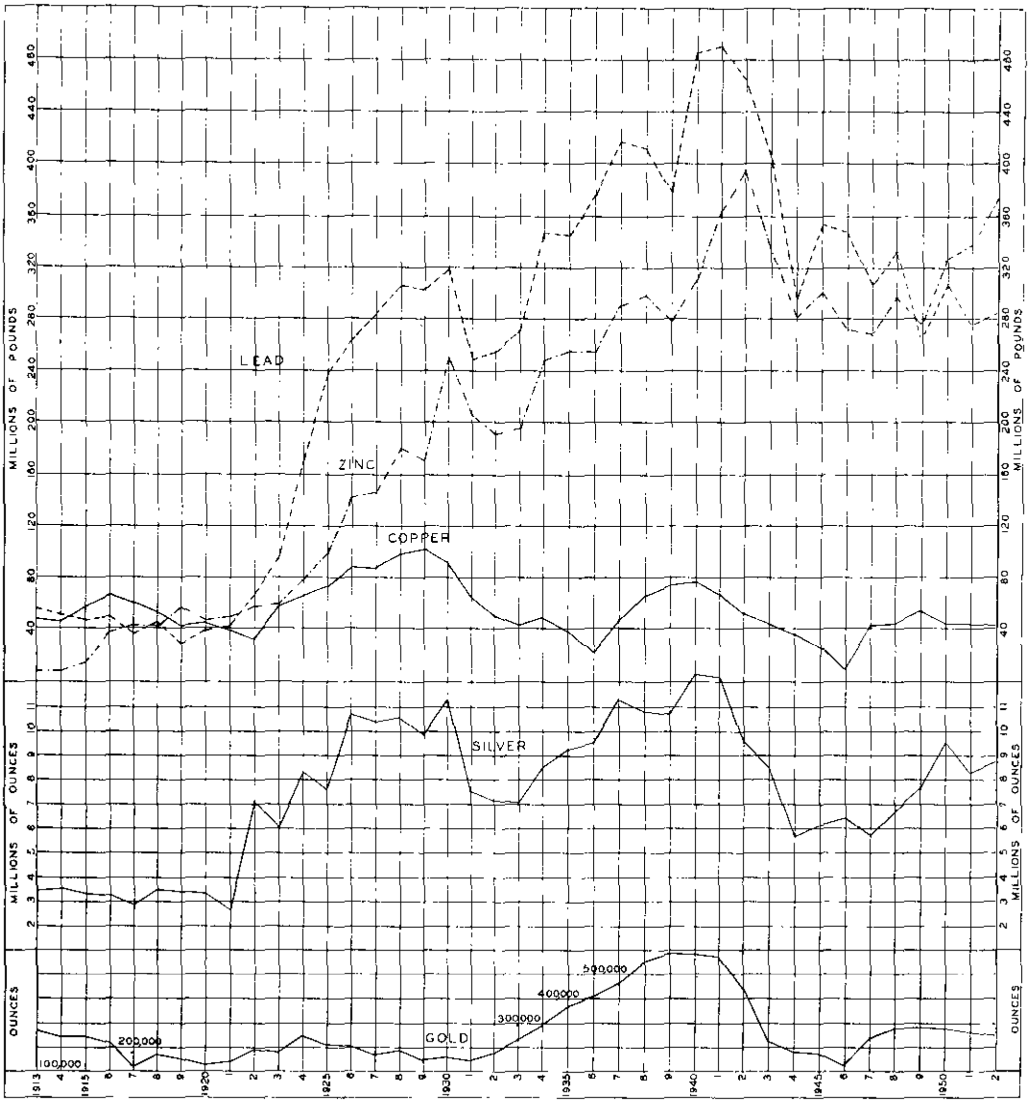


Table VI.—Production of Principal Metals, 1858–1952

Year	Placer Gold		Gold		Silver		Copper		Lead		Zinc		Total Value
	Quantity[1]	Value	Quantity[2]	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
1858–86, incl.	3,105,775	52,798,364											52,798,364
1887	40,810	693,709			17,690	17,331			204,800	9,216			720,256
1888	36,280	616,731			79,780	75,000			674,500	29,813			721,544
1889	34,640	588,923			53,192	47,873			165,100	6,498			644,294
1890	29,080	494,436			70,427	73,948							568,384
1891	25,280	429,811			4,500	4,000							433,811
1892	23,500	399,526			77,160	66,935			808,420	33,064			499,525
1893	20,950	356,131	1,170	23,404	227,000	195,000			2,135,023	78,996			653,531
1894	23,850	405,516	6,252	125,014	746,379	470,219	324,680	16,234	5,662,523	169,875			1,186,858
1895	28,330	481,683	39,270	785,400	1,496,522	977,229	952,840	47,642	16,475,464	532,255			2,824,209
1896	32,000	544,026	62,259	1,244,180	3,135,343	2,100,689	3,818,556	190,926	24,199,977	721,384			4,801,205
1897	30,210	513,520	106,141	2,122,820	5,472,971	3,272,836	5,325,180	266,258	38,841,135	1,390,517			7,565,951
1898	37,840	643,346	110,061	2,201,217	4,292,401	2,375,841	7,271,678	874,781	31,693,559	1,077,581			7,172,766
1899	79,110	1,344,900	138,315	2,857,573	2,939,413	1,663,708	7,722,591	1,351,453	21,862,436	878,870			8,096,504
1900	75,220	1,278,724	167,153	3,453,381	3,958,175	2,309,200	9,997,080	1,615,289	63,358,621	2,691,887			11,348,481
1901	57,060	970,100	210,384	4,348,605	4,396,447	2,462,008	27,603,746	4,446,963	51,582,906	2,010,260			14,237,936
1902	63,130	1,073,140	236,491	4,888,269	3,917,917	1,941,328	29,636,057	3,446,673	22,536,381	824,832			12,174,242
1903	62,380	1,060,420	232,831	4,812,616	2,996,204	1,521,472	34,359,921	4,547,535	18,089,283	689,744			12,631,787
1904	65,610	1,115,300	222,042	4,589,608	3,222,481	1,719,516	35,710,128	4,578,037	36,646,244	1,421,874			13,424,335
1905	57,020	969,300	238,660	4,933,102	3,439,417	1,971,818	37,692,251	5,876,222	56,580,703	2,399,022			16,149,464
1906	55,790	948,400	224,027	4,630,639	2,990,262	1,897,320	42,990,488	8,288,565	52,408,217	2,667,578			18,432,502
1907	48,710	828,000	196,179	4,055,020	2,745,448	1,703,825	40,832,720	8,166,544	47,738,703	2,291,458			17,044,847
1908	38,060	647,000	255,582	5,282,880	2,631,389	1,321,483	47,274,614	6,240,249	43,195,733	1,632,799			15,124,411
1909	28,060	477,000	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	14,668,141
1910	31,760	540,000	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	13,768,731
1911	25,060	426,000	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	11,880,063
1912	32,680	555,500	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	18,218,266
1913	30,000	510,000	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	17,700,838
1914	33,240	565,000	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	15,790,061
1915	45,290	770,000	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	20,762,149
1916	34,150	580,500	221,932	4,587,334	3,301,923	2,059,739	65,379,364	17,784,494	48,727,516	3,007,462	37,168,900	4,043,985	32,063,514
1917	29,180	496,000	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	27,284,474
1918	18,820	320,000	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	27,910,278
1919	16,850	286,500	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	20,036,998
1920	13,040	221,600	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	19,665,965
1921	13,720	233,200	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	13,153,598
1922	21,690	368,800	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	19,600,657
1923	24,710	420,000	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	25,767,062
1924	24,750	420,750	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	35,958,997
1925	16,476	280,092	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	46,480,227

[1] Ounces of crude gold. [2] Ounces of fine gold.

	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
1926	20,912	355,503	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	51,863,534
1927	9,191	156,247	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	45,133,329
1928	8,284	143,208	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	48,425,033
1929	6,983	118,711	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	51,293,570
1930	8,955	152,235	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	41,067,630
1931	17,176	291,992	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	22,827,565
1932	20,400	395,542	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	20,095,777
1933	23,928	562,787	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	25,569,924
1934	25,181	714,431	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	34,610,361
1935	30,929	895,058	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	41,492,627
1936	43,389	1,249,940	404,472	14,168,654	9,521,015	4,296,548	20,806,672	1,971,848	377,971,618	14,790,029	254,581,393	8,439,373	44,916,392
1937	54,153	1,558,245	460,781	16,122,727	11,308,685	5,075,451	46,057,584	6,023,411	419,118,371	21,416,949	291,192,278	14,274,245	64,471,028
1938	57,759	1,671,015	557,522	19,613,624	10,861,578	4,722,288	65,769,906	6,558,575	412,979,182	13,810,024	298,497,295	9,172,822	55,548,348
1939	49,746	1,478,492	587,180	21,221,272	10,771,585	4,361,199	73,254,679	7,392,862	378,743,763	12,002,390	278,409,102	8,544,375	55,000,590
1940	39,067	1,236,928	583,416	22,461,516	12,327,944	4,715,315	77,980,223	7,865,085	485,364,420	16,317,952	310,768,251	10,600,261	63,197,057
1941	43,775	1,385,962	571,026	21,984,501	12,175,700	4,658,545	66,435,583	6,700,693	490,185,657	16,480,042	363,302,195	12,392,238	63,601,981
1942	32,904	1,041,772	444,518	17,113,943	9,677,881	4,080,775	50,097,716	5,052,856	463,269,005	15,575,104	396,857,260	13,536,801	56,401,251
1943	14,600	462,270	224,403	8,639,516	8,526,310	3,858,496	42,307,510	4,971,132	405,285,476	15,214,417	335,137,014	13,405,481	46,551,312
1944	11,433	361,977	186,632	7,185,332	5,705,334	2,453,293	36,300,589	4,356,070	294,797,469	13,265,886	280,356,477	12,055,328	39,677,886
1945	12,589	398,591	175,373	6,751,860	6,157,307	2,893,934	25,852,366	3,244,472	353,497,689	17,674,884	301,737,902	19,431,921	50,395,662
1946	15,729	475,361	117,612	4,322,241	6,365,761	5,324,959	17,500,538	2,240,070	347,990,146	23,489,335	270,718,128	21,143,086	56,995,052
1947	6,969	200,585	243,282	8,514,870	5,707,691	4,109,538	41,783,921	8,519,741	306,400,709	41,884,977	268,450,926	30,147,039	93,376,750
1948	20,332	585,200	286,230	10,018,050	6,718,122	5,038,592	43,025,388	9,616,174	332,996,351	60,072,542	296,012,941	41,234,603	126,565,161
1949	17,886	529,524	288,396	10,382,256	7,636,053	5,669,769	54,856,808	10,956,550	263,580,549	41,645,726	276,324,451	36,604,700	105,788,525
1950	19,134	598,717	283,983	10,805,553	9,507,225	7,666,151	42,212,133	9,889,458	307,122,803	44,391,530	324,263,778	48,882,765	122,234,174
1951	23,691	717,911	261,274	9,627,947	8,215,884	7,768,118	43,249,658	11,980,155	273,456,604	50,316,015	333,910,764	66,448,242	146,858,388
1952	17,554	494,756	251,393	8,615,238	8,796,720	7,315,088	4[illegible],005,512	13,054,893	284,949,396	45,936,692	372,871,717	59,189,656	134,606,323
Totals	5,162,900	94,904,908	13,966,733	395,194,293	360,187,790	203,239,923	2,691,985,251	404,502,402	10,787,621,241	665,774,474	7,858,281,405	544,913,456	2,308,529,456

[1] Ounces of crude gold. [2] Ounces of fine gold.

TABLE VIIA.—SUMMARY OF PRODUCTION, 1951 AND 1952, BY MINING DIVISIONS

Mining Division	Year	Gold—Placer Quantity[1]	Gold—Placer Value	Principal Lode Metals	Miscellaneous Metals	Industrial Minerals	Structural Materials	Coal Quantity	Coal Value	Total
		Oz.	$	$	$	$	$	Tons	$	$
Ainsworth	1951	...	...	2,381,871	...	...	7,850	...	...	2,389,721
	1952	...	...	**9,096,081**	**16,196**	...	**12,555**	...	...	**9,124,832**
Alberni	1951	...	...	19,596	...	...	61,392	...	...	80,988
	1952	...	...	**4,450**	...	...	**38,984**	...	...	**43,434**
Atlin	1951	17,681	535,789	742,810	...	...	1,000	...	...	1,279,599
	1952	**8,751**	**246,645**	**2,809,532**	...	...	**171**	...	...	**3,056,348**
Cariboo	1951	1,396	42,303	1,519,403	...	7,462	77,921	...	...	1,647,089
	1952	**6,567**	**185,090**	**1,466,328**	...	**3,001**	**79,545**	...	...	**1,733,964**
Clinton	1951	7	212	...	...	...	...	...	...	212
	1952	**27**	**761**	...	...	...	**738**	...	...	**1,499**
Fort Steele	1951	21	636	93,377,676	4,229,135	22,578	85,953	1,141,942	7,422,623	105,138,601
	1952	**55**	**1,550**	**72,678,315**	**2,260,442**	**32,317**	**127,493**	**1,085,266**	**7,054,228**	**82,154,345**
Golden	*1951*	...	...	*2,267,756*	...	*99,724*	*17,971*	...	...	*2,385,451*
	1952	...	...	**2,332,066**	**1,246**	**69,908**	**65,210**	...	...	**2,468,430**
Greenwood	1951	...	...	832,435	...	36,850	14,512	...	...	883,797
	1952	...	...	**391,943**	...	**35,707**	**22,325**	...	...	**449,975**
Kamloops	1951	10	303	...	...	156,994	330,382	...	...	487,679
	1952	**4**	**113**	**8,733**	...	**146,636**	**240,645**	...	...	**396,127**
Liard	1951	25	758	...	...	...	43,074	3,119	20,794	64,626
	1952	**22**	**620**	...	...	**23,000**	**155,773**	**3,854**	**25,051**	**204,444**
Lillooet	1951	18	545	4,368,497	3,325	...	46,045	...	...	4,418,412
	1952	**183**	**5,158**	**4,016,421**	...	...	**23,038**	...	...	**4,044,617**
Nanaimo	1951	...	...	335,934	790,000	141,857	1,484,243	396,684	2,578,446	5,330,480
	1952	...	...	**9,443**	**5,474,924**	...	**1,585,782**	**292,627**	**1,902,076**	**8,972,225**
Nelson	1951	9	273	10,044,965	138,323	...	110,215	...	...	10,293,776
	1952	...	...	**11,543,583**	**3,294,771**	...	**394,821**	...	...	**15,233,175**
New Westminster	1951	12	364	...	...	7,135	2,268,596	...	...	2,276,095
	1952	...	...	...	...	**6,450**	**2,520,806**	...	...	**2,527,256**
Nicola	1951	...	...	...	...	...	12,387	899	5,843	18,230
	1952	...	...	**283**	...	...	**83,317**	**1,139**	**7,404**	**91,004**
Omineca	1951	205	6,212	1,806,415	...	...	57,212	27,697	180,030	2,049,869
	1952	**93**	**2,621**	**2,024,930**	**1,295,647**	...	**25,919**	**37,304**	**242,476**	**3,591,593**
Osoyoos	1951	...	...	1,832,952	...	113,393	86,250	...	...	2,032,595
	1952	...	...	**1,856,100**	...	**105,771**	**45,050**	...	...	**2,006,921**
Quesnel	1951	4,286	129,879	1,792	...	223	2,360	...	...	134,254
	1952	**1,815**	**51,155**	...	...	**240**	...	...	...	**51,395**
Revelstoke	1951	...	...	...	...	...	60,376	...	...	60,376
	1952	...	...	**933,467**	...	...	**21,162**	...	...	**954,629**
Similkameen	1951	6	182	7,499,037	2,085	...	41,772	3,941	25,617	7,568,693
	1952	**2**	**56**	**7,890,371**	**176**	...	**40,560**	**6,306**	**40,989**	**7,972,152**
Skeena	1951	5	152	3,907,325	...	...	212,149	...	...	4,119,626
	1952	...	...	**3,896,429**	**140,322**	...	**222,319**	...	...	**4,259,070**
Slocan	1951	...	...	3,543,624	37,223	...	6,750	...	...	3,587,597
	1952	...	...	**3,821,056**	**162,223**	...	...	...	...	**3,983,279**
Trail Creek	1951	...	...	468,722	...	1,410,000	64,393	...	...	1,943,115
	1952	...	...	**449,022**	**547,595**	**1,422,010**	**95,950**	...	...	**2,514,577**
Vancouver	1951	...	...	11,005,924	285,709	497,624	1,629,163	...	...	13,418,420
	1952	...	...	**8,882,852**	...	**337,824**	**1,645,378**	...	...	**10,866,054**
Vernon	1951	10	303	733	...	...	34,250	...	...	35,286
	1952	**35**	**987**	**162**	...	...	**105,088**	...	...	**106,237**
Victoria	1951	...	...	183,010	...	...	3,831,994	...	...	4,015,004
	1952	...	...	...	...	...	**4,044,332**	...	...	**4,044,332**
Totals	1951	23,691	717,911	146,140,477	5,485,800	2,493,840	10,588,210	1,574,362	10,233,353	175,659,591
	1952	**17,554**	**494,756**	**134,111,567**	**13,193,542**	**2,182,864**	**11,596,961**	**1,426,496**	**9,272,224**	**170,851,914**

[1] Crude gold.

NOTE.—Full details for placer gold and for coal are given in this table. The columns headed "Principal Lode Metals," "Miscellaneous Metals," "Industrial Minerals," and "Structural Materials" give the total value only, details being set forth in Tables VIIB, VIIC, VIID, and VIIE.

TABLE VIIB.—PRODUCTION OF PRINCIPAL LODE METALS, 1951 AND 1952, BY MINING DIVISIONS

Division	Year	Quantity	Gold—Lode		Silver		Copper		Lead		Zinc	
			Quantity[1]	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		Tons	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$
Ainsworth	1951	112,063	331	12,197	192,313	181,832			6,147,168	1,131,079	5,310,369	1,056,763
	1952	**310,987**	**754**	**25,840**	**590,258**	**490,840**			**25,751,259**	**4,151,360**	**27,894,922**	**4,428,040**
Alberni	1951	124	527	19,420	186	176						
	1952	**54**	**129**	**4,421**	**35**	**29**						
Atlin	1951	44,509	15,567	573,644	25,885	24,474	121,804	33,740	190,788	35,105	381,141	75,847
	1952	**96,059**	**6,959**	**238,485**	**279,653**	**232,551**	**2,196,927**	**682,783**	**2,297,463**	**370,374**	**8,097,134**	**1,285,339**
Cariboo	1951	109,132	41,110	1,514,903	4,759	4,500						
	1952	**116,412**	**42,672**	**1,462,370**	**4,760**	**3,958**						
Clinton	1951											
	1952											
Fort Steele	1951	2,542,751	2	74	3,141,437	2,970,229			236,609,542	43,536,156	235,533,753	46,871,217
	1952	**2,767,398**	**53**	**1,816**	**2,876,103**	**2,391,681**			**209.829.850**	**33,826,670**	**229.672,093**	**36,458,148**
Golden	1951	58,238	10	368	110,353	104,339			5,209,527	958,553	6,052,741	1,204,496
	1952	**146,841**	**16**	**548**	**113,240**	**110,798**			**9,607,062**	**1,548,754**	**4,233,123**	**671,966**
Greenwood	1951	14,349	272	10,023	708,207	669,610			354,522	65,232	440,050	87,570
	1952	**8,987**	**147**	**5,038**	**387,685**	**322,387**			**188,931**	**30,458**	**214,563**	**34,060**
Kamloops	1951											
	1952	**59**			**1,102**	**916**					**8,889**	**1,411**
Liard	1951											
	1952											
Lillooet	1951	245,914	117,795	4,340,746	29,351	27,751						
	1952	**261,041**	**116,815**	**4,003,250**	**15,839**	**13,171**						
Nanaimo	1951	23,356	4,265	157,165	13,387	12,657	599,681	166,112				
	1952	**1,061**	**105**	**3,598**	**417**	**347**	**17,692**	**5,498**				
Nelson	1951	496,670	781	28,780	48,653	46,001			12,961,693	2,384,952	38,116,746	7,585,232
	1952	**713,236**	**783**	**26,833**	**67,207**	**55,887**			**20,848,804**	**3,361,036**	**51,025,746**	**8,099,827**
New Westminster	1951											
	1952											
Nicola	1951											
	1952	**1**			**247**	**205**			**291**	**47**	**197**	**31**
Omineca	1951	22,646	1,531	56,417	882,684	834,578			1,935,882	356,202	2,810,140	559,218
	1952	**56,908**	**2,181**	**74,743**	**976,692**	**812,188**	**295,758**	**91,919**	**2,726,039**	**439,465**	**3,821,441**	**606,615**
Osoyoos	1951	122,955	48,848	1,800,049	10,452	9,882	83,108	23,021				
	1952	**127,545**	**52,075**	**1,784,610**	**14,012**	**11,652**	**192,252**	**59,750**	**278**	**45**	**269**	**43**
Quesnel	1951	7	1	37	669	633			6,081	1,119	13	3
	1952											
Revelstoke	1951											
	1952	**23,518**	**706**	**24,195**	**147,650**	**122,781**			**1,307,439**	**210.772**	**3,626,802**	**575,719**
Similkameen	1951	1,740,896	8,043	296,385	164,200	155,251	25,433,994	7,045,216	6,449	1,187	5,013	998
	1952	**1,751,703**	**7,923**	**271,521**	**160,900**	**133,800**	**24,083,949**	**7,485,050**				
Skeena	1951	188,130	6,812	251,022	2,156,180	2,038,668			4,194,371	771,764	4.250,609	845,871
	1952	**226,524**	**9,004**	**308,567**	**2,462,239**	**2,047,524**			**4,809,573**	**775,351**	**4.819,121**	**764,987**
Slocan	1951	182,134	143	5,270	470,761	445,104			3,531,131	649,728	12,279,005	2,443,522
	1952	**168,645**	**227**	**7,779**	**529,763**	**440,535**			**6,043,494**	**974,272**	**15,109.423**	**2,398,470**
Trail Creek	1951	1,265	293	10,797	60,881	57,563	1,306,681	361,951	204,942	37,709	3,528	702
	1952	**1,085**	**175**	**5,997**	**55,919**	**46,501**	**1,186,456**	**368,739**	**171,577**	**27,660**	**787**	**125**
Vancouver	1951	796,566	14,619	538,710	180,034	170,222	15,619,717	4,326,661	2,034,202	374,293	28,120,795	5,596,038
	1952	**829,803**	**10,669**	**365,627**	**92,920**	**77,270**	**14,032,478**	**4,361,154**	**1,327,456**	**213,999**	**24,346,741**	**3,864,802**
Vernon	1951	12	8	295	430	407	40	11	109	20		
	1952	**4**			**79**	**66**			**144**	**23**	**466**	**73**
Victoria	1951	9,754	316	11,645	15,062	14,241	84,633	23,443	70,197	12,916	606,861	120,765
	1952											
Totals	1951	6,711,471	261,274	9,627,947	8,215,884	7,768,118	43,249,658	11,980,155	273,456,604	50,316,015	333,910,764	66,448,242
	1952	**7,607,871**	**251,393**	**8,615,238**	**8.796.720**	**7.315,088**	**42.005.512**	**13.054.893**	**284,949,396**	**45,936,692**	**372,871,717**	**59,189,656**

[1] Fine gold.

Table VIIc.—Production of Miscellaneous Metals, 1951 and 1952, by Mining Divisions, Quantity and Value

Division	Year	Antimony[1]		Bismuth[1]		Cadmium[1] [2]		Indium[1]		Iron Ore		Platinum		Tin		Tungsten (WO_3)		Totals
		Lb.	$	Lb.	$	Lb.	$	Oz.	$	Tons	$	Oz.	$	Lb.	$	Lb.	$	$
Ainsworth	1951																	
	1952					**7,533[2]**	**16,196**											**16,196**
Fort Steele	1951													346,718	495,807			495,807
	1952					**2,171[2]**	**4,668**							**212,113**	**250,293**			**254,961**
Golden	1951																	
	1952	**2,339[3]**	**1,031**			**100[2]**	**215**											**1,246**
Lillooet	1951	7,000[4]	3,325															3,325
	1952																	
Nanaimo	1951									113,535	790,000							790,000
	1952									**900,481**	**5,474,924**							**5,474,924**
Nelson	1951					51,613[2]	138,323											138,323
	1952					**11,811[2]**	**25,394**									**1,027,460**	**3,269,377**	**3,294,771**
Omineca	1951																	
	1952															**407,180**	**1,295,647**	**1,295,647**
Similkameen	1951											22	2,085					2,085
	1952											**2**	**176**					**176**
Skeena	1951																	
	1952					**65,266[2]**	**140,322**											**140,322**
Slocan	1951					13,889[2]	37,223											37,223
	1952					**75,453[2]**	**162,223**											**162,223**
Trail Creek	1951																	
	1952																	
Vancouver	1951					106,608[2]	285,709											285,709
	1952																	
Not assigned[1]	1951	1,303,836[5]	619,322	191,471	451,872	992,823[2]	2,660,766	582	1,368									3,733,328
	1952	**2,330,900[6]**	**1,026,994**	**142,246**	**312,941**	**563,838[2]**	**1,212,252**	**404**	**889**									**2,553,076**
Totals	1951	1,310,836	622,647	191,471	451,872	1,164,933	3,122,021	582	1,368	113,535	790,000	22	2,085	346,718	495,807			5,485,800
	1952	**2,333,239**	**1,028,025**	**142,246**	**312,941**	**726,172**	**1,561,270**	**404**	**889**	**900,481**	**5,474,924**	**2**	**176**	**212,113**	**250,293**	**1.434,640**	**4,565,024**	**13,193,542**

[1] Antimony, bismuth, cadmium, and indium are recovered at the Trail smelter from shipments of ore and concentrates from various sources, including sources outside British Columbia. The Trail refinery output of each of the metals bismuth and indium is shown as "not assigned" below the mining division entries in the table.

[2] Cadmium assigned to individual mining divisions is the reported content of shipments to foreign smelters. Cadmium "not assigned" is the reported recovery at the Trail refinery from British Columbia zinc concentrates.

[3] Antimony content of concentrates exported to Bunker Hill smelter.

[4] Estimated content of ore shipped to England.

[5] *Antimony recovered from flue dust and Dore slag exported in the years 1949 to 1951, inclusive, amounting to 6,695,114 pounds valued at $1,435,213, has not been included in the* tabulated statistics. Antimony reported for 1951 is the antimony content of antimonial lead.

[6] 1952 antimony "not assigned" is the antimony content of antimonial lead produced at the Trail smelter and antimony reported as recovered from Dore slag exported.

TABLE VIID.—PRODUCTION OF INDUSTRIAL MINERALS,[1] 1951 AND 1952, BY MINING DIVISIONS

Division	Year	Asbestos		Barite		Diatomite		Fluxes (Limestone, Quartz)		Granules (Roofing)		Gypsum and Products		Mica		Sulphur		Totals
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Lb.	$	Tons	$	$
Cariboo	1951													606,000	7,462			7,462
	1952													**314,000**	**3,001**			**3,001**
Fort Steele	1951											11,289	22,578					22,578
	1952											**14,363**	**32,317**					**32,317**
Golden	1951			1,248	16,224							33,400	83,500					99,724
	1952			**848**	**13,408**							**25,000**	**56,500**					**69,908**
Greenwood	1951							36,850	36,850									36,850
	1952							**35,707**	**35,707**									**35,707**
Kamloops	1951											80,040	156,994					156,994
	1952											**51,749**	**146,636**					**146,636**
Liard	1951																	
	1952		**23,000**															**23,000**
Nanaimo	1951							89,104	141,857									141,857
	1952																	
New Westminster	1951									892	7,135							7,135
	1952									**860**	**6,450**							**6,450**
Osoyoos	1951							18,281	113,393									113,393
	1952							**19,881**	**105,771**									**105,771**
Quesnel	1951					8	223											223
	1952					**12**	**240**											**240**
Trail Creek	1951															141,000	1,410,000	1,410,000
	1952															**142,201**	**1,422,010**	**1,422,010**
Vancouver	1951									4,835	66,632					53,874	430,992	497,624
	1952									**750**	**14,576**					**40,406**	**323,248**	**337,824**
Totals	1951			1,248	16,224	8	223	144,235	292,100	5,727	73,767	124,729	263,072	606,000	7,462	194,874	1,840,992	2,493,840
	1952		**23,000**	**848**	**13,408**	**12**	**240**	**55,588**	**141,478**	**1,610**	**21,026**	**91,112**	**235,453**	**314,000**	**3,001**	**182,627**	**1,745,258**	**2,182,864**

[1] Experimental shipments of pyrophyllite from Semlin Siding, Kamloops Mining Division, and talc from Armstrong, Vernon Mining Division, not included in table.

Table VIIe.—Production of Structural Materials, 1951 and 1952, by Mining Divisions

Division	Year	Cement	Lime and Limestone	Building-stone	Rubble, Riprap, and Crushed Rock	Sand and Gravel	Brick (Common)	Face, Paving, and Sewer Brick	Fire-bricks, Blocks	Clays	Structural Tile (Hollow Blocks), Roof-tile, Floor-tile	Drain-tile and Sewer-pipe	Pottery (Glazed or Unglazed)	Other Clay Products	Division Totals
		$	$	$	$	$	$	$	$	$	$	$	$	$	$
Ainsworth	1951					7,850									7,850
	1952					12,555									12,555
Alberni	1951					61,392									61,392
	1952					38,984									38,984
Atlin	1951					1,000									1,000
	1952					171									171
Cariboo	1951				2,340	75,581									77,921
	1952					79,545									79,545
Clinton	1951														
	1952					738									738
Fort Steele	1951				7,509	78,444									85,953
	1952				8,623	118,870									127,493
Golden	1951					17,971									17,971
	1952				400	64,810									65,210
Greenwood	1951				536	13,976									14,512
	1952				11,844	10,481									22,325
Kamloops	1951				160,648	169,734									330,382
	1952				68,825	171,820									240,645
Liard	1951				228	42,846									43,074
	1952				42	155,731									155,773
Lillooet	1951				3,119	42,926									46,045
	1952				2,039	20,999									23,038
Nanaimo	1951		1,131,630	252,000	730	99,883									1,484,243
	1952		1,339,969	156,000	5,075	84,738									1,585,782
Nelson	1951			13,000	8,032	89,183									110,215
	1952			8,865	9,247	376,709									394,821
New Westminster	1951		81,793		373,307	763,768	22,000	151,125	324,552	55,485	118,769	377,792		5	2,268,596
	1952		64,343		373,295	1,074,524	12,900	107,447	364,842	51,797	42,206	429,435		17	2,520.806
Nicola	1951				2,062	10,325									12,387
	1952				5,461	77,856									83,317
Omineca	1951				1,783	55,429									57,212
	1952				1,464	24,455									25,919
Osoyoos	1951			2,600	*19,000*	*64,650*									86,250
	1952			2,750	1,200	41,100									45,050
Quesnel	1951					2,360									2,360
	1952														
Revelstoke	1951				3,100	57,276									60,376
	1952				810	20,352									21,162
Similkameen	1951				3,000	38,772									41,772
	1952				6,000	34,560									40,560
Skeena	1951		37,904		31,584	140,661				2,000					212,149
	1952		139,860		18,505	63,954									222,319
Slocan	1951					6,750									6,750
	1952														
Trail Creek	1951			4,800		59,593									64,393
	1952			11,200	8,795	75,955									95,950
Vancouver	1951			36,000	528,015	991,368	19,820	2,450	56,190	2,770				10,388	1,647,001
	1952			255,206	450,001	829,798	14,448	13,807	70,839					11,279	1,645,378
Vernon	1951			950	79	33,221									34,250
	1952		8,600	943	3,966	91,579									105,088
Victoria	1951	3,311,439				430,734					52,712	32,414	4,695		3,831,994
	1952	*3,603,273*			*7,200*	*369,681*	*900*				*18,087*	*38,675*	*6,536*		*4,044,332*
Totals	1951	3,311,439	1,251,723	309,350	1,145,072	3,355,693	41,820	153,575	380,742	60,255	171,481	410,206	4,695	10,393	10,606,048
	1952	3,603,273	1,552,772	434,964	982,792	3,839,965	28,248	121,254	435,681	51,797	60,273	468,110	6,536	11,296	11,596,961

Table VIII.—Production (Total Quantity and Value) of Placer Gold[1] and of Principal Lode Metals, by Mining Divisions, 1896 to 1952, Inclusive

Division	Gold—Placer[1]		Gold—Lode		Silver		Copper		Lead		Zinc		Division Totals
	Quantity[2]	Value	Quantity[3]	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Ainsworth	212	5,690	5,511	169,810	9,038,106	5,704,818	10,378	1,225	175,445,693	12,891,249	85,723,735	9,353,038	28,125,830
Alberni	1,607	32,967	299,958	11,227,021	161,128	77,416	2,290,699	343,518	112,888	4,473	......	......	11,685,395
Atlin (1898)[1]	706,327	16,558,089	257,636	9,165,615	367,900	295,175	2,401,828	728,472	2,598,196	412,515	8,478,275	1,361,186	28,521,052
Cariboo (1858)[1]	1,942,318	39,901,175	800,710	29,257,922	88,941	49,840	......	......	2,815	371	492	16	69,209,324
Clinton	10,041	239,389	23,388	827,260	31,564	14,214	57,548	5,905	193	7	......	......	1,086,775
Fort Steele	20,313	462,209	2,587	58,854	176,746,302	93,381,454	28,592	6,193	9,818,526,604	603,069,133	6,808,194,361	448,743,054	1,145,720,897
Golden	467	11,213	100	2,503	1,774,904	1,146,575	68,375	11,934	125,087,097	8,002,599	145,708,884	8,757,031	17,931,855
Greenwood	5,051	114,996	1,132,566	24,353,767	27,141,293	14,873,220	441,226,021	70,504,065	11,722,912	733,375	12,055,595	698,496	111,277,919
Kamloops	27,434	600,208	47,855	1,607,881	299,527	177,725	6,408,272	1,178,704	409,259	27,257	418,117	27,483	3,619,258
Liard	49,918	1,240,580	114	4,120	204	146	......	......	5,810	1,048	......	......	1,245,894
Lillooet (1874)[1]	91,147	1,872,697	2,480,819	87,223,633	634,762	340,062	400	41	62,463	2,542	......	......	89,438,975
Nanaimo	861	19,162	84,009	1,919,998	570,035	336,035	22,092,120	3,610,430	......	......	......	......	5,885,625
Nelson	3,478	86,009	1,326,862	41,485,806	7,190,829	4,108,604	14,702,422	1,648,622	103,546,224	10,445,618	157,200,960	23,446,539	81,221,198
New Westminster	11,413	238,186	4,416	112,407	13,259	6,072	26,489	6,379	28,425	1,119	12,755	481	364,644
Nicola	230	4,652	8,525	234,914	267,345	126,522	549,975	106,230	2,235,428	90,516	320,683	10,597	573,431
Omineca	52,078	1,378,412	15,770	455,644	5,507,307	4,120,890	6,421,967	1,437,607	13,190,433	1,482,170	15,210,912	2,081,322	10,956,045
Osoyoos	190	4,142	1,479,092	44,453,622	570,557	371,904	2,777,945	397,831	256,957	8,151	6,839	398	45,236,048
Quesnel (1858)[1]	634,474	13,311,940	218	7,871	1,926	1,521	82	17	15,772	2,561	13	3	13,323,913
Revelstoke	7,251	155,105	25,670	687,322	2,591,798	1,454,630	7,451	1,105	14,772,254	770,166	4,134,223	604,176	3,672,504
Similkameen	12,047	285,405	151,866	5,225,459	3,570,770	2,025,951	504,992,428	79,046,706	245,026	10,193	69,390	3,614	86,597,328
Skeena	4,366	98,860	2,387,434	60,033,644	57,957,297	34,671,812	689,061,669	98,012,119	50,014,823	4,083,874	14,060,743	2,187,355	199,087,664
Slocan	150	3,596	7,772	199,906	53,634,668	32,776,328	219,318	42,287	412,479,232	20,816,438	335,380,855	26,515,157	80,353,712
Trail Creek[4]	848	24,176	2,949,182	62,571,645	4,168,313	2,416,691	140,445,784	21,347,939	18,484,672	919,716	158,016,197	5,305,786	92,585,953
Vancouver	182	5,306	380,441	11,973,325	4,255,662	2,458,072	835,590,873	122,824,028	13,357,261	1,156,185	109,712,186	15,533,002	153,949,918
Vernon	2,216	58,588	5,223	176,048	8,747	4,702	654	100	11,972	1,162	7,481	799	241,399
Victoria	620	15,453	37,663	812,730	802,325	441,913	21,557,027	3,217,769	210,097	19,848	3,568,709	283,923	4,791,636
Totals	3,585,239	76,728,205	13,915,387	394,248,727	357,395,469	201,382,292	2,690,938,317	404,479,226	10,762,822,506	664,952,286	7,858,281,405	544,913,456	2,286,704,192

[1] For certain mining divisions the figures under "Gold—Placer" are the total estimated production of placer gold from and including the year noted after the name of the division. The placer gold recorded for the other divisions is the total estimated from 1896 to date.
[2] Crude gold.
[3] Fine gold.
[4] Includes zinc and lead recovered at the Trail smelter from current and reclaimed slags, derived from mines in several mining divisions.

TABLE IXA.—QUANTITY AND VALUE OF COAL PER YEAR TO DATE[1]

Year	Tons (2,000 Lb.)	Value	Year	Tons (2,000 Lb.)	Value
1836–59	41,871	$149,548	1906	2,126,965	$5,548,044
1860	15,956	56,988	1907	2,485,961	7,637,713
1861	15,427	55,096	1908	2,362,514	7,356,866
1862	20,292	72,472	1909	2,688,672	8,574,884
1863	23,906	85,380	1910	3,515,944	11,108,335
1864	32,068	115,528	1911	2,573,444	8,071,747
1865	36,757	131,276	1912	3,388,795	10,786,812
1866	28,129	100,460	1913	2,879,251	9,197,460
1867	34,988	124,956	1914	2,426,399	7,745,847
1868	49,286	176,020	1915	2,209,290	7,114,178
1869	40,098	143,208	1916	2,783,849	8,900,675
1870	33,424	119,372	1917	2,686,561	8,484,343
1871	55,458[2]	164,612[2]	1918	2,888,170	12,833,994
1872	55,458[2]	164,612[2]	1919	2,698,022	11,975,671
1873	55,459[2]	164,612[2]	1920	3,020,387	13,450,169
1874	91,334	244,641	1921	2,877,995	12,836,013
1875	123,362	330,435	1922	2,890,625	12,880,060
1876	155,895	417,576	1923	2,848,146	12,678,548
1877	172,540	462,156	1924	2,226,037	9,911,935
1878	191,348	522,538	1925	2,737,607	12,168,905
1879	270,257	723,903	1926	2,609,640	11,650,180
1880	299,708	802,785	1927	2,748,286	12,269,135
1881	255,760	685,171	1928	2,829,906	12,633,510
1882	315,997	846,417	1929	2,521,402	11,256,260
1883	238,895	639,897	1930	2,113,586	9,435,650
1884	441,358	1,182,210	1931	1,912,501	7,684,155
1885	409,468	1,096,788	1932	1,719,172	6,523,644
1886	365,832	979,908	1933	1,416,516	5,375,171
1887	462,964	1,240,080	1934	1,508,741	5,725,133
1888	548,017	1,467,903	1935	1,330,524	5,048,864
1889	649,411	1,739,490	1936	1,508,048	5,722,502
1890	759,518	2,034,420	1937	1,618,051	6,139,920
1891	1,152,590	3,087,291	1938	1,466,559	5,565,069
1892	925,495	2,479,005	1939	1,655,217	6,280,956
1893	1,095,690	2,934,882	1940	1,867,966	7,088,265
1894	1,134,509	3,038,859	1941	2,018,635	7,660,000
1895	1,052,412	2,824,687	1942	2,170,737	8,237,172
1896	1,002,268	2,693,961	1943	2,040,253	7,742,030
1897	999,372	2,734,522	1944	2,165,676	8,217,966
1898	1,263,272	3,582,595	1945	1,700,914	6,454,360
1899	1,435,314	4,126,803	1946	1,639,277	6,220,470
1900	1,781,000	4,744,530	1947	1,923,573	8,587,380
1901	1,894,544	5,016,398	1948	1,809,018	10,854,108
1902	1,838,621	4,832,257	1949	1,917,296	12,462,424
1903	1,624,742	4,332,297	1950	1,542,404	10,025,626
1904	1,887,981	4,953,024	1951	1,574,362	10,233,353
1905	2,044,931	5,511,861	1952	1,426,496	9,272,224
			Totals	132,492,372	$497,761,156

[1] Includes coal used in making coke; *see* Table X and discussion under "Fuel," page 14.

[2] A combined total for 1871, 1872, and 1873 has previously been noted in Annual Reports and the above breakdown is estimated.

TABLE IXB.—COAL PRODUCTION BY DISTRICTS AND MINING DIVISIONS

District and Mining Division	Total to Date			1951		1952	
	Period	Quantity	Value	Quantity	Value	Quantity	Value
Vancouver Island District		Tons	$	Tons	$	Tons	$
Nanaimo Mining Division	1836–1952	78,223,978	279,022,197	396,684	2,578,446	292,627	1,902,076
Nicola-Princeton District							
Kamloops Mining Division	1893–1945	14,995	59,765	....	....	....	....
Nicola Mining Division	1907–1952	2,922,566	10,980,681	899	5,843	1,139	7,404
Osoyoos Mining Division	1926–1927	1,122	5,008	....	....	....	....
Similkameen Mining Division	*1909–1952*	*4,452,800*	*18,383,002*	*3,941*	*25,617*	*6,306*	*40,989*
District totals	1893–1952	7,391,483	29,428,456	4,840	31,460	7,445	48,393
Northern District							
Cariboo Mining Division	1942–1944	290	1,100	....	....	....	....
Liard Mining Division	1923–1952	66,100	360,437	3,199	20,794	3,854	25,051
Omineca Mining Division	1918–1952	282,812	1,357,849	27,697	180,030	37,304	242,476
District totals	1918–1952	349,202	1,719,386	30,896	200,824	41,158	267,527
East Kootenay District							
Fort Steele Mining Division	1898–1952	46,527,709	187,591,117	1,141,942	7,422,623	1,085,266	7,054,228
Provincial totals	1836–1952	132,492,372	497,761,156	1,574,362	10,233,353	1,426,496	9,272,224

TABLE X.—COKE AND BY-PRODUCTS PRODUCTION FOR YEARS 1895 TO 1925[1] AND 1926 TO 1952

Year	Coal Used in Making Coke		Coke Made in Bee-hive Ovens		Coke Made in By-product Ovens		Coke Made in Gas Plants		Total Coke Made		Gas Sold and Used	Tar Produced	Other By-products[2]	Total Production Value of Coke Industry
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value				
	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	$	$	$	$
1895–1925	7,955,795	25,673,600	4,920,457	25,673,600					4,920,457	25,673,600				25,673,600
1926	299,839	1,338,565	105,227	795,841	42,209	244,469	42,468	221,600	189,904	1,261,910	1,009,613	50,035	45,772	2,367,330
1927	269,482	1,290,760	95,281	595,504	35,900	327,215	39,464	178,682	170,645	1,101,401	1,222,379	44,402	18,080	2,386,262
1928	210,207	940,668	68,734	429,590	32,322	263,781	41,711	187,882	142,767	881,253	1,313,407	45,313	14,036	2,254,009
1929	226,363	950,243	75,426	574,279	33,339	308,867	46,573	214,732	155,338	1,097,878	1,461,445	61,084	39,203	2,659,610
1930	225,325	1,002,684	73,708	558,801	31,904	298,004	45,751	232,917	151,363	1,089,722	1,547,092	65,770	11,935	2,714,519
1931	211,334	924,279	73,248	548,550	27,717	236,537	41,836	210,470	142,801	995,557	1,541,454	66,506	32,603	2,636,120
1932	151,750	710,432	33,090	247,615	25,436	217,221	44,645	237,174	103,171	702,010	1,589,656	54,771	14,109	2,360,546
1933	107,400	554,152	6,097	44,813	24,263	213,750	34,156	214,454	64,516	473,017	1,473,433	45,610	3,666	1,995,726
1934	141,384	571,167	24,840	154,105	23,512	213,653	51,184	198,217	99,536	565,975	1,439,287	43,939	4,756	2,053,957
1935	127,776	494,492	27,066	160,565	14,911	109,684	46,111	160,694	88,088	430,943	1,430,057	44,876	3,081	1,908,957
1936	125,810	436,595	34,009	191,843			48,859	138,787	82,868	330,630	1,422,783	38,872		1,792,285
1937	166,124	570,250	48,393	277,726			59,141	330,821	107,534	608,547	1,746,047	46,698		2,401,292
1938	176,877	623,649	54,602	315,294			58,643	345,790	113,245	661,084	1,770,839	44,324		2,476,247
1939	171,242	569,945	50,153	286,491	7,196	37,015	55,395	325,435	112,744	648,941	1,768,977	44,108		2,462,026
1940	184,160	577,706	37,845	220,211	29,124	151,931	60,726	303,421	127,695	675,563	1,810,083	54,379	3,060	2,543,085
1941	235,809	717,584	64,707	392,473	86,656	467,440	8,378	43,758	159,741	903,671	1,925,270	63,569	1,716	2,894,226
1942	255,862	866,795	66,824	439,464	96,428	608,521	6,528	54,307	169,780	1,102,292	2,165,888	86,113	22,028	3,376,321
1943	260,334	983,910	42,766	291,843	43,895	274,402	93,714	647,482	180,375	1,213,727	2,453,592	96,249	18,321	3,781,889
1944	212,883	1,439,891	36,966	301,201	47,401	347,245	88,430	565,393	172,797	1,213,839	2,562,610	56,476	19,046	3,851,971
1945	230,868	1,211,584	13,464	117,369	59,098	434,876	91,682	577,479	164,244	1,129,724	2,721,690	83,828	20,756	3,955,998
1946	251,954	1,441,415	20,542	178,556	53,525	423,025	101,094	648,297	175,161	1,249,878	3,079,009	88,947	53,097	4,470,931
1947	284,049	1,682,602	44,517	427,330	59,638	531,114	91,755	579,635	195,910	1,538,079	3,390,713	124,885	25,780	5,079,457
1948	235,297	1,440,415	47,461	559,735	57,112	630,390	57,678	455,096	162,251	1,645,221	4,520,886	153,130	19,489	6,338,726
1949	323,899	1,979,138	66,407	690,045	89,268	1,018,288	67,449	496,933	223,124	2,205,266	4,148,124	194,728	27,406	6,575,524
1950	333,955	2,027,470	23,703	269,728	127,477	997,200	92,704	686,871	243,884	1,953,799	4,298,161	277,138	27,944	6,557,042
1951	332,416	1,949,117	32,598	387,796	138,051	1,552,764	72,215	571,161	242,864	2,511,721	4,263,754	277,786	22,132	7,075,393
1952	323,922	1,972,918	35,110	440,756	142,156	1,729,924	64,906	525,384	242,172	2,696,064	4,625,747	252,070	25,639	7,599,520
Totals	14,032,116	54,942,026	6,223,241	35,571,124	1,328,538	11,637,316	1,553,196	9,352,872	9,104,972	56,561,312	62,701,996	2,505,606	473,655	122,242,569

[1] *See* foot-note with Table IXA—Coal Production.

[2] "Other by-products" total includes ammonium sulphate, $52,492; ammonia liquor, $103,850; light oils, $16,571; motor fuel, $7,009; naphthalene, $4,077; creosote, $34; benzol (thinning), $312; solvent naphtha, $644; cinders, $263,720; pitch, $5,131; sulphuric acid, $6,658; tar-paint, $2,330; and miscellaneous, $10,827.

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1952

Dividends Paid during 1951 and 1952

	1951	1952
Bralorne Mines Ltd.	$498,800	$374,100
Britannia Mining and Smelting Co. Ltd.	2,314,784	1,659,954
Bulkley Valley Collieries Ltd.	6,000	6,000
Canadian Collieries (D.) Ltd.	112,676	56,338
Consolidated Mining and Smelting Co. of Canada, Ltd.	36,035,666	27,027,345
Crow's Nest Pass Coal Co. Ltd.	248,472	248,336
Granby Consolidated Mining Smelting and Power Co. Ltd.	225,116	225,116
Highland-Bell Ltd.	156,586	78,292
Island Mountain Mines Ltd.	52,536	
Kelowna Mines Hedley Ltd.	240,000	180,000
Reeves MacDonald Mines Ltd.		1,169,000
Sheep Creek Gold Mines Ltd.	206,240	225,000
Silbak Premier Mines Ltd.		50,000
Silver Standard Mines Ltd.	600,362	514,608
Violamac Mines (B.C.) Ltd.		100,000
Western Exploration Co. Ltd.		30,867
Others	224,000	659,000
Totals	$40,921,238	$32,603,956

Dividends Paid Yearly, 1917–52, Inclusive

Year	Amount Paid	Year	Amount Paid
1917	$3,269,494	1936	$10,513,705
1918	2,704,469	1937	15,085,293
1919	2,494,283	1938	12,068,875
1920	1,870,296	1939	11,865,698
1921	736,629	1940	14,595,530
1922	3,174,756	1941	16,598,110
1923	2,983,570	1942	13,627,104
1924	2,977,276	1943	11,860,159
1925	5,853,419	1944	11,367,732
1926	8,011,137	1945	10,487,395
1927	8,816,681	1946	15,566,047
1928	9,572,536	1947	27,940,213
1929	11,263,118	1948	37,672,319
1930	10,543,500	1949	33,651,096
1931	4,650,857	1950	34,399,330
1932	2,786,958	1951	40,921,238
1933	2,471,735	1952	32,603,956
1934	4,745,905		
1935	7,386,070	Total	$447,136,489

Table XI.—Dividends Paid by Mining Companies, 1897–1952—*Continued*

Lode-gold Mines[1]

Company or Mine	Locality	Class	Amount Paid
Arlington	Erie	Gold	$94,872
Athabasca	Nelson	Gold	25,000
Bayonne	Tye Siding	Gold	25,000
Bralorne Mines Ltd.	Bridge River	Gold	16,699,550
Belmont-Surf Inlet	Princess Royal Island	Gold	1,437,500
Cariboo Gold Quartz Mining Co. Ltd.	Wells	Gold	1,679,976
Cariboo-McKinney Con. M. & M. Co.	Camp McKinney	Gold	565,588
Canadian Pacific Exploration (Porto Rico)	Nelson	Gold	37,500
Centre Star	Rossland	Gold-copper	472,255
Fairview Amalgamated	Oliver	Gold	5,254
Fern Gold Mining & Milling Co. Ltd.	Nelson	Gold	9,375
Gold Belt Mining Co. Ltd.	Sheep Creek	Gold	668,595[2]
Goodenough (leasers)	Ymir	Gold	13,731
Hedley Mascot Gold Mines Ltd.	Hedley	Gold	1,290,553
Island Mountain Mines Ltd.	Wells	Gold	1,518,274
I.X.L.	Rossland	Gold	134,025
Jewel-Denero	Greenwood	Gold	11,751
Kelowna Exploration Co. Ltd. (Nickel Plate)	Hedley	Gold	2,040,000
Kelowna Mines Hedley Ltd.	Hedley	Gold	420,000[3]
Kootenay Belle Gold Mines Ltd.	Sheep Creek	Gold	357,856
Le Roi Mining Co.	Rossland	Gold-copper	1,475,000
Le Roi No. 2 Ltd.	Rossland	Gold-copper	1,574,640
Lorne (later Bralorne)	Bridge River	Gold	20,450
Motherlode	Sheep Creek	Gold	163,500
Mount Zeballos Gold Mines Ltd.	Zeballos	Gold	165,000
Nickel Plate (Hedley Gold Mining Co. Ltd.)	Hedley	Gold	3,423,191
Pioneer Gold Mines of B.C. Ltd.	Bridge River	Gold	9,299,393
Poorman	Nelson	Gold	25,000
Premier Gold Mining Co. Ltd.	Premier	Gold	18,858,075[4]
Privateer Mine Ltd.	Zeballos	Gold	1,914,183
Queen (prior to Sheep Creek Gold Mines Ltd.)	Sheep Creek	Gold	98,674
Relief Arlington Mines Ltd. (Second Relief)	Erie	Gold	308,000[2]
Reno Gold Mines Ltd.	Sheep Creek	Gold	1,433,640[2]
Sheep Creek Gold Mines Ltd.	Sheep Creek	Gold	3,609,375[5]
Silbak Premier Mines Ltd.	Premier	Gold	2,425,000[4]
Spud Valley Gold Mines Ltd.	Zeballos	Gold	168,000
Sunset No. 2	Rossland	Gold-copper	115,007
Surf Inlet Consolidated Gold Mines Ltd.	Surf Inlet	Gold	120,279
War Eagle	Rossland	Gold-copper	1,245,250
Ymir Gold	Ymir	Gold	300,000
Ymir Yankee Girl	Ymir	Gold	415,002[2]
Miscellaneous mines		Gold	108,623
Total, lode-gold mines			$74,531,937

[1] The gold-copper properties of Rossland are included in this table.
[2] Includes " Return of Capital " distributions.
[3] Former Kelowna Exploration Company Limited; changed in January, 1951.
[4] Up to and including 1936, dividends paid by Premier Gold Mining Company Limited were derived from operations of the company in British Columbia. Subsequent dividends paid by Premier Gold Mining Company Limited have been derived from the operations of subsidiary companies in British Columbia and elsewhere and are not included in the figure given. In 1936, Silbak Premier, a subsidiary of Premier Gold Mining Company, took over the former gold operations of that company in British Columbia. Dividends paid by Silbak Premier are given above.
[5] In recent years, company revenue has included profits from operation of the Lucky Jim zinc-lead mine.

Table XI.—Dividends Paid by Mining Companies, 1897–1952—*Continued*

Silver-Lead-Zinc Mines

Company or Mine	Locality	Class	Amount Paid
Antoine	Rambler	Silver-lead-zinc	$10,000
Base Metals Mining Corporation Ltd. (Monarch and Kicking Horse)	Field	Silver-lead-zinc	586,143[1]
Beaverdell-Wellington	Beaverdell	Silver-lead-zinc	97,200
Beaver Silver Mines Ltd.	Greenwood	Silver-lead-zinc	48,000
Bell	Beaverdell	Silver-lead-zinc	388,297
Bosun (Rosebery-Surprise)	New Denver	Silver-lead-zinc	25,000
Capella	New Denver	Silver-lead-zinc	5,500
Consolidated Mining and Smelting Co. of Canada, Ltd.	Trail	Silver-lead-zinc	336,116,179[2]
Couverapee	Field	Silver-lead-zinc	5,203
Duthie Mines Ltd.	Smithers	Silver-lead-zinc	50,000
Florence Silver	Ainsworth	Silver-lead-zinc	35,393
Goodenough	Cody	Silver-lead-zinc	45,668
H.B. Mining Co.	Hall Creek	Silver-lead-zinc	8,904
Highland Lass Ltd.	Beaverdell	Silver-lead-zinc	132,464
Highland-Bell Ltd.	Beaverdell	Silver-lead-zinc	1,398,025
Horn Silver	Similkameen	Silver-lead-zinc	6,000
Idaho-Alamo	Sandon	Silver-lead-zinc	400,000
Iron Mountain (Emerald)	Salmo	Silver-lead-zinc	20,000
Jackson	Retallack	Silver-lead-zinc	20,000
Last Chance	Three Forks	Silver-lead-zinc	213,000
Lone Bachelor	Sandon	Silver-lead-zinc	50,000
Lucky Jim	Three Forks	Silver-lead-zinc	80,000
Mercury	Sandon	Silver-lead-zinc	6,000
Meteor	Slocan City	Silver-lead-zinc	10,257
Monitor and Ajax	Three Forks	Silver-lead-zinc	70,500
Mountain Con	Cody	Silver-lead-zinc	71,387
McAllister	Three Forks	Silver-lead-zinc	45,088
Noble Five	Cody	Silver-lead-zinc	72,859
North Star	Kimberley	Silver-lead-zinc	497,901
No. One	Sandon	Silver-lead-zinc	6,754
Ottawa	Slocan City	Silver-lead-zinc	110,429
Payne	Sandon	Silver-lead-zinc	1,438,000
Providence	Greenwood	Silver-lead-zinc	142,328[3]
Queen Bess	Alamo	Silver-lead-zinc	25,000
Rambler-Cariboo	Rambler	Silver-lead-zinc	467,250
Reeves MacDonald Mines Ltd.	Remac	Silver-lead-zinc	1,169,000
Reco	Cody	Silver-lead-zinc	334,992
Ruth Mines Ltd.	Sandon	Silver-lead-zinc	125,490
St. Eugene	Moyie	Silver-lead-zinc	566,000
Silversmith and Slocan Star[4]	Sandon	Silver-lead-zinc	1,267,600
Silver Standard Mines Ltd.	Hazelton	Silver-lead-zinc	1,265,061
Spokane-Trinket	Ainsworth	Silver-lead-zinc	10,365
Standard Silver Lead	Silverton	Silver-lead-zinc	2,734,688
Sunset and Trade Dollar	Retallack	Silver-lead-zinc	88,000
Utica	Kaslo	Silver-lead-zinc	64,000
Violamac Mines (B.C.) Ltd.	New Denver	Silver-lead-zinc	100,000
Wallace Mines Ltd. (Sally)	Beaverdell	Silver-lead-zinc	135,000
Washington	Rambler Station	Silver-lead-zinc	20,000
Western Exploration Co. Ltd.	Silverton	Silver-lead-zinc	30,867
Whitewater	Retallack	Silver-lead-zinc	592,515
Miscellaneous mines		Silver-lead-zinc	70,239
Total, silver-lead-zinc mines			$351,278,546

[1] Includes $466,143 "Return of Capital" distribution prior to 1949.
[2] Earnings of several company mines, and customs smelter at Trail.
[3] Includes $10,504 paid in 1944 but not included in the yearly figure.
[4] These two properties were amalgamated as Silversmith Mines Limited in August, 1939.

Table XI.—Dividends Paid by Mining Companies, 1897–1952—*Continued*

Copper Mines

Company or Mine	Locality	Class	Amount Paid
Britannia M. & S. Co.[1]	Britannia Beach	Copper	$17,248,760
Canada Copper Corporation	Greenwood	Copper	615,399
Cornell	Texada Island	Copper	8,500
Granby Cons. M.S. & P. Co.[2]	Copper Mountain	Copper	29,084,820
Marble Bay	Texada Island	Copper	175,000
Hall Mines	Nelson	Copper	233,280
Miscellaneous mines		Copper	261,470
Total, copper mines			$47,627,229

[1] Britannia Mining and Smelting Company Limited is a subsidiary of the Howe Sound Company, which is the holding company for Britannia and for other mines in Mexico and the State of Washington. Dividends paid by the Howe Sound Company, therefore, cannot be credited to British Columbia. Dividends in the above table for Britannia have been paid by that company, none being paid subsequent to 1930, until 1939. In making comparison with yearly totals, the amounts shown as paid by the Howe Sound Company have been deducted for the years shown, so the total in the annual report concerned will show the higher figure.

[2] The Granby Consolidated Mining Smelting and Power Company dividends commenced in 1904 and cover all company activities in British Columbia to date, the present operations being conducted at Allenby and Copper Mountain. The dividends as set out in the table in the Minister of Mines Annual Report for 1942 were incorrect; the correct total is as above. The figure now includes all dividends, capital distributions, and interim liquidating payments, the latter being $4,500,000, paid, in 1936, prior to reorganization.

Coal Mines

Company or Mine	Locality	Class	Amount Paid
Wellington Collieries Ltd.	Nanaimo	Coal	$16,000,000
Bulkley Valley Collieries Ltd.	Telkwa	Coal	12,000
Crow's Nest Pass Coal Co. Ltd.	Fernie	Coal	14,979,894
Canadian Collieries (D.) Ltd.	Nanaimo	Coal	563,272
Total, coal mines			$31,555,166

Aggregate of All Classes

Lode-gold mining	$74,531,937
Silver-lead-zinc mining and smelting	351,278,546
Copper-mining	47,627,229
Coal-mining	31,555,166
Miscellaneous, structural, and placer gold	5,032,655
Total	$510,025,523

Note.—The term "Miscellaneous" noted in each class of dividend covers all payments of $5,000 and under, together with payments made by companies or individuals requesting that the item be not disclosed.

In compiling the foregoing table of dividends paid, the Department wishes to acknowledge the kind assistance given by companies, individuals, and trade journals in giving information on the subject.

TABLE XII.—PRINCIPAL ITEMS OF EXPENDITURE, REPORTED FOR MINING OPERATIONS OF ALL CLASSES

Class	Salaries and Wages	Fuel and Electricity	Process Supplies
Lode-mining	$47,463,148	$6,126,377	$19,958,156
Placer-mining	203,321	25,285	16,340
Coal-mining	6,047,795	369,455	1,041,358
Miscellaneous metals and industrial minerals	4,660,838	1,951,069	4,984,072
Structural materials industry	3,881,529	1,659,086	1,024,574
Totals, 1952	**$62,256,631**	**$10,131,272**	**$27,024,500**
Totals, 1951	52,561,952	7,283,051	24,724,101
1950	42,738,035	6,775,998	17,500,663
1949	41,023,786	7,206,637	17,884,408
1948	38,813,506	6,139,174	11,532,121
1947	32,160,338	5,319,470	13,068,948
1946	26,190,200	5,427,458	8,367,705
1945	22,620,975	7,239,726	5,756,628
1944	23,131,874	5,788,671	6,138,084
1943	26,051,467	7,432,585	6,572,317
1942	26,913,160	7,066,109	6,863,398
1941	26,050,491	3,776,747	7,260,441
1940	23,391,330	3,474,721	6,962,162
1939	22,357,035	3,266,000[1]	6,714,347
1938	22,765,711	3,396,106	6,544,500
1937	21,349,690	3,066,311	6,845,330
1936	17,887,619	2,724,144	4,434,501
1935	16,753,367	2,619,639	4,552,730
Grand totals, 1935–52	$545,017,167	$98,133,819	$188,746,884

[1] Estimated.

NOTE.—" Process supplies " include explosives, chemicals, drill-steel, lubricants, etc.

Table XIII.—Average Number Employed in the Mining Industry, 1901–52

Year	Placer-mining	Lode-mining			In Concentrators	In Smelters	Coal-mining			Structural Materials		Miscellaneous	Total[1]
		Under	Above	Total			Under	Above	Total	Quarries and Pits	Plants		
1901	....	2,736	1,212	3,948	....	....	3,041	931	3,974	....	....	....	7,922
1902	....	2,219	1,126	3,345	....	....	3,101	910	4,011	....	....	....	7,356
1903	....	1,662	1,088	2,750	....	....	3,137	1,127	4,264	....	....	....	7,014
1904	....	2,143	1,163	3,306	....	....	3,278	1,175	4,453	....	....	....	7,759
1905	....	2,470	1,240	3,710	....	....	3,127	1,280	4,407	....	....	....	8,117
1906	....	2,680	1,303	3,983	....	....	3,415	1,390	4,805	....	....	....	8,788
1907	....	2,704	1,239	3,943	....	....	2,862	907	3,769	....	....	....	7,712
1908	....	2,567	1,127	3,694	....	....	4,432	1,641	6,073	....	....	....	9,767
1909	....	2,184	1,070	3,254	....	....	4,713	1,705	6,418	....	....	....	9,672
1910	....	2,472	1,237	3,709	....	....	5,903	1,855	7,758	....	....	....	11,467
1911	....	2,435	1,159	3,594	....	....	5,212	1,661	6,873	....	....	....	10,467
1912	....	2,472	1,364	3,837	....	....	5,275	1,855	7,130	....	....	....	10,967
1913	....	2,773	1,505	4,278	....	....	4,950	1,721	6,671	....	....	....	10,949
1914	....	2,741	1,433	4,174	....	....	4,267	1,465	5,732	....	....	....	9,906
1915	....	2,709	1,435	4,144	....	....	3,708	1,283	4,991	....	....	....	9,135
1916	....	3,357	2,036	5,393	....	....	3,694	1,366	5,060	....	....	....	10,453
1917	....	3,290	2,198	5,488	....	....	3,760	1,410	5,170	....	....	....	10,658
1918	....	2,626	1,764	4,390	....	....	3,658	1,769	5,247	....	....	....	9,637
1919	....	2,513	1,746	4,259	....	....	4,145	1,821	5,966	....	....	....	10,225
1920	....	2,074	1,605	3,679	....	....	4,191	2,158	6,349	....	....	....	10,028
1921	....	1,355	975	2,330	....	....	4,722	2,163	6,885	....	....	....	9,215
1922	....	1,510	1,239	2,749	....	....	4,712	1,932	6,644	....	....	....	9,393
1923	....	2,102	1,516	3,618	....	....	4,342	1,807	6,149	....	....	....	9,767
1924	....	2,353	1,680	4,033	....	....	3,894	1,524	5,418	....	....	....	9,451
1925	....	2,298	2,840	5,138	....	....	3,828	1,615	5,443	....	....	....	10,581
1926	299	2,606	1,735	4,341	808	2,461	3,757	1,565	5,322	493	324	124	14,172
1927	415	2,671	1,916	4,587	854	2,842	3,646	1,579	5,225	647	138	122	14,830
1928	355	2,707	2,469	5,176	911	2,748	3,814	1,520	5,334	412	368	120	15,424
1929	341	2,926	2,052	4,978	966	2,948	3,675	1,353	5,028	492	544	268	15,565
1930	425	2,316	1,260	3,576	832	3,197	3,389	1,256	4,645	843	344	170	14,032
1931	688	1,463	834	2,297	581	3,157	2,957	1,125	4,082	460	526	380	12,171
1932	874	1,355	900	2,255	542	2,036	2,628	980	3,608	536	329	344	10,524
1933	1,134	1,786	1,335	3,121	531	2,436	2,241	853	3,094	376	269	408	11,369
1934	1,122	2,796	1,729	4,525	631	2,890	2,050	843	2,893	377	187	360	12,985
1935	1,291	2,740	1,497	4,237	907	2,771	2,145	826	2,971	536	270	754	13,737
1936	1,124	2,959	1,840	4,799	720	2,678	2,015	799	2,814	931	288	825	14,179
1937	1,371	3,603	1,818	5,421	1,168	3,027	2,286	867	3,153	724	327	938	16,129
1938	1,303	3,849	2,266	6,115	919	3,158	2,088	874	2,962	900	295	369	16,021
1939	1,252	3,905	2,050	5,955	996	3,187	2,167	809	2,976	652	311	561	15,890
1940	1,004	3,923	2,104	6,027	1,048	2,944	2,175	699	2,874	827	334	647	15,705
1941	939	3,901	1,823	5,724	1,025	3,072	2,229	494	2,723	766	413	422	15,084
1942	489	2,920	1,504	4,424	960	3,555	1,892	468	2,360	842	378	262	13,270
1943	212	2,394	1,699	4,093	891	2,835	2,240	611	2,851	673	326	567	12,448
1944	255	1,896	1,825	3,721	849	2,981	2,150	689	2,839	690	351	628	12,314
1945	209	1,933	1,750	3,683	822	2,834	1,927	503	2,430	921	335	586	11,820
1946	347	1,918	1,817	3,735	672	2,813	1,773	532	2,305	827	555	679	11,933
1947	360	3,024	2,238	5,262	960	3,461	1,694	731	2,425	977	585	869	14,899
1948	348	3,143	2,429	5,572	1,126	3,884	1,594	872	2,466	1,591	656	754	16,397
1949	303	3,034	2,724	5,758	1,203	3,763	1,761	545	2,306	2,120	542	626	16,621
1950	327	3,399	2,415	5,814	1,259	3,759	1,745	516	2,261	1,916	616	660	16,612
1951	205	3,785	3,695	7,480	1,307	4,044	1,462	463	1,925	1,783	628	491	17,863
1952	**230**	**4,171**	**3,923**	**8,094**	**1,516**	**4,120**	**1,280**	**401**	**1,681**	**1,530**	**557**	**529**	**18,257**

[1] The average number employed in the industry is the sum of the averages for individual companies. The average for each company is obtained by taking the sum of the numbers employed each month and dividing by 12, regardless of the number of months worked.

Table XIV.—Lode-metal Mines—Tonnage, Number of Mines, Net and Gross Value of Principal Metals,[4] 1901–52

Year	Tonnage[1]	Number of Shipping Mines	Number of Mines Shipping over 100 Tons	Gross Value as Reported by Shipper[2]	Freight and Treatment[2]	Net Value to Shipper[3]	Gross Value of Lode Metals Produced[4]
1901	920,416	119	78	....	....	....	$14,100,282
1902	998,999	124	75	....	....	....	11,581,153
1903	1,286,176	125	74	....	....	....	12,103,237
1904	1,461,609	142	76	....	....	....	12,909,035
1905	1,706,679	146	79	....	....	....	15,980,164
1906	1,963,872	154	77	....	....	....	18,484,102
1907	1,804,114	147	72	....	....	....	17,316,847
1908	2,083,606	108	59	....	....	....	15,847,411
1909	2,057,713	89	52	....	....	....	15,451,141
1910	2,216,428	83	50	....	....	....	14,728,731
1911	1,770,755	80	45	....	....	....	11,454,063
1912	2,688,532	86	51	....	....	....	17,662,766
1913	2,663,809	110	58	....	....	....	17,190,838
1914	2,175,971	98	56	....	....	....	15,225,061
1915	2,690,110	132	59	....	....	....	19,992,149
1916	3,188,865	169	81	....	....	....	31,483,014
1917	2,761,579	193	87	....	....	....	26,788,474
1918	2,892,849	175	80	....	....	....	27,590,278
1919	2,112,975	144	74	....	....	....	19,750,498
1920	2,178,187	121	60	....	....	....	19,444,365
1921	1,562,645	80	35	....	....	....	12,920,398
1922	1,573,186	98	33	....	....	....	19,227,857
1923	2,421,839	77	28	....	....	....	25,347,092
1924	3,397,105	86	37	....	....	....	35,538,247
1925	3,849,269	102	40	....	....	....	46,200,135
1926	4,775,073	138	55	....	....	$38,558,613	51,508,031
1927	5,416,021	132	52	....	....	27,750,364	44,977,082
1928	6,241,310	110	49	....	....	29,070,075	48,281,825
1929	6,977,681	106	48	....	....	34,713,887	51,174,859
1930	6,803,846	68	32	....	....	21,977,688	40,915,395
1931	5,549,103	44	22	....	....	10,513,931	22,535,573
1932	4,340,158	75	29	....	....	7,075,393	19,700,235
1933	4,030,978	109	47	....	....	13,976,358	25,007,137
1934	5,116,897	145	69	....	....	20,243,278	33,895,930
1935	4,916,148	177	72	....	....	25,407,914	40,597,569
1936	4,381,027	168	70	....	....	30,051,207	43,666,452
1937	6,145,144	185	113	$48,617,920	$4,663,843	43,954,077	62,912,783
1938	7,377,021	211	92	40,222,237	4,943,754	35,278,483	53,877,333
1939	7,211,223	217	99	45,133,788	4,416,919	40,716,869	53,522,098
1940	7,937,358	216	92	50,004,909	6,334,611	43,670,298	62,848,642
1941	7,938,803	200	96	52,354,870	5,673,048	46,681,822	62,216,019
1942	6,708,277	126	76	50,494,041	5,294,637	45,199,404	55,359,479
1943	5,429,557	48	32	37,234,070	3,940,367	33,293,703	46,089,042
1944	4,763,332	51	31	29,327,114	2,877,706	26,449,408	39,315,910
1945	4,377,722	36	27	34,154,917	2,771,292	31,383,625	49,997,071
1946	3,705,375	50	32	48,920,971	2,904,130	46,016,841	56,519,691
1947	4,953,030	75	33	81,033,093	4,722,010	76,311,087	93,176,165
1948	5,655,266	97	51	118,713,859	18,585,183	100,128,727	125,979,961
1949	6,095,441	118	54	99,426,678	19,613,185	79,814,604	105,259,001
1950	6,782,912	112	58	108,864,792	22,113,431	86,751,361	121,635,457
1951	6,711,471	119	64	142,590,427	25,096,743	117,493,684	146,140,477
1952	**7,607,871**	**95**	**58**	**140,070,389**	**30,444,575**	**106,601,451**	**134,111,567**

[1] Does not include mercury or tungsten ores, iron ores, or silica (flux).
[2] Data not collected before 1937.
[3] Previous to 1937 the shipper reported "Net Value at Shipping Point," no indication being given as to how the net value was computed. From 1937 on the shipper has reported "Gross Value," from which deduction of freight and treatment gives "Net Value."
[4] Gross value as represented by valuing gold, silver, copper, lead, and zinc at yearly average prices.

TABLE XV.—LODE-METAL PRODUCERS IN 1952

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
NORTHERN BRITISH COLUMBIA										
Atlin Mining Division			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Big Bull and Tulsequah Chief	Tulsequah	Tulsequah Mines Ltd., Trail	96,059	Zinc concentrates, 8,798 tons; lead concentrates, 2,220 tons; copper concentrates and copper-lead concentrates, 5,448 tons	6,757	285,240	2,270,377	2,575,788	10,845,069	41,170
Engineer	Tagish Lake	Engineer Partnership, Atlin		Bullion	202	118				
Liard Mining Division										
Nil										
CENTRAL BRITISH COLUMBIA										
Cariboo Mining Division										
Cariboo Gold Quartz	Wells	Cariboo Gold Quartz Mining Co. Ltd., Vancouver	71,138	Bullion	24,574	2,237				
Island Mountain	Wells	Island Mountain Mines Co. Ltd., Vancouver	45,274	Bullion	18,098	2,523				
Clinton Mining Division										
Nil										
Omineca Mining Division										
Cronin Babine	Smithers	Cronin Babine Mines Ltd., Vancouver	3,510	Lead concentrates, 194 tons; zinc concentrates, 232 tons	28	23,824		268,672	282,486	3,752
Dorreen	Dorreen	Dorreen Mines Ltd., Vancouver	525[1]	Lead concentrates, 20 tons	105	261		6,917	2,959	
Emerald Glacier	Burns Lake	Emerald Glacier Mines Ltd., Montreal, Que.	2,908	Lead concentrates, 780 tons; zinc concentrates, 706 tons	31	46,823		955,398	870,061	
Silver Standard	Hazelton	Silver Standard Mines Ltd., Vancouver	20,893	Lead concentrates, 1,629 tons; zinc concentrates, 2,681 tons	1,750	907,646		1,638,529	3,351,022	46,980
Red Rose and Rocher Deboule	Skeena Crossing	Western Tungsten Copper Mines Ltd., Vancouver	33,951[1]	Copper-gold concentrates, 974 tons; tungsten concentrates, 276 tons; 20,359 units WO_3	267	18,640	305,498			
Quesnel Mining Division										
Nil										

[1] Estimated.

TABLE XV.—LODE-METAL PRODUCERS IN 1952—*Continued*

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
COAST AND ISLANDS										
Alberni Mining Division			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Privateer	Zeballos	Lessees, Privateer Mine Ltd., Vancouver	50	Bullion	117	31				
White Star	Zeballos	Andrew Donaldson, Zeballos	4	Crude ore	12	5				
Nanaimo Mining Division										
Iron Hill	Quinsam Lake	The Argonaut Co. Ltd., Vancouver		Iron-ore concentrates, 666,387 tons						
Prescott, Lake	Texada Island	Texada Mines Ltd., Vananda		Iron-ore concentrates, 234,094 tons						
Vananda	Vananda	Vananda Mines (1948) Ltd., Vancouver	1,061	Crude ore	105	439	22,997			
New Westminster Mining Division										
Nil										
Skeena Mining Division										
East	Tide Lake	Mrs. Julia K. Phillips, Stewart	1	Crude ore	35	51				
Indian	Premier	Indian Mines (1946) Ltd., Vancouver	10,358	Crude ore[2]	850	33,172		826,938	1,035,178	
Premier Border	Premier	Premier Border Gold Mining Co. Ltd., Vancouver	14,701	Crude ore[2]	1,357	25,074		1,014,615	1,209,809	
Silbak Premier	Premier	Silbak Premier Mines Ltd., Vancouver	65,703	Lead concentrates, 1,795 tons; zinc concentrates, 3,961 tons	6,689	99,944		2,206,116	3,256,952	65,266
Torbrit	Kitsault River	Torbrit Silver Mines Ltd., Toronto, Ont.	135,761	Silver-lead concentrates, 2,827 tons; silver bullion	38	2,346,651		1,015,040	167,015	
Vancouver Mining Division										
Britannia	Britannia Beach	Britannia Mining & Smelting Co. Ltd., Britannia Beach	829,652	Copper concentrates, 24,528 tons; zinc concentrates, 26,511 tons; lead concentrates, 359 tons; pyrite concentrates, 81,805 tons	10,669	97,017	14,255,948	2,246,358	28,590,898	130,799
Cambrian Chieftain	Pender Harbour	Chieftain Exploration Ltd., Vancouver	151	Crude ore		560	23,320			
Victoria Mining Division										
Nil										

SOUTH CENTRAL BRITISH COLUMBIA										
Greenwood Mining Division										
Crown Point (Caladian)	Westbridge	Campbell, Meredith & Murray, Vancouver	37	Crude ore		99		2,428	5,665	
Highland-Bell	Beaverdell	Highland-Bell Ltd., Vancouver	8,811	Lead concentrates, 258 tons; zinc concentrates, 162 tons; jig concentrates, 74 tons	130	374,710		176,452	217,212	1,834
Providence	Greenwood	Wanke & Johnson, Greenwood	7	Crude ore	8	2,231		929	805	
Wellington	Beaverdell	Silver Bounty Mines Ltd., Vancouver	132	Crude ore	9	18,556		19,065	28,746	
Kamloops Mining Division										
Ex. No. 1	Adams Plateau	T. J. Bischoff, Celista	59	Crude ore		1,124		41,827	10,458	
Lillooet Mining Division										
Bralorne	Bridge River	Bralorne Mines Ltd., Vancouver	175,005	Bullion; gold concentrates, 3,427 tons	74,415	17,992				
Pioneer	Bridge River	Pioneer Gold Mines of B.C. Ltd., Vancouver	86,036	Bullion	42,400	9,996				
Nicola Mining Division										
Molony	Merritt	Mrs. Mary Molony, Merritt	1	Crude ore		252		307	232	
Osoyoos Mining Division										
Fairview	Oliver	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	19,881	Silica flux						
Nickel Plate	Hedley	Kelowna Mines Hedley Ltd., Hedley	120,786	Gold concentrates and precipitates, 5,702 tons	52,072	14,435	192,252			
Okanagan	Vernon	J. K. and W. J. Armstrong and J. Trombley, Penticton	6	Crude ore	3	11		293	316	
Oregon (French)	Hedley	Kelowna Mines Hedley Ltd., Hedley	6,753	Gold concentrates and precipitates, included in Nickel Plate						
Similkameen Mining Division										
Copper Mountain	Copper Mountain	Granby Cons. M. S. & P. Co. Ltd., Copper Mountain	1,751,703	Copper concentrates, 61,813 tons	7,923	169,368	24,702,079			
Vernon Mining Division										
Royal	Vernon	George Caryk, Vernon	4	Crude ore		81		152	548	

[2] Milled at Silbak Premier.

TABLE XV.—LODE-METAL PRODUCERS IN 1952—*Continued*

Property or Operator	Location of Mine	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Contents					
					Gold	Silver	Copper	Lead	Zinc	Cadmium
SOUTHEASTERN BRITISH COLUMBIA										
Ainsworth Mining Division			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Ayesha	Ainsworth	T. Lane, Ainsworth	43	Crude ore		256		8,623	13,016	
Black Fox	Keen Creek	Ainsworth Base Metals Ltd., Vancouver	707	Crude ore	6	1,059		9,264	115,932	
Bluebell	Riondel	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	136,212	Lead concentrates, 10,669 tons; zinc concentrates, 15,540 tons		225,995		15,672,897	15,838,897	69,580
B.N.A.	Keen Creek	W. E. and L. V. Newton, Penticton	68	Crude ore	2	9,702		14,528	17,103	
Cork-Province	Keen Creek	Base Metals Mining Corp. Ltd., Vancouver	34,095	Lead concentrates, 1,235 tons; zinc concentrates, 4,621 tons	21	79,654		1,667,744	4,957,011	42,864
Highland	Ainsworth	E. Meyer and B. Sterna, Ainsworth	89	Crude ore		1,350		77,417	5,847	
Highlander	Ainsworth	Yale Lead & Zinc Mines Ltd., Ainsworth	56,095	Lead concentrates, 4,180 tons; zinc concentrates, 1,438 tons	37	131,107		5,799,951	1,712,987	
Humboldt	Crawford Creek	Talmor Mines Ltd., Nelson	21	Crude ore		698		16,355	3,528	
Kootenay Florence	Ainsworth	Western Mines Ltd., Vancouver	21,484	Lead concentrates, 1,427 tons; zinc concentrates, 976 tons	87	27,505		1,950,806	1,004,743	8,234
Moonshine	Lardeau	B.C. Metal Mines Ltd., Vancouver	60[1]	Crude ore		386		12,603	9,320	
New Jerusalem	Ainsworth	Ainslo Mining Co. Ltd., Nelson	246	Crude ore	8	375		16,477	12,509	84
Nicolet	Ainsworth	E. A. Linn and A. Augustine, Kaslo	296	Crude ore		986		60,580	35,456	
Pilot Bay	Pilot Bay	G. L. Green and C. D. Stearns, Nelson	1,113	Tailings; lead concentrates, 50 tons; zinc concentrates, 613 tons		3,135		82,918	605,654	3,317
Scranton	Woodbury Creek	Scranton Mines Ltd., Portland, Ore.	2,514	Crude ore	441	21,825		568,043	499,365	1,663
Silver Bear	Keen Creek	S. Hallgren, Ainsworth	13	Crude ore		163		282	1,412	
Spokane	Ainsworth	T. Hawes and S. McLellan, Ainsworth	32	Crude ore		460		33,418	5,341	
Vigilant	Woodbury Creek	J. A. Cooper, Ainsworth	1,951	Crude ore		3,824		252,317	101,433	434
Whitewater	Retallack	Retallack Mines Ltd. (Kootenay Belle Gold Mines Ltd., Retallack)	56,000[3]	Lead concentrates, 743 tons; zinc concentrates, 7,207 tons	152	94,168		874,358	7,896,962	48,891
Winona Boon	Jackson Basin	L. N. Garland, Retallack	3	Crude ore		343		3,595	1,017	
Fort Steele Mining Division										
Estella	Wasa	Estella Mines Ltd., Vancouver	54,100	Lead concentrates, 3,321 tons; zinc concentrates, 8,315 tons	31	60,419		4,350,840	9,897,194	284
Kootenay King	Fort Steele	Kootenay Base Metals Ltd., Vancouver	13,362	Lead concentrates, 1,252 tons; zinc concentrates, 1,474 tons	22	26,391		1,464,170	1,803,094	2,171
Society Girl	Moyie	Society Girl Mining Syndicate, Vancouver	403	Crude ore		664		58,235	1,452	
Sullivan	Kimberley	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	2,699,533	Lead concentrates, 139,337 tons; zinc concentrates, 246,099 tons		2,846,304		215,000,283	258,139,395	

Golden Mining Division										
Monarch and Kicking Horse	Field	Base Metals Mining Corp. Ltd., Toronto, Ont.	14,885	Lead concentrates, 115 tons; zinc concentrates, 1,097 tons	......	3,144	......	239,457	1,670,595	3,211
Paradise	Invermere	Sheep Creek Gold Mines Ltd., Vancouver	19,250	Lead concentrates, 1,282 tons; zinc concentrates, 2,641 tons	16	61,625	......	1,298,987	2,661,133	8,914
Silver Giant	Spillimacheen	Giant Mascot Mines Ltd., Vancouver	112,705	Lead concentrates, 5,912 tons; zinc concentrates, 390 tons	......	71,184	......	8,574,050	654,772	100
Western Cross	Golden	N. Robert and R. L. Kirk, Golden	1	Crude ore	......	5	......	212	216	......
Nelson Mining Division										
Alice	Creston	R. Welloff and S. Maines, Creston	25	Crude ore	......	260	......	14,939	162	......
Arlington	Erie	New Arlington Mines Ltd., Nelson	2,870	Lead concentrates, 140 tons	443	1,660	......	24,375	30,437	......
Cricket No. 2	Kuskanook	E. Bainbridge, Boswell	1	Crude ore	......	30	......	503	9	......
Dewey	Ymir	S. Nelson and H. Erickson, Castlegar	13	Crude ore	......	44	......	1,526	1,232	......
Emerald-Feeney-Dodger	Salmo	Canadian Exploration Ltd., Vancouver, and Canadian Government per Canadian Exploration Ltd.	104,776	**Tungsten concentrates, 51,373 units WO_3**	......	......	......	......	......	......
Jersey	Salmo	Canadian Exploration Ltd., Salmo	369,335	Lead concentrates, 6,841 tons; zinc concentrates, 18,185 tons	......	34,196	......	15,445,029	34,314,011	268,300
Lakeview	Sanca	Mrs. K. C. Timmons, Boswell	38	Crude ore	1	334	......	14,652	24,477	......
Protection (Goodenough)	Ymir	Pacific Mining Services Ltd., Vancouver; J. Turk, F. Padulo, and L. Masura, Ymir	1,056	Crude ore	184	3,593	......	86,606	102,395	1,134
Queen	Sheep Creek	Sheep Creek Gold Mines Ltd., Nelson	4	Clean-up material	111	26	......	......	......	......
Reeves MacDonald	Remac	Reeves MacDonald Mines Ltd., Vancouver	339,794	Lead concentrates, 4,064 tons; zinc concentrates, 21,541 tons	......	27,149	......	6,330,418	22,772,878	138,151
Silver Hill	Crawford Creek	Abco Mining Corp. Ltd., Nelson	16	Crude ore	......	216	......	1,177	743	......
Spokane	Bayonne	S. MacDonald and K. K. Laib, Bayonne	35	Crude ore	18	351	......	10,143	973	......
Sun	Fortynine Creek	W. Rozan, Nelson	28	Crude ore	26	22	......	386	111	......
Revelstoke Mining Division										
Mastodon	Revelstoke	Mastodon Zinc Mines Ltd., Toronto, Ont.	16,399	Zinc concentrates, 2,987 tons	......	2,953	......	77,475	3,433,189	12,575
Spider	Camborne	Sunshine Lardeau Mines Ltd., Vancouver	7,119	Crude ore, 800 tons; lead concentrates, 692 tons; zinc concentrates, 581 tons	706	147,710	......	1,298,777	836,525	......
Slocan Mining Division										
Bosun	Silverton	New Santiago Mines Ltd., Vancouver	67	Crude ore	1	5,256	......	47,905	16,233	......
Galena Farm	Silverton	F. S. Mills and W. D. Pengelly, Silverton	638	Crude ore	......	7,451	......	66,948	116,209	......
Little Tim	Springer Creek	Hardex Mines Ltd. and Harrison Drilling & Exploration Co. Ltd., Slocan City	52	Crude ore	1	6,660	......	9,662	4,472	......

[1] Estimated.
[2] Estimated tonnage from Whitewater, and from Richmond-Eureka, Altoona, and Monitor in Slocan Mining Division. Company records taken over by trust company, and official data not available.

only on weathered surfaces. Most of the beds are at least several feet thick, but thinner one were noted. Fragments range in size from a fraction of an inch to as much as several inches; most are angular, but some, especially the larger ones, are rounded. Fragments about one-eighth to one-quarter inch across are most common. The larger fragments are fine grained, and most of them consist of tuff or other volcanic rock. The fragmental beds have a tuffaceous groundmass, and in some the groundmass includes sedimentary material.

Sediments interbedded with the volcanics include argillite and conglomerate. The argillite is generally dark, nearly black in colour, but weathers to a light grey, and some of it to nearly white. It is characteristically thin bedded, and many beds are less than one-tenth of an inch thick. Generally, the thinner beds are in groups a few inches thick. In a few places the argillite is thick enough to constitute mappable units which are shown on Figure 7.

The conglomerates are common only in the eastern part of the formation close to the contact with the Pasayten formation. Most are greenish, but some have a distinctive purplish cast. They consist of rounded and subangular pebbles and cobbles as much as several inches across, in a tuffaceous groundmass. The pebbles and cobbles consist mostly of tuffs, flows, and fine-grained intrusives and include a comparatively small proportion of sediments.

The members of the Dewdney Creek formation are considerably altered. Pyrite is commonly present, and many outcrops, particularly in the west, are rusty.

The Pasayten formation includes arkose, argillite, and conglomerate, and differs markedly from the Dewdney Creek formation. Arkose predominates; most of it is relatively coarse grained and consists of readily recognizable grains of quartz and feldspar, and minor amounts of mica. Small pebbles are common. It is grey and weathers to a light-grey colour. In a few places, bedding planes are discernible, but most of it is massive. The arkose closely resembles a medium-grained granitic rock and is hard and resistant to weathering.

The argillites are thin bedded like those of the Dewdney Creek formation but, unlike them, do not weather to light grey and are quite dark on weathered surfaces. They tend to break down to a rubble on weathering and do not outcrop prominently. These argillites form belts as much as several hundred feet wide and are shown on Figure 7.

The conglomerates consist largely of cobbles and of a minor proportion of pebbles in a sandy or arkosic matrix. Most of the cobbles, many of which are over 1 foot in diameter, consist of medium- and coarse-grained granitic rock; a small proportion of the cobbles is volcanic, or sedimentary, or gneissic. The conglomerates occur in the northeast and, to a lesser extent, in the west, where they are interbedded with argillite and arkose.

In the Dewdney Creek formation, Cairnes found numerous fossils that have been considered to be of Upper Jurassic or Lower Cretaceous age. The Pasayten formation contains fossils of Lower Cretaceous age, and it is generally concluded to be younger than the Dewdney Creek formation. It is obvious that considerable time must have lapsed between the deposition of the Dewdney Creek formation and the Pasayten formation, during which time granitic masses were unroofed.

The two formations are intruded by numerous sills and dykes and one stock. These vary considerably in composition, but most of them range between diorite and gabbro. Some of the sills are lamprophyres. The intrusive bodies range from fine-grained, nearly glassy, to medium-grained types, with crystals in the largest bodies attaining lengths of one-quarter inch. The intrusive bodies are much alike in both formations, with the exception that those in the Pasayten formation are somewhat darker and do not include any sills. The dykes in the Dewdney Creek formation strike westward, and those in the Pasayten formation strike west-northwestward.

TABLE XVI.—LODE-METAL MINES EMPLOYING AN AVERAGE OF TEN OR MORE MEN DURING 1952[1]

Name of Mine or Operator	Days Operating		Tons		Average Number Employed	
	Mine	Mill	Mined	Milled	Mine	Mill
Shipping Mines						
Big Bull and Tulsequah Chief (Tulsequah Mines Ltd.)	366	366	96,059	96,059	193	21
Cariboo Gold Quartz Mining Co. Ltd.	303	363	71,138	71,138	204	20
Island Mountain Mines Co. Ltd.	366	366	45,274	45,274	114	11
Cronin Babine Mines Ltd.	300	108	4,100	3,510	30	2
Dorreen Mines Ltd.	300[2]	.....	400[2]	400[2]	10	2
Emerald Glacier Mines Ltd.	314	365	2,908	2,908	27	9
Silver Standard Mines Ltd.	278	355	25,590	20,893	99	15
Red Rose and Rocher Deboule (Western Tungsten Copper Mines Ltd.)	320	330	32,397	29,197	135	72[3]
The Argonaut Co. Ltd.	277	277	(6)	(6)	278	(5)
Texada Mines Ltd.	156	156	(6)	(6)	111	7
Vananda Mines (1948) Ltd.	(6)	.....	1,061	.....	16[2]	.....
Silbak Premier Mines Ltd.	306	306	90,762[4]	90,762[4]	197	11
Torbrit Silver Mines Ltd.	366	366	135,761	135,761	123	25
Britannia Mining & Smelting Co. Ltd.	281	273	829,652	829,652	669	216
Highland-Bell Ltd.	180	167	8,811	8,811	29	5
Bralorne Mines Ltd.	366	366	175,005	175,005	441	21
Pioneer Gold Mines of B.C. Ltd.	363	365	86,036	86,036	286	14
Nickel Plate (Kelowna Mines Hedley Ltd.)	280	365	127,539[7]	127,539[7]	166	64
Fairview (Cons. M. & S. Co. of Canada, Ltd.)	365	.....	19,881	.....	13	.....
Copper Mountain (Granby Cons. M.S. & P. Co. Ltd.)	358	358	1,751,703	1,751,703	703	211
Bluebell (Cons. M. & S. Co. of Canada Ltd.)	301	252	136,212	136,212	227	12
Cork-Province (Base Metals Mining Corp. Ltd.)	366	366	34,095	34,095	59	8
Highlander (Yale Lead & Zinc Mines Ltd.)	281	348	56,095	56,095	67	19
Kootenay Florence (Western Mines Ltd.)	365	365	21,484	21,484	36	7
Moonshine (B.C. Metal Mines Ltd.)	287	.....	26	.....	11	.....
Scranton Mines Ltd.	365	.....	2,514	.....	11	.....
Whitewater (Kootenay Belle Gold Mines Ltd.)	330[2]	330[2]	56,000[2]	56,000[2]	67	20
Estella Mines Ltd.	280	280	54,100	54,100	91	20
Kootenay King (Kootenay Base Metals Ltd.)	338	250	13,362	13,362	31	6
Sullivan (Cons. M. & S. Co. of Canada, Ltd.)	366	366	2,699,533	2,699,533	1,403	493
Giant Mascot Mines Ltd.	365	365	112,705	112,705	87	17
Monarch and Kicking Horse (Base Metals Mining Corp. Ltd.)	240	120	14,885	14,885	46	3
Paradise (Sheep Creek Gold Mines Ltd.)	341	343	19,250	19,250	45	7
Arlington (New Arlington Mines Ltd.)	365	117	2,870	2,870	9	2
Emerald-Dodger-Feeney (Canadian Exploration Ltd.)	365	366	109,776	109,776	134	42
Jersey (Canadian Exploration Ltd.)	365	365	369,335	369,335	570	40
Reeves MacDonald Mines Ltd.	277	345	339,794	339,794	169	21
Mastodon Zinc Mines Ltd.	307	122	16,399	16,399	102	3
Spider (Sunshine Lardeau Mines Ltd.)	295	164	7,221	7,119	42	9
Little Tim (Hardex Mines Ltd. and Harrison Drilling & Exploration Co. Ltd.)	366	.....	52	.....	20	.....
Noble Five (Cody-Reco Mines Ltd.)	300	.....	1,980	1,980	14	22[3]
Standard, Enterprise, and Mammoth (Western Exploration Co. Ltd.)	277	251	28,000	24,000	75	17
Van Roi Consolidated Mines Ltd.	210[2]	210[2]	26,000[2]	26,000[2]	65	10
Violamac Mines (B.C.) Ltd.	365	324	12,182	12,182	45	7
Lucky Jim (Sheep Creek Gold Mines Ltd.)	306	319	101,769	101,769	90	10
Non-shipping Mines						
Sil Van Consolidated Mining & Milling Co. Ltd.	.....	.....	.....	.....	51	.....
Attwood Copper Mines Ltd.	.....	.....	.....	.....	19	.....
Wayside (L.A.P. Mining Co. Ltd.)	.....	.....	.....	.....	14	.....
Jackson Basin Mining Co. Ltd.	.....	.....	.....	.....	17	.....
H.B. (Cons. M. & S. Co. of Canada, Ltd.)	.....	.....	.....	.....	168	.....
Silver Ridge Mining Co. Ltd.	.....	.....	.....	.....	13	.....
Silversmith (Carnegie Mines Ltd.)	.....	.....	.....	.....	110	.....
Rossland Mining Co. Ltd.	.....	.....	.....	.....	19	.....

[1] The average number employed includes wage-earners and salaried employees. The average is obtained by adding the monthly figures and dividing by 12, irrespective of the number of months worked.
[2] Estimated.
[3] Includes construction crew.
[4] Includes ore milled for Indian Mines Ltd. and Premier Border.
[5] Included in mine figure.
[6] Not available.
[7] Includes ore mined and milled from French mine.

Departmental Work

OFFICES

The Department of Mines offices in Victoria are on the fourth floor of the Douglas Building. The analytical laboratories are housed in the one-story building that originally housed the Legislative Assembly and now faces Superior Street.

ADMINISTRATION BRANCH

The Administration Branch is responsible for the administration of the Provincial laws regarding the acquisition of rights to mineral and to coal, petroleum and natural gas, and deals with other departments of the Provincial service for the Department or for any branch.

Gold Commissioners, Mining Recorders, and Sub-mining Recorders, whose duties are laid down in the "Mineral Act" and the "Placer-mining Act," administer these Acts and other Acts relating to mining. Mining Recorders, in addition to their own functions, may also exercise the powers conferred upon Gold Commissioners with regard to mineral claims within the mining division for which they have been appointed. Similar duties may be performed by Mining Recorders with regard to placer claims but not in respect of placer-mining leases. Recording of location and of work upon mineral claims, placer claims, and placer-mining leases as required by the various Acts must be made at the office of the Mining Recorder for the proper mining division. Information concerning claims and leases and concerning the ownership and standing of claims and leases in any division may be obtained from the Mining Recorder for the mining division in which the property is situated. Sub-Mining Recorders, who act as forwarding agents, are appointed at various places throughout the Province. They are authorized to accept documents and fees, and forward them to the office of the Mining Recorder for the correct mining division. Officials and their offices in various parts of the Province are listed in the table on pages 50 and 51.

Central Records Offices (Victoria and Vancouver)

The transcripts of all recordings made in Mining Recorders' offices throughout the Province are sent to the office of the Chief Gold Commissioner in Victoria twice each month, and include the names of lessees of reverted Crown-granted mineral claims. These records and maps showing the approximate positions of mineral claims held by record and of placer-mining leases may be consulted by the public during office hours at Victoria and at the office of the Gold Commissioner at Vancouver, 300 West Pender Street. The maps conform in geographical detail, size, and number to the reference and mineral reference maps issued by the Department of Lands, and the approximate positions of mineral claims held by record and of placer-mining leases are plotted from details supplied by the locators. Provision has been made to supply the general public, on request to the office of the Chief Gold Commissioner, with copies of the maps.

Gold Commissioners and Mining Recorders

The locations of the offices and the names of the Gold Commissioner, Mining Recorder, and Sub-Recorder for each mining division are given in a table on pages 50 and 51.

Mining Divisions Amalgamated since 1949

Date	Mining Divisions Amalgamated	New Name	Mining Recorder's Office
Oct. 1, 1949	Revelstoke and Lardeau	Revelstoke	Revelstoke.
Dec. 1, 1949	Kamloops and Ashcroft	Kamloops	Kamloops.
Apr. 1, 1951	Skeena and Portland Canal	Skeena	Prince Rupert.
Mar. 1, 1952	Stikine and Peace River	Liard	Victoria.

Mining Laws and Laws Related to Mining

Synopses of mining laws and of laws related to mining are available on application. The titles of the various Acts and the price charged for each are listed below. Upon payment of the price a copy of any Act may be obtained from the office of the Chief Gold Commissioner, or from the office of any Gold Commissioner, or from the Queen's Printer, Victoria.

	Price
Department of Mines Act	$0.15
Mineral Act	.25
Placer-mining Act	.25
Metalliferous Mines Regulation Act	.50
Coal-mines Regulation Act	.70
Mines Right-of-way Act	.15
Iron and Steel Bounties Act	.15
Indian Reserves Mineral Resources Act	.15
Prospectors' Grub-stake Act	.15
Taxation Act	.75
Forest Act	.80
Greater Vancouver Water District Act	.80
Security Frauds Prevention Act	.30
Coal Sales Act	.15
Coal Act	.15
Petroleum and Natural Gas Act	.25
Regulations under Petroleum and Natural Gas Act	.25

Purchasing of Gold

Late in 1935 the Department of Finance, co-operating with the Department of Mines, undertook to purchase placer gold, in quantities of not less than 3 pennyweight and not more than 2 ounces in weight, from individual placer-miners. The Gold Commissioners throughout the Province pay cash for clean placer gold and purchase dirty placer gold and amalgam on a deferred-payment basis. The scheme was established during the depression years to give the individual miner the best possible price for his gold, and this has been realized in that the total price paid has been almost exactly the same as the receipts from the Royal Canadian Mint. In the first seven years of operation the number of lots purchased averaged more than 1,400 a year; since then the number has averaged less than 100. The amounts paid for gold purchased under this scheme to the end of 1952 total $317,468. In 1952 ninety-eight lots of gold were purchased for $4,476; the rate per ounce was $31. The Province of British Columbia ceased purchasing placer gold on January 2nd, 1953.

Coal, Petroleum and Natural Gas

Effective April 1st, 1953, the Administration Branch is responsible for the administration of the "Petroleum and Natural Gas Act." Copies of this Act may be obtained upon application to the office of the Controller, Department of Mines, Victoria, B.C., or the Queen's Printer, Victoria, B.C.

GOLD COMMISSIONERS' AND MINING RECORDERS' OFFICE STATISTICS, 1952

Mining Division	Free Miners' Certificates				Lode-mining					Placer-mining				Revenue		
	Individual	Company	Special	Provisional (Placer)	Mineral Claims Recorded	Certificates of Work	Certificates of Improvements	Bills of Sale, etc.	Leases of Reverted Crown-granted Mineral Claims	Placer Claims Recorded	Placer Leases Granted	Certificates of Work, Placer Leases	Bills of Sale, etc.	Free Miners' Certificates	Mining Receipts	Totals
Ainsworth	213	4	6	......	673	669	......	151	98	......	......	......	......	$1,693.50	$8,871.75	$10,565.25
Alberni	104	5	......	......	181	188	14	25	14	......	1	2	5	851.25	6,403.00	7,254.25
Atlin	157	......	8	......	129	317	......	36	20	8	8	91	31	838.25	7,901.00	8,739.25
Cariboo	345	10	6	......	102	275	......	20	27	6	112	286	131	2,752.50	16,209.25	18,961.75
Clinton	38	......	1	3	146	141	......	2	7	......	......	3	10	187.75	1,442.05	1,629.80
Fort Steele	197	1	4	......	163	273	......	49	5	2	18	23	16	1,150.50	5,972.92	7,123.42
Golden	85	4	......	......	131	145	5	18	14	......	......	......	......	724.25	3,957.50	4,681.75
Greenwood	126	......	2	3	186	163	......	44	61	2	1	10	1	570.50	4,166.75	4,737.25
Kamloops	332	2	6	6	564	792	3	335	16	2	11	1	......	1,695.50	7,480.00	9,175.50
Liard	322	3	......	......	414	195	7	38	......	......	6	16	24	1,552.45	4,512.60	6,065.05
Lillooet	184	6	......	3	188	466	5	59	7	......	......	30	4	1,426.50	3,851.65	5,278.15
Nanaimo	152	......	......	2	277	217	5	52	33	1	......	......	......	655.00	2,766.50	3,421.50
Nelson	444	5	15	8	641	1,926	12	192	52	3	1	6	1	3,365.75	18,701.00	22,066.75
New Westminster	282	......	......	29	275	255	9	50	1	......	10	22	11	1,228.25	5,186.75	6,415.00
Nicola	23	1	......	......	91	180	......	25	......	......	......	7	5	261.25	1,006.00	1,267.25
Omineca	397	13	8	......	597	985	25	132	23	3	6	51	13	2,886.00	20,527.35	23,413.35
Osoyoos	140	......	......	4	216	79	......	26	9	......	1	......	......	736.50	2,472.25	3,208.75
Quesnel	339	9	6	5	84	225	......	8	......	3	16	103	50	2,519.25	5,715.25	8,234.50
Revelstoke	160	8	5	......	303	334	......	57	39	......	4	24	13	1,920.50	12,128.25	14,048.75
Similkameen	168	4	5	2	126	305	......	29	12	1	2	17	8	1,057.00	2,414.25	3,471.25
Skeena	319	2	3	......	320	566	......	326	203	2	1	......	1	1,689.50	11,881.50	13,571.00
Slocan	118	2	1	......	108	386	......	33	......	......	......	5	......	721.50	5,380.50	6,102.00
Trail Creek	102	2	......	......	47	41	......	11	8	......	......	1	......	655.00	1,325.15	1,980.15
Vancouver	1,332	143	29	15	189	114	......	21	45	......	......	......	......	19,448.50	4,356.00	23,804.50
Vernon	151	2	......	18	85	44	2	8	2	......	1	7	......	810.25	647.25	1,457.50
Victoria	214	17	2	15	55	51	......	10	17	1	2	3	......	2,582.75	2,451.26	5,034.01
Totals for Province, 1952	6,444	243	107	113	6,291	9,332	87	1,757	713	34	201	708	324	$53,979.95	$167,727.73	$221,707.68
Totals for Province, 1951	5,932	211	90	62	6,706	5,688	187	1,278	856	48	187	922	257	47,498.25	153,128.16	200,626.41

List of Gold Commissioners, Mining Recorders, and Sub-Mining Recorders in the Province

Mining Division	Location of Office	Gold Commissioner	Mining Recorder	Sub-Recorder
Ainsworth	Kaslo	C. Macdonald	B. F. Palmer.	
Sub-office	Poplar			A. Robb.
Alberni	Alberni	H. W. Harding	H. W. Harding	R. MacGregor.
Sub-office	Nanaimo			W. H. Cochrane.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Tofino			R. R. Barr.
Sub-office	Zeballos			Mrs. M. Kilner.
Atlin	Atlin	B. J. H. Ryley	B. J. H. Ryley	L. D. Sands.
Sub-office	Lower Post			J. Dowsett.
Sub-office	Pouce Coupe			H. O. Callahan.
Sub-office	Telegraph Creek			Mrs. M. Dick.
Sub-office	Tulsequah			H. L. Abbott.
Cariboo	Barkerville	G. H. Dunlop (Acting)	G. H. Dunlop (Acting).	
Sub-office	Fort McLeod			J. E. McIntyre.
Sub-office	McBride			T. R. Maxwell.
Sub-office	Prince George			G. H. Hallett.
Sub-office	Quesnel			S. Allen.
Clinton	Clinton	W. H. Cope	W. H. Cope.	
Sub-office	Haylmore			W. Haylmore.
Sub-office	Williams Lake			Miss J. Foster.
Fort Steele	Cranbrook	E. L. Hedley	E. L. Hedley.	
Sub-office	Fernie			F. E. P. Hughes.
Golden	Golden	S. M. Carling	S. M. Carling.	
Sub-office	Invermere			T. N. Weir.
Greenwood	Grand Forks	W. E. McLean	W. E. McLean	Miss E. R. Wilkinson.
Sub-office	Beaverdell			L. F. Crump.
Sub-office	Greenwood			G. A. Hartley.
Sub-office	Oliver			L. M. McKinnon.
Kamloops	Kamloops	D. Dalgleish	D. Dalgleish	R. A. McDonnell.
Sub-office	Ashcroft			D. H. Bruce.
Sub-office	Chu Chua			G. M. Fennell.
Sub-office	Salmon Arm			W. T. McGruder.
Liard	Victoria	K. B. Blakey.		
Sub-office	Burns Lake			A. Fisher.
Sub-office	Fort St. James			N. Henry.
Sub-office	Fort St. John			W. A. Munro.
Sub-office	Lower Post			J. Dowsett.
Sub-office	Pouce Coupe			H. O. Callahan.
Sub-office	Prince George			G. H. Hallett.
Sub-office	Telegraph Creek			Mrs. M. Dick.
Lillooet	Lillooet	E. B. Offin	E. B. Offin	Miss D. M. Eggie.
Sub-office	Haylmore			W. Haylmore.
Nanaimo	Nanaimo	W. H. Cochrane	W. H. Cochrane.	
Sub-office	Alberni			H. W. Harding and R. MacGregor.
Sub-office	Alert Bay			D. J. Phillips.
Sub-office	Courtenay			G. W. McFarland.
Sub-office	Quatsino			Axel Hansen.
Sub office	Vananda			Henry Carter.
Nelson	Nelson	K. D. McRae	K. D. McRae	J. C. Hughes.
Sub-office	Creston			R. S. Allen.
Sub-office	Salmo			M. C. Donaldson.
New Westminster	New Westminster	J. F. McDonald	G. C. Kimberley.	
Sub-office	Chilliwack			E. L. Anderson.
Sub-office	Hope			J. H. Richmond.
Nicola	Merritt	D. Dalgleish (Kamloops)	T. G. O'Neill.	
Omineca	Smithers	G. H. Beley	G. H. Beley.	
Sub-office	Burns Lake			A. Fisher.
Sub-office	Copper River			L. G. Skinner.
Sub-office	Dorreen			W. E. Horwill.
Sub-office	Fort St. James			Norman Henry.
Sub-office	Fort St. John			W. A. Munro.
Sub-office	Hazelton			C. H. Drake.
Sub-office	Manson Creek			T. C. Hamilton.
Sub-office	Prince George			G. H. Hallett.
Sub-office	Takla Landing			Mrs. G. M. Henry.
Sub-office	Telkwa			T. J. Thorp.
Sub-office	Terrace			J. W. Dobbie.
Sub-office	Vanderhoof			F. B. Wheeler.
Osoyoos	Penticton	T. S. Dalby	T. S. Dalby.	
Sub-office	Hedley			L. A. Doree.
Sub-office	Keremeos			L. S. Coleman.
Sub-office	Oliver			L. M. McKinnon.

LIST OF GOLD COMMISSIONERS, MINING RECORDERS, AND SUB-MINING RECORDERS IN THE PROVINCE—*Continued*

Mining Division	Location of Office	Gold Commissioner	Mining Recorder	Sub-Recorder
Quesnel	Williams Lake	Miss J. Foster	Miss J. Foster.	
Sub-office	Barkerville			G. H. Dunlop.
Sub-office	Keithley Creek			Mrs. E. Rae.
Sub-office	Likely			C. W. Speed.
Sub-office	Quesnel			S. Allen.
Revelstoke	Revelstoke	W. G. Fleming	W. G. Fleming.	
Sub-office	Beaton			S. A. Hanham.
Similkameen	Princeton	Chas. Nichols	Chas. Nichols.	
Sub-office	Hedley			L. A. Doree.
Skeena	Prince Rupert	G. Forbes	G. Forbes.	
Sub-office	Alice Arm			Mrs. M. Carlson.
Sub-office	Burns Lake			A. Fisher.
Sub-office	Copper River			L. G. Skinner.
Sub-office	Queen Charlotte			H. R. Beaven.
Sub-office	Stewart			W. S. Orr.
Sub-office	Terrace			J. W. Dobbie.
Slocan	New Denver	C. Macdonald (Kaslo)	F. Broughton	Miss M. Butlin.
Sub-office	Slocan			W. E. Graham.
Trail Creek	Rossland	W. L. Draper	W. L. Draper.	
Vancouver	Vancouver	J. Egdell	Mrs. D. White (Deputy)	Mrs. F. Sherman.
Sub-office	Alert Bay			D. J. Phillips.
Sub-office	Powell River			J. V. Gaspard.
Vernon	Vernon	A. E. Wilson	A. E. Wilson.	
Sub-office	Kelowna			E. R. Oatman.
Victoria	Victoria	K. B. Blakey	R. H. McCrimmon (Deputy)	Miss D. T. Arnott.

ANALYTICAL AND ASSAY BRANCH

By G. C. B. Cave, Chief Analyst

During 1952 the chemical laboratory in Victoria issued reports on 1,920 samples from prospectors* and Departmental engineers. A laboratory examination of a prospector's sample generally consists of the following: (1) A spectrographic analysis to determine if any base metals are present in interesting percentages; (2) assays for precious metals, and for base metals shown by the spectrographic analysis to be present in interesting percentages. The degree of radioactivity is measured on all samples submitted by prospectors and Departmental engineers; these radio assays are not listed below in the table.

The laboratory reports were distributed in the following manner among prospectors who were not grantees, prospectors who were grantees under the "Prospectors' Grubstake Act," and Departmental engineers:—

	Samples	Spectrographic Analyses	Assays
Prospectors (not grantees)	1,102	1,006	2,312
Prospectors (grantees)	251	233	533
Engineers	567	347	1,843
Totals	1,920	1,586	4,688

Determinations of calorific value were made on six samples of coal for Departmental engineers.

* A reasonable number of specimens are examined, and a reasonable number of samples are assayed, without charge, for a prospector who makes application for free assays and who satisfies the Chief Analyst that prospecting is his principal occupation during the summer months. A form for use in applying for free assays may be obtained from the office of any Mining Recorder.

Mineral specimens submitted for identification and rocks for classification are examined by the Mineralogical Branch of the Department.

Work for other departments included the following: One chemical analysis of water for the Department of Lands and Forests; spectrochemical analyses on two samples of coal ash for the Coal, Petroleum and Natural Gas Commission; seven samples for examination and analysis, including the identification of an organic resin, the absorptive capacity of moss, a test for selenium, tests for fluorine in animal tissue, and analyses of agricultural raw materials for the Department of Agriculture.

For the Purchasing Commission, specification analyses were carried out on four samples of soap, eleven samples of anti-freeze, and ten samples of textiles.

For the Attorney-General's Department and the Royal Canadian Mounted Police, forty-nine cases of a chemico-legal nature were undertaken; they involved the scientific examination and analysis of 278 individual exhibits. Of the forty-nine cases, thirteen involved the analysis for narcotics under "The Opium and Narcotic Drug Act," six involved the analysis of liquids for their alcohol content, eighteen required toxicological analyses for possible poisons in viscera, and one required the determination of the alcohol content of blood. The remaining eleven cases were of a different and diversified nature, requiring the examination of materials such as animal hairs, glass, textile fibres, and paints. Expert evidence was presented in Courts of Law on nine occasions.

For the British Columbia Research Council, complete spectrochemical analyses were made on three samples of alloys and on one sample of flue dust.

For the Department of Mining and Metallurgy of the University of British Columbia, complete spectrochemical analyses were made on seven samples of treated ore pulp and on two samples of powdered metal.

For the Department of National Defence, R.C.E.M.E., specific gravity determinations were made on ten samples of reclaimed anti-freeze.

A total of ninety-eight lots of placer gold, amounting to 144.3924 ounces, after melting, and representing purchases from individual placer-miners, was received from Gold Commissioners.

Provincial Government examinations for certificates of competency and licence to practise assaying in British Columbia were held in May and in December. In May, four candidates were examined; two passed and two were granted supplemental examinations in wet assaying. In December, four candidates were examined; one passed, one failed, and two passed supplemental examinations in wet assaying.

INSPECTION BRANCH

Organization and Staff

Inspectors and Resident Engineers

H. C. Hughes, Chief Inspector........Victoria.
Robert B. Bonar, Senior Inspector of Mines........Victoria.
L. Wardman, Electrical Inspector........Victoria.
J. A. Mitchell, Senior Inspector of Mines........Victoria.
J. W. Patterson, Inspector and Resident Engineer........Prince Rupert.
J. H. Bennett, Inspector and Resident Engineer........Prince Rupert.*
Robert B. King, Inspector and Resident Engineer........Vancouver.
A. R. C. James, Inspector and Resident Engineer........Cumberland.
J. E. Merrett, Inspector and Resident Engineer........Lillooet.
E. R. Hughes, Inspector and Resident Engineer........Princeton.
J. W. Peck, Inspector and Resident Engineer........Nelson.
H. N. Curry, Inspector and Resident Engineer........Cranbrook.
D. R. Morgan, Inspector and Resident Engineer........Fernie.
Mrs. A. E. Davis, Secretary........Victoria.

* *See* note under "Staff Changes."

The Inspectors are stationed at the places listed and inspect coal mines, metalliferous mines, and quarries in their respective districts. They also examine prospects and mining properties.

J. A. Mitchell supervises the Department's programme as regards roads and trails and grub-stakes.

Instructors, Mine-rescue Stations

Arthur Williams	Cumberland Station.
T. H. Cunliffe	Princeton Station.
Joseph J. Haile	Fernie Station.
H. W. Aitchison	Nelson Station.

Board of Examiners for Coal-mine Officials

H. C. Hughes, Chairman	Victoria.
Robert B. Bonar, Secretary	Victoria.
E. R. Hughes, Member	Princeton.

R. B. Bonar, E. R. Hughes, and the Inspectors for the district in which an examination is being held form the Board for granting certificates of competency to coal-miners. In the absence of the Inspector, the Mine-rescue instructor is authorized to act in his stead.

An Inspector is empowered to grant provisional certificates to coal-miners for a period not exceeding sixty days between regular examinations.

Staff Changes

On January 15th, 1952, H. N. Curry was appointed Inspector and Resident Engineer at Cranbrook to replace F. J. Hemsworth, who resigned on November 5th, 1951.

On April 30th, 1952, J. W. Patterson was appointed Inspector and Resident Engineer at Prince Rupert to replace J. H. Bennett, who resigned on March 10th, 1952.

MINERALOGICAL BRANCH

Field work by officers of the Mineralogical Branch consists principally of geological mapping and examination of mineral deposits. The results are published partly in the Annual Report of the Minister of Mines and partly in a series of bulletins. The Mineralogical Branch supplies information regarding mineral deposits and the mineral industry, in response to inquiries received in great number. The activities of the Branch also include identification of rock and mineral specimens submitted by prospectors and others, and the examination of all samples submitted by prospectors to the Analytical Branch.

Staff

Engineers on the permanent staff of the Mineralogical Branch are classified as Assistant Geologists, Associate Geologists, Geologists, or as Mineral Engineers—Grade 1 or Grade 2. They are engineering graduates with postgraduate training in geology.

On December 31st, 1952, the staff of the Mineralogical Branch was as follows:—

H. Sargent	Chief of Mineralogical Branch.
M. S. Hedley	Geologist.
S. S. Holland	Geologist.
J. M. Black	Associate Geologist.
W. R. Bacon	Associate Geologist.
G. E. P. Eastwood	Associate Geologist.
J. W. McCammon	Mineral Engineer—Grade 1.
A. F. Shepherd	Assistant Geologist.
J. T. Fyles	Assistant Geologist.

G. G. L. Henderson	Assistant Geologist.
H. W. Nasmith	Assistant Geologist.
A. Sutherland Brown	Assistant Geologist.
K. S. Crabtree	Draughtsman.
W. Player	Lapidary.
Mrs. C. C. Savage	Clerk-Stenographer (Editorial Assistant).
Miss B. Leyland	Secretary.
Miss M. H. Forrest	Clerk-Stenographer (Assistant Librarian).

Mr. Shepherd acts as office engineer and librarian. Dr. Hedley has directed the editing of the 1952 Annual Report of the Minister of Mines and edited the section on lode-mining. The section on placer-mining was edited by Dr. Holland, and the section on structural materials and industrial minerals was edited by Mr. McCammon.

Staff Changes

Mrs. C. C. Savage succeeded Mrs. C. E. Browne as editor of English, Miss B. Leyland succeeded Mrs. C. E. Fletcher as branch secretary, and Miss M. H. Forrest succeeded Miss L. Primrose as assistant to the librarian.

W. R. Bacon and A. Sutherland Brown, who had been on leave of absence for post-graduate study, returned to duty in May. Dr. Bacon was reclassified as associate geologist on his return.

Field Work

M. S. Hedley examined properties in the East and West Kootenay areas and assisted in directing the field-work projects at Ainsworth, south of Nelson, and at Windermere.

S. S. Holland made preliminary studies in the Trout Lake area, examined properties in the Kamloops area and on Rocher Déboulé Mountain, and assisted in directing field work in the Cariboo area.

J. M. Black mapped Summit Camp in the Upper Tulameen area, mapped the Iron Hill property at Quinsam Lake, and made examinations on Vancouver Island.

W. R. Bacon examined iron deposits on Texada Island and at Quatsino and Zeballos on Vancouver Island, the copper-lead-zinc prospect on Gibson Island, the Ecstall River pyrite deposits, the Lucky Four copper prospect, and made preliminary studies in the Portland Canal area.

G. E. P. Eastwood completed detailed mapping in the southern part of the Ainsworth camp.

J. W. McCammon examined lead-zinc prospects in the Osilinka River-Nina Lake area (Omineca), and gypsum, barite, and silica deposits at Falkland, Golden, and southern Okanagan areas. He also examined uranium-tantalum-columbium deposits in the North Thompson River area and kyanite deposits in the North Thompson and Big Bend areas.

J. T. Fyles continued the programme of detailed mapping in Salmo-Pend d'Oreille River, a lead-zinc area.

G. G. L. Henderson completed the mapping programme near Windermere in the area that includes large gypsum deposits. Mr. Henderson visited Kemano during the autumn and winter and mapped underground workings driven after Mr. Stuart had left that area.

H. W. Nasmith made ground-water studies in the Quesnel-Prince George and Vanderhoof areas, and engineering geology studies at Cottonwood River bridge-site.

A. Sutherland Brown did detailed geological mapping in the Cariboo area from the Cariboo Hudson to the Island Mountain mines.

R. A. Stuart was engaged for the summer in geological mapping underground and on surface in the Tahtsa-Kemano tunnel, and along the route of the tunnel.

W. H. Mathews spent about six weeks in the field on ground-water studies in the Fort St. John-Pouce Coupe area.

GRUB-STAKING PROSPECTORS

Each year since 1943 the Department of Mines has provided assistance to prospectors who were able to qualify. During 1952 the maximum grub-stake of $300 was provided, usually in two instalments. An amount up to $200 was added where necessary for travelling expenses to enable the grantee to reach the prospecting area.

Statistics

Field Season	Approximate Expenditure	Men Grub-staked	Samples and Specimens Received at Department Laboratory	Mineral Claims Recorded
1943	$18,500	90	773	87
1944	27,215	105	606	135
1945	27,310	84	448	181
1946	35,200	95	419	162
1947	36,230	91	469	142
1948	35,975	92	443	138
1949	31,175	98	567	103
1950	26,800	78	226	95
1951	19,385	63	255	137
1952	19,083	50	251	95

Samples and specimens received from grub-staked prospectors are identified, spectrographed, assayed, and tested for radioactivity.

During 1952, examination options were taken on two properties that had been relocated by grub-staked prospectors. Of the prospectors grub-staked in 1952, sixteen will be refused further grub-stakes because of unsatisfactory performance. The following notes briefly cover the activities of prospectors grub-staked during 1952.

Atlin Mining Division.—Occurrences of short-fibre asbestos and minor amounts of magnesite were investigated in the Monarch Mountain area, near the Haines road. Scattered mineralization was reported from the Mansfield Creek, Tatshenshini River, and Blanchard River areas. In the Taku River district, prospecting was done in the neighbourhood of Erickson Creek, Sittakanay Creek, and King Salmon Lake.

Liard Mining Division.—Work was done for part of the season on both sides of the Lower Post–McDame road, and in the vicinity of Long Lake, Poorman Lake, Dennis Creek, and the Cassiar Asbestos camp. No findings were made, although discovery of a small outcrop containing manganese was reported.

Skeena Mining Division.—Further work was done in the Alice Arm area, above the Torbrit mine. Some interesting geological conditions were reported, but no discoveries were made.

Some work was done on the coast in the King Island area south of Ocean Falls, where reported zinc occurrences were investigated.

Omineca Mining Division.—Considerable prospecting was done in the Hogem Range, principally between Fall River and Ominicetia Creek, tributaries of the Omineca River. No discoveries of interest were recorded.

Further prospecting was also done in the Silver Creek area, using the old Bralorne Mercury Camp as a base camp. No new discoveries were recorded, but the Lustdust group of claims was optioned late in the year.

Some interesting geology was observed near Francois and Tahtsa Lakes and in the Uncha valley, and one mineralized outcrop was discovered. Claims were also located on some old discoveries south of Eutsuk Lake.

Lillooet Mining Division.—Some work was done near the divide at the headwaters of Gun Creek, and on the Lillooet River above and below Pemberton. A small amount of work was also done up Texas Creek from the Fraser River toward the Cayoosh Creek basin.

Clinton Mining Division.—Near Clinton more work was done around previously known magnesite and chromite showings, but no new discoveries of importance were made. Some work was also done west of the Fraser River in the Black Dome Mountain area, still farther west near Poison Mountain, and in the south Chilcotin area. Quartz veins were investigated, but nothing of importance was discovered.

Kamloops Mining Division.—Intensive prospecting was done in the Mann (Blackwater) Creek watershed from a point 1 mile west of the highway nearly to the headwaters. A narrow quartz vein containing commercial values in lead and zinc was discovered, and was opened up by stripping and trenching. Considerable work was also done on ground adjacent to the old Queen Bess property.

Some prospecting was done near Crowfoot Mountain above Shuswap Lake. Some old showings containing silver, lead, and zinc and small percentages of tin were examined, and the adjoining ground carefully investigated.

Vernon Mining Division.—Fairly intensive prospecting was done near the north end of Mabel Lake, starting at Noisy Creek and continuing up the larger streams flowing into the north end of Mabel Lake.

Osoyoos Mining Division.—Fairly intensive prospecting was done on both sides of the Ashnola River, 5 miles above its junction with the Similkameen. Several heavily pyritized showings in argillite were examined, and some sign of radioactivity was recorded on a Geiger counter. A number of claims were located.

Nelson Mining Division.—In the Bayonne mine district, ground close to Elmo Lake, the Iva Fern mine, Cultus Creek, and Blazed Creek was carefully investigated. Several narrow quartz veins containing lead and zinc were discovered and a large gossan outcrop was investigated, but no important discoveries were made.

Ainsworth Mining Division.—Several prospectors worked around Duncan Lake and in the neighbourhood of Little Glacier and Howser Creeks. Another man worked on Lavina Mountain and at the headwaters of Wilson Creek near the north end of Slocan Lake.

Fort Steele Mining Division.—Prospecting continued on the headwaters of Lavington, Doctor, and Skookumchuck Creeks. Discovery of a deposit of chalcopyrite near a granite contact was reported, but no further details were given. A small amount of work was done in the Roaring Creek watershed fairly close to the Estella mine.

Revelstoke Mining Division.—Some work was done in the Trout Lake area, between Cherryville and Sugar Lake, near the Big Ledge property, at St. Leon Creek, and up Canyon Creek from Gerrard. Other than disseminated galena in a shear zone and scattered short-fibre asbestos in a belt of serpentine, nothing of importance was discovered.

Opposite the mouth of Downie Creek, a little work was done investigating the stream valleys west of the Columbia River. This work was not completed, and more time should be spent in the area.

Good work was done between the upper reaches of Downie Creek and Keystone Creek, and on ground within a 2-mile radius of Keystone Creek. Further prospecting on an old property in the area resulted in some interesting new discoveries.

New Westminster Mining Division.—Prospecting was continued along the Anderson River near Boston Bar, about 7 miles upstream from the Fraser River. No discoveries have been made in this area, but logging-roads are being extended farther east every year, making more of the country accessible.

Vancouver Mining Division.—Some prospecting was done adjacent to a copper showing at Dodd Lake near Powell River.

Near Hope some work was done near Silver Peak Mountain, but no important results were reported. High ground in the vicinity of Emory, Gordon, Ruby, and American Creeks was prospected, special attention being paid to a reported contact between granite and serpentine. No finds were made. Some quartz veins in the Vedder River area were investigated.

Some work was done near the north end of Pitt Lake and the headwaters of Pitt River and Mamquam River. With the exception of minor occurrences of chalcopyrite in volcanics and limestone in this latter area, no finds were reported.

In the Birkenhead River-Lillooet Lake area and south of Tenquille Lake, the discovery of several large gossan outcrops was reported, and one 4-foot quartz vein containing low values in lead and zinc was discovered.

Alberni Mining Division.—Prospecting was done on the west side of the Zeballos River and at the headwaters of the Zeballos, Artlish, and Kaouk Rivers. Some mineral occurrences were found near the contact of limestone and argillite with intrusive rocks. In the Nomash River area, volcanics intruded by granite tongues were found in places to contain some chalcopyrite.

Prospecting was continued in the Shelter Arm area, in White Pine Cove, in Herbert Arm, and in the Megin River-Megin Lake areas, and a small amount of work was done north of Bedingfield Bay.

At the end of Pipestem Inlet, prospecting was continued where copper, lead, and zinc mineralization had been found previously in limestone.

Nanaimo Mining Division.—The Adams River area near the north end of Vancouver Island received a small amount of attention. Fire hazard interfered with some work planned in the Siwash Mountain area near Nanoose, although a small amount was accomplished.

In the Jordan River area, some prospecting was done in a belt of granite, gneiss, and schist near Copeland Creek. Nothing was discovered.

The grub-stake programme was supervised by J. A. Mitchell and D. H. Rae.

MUSEUMS

The Department has a large exhibit of mineral and rock specimens in the Douglas Building, Victoria; collections are displayed in the joint office in Vancouver and in the offices of the Inspectors of Mines in Nelson and Prince Rupert.

Information regarding collections of specimens of rocks and minerals available to prospectors and schools in British Columbia will be found on page 346.

Specimens from the collection in Victoria, accumulated in a period of nearly sixty years, are displayed in cases on the fourth floor of the Douglas Building. The collection includes specimens from many of the mines and prospects in the Province, and also specimens of type rocks and special minerals from British Columbia and elsewhere.

British Columbia material includes specimens collected by officers of the Department of Mines and specimens donated by property-owners. The collection also includes type specimens purchased from distributers. Other valued specimens or groups of specimens have been donated or loaned to the museum. Grateful acknowledgment is made of the following gifts and loans received by the museum in 1952:—

From Frank Bobner, Ketchikan, Alaska, jade variety nephrite from Wheaton (Boulder) Creek, 58° 129° S.

From Canadian Exploration Company Limited, specimens representing lead-zinc and tungsten ores from the company's mines near Salmo, 49° 117° S.E.

From Kelowna Mines Hedley Limited, specimens representative of the gold ore from the Nickel Plate mine, 49° 120° S.E.

PUBLICATIONS

Annual Reports of the Minister of Mines, bulletins, and other publications of the Department, with prices charged for them, are listed on pages 343 to 345.

Publications may be obtained from the offices of the Department in Victoria and elsewhere in the Province. They are also available for reference use in the Department's library (Mineralogical Branch) at Victoria, in the joint office in Vancouver, and in the offices of the Inspectors of Mines in Nelson and Prince Rupert, as well as in public libraries listed on page 346.

MAPS SHOWING MINERAL CLAIMS, PLACER CLAIMS, AND PLACER-MINING LEASES

From the details supplied by the locators, the approximate positions of mineral claims held by record and of placer-mining leases are shown on maps that may be inspected in the Central Records Offices of the Department of Mines in Victoria and in Vancouver. Copies of these maps may be obtained on request, as outlined on page 346. The boundaries of surveyed claims and leases are shown on the reference maps and other maps of the British Columbia Department of Lands and Forests.

JOINT OFFICES OF THE BRITISH COLUMBIA DEPARTMENT OF MINES AND THE DEPARTMENT OF MINES AND TECHNICAL SURVEYS, CANADA

The Provincial Department's Inspector and Resident Engineer, the Gold Commissioner and Mining Recorder for the Vancouver Mining Division, and the officers of the Federal Geological Survey occupy one suite of offices. All official information relating to mining is now available to the public in the one suite of offices in Vancouver.

The services offered to the public include technical information on mining, the identification of mineral specimens, distribution of Federal and Provincial mining publications, a reference library, a display of rocks and minerals, and a central records office.

Topographic Maps and Air Photographs

Topographic mapping and air photography are carried on by the Surveys and Mapping Branch of the British Columbia Department of Lands and Forests and by services of the Federal Government Departments of Mines and Technical Surveys and of National Defence.

Surveys for the Legal Surveys Division of the Department of Lands and Forests in 1952 included 31,000 acres of Crown land surveyed in the Peace River District for settlement, 62 miles of control and right-of-way survey on the Alaska Highway and ten district lots surveyed on the Haynes cut-off, 12 miles of right-of-way survey on the Cariboo Highway, 21 miles of right-of-way survey on the Hope–Princeton Highway, and 66 miles of right-of-way survey and 30 miles of preliminary survey on the John Hart Highway.

Departmental surveys were completed at Prince George, Bonaparte Lake, Parsnip River, Alberni, Shawnigan Lake, Campbell River, Shuswap Lake, Pemberton, Castlegar, Bralorne, Jewel Lake, Savona, Tête Jaune, University Endowment Lands (Point Grey), Telegraph Creek.

Interim maps showing planimetry, based on air photographs and existing ground control, are compiled by the map compilation division of the Air Survey Division of the Surveys and Mapping Branch of the Department of Lands and Forests. These maps record much topographic information and show the centres of vertical air photographs in the area covered. They are a very valuable source of topographic information in advance of the more detailed standard topographic maps.

In 1952 the Topographic Division of the Department of Lands and Forests had six survey parties in the field, obtaining control for standard topographic maps at a scale of 1 mile to the inch with 100-foot contours. After five regular parties had returned, a sixth party went into the field for a month. The six parties obtained control for seventeen and one-half map-sheets with a controlled area of 5,700 square miles. One other party was in the field; it completed 110 miles of precise triangulation control, connecting the coast triangulation to the main interior net via Bella Coola-Chilcotin.

Two services of the Federal Government—the Topographical Survey (Surveys and Mapping Branch, Department of Mines and Technical Surveys) and the Army Survey Establishment (Department of National Defence)—work in close co-operation, and together, during 1952, completed the field work for thirty-seven and one-half 1-mile sheets and nine 4-mile topographic sheets in British Columbia.

In the Annual Report of the Deputy Minister of Lands for 1952, coverage by air photographs and by topographic and interim maps is indicated on a series of base maps which also show the reference grid and the lettering and numbering system by means of which reference to any part of the Province may be made.

Further information about topographic maps, interim maps, and air photographs for British Columbia made by the Federal or Provincial service may be obtained from the Director of Surveys and Mapping Branch of the Department of Lands and Forests. Air photographs may be bought or, under some circumstances, may be borrowed from the Air-photo Library of the Branch.

Department of Mines and Technical Surveys

The Canadian Government Department of Mines and Technical Surveys, created by an Act of Parliament introduced in November, 1949, took over most of the branches and functions related to mining of the former Department of Mines and Resources. The Mines Branch, Geological Survey of Canada, and Surveys and Mapping Branch are the three branches of the Department of the most direct interest to the mining industry. Brief reference to the work of the Surveys and Mapping Branch in British Columbia is made in the preceding note headed " Topographic Maps and Air Photographs." A note on the Geological Survey of Canada follows this paragraph and is followed by a note on the Mines Branch.

GEOLOGICAL SURVEY OF CANADA

By an arrangement made at the time the Province of British Columbia entered Confederation, geological investigations and mapping in the Province are carried on by the Geological Survey of Canada. Several geological parties are in the field each year. Many excellent reports and maps covering areas of British Columbia have been issued by the Geological Survey of Canada, and they have made available a great amount of information that has been of much benefit to the mining and prospecting activities in British Columbia.

A branch office of the Geological Survey of Canada is maintained in Vancouver. Maps and reports on British Columbia can be obtained there. W. E. Cockfield is in charge of this office.

Field Work by the Geological Survey of Canada in British Columbia, 1952

J. D. Aitken continued geological mapping of the Atlin area (longitude 132° to 134°, latitude 59° to 60°).

J. E. Armstrong completed geological mapping of the Vancouver North and Vancouver South areas (longitude 123° to 123° 30′, latitude 49° to 49° 30′) and the adjoining New Westminster area (longitude 122° 30′ to 123°, latitude 49° to 49° 15′), continued general supervision of geological mapping and study of Pleistocene deposits in these areas and in adjoining more easterly parts of the Fraser delta, and assisted at intervals in the work of the Provincial soils surveys and on special investigations on ground-water and engineering problems.

R. L. Christie continued geological mapping of the Bennett area (longitude 134° to 136°, latitude 59° to 60°).

W. E. Cockfield assisted the Dominion-Provincial Board Fraser River Basin in connection with flood-control projects, assisted soil-survey parties in Kamloops and East Kootenay districts on Pleistocene geology, and visited several mineral properties to obtain information for other Government departments.

S. Duffell completed geological mapping of the Whitesail Lake area (longitude 126° to 128°, latitude 53° to 54°).

J. G. Fyles continued mapping the Pleistocene geology of the Horne Lake (longitude 124° 30′ to 125°, latitude 49° 15′ to 49° 30′) and adjoining Parksville (longitude 124° to 124° 30′, latitude 49° 15′ to 49° 30′) areas.

H. Gabrielse continued geological mapping of the McDame area (longitude 128° to 130°, latitude 59° to 60°).

E. Hall continued his work at Columbia River dam-sites, examining and correlating drill cuttings and cores for the Federal Engineering and Water Resources Branch, Department of Resources and Development.

P. Harker examined, measured, and collected fossils from exposed sections of Carboniferous formations in the vicinity of Fernie and Crowsnest Pass.

J. A. Jeletzky continued detailed stratigraphic studies of the fossiliferous Mesozoic and Tertiary formations along a northern portion of the west coast of Vancouver Island.

A. G. Jones studied geological conditions at three dam-site areas on Columbia River between the Big Bend and Revelstoke, at the request of the Engineering and Water Resources Branch of the Federal Department of Resources and Development.

G. B. Leech completed geological mapping of the St. Mary Lake area (longitude 116° to 116° 30′, latitude 49° 30′ to 49° 45′).

H. W. Little completed geological mapping of the Nelson area, west half (longitude 117° to 118°, latitude 49° to 50°), and commenced mapping of the adjoining Kettle River area, east half (longitude 118° to 119°, latitude 49° to 50°).

D. J. McLaren examined, and collected fossils from, Devonian formations exposed in the Cecilia-Wapiti Lakes region of the east-central British Columbia Rockies, and at Pine Pass south of Peace River.

D. K. Norris continued a detailed and systematic study of the character and distribution of stresses in Crowsnest Pass collieries and their relation to observed fault and fold structures.

J. E. Reesor completed geological mapping of the Dewar Creek area (longitude 116° to 116° 30′, latitude 49° 45′ to 50°).

J. A. Roddick completed geological mapping of the Coquitlam area (longitude 122° 30′ to 123°, latitude 49° 15′ to 49° 30′).

H. W. Tipper continued geological mapping of the Nechako area (longitude 124° to 126°, latitude 53° to 54°).

Publications of the Geological Survey

The following reports relating to British Columbia published by the Geological Survey were received by the British Columbia Department of Mines during 1952:—

Publications of the Geological Survey of Canada (1917–52), compiled by L. B. Leafloor.

Prospecting for Uranium in Canada, by officers of the Radioactivity Division.

Economic Geology Series No. 16: Canadian Deposits of Uranium and Thorium, by A. H. Lang.

Paper 52-12: The Princeton Coalfield, British Columbia, by W. S. Shaw.

Paper 52-13: Bonnington Map-area, British Columbia, by R. Mulligan.

Paper 52-15: St. Mary Lake, British Columbia, by G. B. Leech.

Paper 52-19: The Tulameen Coalfield, British Columbia, by W. S. Shaw.

Paper 52-21: Whitesail Lake Map-area, British Columbia, by S. Duffell.

Bulletin 21: Ammonite Faunas of the Upper Cretaceous Rocks of Vancouver Island, British Columbia, by J. L. Usher.

Memoir 262: Ashcroft Map-area, British Columbia, by S. D. Duffell and K. C. McTaggart.

Map 900A: Canada, principal mining areas and producing mines.

MINES BRANCH

The Mines Branch has branches dealing with mineral resources, mineral dressing and process metallurgy, physical metallurgy, radioactivity, and fuels and explosives. Publications of the Mines Branch pertaining to British Columbia received in 1952 included tabular pamphlets dealing with coal mines, gold mines, stone quarries, petroleum refineries, and milling plants in Canada, and the reports listed below:—

Mines Branch No. 831: Analyses of Canadian Coals and Peat Fuels, by J. H. H. Nichols.

Mines Branch No. 832: Analyses of Canadian Crude Oils.

Memorandum Series 118: Sulphur and Pyrites in Canada, by T. H. James.

Memorandum Series 125: Tin in Canada: Occurrences and Uses, by W. R. McClelland.

The Mineral Dressing and Process Metallurgy Division investigates the milling of ores and industrial minerals from many deposits and also tests clays and other ceramic materials. The British Columbia Department of Mines has received the following reports on work performed by the Mineral Dressing and Process Metallurgy Division, in 1952, on British Columbia ores:—

Investigation No.	Title
MD2863.	The Recovery of Metals from a Gold-Silver Telluride Ore from the Tchaikazan Valley, 70 Miles from Hanceville, British Columbia.
MD2868.	Flotation Tests on a Sample of Zinc Ore from the Danzig Property of the Spud Valley Gold Mines Ltd., Vancouver Island, British Columbia.
MD2898.	Concentration Tests on a Sample of Gold-Silver-Lead-Zinc Ore from the Silver Cup Property in the Lardeau-Trout Lake Area, British Columbia.
MD2893.	Flotation Tests on an Antimony Ore from the Gray Rock Mining Company Limited, Bridge River District, British Columbia.
MD2946.	Investigations for the Recovery of Silver, Copper, and Tungsten Values in a Complex Ore (Sample No. 2) from the Rocher Deboule Property in British Columbia.
MD2948.	Flotation and Cyanidation Tests on a Gold-Silver-Lead-Zinc Ore from the Sil Van Consolidated Mining and Milling Company Limited, Smithers, British Columbia.
	Concentration Tests on a Shipment of Manganese Ore from " Okalla Manganese," Penticton, British Columbia.

Metal-mining (Lode)

CONTENTS

NOTES ON METAL MINES—*Continued*

NOTES ON METAL MINES—*Continued*

NOTES ON METAL MINES—*Continued*

NOTES ON METAL MINES—*Continued*

GENERAL REVIEW

The quantity of ore mined, the quantity of each metal and its value, the average number employed, for 1952 and preceding years, and other data are tabulated under " Statistics," in the section that begins on page 13. Table No. XV lists the production of individual properties and gives the name and address of the owner or agent of each producing property. Formerly the production of individual properties was incorporated in the property descriptions. The statistical tables are listed on page 15.

In 1952 there were marked drops in the average prices of lead and zinc. The price of zinc fell from the record level of 19.5 cents set in 1951 to 12.5 cents in 1952, and although there were some oscillations the price remained low at the end of the year. The price of lead was reduced almost as drastically. The only major metal in an improved position was copper.

Gold, silver, copper, lead, and zinc produced at British Columbia lode mines in 1952 had a gross value of $134,111,567. Miscellaneous metals, including iron ore, tungsten, tin, and minor metals recovered at the Trail smelter had a gross value of $13,193,366. The total quantity of ore mined at all lode mines amounted to 9,147,469 tons and came from one hundred mines, of which sixty-three produced 100 tons or more. The average number employed in the lode-mining industry in 1952, including mines, concentrators, and smelters, was 13,730.

In 1952 forty-two mills including magnetic concentrators were operated, including thirty-three that were in operation in previous years and nine that were built or entirely remodelled in 1952. Six mills at the H.B., Jackson, Lightning Peak, Regal, Sil Van, and Wayside mines were partly built or were completed but did not operate. Of the nine new mills brought into operation, the mills at Cody Reco, Cronin, Kootenay King, Mastodon, and Rocher Deboule closed before the end of the year, and only those at the Bluebell, Silversmith, Spider, and Texada Island continued in operation. Six other casualties included the mills at Dorreen, Kenville, Monarch, Twin J, Van Roi, Western Exploration, and Whitewater. In summary, of forty-two mills that operated and six that were built and essentially ready for operation in 1952, only thirty were in operation at the end of the year. Most of the closings or failures to operate were attributable to the decline in prices of lead and zinc.

In addition to the decline in base-metal prices and the increase in the value of the Canadian dollar relative to United States currency, some operators of lead and zinc mines met difficulty in readily disposing of their products in the latter part of 1952 because of a power shortage on the Kootenay River. The smelter capacity at Trail was reduced 10 per cent as a result of the power shortage, mines in general were prorated in terms of past production, and a limit was set on the tonnage accepted by the smelter. A number of mines shipped all or part of their products to United States smelters, in some instances with an appreciable loss of revenue.

The Trail smelter recorded custom receipts of 4,299 tons of crude ore from properties in British Columbia. It also recorded the receipt of 39,978 tons of lead concentrates and 79,330 tons of zinc concentrates. Shipments to the Tacoma smelter included the copper concentrates from the Britannia and Copper Mountain mines. Most lead and zinc concentrates went to Trail but, because of the power shortage, more than usual went to American smelters. Concentrated iron ore was shipped to Japan. Tungsten concentrates were sold under government contract in Eastern Canada and in the United States.

The increased activity in the mining and exploration of silver-lead-zinc deposits begun in 1951 did not decline appreciably until the autumn of 1952. Most of the new activity was in the Kootenays, with the greatest shown in the Lardeau and Salmo-Nelway areas. Milling of Bluebell ore started in April at the rate of 500 tons per day, after a lapse of nearly thirty years. A mill of 1,000-tons-per-day capacity at the H.B. mine was virtually completed at the end of the year. Activity in the Lardeau was the greatest in many years; a road link was made between Kaslo and Lardeau and another along the shore of Trout Lake, enabling vehicles to drive between Beaton and Kaslo. Some deep exploratory drilling was done in the Salmo-Nelway area in the hope of finding ore in hidden structures in limestone, but with negative results.

Silver-lead-zinc properties closing after many years of operation included the Monarch and Kicking Horse, the Whitewater, and the Standard and Mammoth.

Exploration at Ecstall River showed renewed interest in the large pyritic deposits there. Geophysical work was done, and the deposits were tested to a depth of 1,000 feet by directional diamond-drill holes. Exploration was resumed at the Pacific Nickel property.

Tungsten concentrates were produced in quantity at the Canadian Exploration mines at Salmo. The Emerald mine and a block of ground named the Dodger were rebought from the Canadian Government, together with the mill built in 1951. Milling capacity was increased to 650 tons per day to treat scheelite ore from various parts of the company's ground. The Red Rose, which resumed production late in 1951 after an eight-year shut-down, milled scheelite ore at an average rate of nearly 100 tons per day during 1952. Six properties containing scheelite and one containing wolframite were investigated.

Concentrated iron ore for the Japanese market continued to be produced at Upper Quinsam Lake, and new production started from the long-known deposits on Texada Island. Iron-ore deposits at Iron River, Zeballos, and Kathleen Lake were diamond drilled. A small part of the Upper Quinsam Lake ore went to United States destinations.

Advances and innovations in mining practice included the drilling of blast-holes with leyner machines using sectional steel and tungsten-carbide bits at the Copper Mountain, Toric, and Silver Giant mines. At Copper Mountain this method of blast-hole drilling has largely superseded the use of diamond drills. Trackless mining with diesel equipment, started in 1951 at the Dodger mine, was instituted at the Jersey mine in place of conventional mining methods in flat-dipping lead-zinc orebodies. At the Jersey mine a system of conveyor belts and raises was installed in place of an aerial tram to transport lead-zinc ore from the mine to the mill in the valley bottom.

NOTES ON METAL MINES

ATLIN*

FOURTH OF JULY CREEK (59° 133° N.W.)

Silver-Lead-Zinc

Atlin Ruffner Mines (B.C.) Limited

Company office, 302 Bay Street, Toronto; mine office, Atlin. J. D. Williamson, engineer in charge. Capital: 3,000,000 shares, $1 par value. The property is about 10 miles up Fourth of July Creek from the highway connecting Atlin to the Alaska Highway. The underground and surface work on this property was suspended in January but was resumed early in August, and the company reports that twenty exploration holes were drilled on the adjoining Vulcan group and Big Canyon claims which were acquired in 1952. This drilling, which totalled 4,005 feet, was done to investigate the continuation of vein zones on the original Atlin Ruffner property into the newly acquired ground. In addition to the Vulcan group and Big Canyon claims, the company acquired the Hurrah, Blacksmith, and Saddle No. 1 and No. 2 claims.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1925, pp. 115–117.]

BOULDER CREEK (59° 133° N.E.)

Tungsten

Black Diamond (Black Diamond Tungsten Limited)

J. A. Wilcox, manager. The Black Diamond property is at the head of Boulder Creek about 16 miles from the village of Atlin. This company, which was formed by Transcontinental Resources Limited, continued to do exploration and development work. The company reports that this work consisted of 400 feet of advance in an adit driven along No. 5 zone at an elevation of 5,800 feet; 440 feet of underground diamond drilling on No. 5 zone; 175 feet of surface diamond drilling on No. 1 zone; bulk sampling of Nos. 5, 6, and 6A zones; completion of a geological map of the entire property and of the group of twenty-one mineral claims adjoining the property to the northeast; and trenching, test pitting, and bulk sampling on the latter claims.

More work was done on the road connecting the mine camp with the Boulder Creek road; a truck-road was built from the mine camp to the adit, and an access road was built to the adjoining claims on the northeast.

Work was suspended in the fall with the intention of resuming in 1953.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1950, pp. 72–73.]

TAKU RIVER*

Gold-Silver-Copper-Lead-Zinc

Big Bull, Tulsequah Chief (Tulsequah Mines, Limited). — (58° 133° N.W.) Company office, Tulsequah. J. C. MacLean, property superintendent. This company, a subsidiary of The Consolidated Mining and Smelting Company of Canada, Limited, controls the Tulsequah Chief and Big Bull mines. The ore from both mines is concentrated in the Polaris-Taku mill, which is leased by The Consolidated Mining and Smelting Company.

* By J. W. Patterson.

Production, development, and exploration at the two mines was as follows:—

	Big Bull (Ft.)	Tulsequah Chief (Ft.)	Total (Ft.)
Shaft raising		681	681
Stations		143	143
Drifting and crosscutting	533	408	941
Subdrifting	810	85	895
Raising	1,934	1,356	3,290
Diamond drilling—			
Underground	974	4,557	5,531
Surface		911	911
Ore milled (tons)	66,782	29,277	96,059

To enable the company to increase the milling rate from 300 to 500 tons per day, the mill building was enlarged to provide space for an additional ball mill, classifier, thickener, filter, and a bank of flotation machines. A 450-horsepower generating unit was added to the power plant. Besides the expansion of the mill and power-house buildings, a new thirty-five-man bunk-house, an addition to the cook-house, a warehouse and office, and several small staff houses were constructed. Three oil-storage tanks were erected. Except for a new ore-storage bin at the Tulsequah Chief, there was no construction at the mine-sites.

As usual, trouble was encountered during the flood season. The bridge on the Big Bull road was washed out and the river changed its course below the Tulsequah Chief, necessitating the construction of three new pile bridges with spans of about 20 feet.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1947, pp. 68–70; 1929, pp. 136–141.]

Erickson-Ashby (The Consolidated Mining and Smelting Company of Canada, Limited).—(58° 133° N.W.) This property is near the top of Erickson Mountain on the south side of the Taku River almost directly opposite the Big Bull mine.

After the great deal of work required to move a diamond drill up to the property, 1,064 feet of drilling was done. The option on the property was dropped at the end of 1952.

PORTLAND CANAL*

Copper

Maple Bay (55° 130° S.E.) This property, on the east shore of Portland Canal directly west of Anyox, was examined by Bidgood Kirkland Gold Mines Limited of Toronto during the period between August 14th and October 27th. An average of seven men was employed at the property.

SALMON RIVER (56° 130° S.E.)

Gold-Silver-Lead-Zinc

Silbak Premier Mines Limited Company office, 907 Birks Building, Vancouver; mine office, Premier. D. L. Pitt, managing director; A. Kirby, Jr., mine superintendent; S. F. Macdonald, mill superintendent. At the Silbak Premier and Premier Border mines there were no stoppages in either milling or mining during 1952. The shaft started in 1952 on the Premier Border property has been completed and is now in use, giving access to two new levels. Development and production figures are as follows:—

		Silbak Premier	Premier Border
Drifting, raising, and crosscutting	ft.	3,205	713
Diamond drilling	ft.	14,952	2,099
Ore milled	tons	65,703	14,701

* By J. W. Patterson.

Indian Mines (1946) Ltd. Company office, 615 Credit Foncier Building, Vancouver. During the latter part of 1952 Silbak Premier Mines Limited carried out mining operations at the Indian mine, the ore being transported to the Premier mill by 2 miles of aerial tramway. Development and production figures are as follows: Drifting, raising, and crosscutting, 565 feet; diamond drilling, 253 feet; production, 10,358 tons. The average number of men employed at the mine was thirty.

Silver-Lead-Zinc

Silver Tip (Silver Tip Gold Mines Limited) Company office, 211 Pemberton Building, Victoria. George Winkler, managing director; W. R. Tooth, manager. This property is about 21 miles north of Stewart and about 1½ miles north of the old Big Missouri camp. During the period between August 11th and October 11th the average number of men employed was four. A stope 52 feet long was prepared for production, two ore-bins were built, and some work was done on the 1½ miles of road between the mine and the Big Missouri property. An estimated 200 tons of ore was stored in the ore-bins. A four-wheel-drive 2-ton truck, a small compressor and a jackdrill, all new equipment, were used at the mine.

SUMMIT LAKE (56° 130° S.E.)

Gold-Silver

East The East group, about 4 miles north of Summit Lake, is owned by A. Phillips, of Stewart. It can be reached by aeroplane from Portland Canal to Tide Lake and then by 5½ miles of tractor-road which was constructed during the summer of 1952. Little mining work was done while the road was being built, but A. Phillips reports that 60.75 pounds of electrum ore, averaging about $20 per pound, was shipped, and that 5 tons of a lower-grade ore was ready to be shipped. Construction was started on a new building which is to be completed in 1953. Five men were employed. In October operations were stopped for the winter.

BEAR RIVER (55° 129° N.W.)

Lead-Silver-Zinc

Big Four (Cassiar Consolidated Mines Limited) Company office, 789 Pender Street, Vancouver. The Big Four property, a consolidation of the Prosperity, Silverado, Porter Idaho, and Silver Key groups, was formerly owned by Big Four Silver Mines Ltd. and is now controlled by Cassiar Consolidated Mines Limited. Capital, 3,000,000 shares, 50 cents par value, of which 1,000,000 shares have been issued for the properties, the remaining 2,000,000 shares being reserved for The Consolidated Mining and Smelting Company of Canada, Limited.

During the summer of 1952 "E" and "D" levels and the "I" level adit of the Porter Idaho and Prosperity mines were partly rehabilitated. Part of the ground in which the mine workings are located was geologically mapped, and 253 feet of diamond drilling was done.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1930, pp. 102–104.]

ALICE ARM*

Silver

Toric (Torbrit Silver Mines Limited) (55° 129° N.W.) Registered office, 309 Royal Bank Building, Vancouver; executive office, 350 Bay Street, Toronto. G. B. Tribble, manager; A. M. Cormie, mine superintendent; R. W. Burton, mill superintendent. Capital: 3,000,000 shares, $1 par value. The mine is reached by 17 miles of road from Alice Arm along the west bank of the Kitsault River.

* By J. W. Patterson.

A total of 135,761 tons of ore was milled at an average rate of 370 tons per day. From this ore, 372,209 ounces of silver was recovered as bullion from cyanidation and 2,827 tons of concentrate was produced, containing 1,974,442 ounces of silver, 1,015,040 pounds of lead, and 167,015 pounds of zinc.

A summary of the work performed underground and the ore and waste broken in 1952 follows:—

Work Done	Level	Advance	Ore	Waste
		Ft.	Tons	Tons
Drifting	800	1,060	889	6,734
	900	1,149	4,467	4,455
	1000	31	267	......
	1150	23	73	......
Total drifting	......	2,263	5,696	11,189
Raising	800	236	425	525
	900	718	2,129	372
Total raising	......	954	2,554	897
Stope drifting	800	128	163	303
	900	309	1,394	......
	1000	254	180	788
	1150	30	305	......
Total stope drifting	......	721	2,042	1,091
Stope raising	800	255	181	687
	900	2,336	7,501	2,045
	1000	406	973	548
	1150	66	213	......
Total stope raising	......	3,063	8,868	3,280
Sumps	800	16	......	113
	1000	14	......	97
Total sumps	......	30	......	210
Ore-passes	800	4	......	236
Stoping	900	......	87,917	64
	1000	......	22,500	......
	1150	......	15,648	858
Total stoping	......	......	126,065	922
Total, mine	......	7,035	145,225	17,825
Diamond drilling	800	5,146	......	......
	900	2,126	......	......
	1000	1,022	......	......
Total diamond drilling	......	8,294	......	......

Most of the ore is now broken by long blast-holes which are drilled with leyner machines and tungsten carbide bits attached to sectional steel.

On the surface, except for the erection of a recreation hall equipped with two bowling alleys, an auditorium, and a small general store, there has been little construction activity.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 102–103.]

OBSERVATORY INLET*

Copper

Anyox (The Consolidated Mining and Smelting Company of Canada, Limited).—(55° 129° S.W.) The detailed geological and geophysical work started in this area in

* By J. W. Patterson.

1950 was completed. A total of 2,352 feet of diamond drilling to check the results of this work was done in four holes.

GIBSON ISLAND†

Copper-Lead-Zinc

Gibson Girl

(53° 130° N.E.) This property, consisting of six Crown-granted mineral claims, is owned by M. M. Stephens, of Prince Rupert. The claims are on Gibson Island, at the mouth of Grenville Channel. The island is 28 miles south of Prince Rupert. Base-metal mineralization was discovered on Gibson Island over forty years ago. The original find was made on what is now the Gibson Girl mineral claim. Other showings were uncovered by surface work which has been carried out intermittently by various individuals and mining companies. During World War I the Granby organization did a limited amount of underground work on the original find.

In the summer of 1951 the property was investigated by Gibson Girl Mines Limited, a company headed by K. J. Springer. Twenty-two holes were diamond drilled to a total length of 5,279 feet. The property was examined in August, 1952.

Gibson Island is an uninhabited island, 1 square mile in area. Several ridges, all under 300 feet in elevation, traverse the island in a northwesterly direction. Timber, especially hemlock, is plentiful on the ridges.

The island is composed of intensely metamorphosed sediments of the Prince Rupert formation. Lenses of massive, white to greyish white, coarsely crystalline limestone are interbedded with schists. Some of the limestone lenses are several hundred feet thick and form the prominent ridges of the island. Quartz-feldspar-biotite, chlorite, and hornblende-muscovite-garnet are the dominant varieties of schist. The low swampy areas of the island mark stratigraphic horizons in which the softer schists are abundant. The sediments have a general strike of north 20 degrees west and dip vertically or nearly so.

barite

The mineralization consists of pyrite, chalcopyrite, sphalerite, galena, and very sparse molybdenite in a siliceous gangue that contains variable amounts of calcite, epidote, pink garnet, actinolite, and diopside. It occurs sporadically for at least 1,500 feet along and near a contact between schists and a ridge of limestone. Within the wide lens of limestone forming the ridge, the mineralization is restricted to narrow siliceous bands and schistose partings that have little persistence vertically or horizontally. The mineralization is a little more abundant in the schists, especially where a schist band is in contact with an interbed of limestone.

The strongest mineralization is exposed in two trenches, 50 feet apart, on the original discovery. Surface work to north and south of these trenches did not disclose sections of comparable width and grade (*see* Fig. 1 and the following table). Drill-holes beneath the original discovery intersected sulphides but failed to indicate the presence of an economic deposit. The underground development is shown in Section B-B′, Figure 1. Information on the lower workings, which are flooded, was obtained from the 1917 Annual Report of the Minister of Mines.

Mineralization is fairly widespread but has not been found sufficiently concentrated to form an orebody. This may be due to the lack of some strong controlling feature, such as a fault or fold, that might have localized deposition of the sulphides.

† By W. R. Bacon.

– stratiform in alt'd zones // to bedding
not a typical skarn.

Tunnels ca 2000'
Drill length up to 3000'

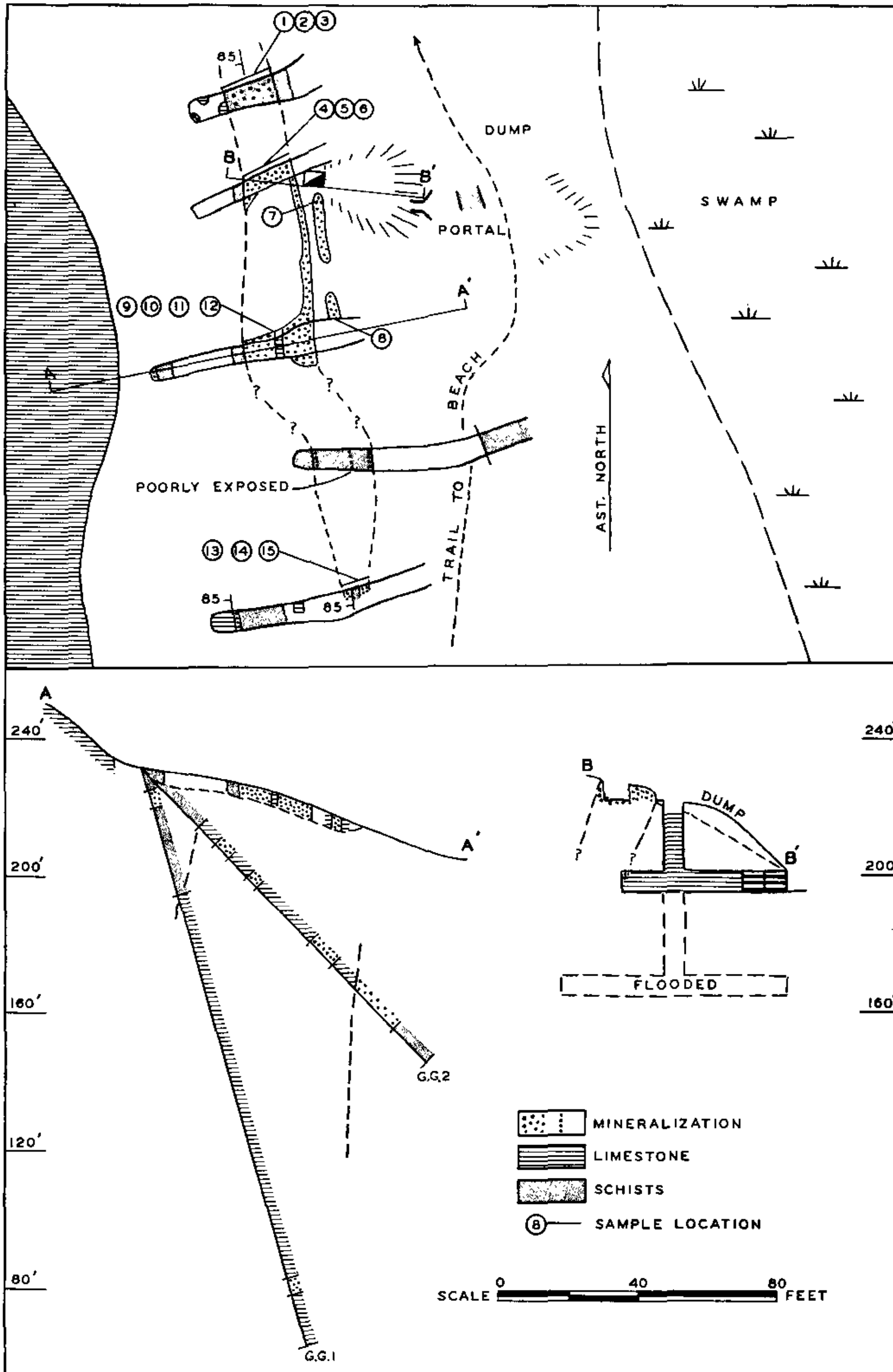


Figure 1. Gibson Girl—plan and sections of main showing.

Fifteen samples were taken at locations shown in Figure 1. These assayed as follows:—

Sample No.	Width	Silver	Copper	Lead	Zinc
	Ft.	Oz. per Ton	Per Cent	Per Cent	Per Cent
1	6.5	0.2	0.4	0.3	0.3
2	4.0	0.6	1.6	0.3	0.2
3	4.5	1.0	2.4	0.3	0.5
4	5.0	0.5	2.5	0.2	1.1
5	6.0	1.1	2.8	0.9	1.9
6	3.0	0.2	2.3	1.5	3.1
7	4.0	1.4	3.4	0.4	1.1
8	3.3	2.7	3.3	6.7	9.6
9	4.2	0.8	3.6	4.7	7.2
10	4.3	0.7	1.8	2.4	4.8
11	4.0	0.3	1.1	0.4	1.3
12	5.0	0.8	1.2	2.0	2.5
13	2.0	0.8	2.4	0.6	2.3
14	2.3	0.7	1.2	0.1	0.3
15	3.2	0.8	2.4	0.6	2.3

N.B.—Samples No. 2 and No. 6 assayed 0.01 ounce of gold per ton; all others assayed *nil* or trace.

ECSTALL RIVER*

Pyrite-Zinc-Copper

Ecstall (Sulgas Properties Ltd.) (53° 129° N.W.) Sulgas Properties Ltd. is a private company, incorporated in 1951. Company office, 744 West Hastings Street, Vancouver. Directors: F. W. Guernsey, Vancouver; R. D. Mollison, H. R. Brainerd, B. G. Bedichek, all of New York. Capital: 2,000 shares, $100 per share. The Ecstall property consists of twenty-one Crown-granted claims and fractional claims which extend across the Ecstall River at a point 30 miles above its confluence with the Skeena River. The property is 45 miles southeast of Prince Rupert.

Large pyritic deposits on the Bluestone and Bell Helen claims have been investigated intermittently during the past fifty years. These two claims and the Red Bluff and Red Gulch comprise the original group located in 1900. In that year the property was purchased by Victoria interests and the British Columbia Pyrites Company Limited was formed. This company spent two years investigating the deposits by tunnels and drill-holes. A small shipment of pyritic material to the Victoria Chemical Works contained 45 per cent sulphur.

The property was idle from 1903 until 1917, when The Granby Mining Smelting and Power Company Limited, with a new smelter at Anyox, 110 miles north, took an option on the ground. Granby drilled the deposits in 1918 and 1919 and then dropped the option; a second option was obtained in 1923 but, after additional drilling, this, too, was dropped and the property reverted to the Victoria owners.

In 1937 the property was acquired by American interests represented by F. W. Guernsey, Vancouver. In that year Northern Pyrites Ltd. was formed and some diamond drilling was done to check the results of previous drilling. In 1938 underground development was begun, and by 1940 the new workings consisted of a 9- by 8-foot adit 2,780 feet long, seven crosscuts totalling 725 feet in length, and a 600-foot raise to surface.

No further work was done on the property until the summer of 1952, when the present company, which represents the same interests as did Northern Pyrites Ltd., engaged in a vigorous programme of further exploratory work. This included 1,378 feet of surface drilling, 8,880 feet of underground drilling, and geological reconnaissance of a considerable area surrounding the ore occurrences. In addition, geophysicists, using

* By W. R. Bacon.

a new low-frequency electromagnetic method, carried out experiments in the immediate vicinity of the known deposits.

The Ecstall River traverses an exceedingly rugged part of the Coast Range. Throughout much of its length the river has a low gradient and is shallow, flowing over and around innumerable sandbars. Tides are effective to the western boundary of the property, and at high tide boats of shallow draught, such as the average salmon troller, can reach the landing constructed at this point. From the landing an old tramway, 2,250 feet long, leads directly to the adit and mine buildings on the Red Gulch claim.

The deposits are in the canyon of Red Gulch Creek, a stream that flows due south into Ecstall River. Their regional setting is a northerly trending remnant of metamorphic rocks intruded by granitic rocks of the Coast Range. The metamorphic rocks occur on either side of the river and have been traced for 6 miles in a north-south direction. The remnant is 3 miles wide at the Ecstall River.

On the eastern slope of Red Gulch Creek good exposures of bedrock occur in half a dozen narrow gashes cut by intermittent tributary streams. The main rock type is a dark greyish-green, carbonatized chlorite-biotite schist in which there are bands of arenaceous limestone, quartzite, and dark-grey argillite. Sparse outcrops of chlorite-biotite schist occur immediately west of Red Gulch Creek.

The rocks in Red Gulch Creek are distinct from those that flank it. They form a band that has a maximum width of approximately 600 feet. These rocks are, at least in part, metamorphosed sediments consisting of quartz-biotite-chlorite schists, quartz-hornblende-chlorite schists, quartzite grading to quartz-mica schist, minor black argillite, and a granitic gneiss.

As shown in Figure 2, the granitic gneiss occurs in a band east of the deposits. This rock is called a granitic gneiss rather than a gneissic granite because certain facts suggest that it is a metamorphic rock. Two specimens examined petrographically consist of abundant quartz, biotite, plagioclase, muscovite, chlorite, clinozoisite, and minor carbonate and pyrite. The alignment of the micas and chlorite is strong, and the quartz grains are elongate parallel to the foliation. Plagioclase comprises less than 20 per cent of the rock or about one-third the normal content of Coast Range granodiorite. This and the lack of igneous texture is considered evidence that the gneissic band is probably of sedimentary origin and not a sill. For comparative purposes, a specimen of the Coast intrusives was obtained from a point just east of the eastern border of the metamorphic remnant. Although strongly gneissic, it is quite distinct from the rock described above. It is a granophyric rock composed of abundant andesine, hornblende, biotite, quartz, and minor potash feldspar.

In the vicinity of the deposits the rocks strike northward and dip eastward at 80 degrees or more. The secondary foliation is parallel to the bedding.

The deposits are massive sulphide replacements. The two main deposits are known as the North lens and the South lens, but, with the exception of the northern part of the North lens, these bodies are more tabular than lenticular. The mineralization consists of medium to coarse pyrite, minor sphalerite and chalcopyrite, and minute amounts of pyrrhotite and galena. Because of the granular nature of the pyrite, the mineralized outcrops tend to disintegrate readily.

The in echelon relationship of the North and South lenses is evident at the surface (*see* Fig. 2) and in the underground workings. These bodies conform to the attitude of the enclosing sediments and are relatively complete replacements of certain favourable beds. Although the nature of the replaced rock is not definitely known, three blocks of quartzite were noted within the northernmost exposures of the North lens.

The possibility that the two bodies occur in the same stratigraphic horizon was considered and rejected. Where best exposed (in Nos. 3 and 4 crosscuts), the rock between the two bodies exhibits no evidence of a fault or tight fold.

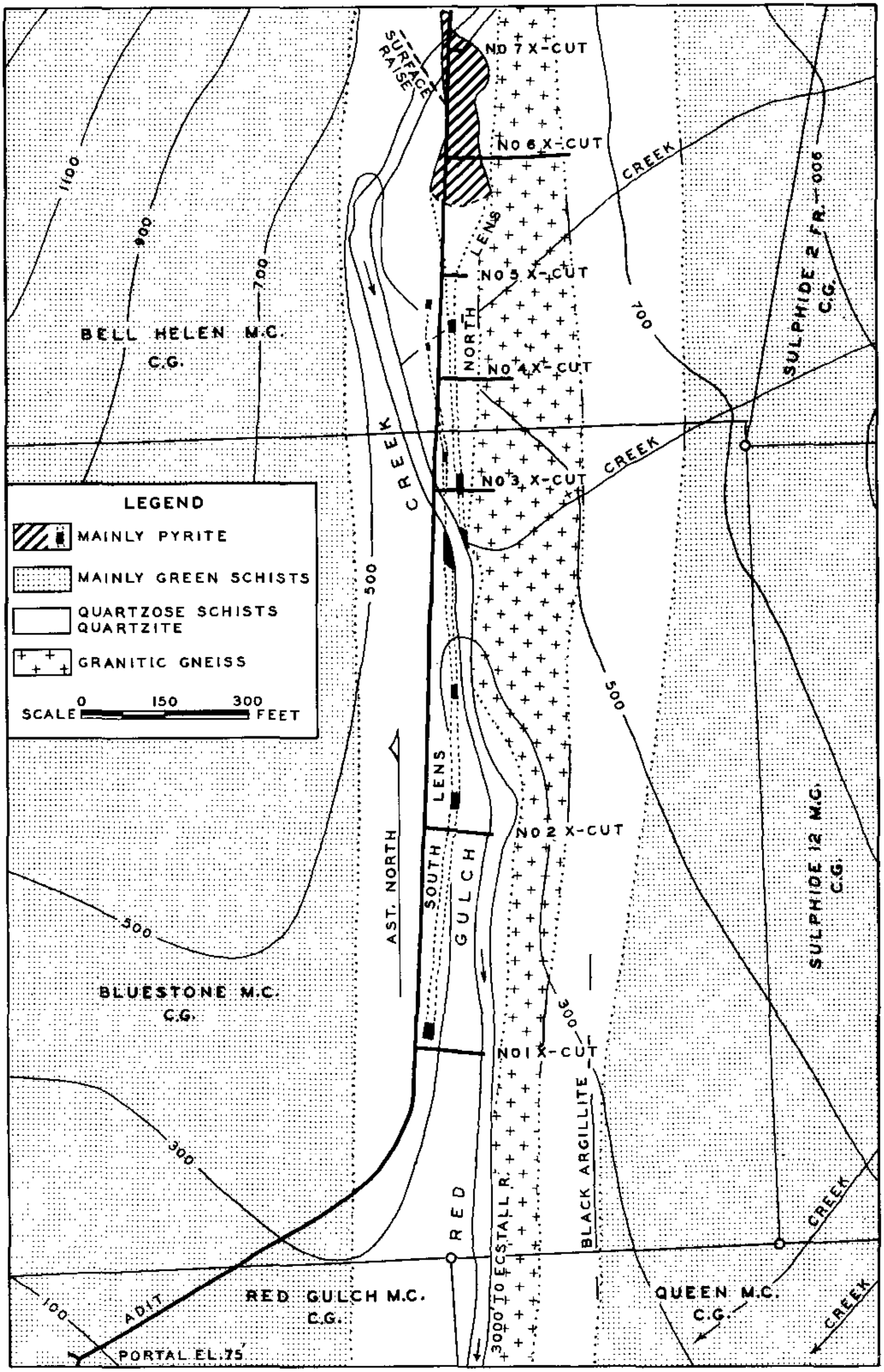


Figure 2. Ecstall River pyrite deposit—main deposit and workings.

Steeply plunging corrugations of unknown significance are not uncommon in the schistose rocks enclosing the deposits. Actual dragfolds are much less common. Dragfolds occur in the northern part of the North lens, where, in places, they can be traced in spite of the massive nature of the mineralization. Some are marked by thin bands of unmineralized sericite schist. These dragfolds plunge at 70 degrees in a south 35 degrees east direction and have been responsible for an appreciable thickening of the favourable horizon.

Sericite schist is found sporadically along the margins of the deposits. A band of this schist 40 to 50 feet wide can be traced northward from the North lens for more than 3,500 feet and is believed to have resulted from strong shearing along an argillaceous horizon. The possible extension of this shear zone south of the deposits is obscured by overburden.

The North and South lenses are large bodies. At the surface the North lens is exposed for a length of 950 feet and has a maximum width of 120 feet. At the adit level its indicated length is 700 feet; its greatest width is in No. 6 crosscut, where 96 feet of massive sulphides is exposed. The underground workings establish 500 feet of backs at the widest part of the North lens.

At the surface the South lens is exposed for a length of 1,300 feet. For 900 feet of this length, the lens is 15 feet wide or more. At the adit level its average width is 24 feet for a length of 1,000 feet. The underground workings establish 240 feet of backs.

Drilling appears to indicate that the North lens diminishes sharply below the adit level but that the South lens continues downward for hundreds of feet. The deepest drill-hole testing the South lens intersected that body at a depth of 900 feet below sea-level.

Although a full explanation for the setting of these deposits must await further study and development, two facts are considered significant. First, the deposits are confined to a band of distinctive quartzose rocks and, second, they occur along a shear zone within these rocks. Dragfolding is locally important, having controlled the form of the northern part of the North lens, but whether it was a major factor in the localization of the deposits as a whole is not known.

A smaller untested deposit, known as the Third Outcrop, occurs on the east bank of Red Gulch Creek, 2,500 feet north of the northern end of the North lens. Here, at an elevation of 1,100 feet, massive pyrite is exposed for a length of 100 feet and a maximum width of 8 feet.

One of the main handicaps to the successful development of the property has been its location. The mine production cannot be shipped by way of the Ecstall River. It is understood that the company plans a survey to establish the best route for a road or railway from the property east to Douglas Channel. The two main deposits contain low values in silver and gold as well as economically interesting amounts of zinc and copper. The property was originally considered solely as a source of pyrite or sulphur.

The main deposits have been tested to depths far below the adit level by means of an ingenious method of drilling. Because the workings traverse little more than the stratigraphic horizon in which the deposits occur, and suitable underground locations were not available for the normal drilling of deep holes, directional drilling was employed. For example, the South lens was tested to depths as much as 975 feet below the adit by holes collared at the ends of No. 1 and No. 2 crosscuts. These holes were started in the hangingwall of the South lens and were drilled downward in an easterly direction, away from the deposit. When desired depths were approached, the holes were progressively wedged until they were drilled westward at relatively low angles. In this way intersections approximating true widths were obtained at specific depths. The Tro-Pari compass was used for determining bearings and dips in the drill-holes.

USK*

Copper

Nicholson Creek Mining Corporation (54° 128° N.E.) Mine office, Usk. W. D. Galbraith, manager. This property is 2 miles by road from Usk. In 1952, 750 feet of underground diamond drilling, 28 feet of drifting, and some open-cutting and trenching were done. One ton of ore was shipped for mill testing. Mr. Galbraith reports that drifting and raising are planned for 1953.

[Reference: *Geol. Surv., Canada,* Mem. 205, 1937, pp. 53–55.]

Copper-Silver-Lead-Zinc-Gold

Grotto (Tungsten of British Columbia Ltd.) (54° 128° N.E.) Company office, 717 West Pender Street, Vancouver. J. Bell, manager. Access to the property from the railway at Pitman is by 2 miles of tractor-road along the north side of Hardscrabble Creek. This property, formerly known as the Diamond and later as the Diorite group, has not been worked for some time. Starting in September, 1952, the road was built to the property and a small camp was built. Underground work consisted of rehabilitation of No. 1 and No. 2 adits, and some drifting and stoping were done in No. 2 adit. The ore from No. 2 adit was sacked for shipment. The average number of men employed was eight.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1937, pp. C 4–C 7.]

DORREEN*

Gold-Copper-Lead-Zinc

Fiddler (Dorreen Mines Limited) (54° 128° N.E.) Company office, 525 Seymour Street, Vancouver. Alex Mackenzie, president; J. D. Boulding, manager. Capital: 3,000,000 shares, 50 cents par value. The mine camp is on Knauss Creek, about 5 miles west of Dorreen by road. The mine operated during 1952 until it was closed for the winter on October 15th. During that time about thirteen men were employed. Considerable difficulty was encountered during the winter in efforts to keep open the one-half mile of road between the camp and the mine. Snowslides were a hazard to the road and to the 12-inch pipe-line that supplies water to drive the numerous Pelton wheels in the mill.

In 1952, 252 feet of drifting, 113 feet of crosscutting, 166 feet of raising, and 1,400 feet of diamond drilling were done. A vein recently discovered above the top entry to the mine was followed for 48 feet by a drift at 2,466 feet elevation.

During operation of the mill from May 23rd to August 28th, 525 tons of ore was milled. Approximately 20 tons of bulk concentrate shipped to the Trail smelter assayed: Gold, 5.25 oz. per ton; silver, 13.05 oz. per ton; lead, 17.3 per cent; zinc, 7.4 per cent; copper, 2.6 per cent.

HAZELTON†

Silver-Lead-Zinc-Gold-Cadmium

Silver Standard Mines Limited (55° 127° S.W.) Company office, 602 West Hastings Street, Vancouver. William Dunn, superintendent. Capital: 3,500,000 shares, 50 cents par value. The vertical shaft is now 510 feet below the 1300 level. From the shaft, No. 4 and No. 6 veins were reached by crosscuts on the 1150 and 1000 levels. Drifting was done on both veins on these two levels, and vein continuity with depth was established.

On the surface No. 12 vein was exposed by stripping for 120 feet. Values in a length of 78 feet are reported by the company to be good. An attempt to strip No. 6 vein proved

* By J. W. Patterson.
† By J. W. Patterson, except as noted.

unsuccessful because the overburden was too thick. Some biogeochemical work was done, but the results so far are inconclusive. The Nos. 12 and 13 vein showings on the Black Prince group are now connected with the main camp by a truck-road.

Underground, 19,525 man-shifts were worked in 278 operating days in 1952. A summary provided by the company of the work done is tabulated below.

	Tons		Cu. Ft.
Ore mined	29,590	Shaft stations and pockets	2,996
Sorted out as waste	8,697	Sumps	1,338
Milled	20,893	Total	4,334

	Ft.
Drifting	1,493
Crosscutting	713
Raising	865
Shaft sinking	31
Subdrifting	260
Total	3,362

Diamond drilling totalled 2,471 feet on surface and 1,491 feet underground.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1950, pp. 87–95.]

American Boy (American Standard Mines Limited)

(55° 127° S.W.) Company office, 826 Vancouver Block, Vancouver. L. B. Gatenby, manager. Capital: 3,000,000 shares, $1 par value. During the first three months of 1952 the shaft sinking started in September, 1951, on an oreshoot discovered that year, was continued to a depth of about 40 feet. In the first 35 feet the oreshoot averaged 6.2 feet in width. No continuation was found of the mineralization on the strike of the vein or fault mentioned in the 1951 Annual Report.

From May to September a crew of four men with a D-4 bulldozer did considerable prospecting, surface stripping, and trenching. The area in which this work was done was geologically mapped. Several veins discovered contained some silver, lead, and zinc mineralization, but were too narrow to be commercial.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1950, pp. 95–96.]

Copper-Gold-Silver

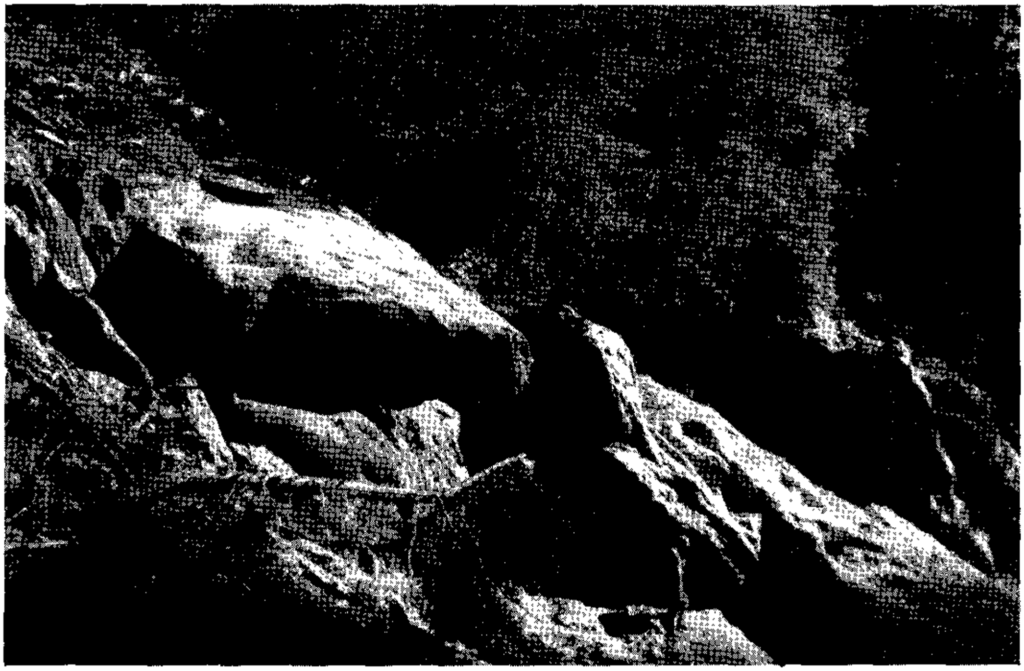
Rocher Deboule (Western Tungsten Copper Mines Limited)*

(55° 127° S.W.) Company office, 604 Hall Building, Vancouver. James Mackee, president; R. S. Douglas became mine manager in August, 1952. Capital, 3,000,000 shares; $1 par value. The company owns and operates the Rocher Deboule mine at the head of Juniper Creek, 11 miles by road from Skeena Crossing. The mine was first operated between 1911 and 1918, when the two main veins, Nos. 2 and 4, were explored by more than 12,000 feet of crosscuts, drifts, and raises. No. 4 vein is developed by the 100 level, elevation 5,302 feet, and by the 300 level, elevation 5,150 feet, which is connected by winze to the 500 level, now flooded.

No. 2 vein is on the footwall side of No. 4 vein and outcrops down the hill from it. It is developed by two adit levels—the 1200 at 4,167 feet elevation and the 1000 at 4,428 feet elevation. The 1200 level was driven as a straight crosscut for about 3,200 feet to the northern boundary of the Jack Pine claim in an attempt to intersect the downward continuation of No. 4 vein. On this level there is about 2,400 feet of drifting on No. 2 vein.

The portal of 1200 level is on the Joe Fraction (Lot 533), and the mine workings are on that claim and the Juniper (Lot 2400), the Balsam (Lot 2401), and the Jack Pine

* By S. S. Holland.



Outcrop of massive pyrite, North lens, Ecstall River.

Silver Standard mill.

Rocher Deboule mill.

Looking southwest down Kemano River from 1,600-foot level of Alcan project.

(Lot 2402). A surface tram runs from the portal of 1200 level to 300 level, which is the haulage level for the upper workings.

The recorded production of the mine is as follows:—

Year	Tons	Gold	Silver	Copper	Lead	Zinc
		Oz.	Oz.	Lb.	Lb.	Lb.
1915	17,000	1,418	21,893	2,788,000		
1916	16,760	1,184	16,738	1,753,225		
1917	2,889	781	7,987	714,871		
1918	3,184	832	16,247	635,870		
1929	72	10	2,972	6,120	751	7,219
Totals	39,905	4,225	65,837	5,898,086	751	7,219

No. 4 vein contributed most of this ore. Only two small stopes on No. 2 vein were worked.

The present company, formed in 1949 to explore the gold-cobalt-uranium showings on the near-by Victoria claim, began work at the Rocher Deboule mine in the summer of 1950 in the belief that copper ore of milling grade would be developed on No. 2 vein. The portal of the 1200 level, which had been completely covered by a rockslide, was uncovered, the upper levels were cleaned out, and a camp was built. In 1951 a few hundred feet of underground work was done, camp construction was finished, and construction of a concentrator and of a hydro-electric power plant was begun. The mill installation was completed early in 1952 and was put into operation in May. Other construction consisted of an assay office, a boiler-house, a warehouse, a hoist-room at the inclined railway, and a bunk-house. The hydro-electric power plant on Jupiter Creek was put into operation in the autumn, but due to partial collapse of the dam shortly afterwards, its use was discontinued. Underground work is reported by the company to consist of 720 feet of drifting and crosscutting and 636 feet of raising; no diamond drilling was done. Ore was mined from No. 2 vein on 1000 level in stopes east of 10-7w raise. Production in 1952 was 12,814 tons. Gross content: Copper, 305,498 lb.; silver, 18,640 oz.; gold, 267 oz. In November, 1952, mining and milling were terminated and part of the mill machinery was moved over to the Red Rose to increase the capacity of that mill.

The contact of the grey granodiorite which forms the core of Rocher Déboulé Mountain runs in a northerly direction through the Log Cabin, Juniper, and Jack Pine claims. Brown argillaceous and tuffaceous sediments of the Hazelton group, into which the granodiorite is intruded, are penetrated by the western ends of the drifts on 1000 and 1200 levels. There the contact strikes northwestward and dips about 65 degrees southwest. The mine workings lie almost wholly within the Rocher Déboulé granodiorite. Narrow porphyritic diorite dykes intrude the granodiorite to the west of the portal of 300 level, and a narrow pale-green dyke lies about 450 feet west of the main crosscut on 1200 level. On 1000 and 1200 levels, No. 2 vein is cut by the Rocher dyke, a fine-grained grey quartz diorite dyke about 40 feet thick. It has chilled margins against the granodiorite and strikes north and dips 55 degrees west. The Rocher dyke is said to be exposed in the drift at the north end of 1003 crosscut, but that section was inaccessible when the writer examined the property.

Vein mineralization occupies northeasterly striking and northwesterly dipping fractures. The fracture occupied by No. 2 vein strikes about north 70 degrees east, but variations in strike between north 60 and north 80 degrees east exist. The fracture dips northwest at angles ranging between 30 and 70 degrees. Despite there being a considerable range in dip of the fracture on 1000 level, the average increases progressively westward from 40 degrees near the crosscut to 56 degrees near the sedimentary contact. Similarly, on 1200 level the average dip increases westward from 36 degrees in the section east of the Juniper fault to 54 degrees in the section east of the Rocher dyke,

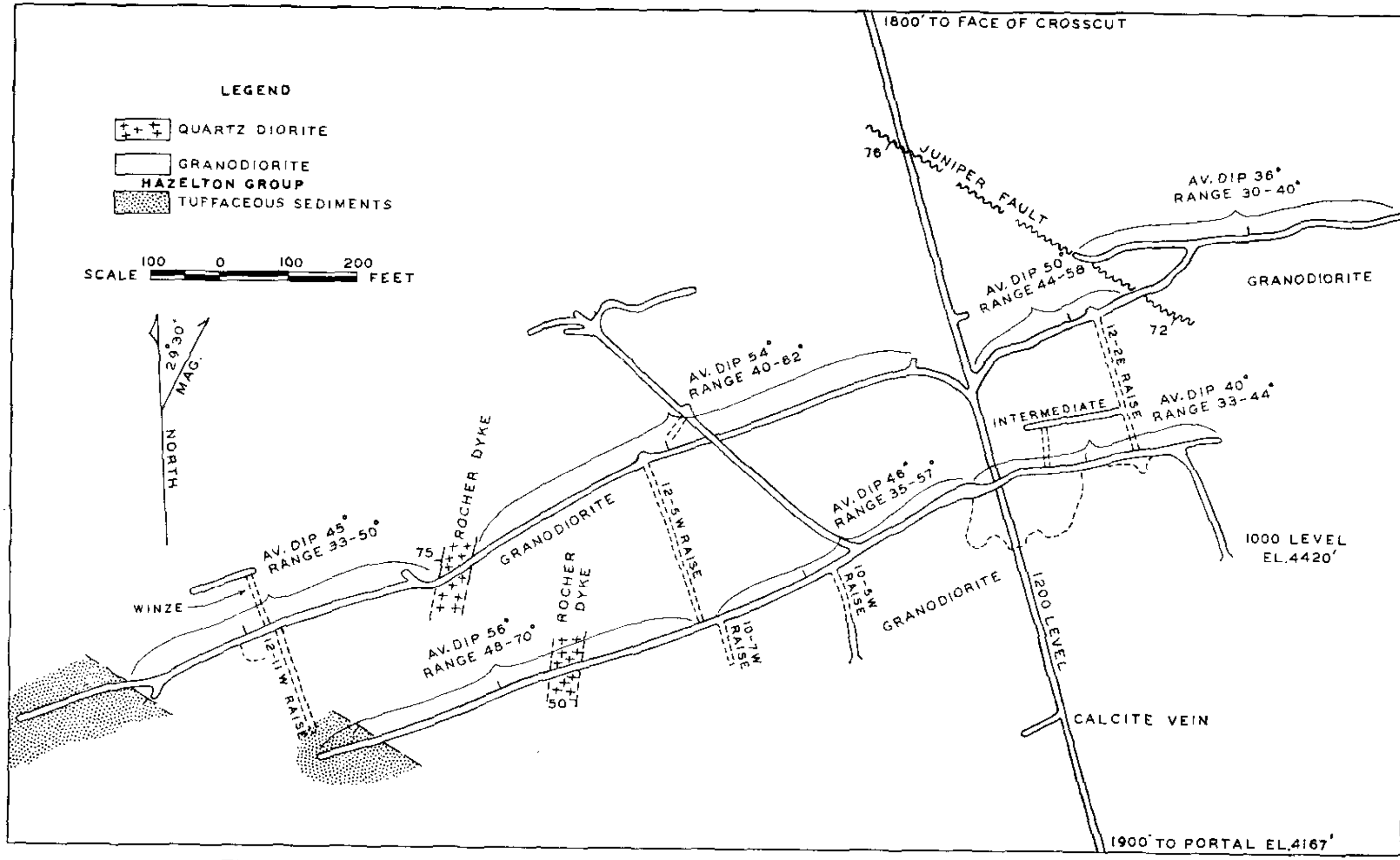


Figure 3. Western Tungsten Copper Mines Limited—plan of 1000 and 1200 levels, Rocher Deboule mine.

while west of the Rocher dyke the average dip decreases to 45 degrees northwest. The No. 2 vein fracture crosses the granodiorite-sedimentary contact, and the horizontal displacement of the contact is 12 feet right on 1200 level and about 8 feet right on 1000 level. No. 2 vein is cut by the Rocher dyke, which occupies a fault that offsets the No. 2 vein fracture about 15 feet right. Late movement along the No. 2 vein fracture in turn offsets the Rocher dyke 4 feet left on 1000 level, and on 1200 level offsets a narrow pale-green dyke possibly as much as 25 feet left. Striations on the hangingwall of the vein dipping from 10 degrees east to horizontal indicate that the direction of the last movement must have been almost horizontal.

On 1200 level the vein fracture is cut by the Juniper fault, which strikes about north 55 degrees west, dips about 75 degrees southwest, and appears to offset the vein about 100 feet to the left. However, east of the fault the vein is dragged in a direction that suggests a right-hand displacement and thereby introduces the possibility that No. 2 vein may lie to the south of the present drift.

The No. 2 vein occupies a shear zone a few inches to as much as 4 to 5 feet in width. On the 1000 level the average width of the zone is about 2 feet and on 1200 level it is considerably less. Granodiorite in the shear zone is silicified, largely replaced by hornblende, and in part mineralized. The altered rock is fractured and invaded by vein quartz mineralized with pyrrhotite, pyrite, grey copper, chalcopyrite, galena, sphalerite, and cobaltite. Scheelite is locally present, and molybdenite is reported, though was not seen. Copper is largely present as grey copper rather than chalcopyrite, and in this regard the mineralogy of No. 2 vein differs from that of No. 4, where massive chalcopyrite was sorted from the vein and shipped. In a few places copper minerals are present in the footwall of the vein beyond the limits of the shear zone, but the copper content of such material is low. Both 1200 and 1000 levels were examined under ultraviolet light, and it is apparent that the amount of scheelite is small and is localized in the winze on 1200 level and at a few points along the level. Assays indicate that erratic, high gold values occur in the winze, along the drift to the east, and at points on 1000 level.

Observations on the two levels indicate that on No. 2 vein greatest widths occur where the dip of the vein is flattest. Moreover, the greater widths appear to accompany those sections of vein having the most easterly strike and are probably associated with voids or low-pressure areas created by the right-hand movement along the sinuous fracture.

Ore Reserves.—Estimates of ore reserves released by the company have varied greatly. In June, 1951, A. L. Clark, the managing director and consulting engineer, estimated the indicated ore reserve in No. 2 vein at 200,000 tons, grading 4.1 per cent copper, 0.4 ounce gold, and 4 ounces of silver per ton. At that time no systematic sampling of the vein had been done. In November, 1951, Hill and Legg, consulting engineers of Vancouver, were retained by the company to report on the ore reserves. About 100 samples taken during the course of their examination indicated two orebodies on 1200 level lying east and west of the winze. The orebody east of the winze was considered to be 130 feet long and that west of the winze 147.5 feet. A mining width of 4 feet was assumed and that the ore has a dip length equal to its strike length. The reserve in these two shoots was calculated by them to be 11,050 tons. Hill and Legg sampled only the western 500 feet of vein on 1000 level and did not allow any ore on that level.

On December 12th, 1951, N. N. Kohanowski, associate professor of mining geology at the University of North Dakota, submitted a report to the company. He took twelve samples and on No. 2 vein calculated a total of 315,000 tons of " indicated and reasonably assured " ore having a content of about 4 per cent copper. This estimate assumed ore to extend for 850 feet east of the winze on 1200 level, to extend as much as 350 feet below 1200 level, to extend to a height from 225 to 370 feet above 1000 level, and included a very large tonnage of ore in the sedimentary rocks extending as much as 500 feet beyond the granodiorite contact. On the basis of present knowledge, these assumptions are not warranted.

In March, 1952, forty-one samples were taken on 1000 level, seven in 12-5w raise, five in 12-11w raise, and twenty-seven on 1200 level by J. E. Merrett and A. R. C. James, of the Department of Mines. These samples do not indicate any further oreshoots on 1200 level other than the two previously indicated by Hill and Legg near the winze. On 1000 level between the crosscut and the Rocher dyke, average assay content of the vein is as follows:—

Description	Width	Gold	Silver	Copper
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent
For 350 feet west of the portal crosscut	2.4	0.06	14.3	4.4
For 120 feet on each side of 10-5 Raise	2.34	0.12	4.5	3.2
For 180 feet between 12-5w Raise and the Rocher dyke	1.25	0.04	3.5	3.6

The average width of the vein on 1000 level in the 900 feet between the crosscut and the Rocher dyke, determined from the above sample widths and from independent observations, is 2 feet.

In August, 1952, nineteen samples were taken at 10-foot intervals on 1000 level to resample the vein between the 12-5w raise and the Rocher dyke. The average of these assays is: Width, 1.8 feet; gold, 0.11 oz. per ton; silver, 6.8 oz. per ton; copper, 3.3 per cent.

The following conclusions were reached regarding No. 2 vein:—

(1) Two oreshoots exist near the winze on 1200 level but their dip length is unknown. No other mineralization of ore grade is known on 1200 level.

(2) On 1000 level the vein is considerably less than mining width, and on mining a dilution of from 50 to 100 per cent would be incurred unless the footwall waste rock were broken separately.

(3) The copper content of 3 per cent and more in the vein on 1000 level does not extend through to the 1200 level, some 260 feet vertically below. Good copper values extend only part way down 12-5w raise below 1000 level.

(4) There is far too little information regarding the width and metal content of the vein above and below the levels for a close estimate of probable ore reserves to be made. Nevertheless, there is sufficient information available to indicate that on the basis of conservative engineering practices the large tonnage estimates of Clark and Kohanowski were not justified.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1914, pp. 185–188; 1916, pp. 106–109; 1918, p. 111; 1951, p. 110. *Geol. Surv., Canada,* Mem. 223, pp. 50–55; Mem. 110, pp. 7–14.]

Rocher Deboule Mountain Mines Limited

(55° 127° S.W.) Company office, 513 Royal Bank Building, Vancouver 2. Capital, 3,000,000 shares, 50 cents par value. This company holds the Jo Ann and Gae Nos. 1 to 6 claims, the Hazelton View, Moose, Elk, and Lead Pick Crown-granted claims to the west of Western Tungsten Copper Mines Limited. During the summer of 1952 some diamond drilling was done to outline the No. 4 Rocher vein, most of the drilling having been done on the Moose, Elk, and Lead Pick claims. Three miles of jeep-road were constructed from Highway No. 16 along the old Rocher tramway.

Tungsten

Red Rose (Western Tungsten Copper Mines Limited)

(55° 127° S.W.) Company office, 505 Dunsmuir Street, Vancouver; mine office, Skeena Crossing. W. N. Taylor, general superintendent. Capital: 3,000,000 shares, $1 par value. The mine is on Rocher Déboulé Mountain and is reached by 11 miles of road from Skeena Crossing. Concentration of ore started in December, 1951, and continued, except for brief shut-downs, throughout 1952. The tonnage milled increased from about 25 tons per day in January to about 100 tons per day in October, November, and December, bringing the total to 21,137 tons for 1952.

Development work consisted of 876 feet of drifting, 50 feet of crosscutting, 923 feet of raising, and 700 feet of exploratory diamond drilling. Total construction consisted of two bunk-houses, one dwelling, one office, and 1,250 feet of snowsheds at the mine-site, and one bunk-house, one combined refrigerator and store-house, one boiler-house, one oil-shed, six prefabricated dwellings, and additions to the mill and warehouse at the mill-site.

Danger from snowslides existed for some time during the spring, and one slide at the mill-site collapsed an old empty bunk-house. Travel facilities between mill and mine were poor in the winter months, the only means of travel being by the aerial tramway or on foot.

Silver-Lead-Zinc

Brunswick (Skeena Silver Mines Ltd.) (55° 127° S.W.) Company office, 1347 Marine Drive, West Vancouver. W. F. McGowan, manager. Capital: 3,000,000 shares, no par value. This company's property is within three-quarters of a mile of the Red Rose mill-site. The Brunswick vein was followed 228 feet by drifting until it was displaced by a fault. The faulted segment was found later by diamond drilling. Four men were continuously employed as prospectors during the summer, and a scheelite deposit on Armagosa Creek is reported to have been discovered by them.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1925, pp. 134–135.]

SMITHERS*

Gold-Silver-Lead-Zinc

Duthie, Mamie, Sil Van (Sil Van Consolidated Mining & Milling Company Ltd.).—(54° 127° N.E.) Company office, 602 West Hastings Street, Vancouver; mine office, Smithers. C. H. Macdonald, superintendent. Capital: 3,500,000 shares, no par value.

The main haulage on the 3800 level was widened and straightened for a distance of 1,509 feet, and considerable underground development was accomplished in 1952.

	Duthie Mine (Ft.)	Victory Mine (Ft.)
Drifting	1,561	262
Crosscutting	41	......
Raising	881	81
Diamond drilling	100	......

The company planned to start milling in November, 1952, but, owing to the inability of the Trail smelter to accept their concentrates, it was decided on October 31st to stop surface construction temporarily. Only a small amount of work is required to make the surface plant ready for use.

The surface plant consists of a prefabricated steel power-house equipped to supply requirements of the mill and mine, and a 150-ton mill which includes the old mill building, now used to house the crushing plant, and the new main mill building which contains the concentration plant. A 500-ton coarse-ore bin and a 500-ton fine-ore bin were built. Water for the mill will be brought by a 6-inch water-line 5,000 feet from Aldrich Lake.

Nine three- and four-room dwellings were erected to house married personnel.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1948, pp. 82–85.]

* By J. W. Patterson.

Silver-Lead-Zinc

Empire, Snowshoe (Sunset Empire Mining Company, Limited)

(54° 127° N.E.) Office, Room 6, Smithers Confectionary Building, Main Street, Smithers. The Empire and Snowshoe groups are near the head of Simpson Creek on the eastern slope of Hudson Bay Mountain, about 5½ miles from Smithers. A third group held by the company, the Malnok, adjoins the Sil Van property at the foot of Toboggan Glacier on the northwestern slope of Hudson Bay Mountain. The Empire group, which has been enlarged to include a group formerly known as Heather, was once owned by the late D. C. Simpson, after whom the creek was named.

During the summer of 1952 the road to the railway near Smithers was made suitable for tractor haulage. C. A. Munroe, who directed the work, reports that the Empire vein was uncovered by trenching for an additional 600 feet. Some stripping and benching were done below the Empire adit, resulting in the location of the downward extension of the Empire vein.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1928, pp. 161–162; 1931, p. 73.]

Silver-Lead-Zinc

Cronin (Cronin Babine Mines Limited)

(54° 126° N.W.) Company office, 744 West Hastings Street, Vancouver; mine office, Smithers. C. Rutherford, consulting engineer. Access to the Cronin mine on Cronin Mountain is by about 35 miles of road from Smithers. Work started on the property in 1951 and was terminated on November 5th, 1952, due, according to a company report, to inability to dispose of zinc concentrates and to the low base-metal prices.

From January to November rehabilitation of the important sections of the mine was completed, a truck-road extending from the mill to the mine was built, and several buildings were completed, including a 40-ton mill, two bunk-houses, and a machine-shop. Milling commenced on July 17th and stopped on November 5th. During this period 3,510 tons of ore was milled.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 94–98.]

TELKWA*

Zinc

Cassiar Crown and Lakeview (Copper Ridge Silver Zinc Mines Limited)

(54° 126° N.W.) Company office, 525 Seymour Street, Vancouver. R. Brown, president; F. J. Schroeder, secretary; B. I. Nesbitt, consulting geologist; J. S. Ives, engineer in charge of operations. Capital: 3,000,000 shares, 50 cents par value. A controlling interest in the company is held by Transcontinental Resources Limited. The property is on Grouse Mountain and is served by about 4 miles of jeep-road which joins the highway 16 miles southeast of Telkwa.

A total of 5,317.5 feet of diamond drilling was done, including 438 feet from No. 2 level and 3,200 feet from the surface to outline the Ruby zone, 142 feet of underground drilling on a subsidiary structure, and 1,538 feet of surface drilling on the Lakeview zone. A geological map was made of the underground workings and the surface rock exposures of the extensive holdings; this was supplemented by detailed resampling of the underground workings.

Work was suspended in August, the outlook for zinc not being considered sufficiently encouraging to warrant development or further exploration.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1951, pp. 113–117.]

* By J. W. Patterson.

Howson Creek

Duchess (Kennco Explorations, (Canada) Limited).—(54° 127° N.W.) The company reports that surface trenching and mapping were done in the vicinity of the Duchess copper and zinc showings, about 20 miles southwest of Telkwa.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 113–117.]

HOUSTON*

Gold

Bob Creek (54° 126° N.W.) This property is on Bob Creek, about 10 miles south of Houston. C. D. McCord, of Transcontinental Resources Limited, prepared a detailed geological map of the property, but no further work was done because the cost of adequate sampling was considered prohibitive.

TOPLEY†

Gold-Silver-Copper-Zinc

Topley Richfield (Topley Mining Syndicate) (54° 126° N.E.) Company office, 602 West Hastings Street, Vancouver. R. H. Wilson, president. This property is about 7 miles north of Topley and can be reached by car. The syndicate reports that surface trenching and stripping were done on the Red Top and North Star groups of claims. Portions of the 360 feet of trenching on the Red Top group south of the Innes shaft disclosed narrow veins in which were small quantities of gold, silver, lead, zinc, and copper. On the North Star group two 100-foot trenches as much as 16 feet deep failed to penetrate the overburden.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1937, pp. C 26–C 27.]

Gold-Silver-Lead-Zinc-Copper

Golden Eagle This property is owned by Mrs. D. Heenan, of Topley, and is about 7 miles by motor-road north of Topley. Between May 25th and July 31st two diamond-drill holes—No. 1, 294 feet deep, and No. 2, 265 feet deep—were drilled by Mindus Corporation Limited. The company states in its report that work was stopped because the values in the mineralization intersected by the drill-holes were very low.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1937, pp. C 24–C 26.]

Silver Cup‡ Mathew Sam, of Topley, owns the Silver Cup group, comprising the Silver Cup, Vincent, Big Quay, High Command, Sam, and Maple Leaf claims on the south side of Richfield (Finlay) Creek about 7 miles by road from Topley. In earlier reports the same ground was known as either the Gold or Cup group. In 1951 and 1952 the group was under option to W. F. McGowan, of Vancouver.

The claims are underlain by andesite breccia and andesite porphyry that outcrop prominently along the canyon on Richfield Creek.

The showings consist of two rather flat quartz veins. One north of the camp and about 25 feet above creek level is exposed in several old open-cuts and in the Mathew Sam adit about 130 feet long. The other vein is exposed in an incline about 100 feet above creek level and about 750 feet northeast of the Mathew Sam adit.

The following table enumerates the shipments of sorted ore that were made to the sampling plant at Prince Rupert:—

* By J. W. Patterson.
† By J. W. Patterson, except as noted.
‡ By S. S. Holland.

Tons	Gold	Silver	Copper	Lead	Zinc
1938	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent	Per Cent
3.6	0.02	18.4	1.8	26.0	10.0
2.645	0.02	17.2	1.8	32.6	10.5
0.139	0.06	77.4	0.9	Trace	0.2
0.1875	0.10	60.8	Trace	......	3.0
1.513[1]	......	......	......	......	......
1939					
0.1415	0.04	70.7	2.4	13.9	9.1
0.1360	0.01	23.0	0.8	11.4	12.3
0.0575	0.03	73.5	0.8	......	Trace
0.0856	0.24	67.7	0.8	1.4	6.2
0.0378	0.22	173.4	0.5	......	......
1941					
0.2635	0.20	87.9	0.10	......	......
1942					
0.0507	0.05	24.8	......	......	......
0.0525	0.02	8.8	......	......	......
0.0470	0.02	12.1	......	......	......

[1] Total weight of twenty-one small lots shipped to sampling plant at Prince Rupert (see *Minister of Mines, B.C.*, Ann. Rept. 1938, p. A 38).

Early in 1952 the portal of the Mathew Sam adit was enlarged and retimbered, and about 55 feet of tunnel driven to the southeast. A quartz vein up to a maximum width of 30 inches is exposed in the underground workings. It strikes northeast and dips 25 degrees and less to the northwest. At about 95 feet from the portal the vein is cut by a northeasterly striking normal fault dipping 37 degrees southeast. The segment of vein on the hangingwall side of the fault has moved downward, the dip-slip being about 20 feet. For the innermost 25 feet the vein dips very gently northwest and rises to a height of only 3 feet on each wall of the crosscut. The quartz is mineralized with pyrite, galena, sphalerite, and grey copper. The average of nine samples taken by an examining engineer along 80 feet of workings is as follows: Width, 1.6 feet; gold, 0.01 oz. per ton; silver, 14 oz. per ton; lead, 10.1 per cent; zinc, 13.2 per cent.

Six samples were taken, whose assays follow:—

Sample No.	Width	Silver	Lead	Zinc
	In.	Oz.	Per Cent	Per Cent
1. Face of adit	24	2.6	4.9	6.4
2. 10 feet from face	13	1.2	0.15	3.8
3. 80 feet from portal, southeast wall of raise	24	4.0	6.4	12.7
4. 85 feet from portal, northwest wall of raise	39	20.0	11.9	10.9
5. 95 feet from portal, face of raise	30	12.1	34.4	7.2
6. 60 feet from portal	24	4.5	14.3	2.7

The incline, about 750 feet upstream from the Mathew Sam adit and on the south side of Richfield Creek and 100 feet above it, was cleaned out and unwatered. The incline is driven horizontally for 12 feet in a southeasterly direction then down a 23-degree slope for 35 feet. The working exposes a quartz vein striking north 50 degrees east and dipping 20 degrees southeast. The vein is from 16 to 20 inches in width and is mineralized with pyrite, sphalerite, and some galena and grey copper. Four samples taken at 5-foot intervals along the southwest wall of the incline assayed as follows:—

Location	Width	Silver	Lead	Zinc
	In.	Oz. per Ton	Per Cent	Per Cent
12 feet in from portal	20	1.8	0.4	13.9
17 feet from portal	21	2.4	1.4	16.5
22 feet from portal	16	2.5	2.0	11.0
27 feet from portal	20	6.1	1.7	16.2

A short adit was driven beside a small creek between the incline and the road to the south. A small amount of scheelite was present in a narrow quartz stringer when the adit was being driven, but none is to be seen now.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1937, pp. C 27–C 32; 1938, B 36, B 38; 1939, 56, 58; 1941, 44; 1942, 31.]

TAHTSA LAKE*

Silver-Lead-Zinc

Emerald (Emerald Glacier Mines Limited) (53° 127° N.E.) Mine office, Burns Lake. Manager, R. B. Fahrig. Capital: 3,000,000 shares, no par value. This property is on Sweeney Mountain, about 3 miles from the road to Tahtsa Lake built by Aluminum Company of Canada Limited. This road is well maintained, and during the summer months automobile travel to the foot of Sweeney Mountain presents no difficulty. It is advisable to check the condition of the road to the mine camp before attempting to go farther by car. In the winter this road and the extension to the 6400 level were kept open with considerable difficulty.

A total of 299 feet of drifting and 46 feet of crosscutting were done on the 6400 level, and 656 feet of drifting, 471 feet of crosscutting, and 3,266 feet of diamond drilling were done on the 6000 level. The total production of 2,908 tons was taken from a stope on the 6400 level. The ore was trucked to Burns Lake and then shipped to the Kenville mill at Nelson for treatment. The mine was worked continuously from January 1st to November 9th, when operations ceased. About thirty-two men were employed at the mine.

Lead Empire (Lead Empire Syndicate).—(53° 127° N.E.) The claims held by this company are about half-way between Tahtsa and Kidprice Lakes. Six men employed from July 9th to September 14th worked on trails and open-cuts.

Smith-Nash† (53° 127° S.W.) This group of fourteen claims and one fractional claim was located by G. Smith and F. Nash, of Vancouver, in September, 1952. It is on the steep south slope of a ridge extending southwest from Sandifer Peak. The ground is 10 miles east of Kemano and can most easily be reached from Sandifer Lake.

Several limonite-stained quartz veins have been seen on the claims from the air, but only one has been examined. The veins are near the eastern contact of the Coast Range batholith on an anticlinal structure. The country rock on the east side of the group consists of interbedded greenstone and gneissic quartzite; on the west, nearer the batholith, it consists of granitic gneisses containing numerous pegmatite bands and dykes and occasional barren quartz veins.

The only vein examined occupies a shear zone striking northwest and dipping steeply southwest. It outcrops continuously between elevations of 4,500 feet and 5,000 feet in a steep shear-controlled gully on the northeasternmost claim of the group. At the top of the gully, the vein, which is here about 4 feet wide, disappears beneath talus on a small bench and could not be located in the bluffs above. At the 4,500-foot elevation, the only place where the vein is accessible, it swells to a width of about 15 feet, then pinches out abruptly. The sheared zone, about 8 feet in width, continues below the pinch-out of the quartz, but flattens in dip and swings to a more easterly strike.

The only visible metallic mineral is pyrite, which occurs as disseminated blebs and stringers in the quartz. Several stringers of massive granular pyrite from 2 to 6 inches wide occur at the hangingwall and footwall of the lowest seen part of the vein, and in the sheared zone below the quartz pinch-out. The sheared wallrock is only slightly mineralized.

---

* By J. W. Patterson, except as noted.

† By R. A. Stuart.

The following type samples were taken:—

	Gold (Oz. per Ton)	Silver (Oz. per Ton)
1. Mineralized vein quartz	0.39	0.2
2. Massive pyrite from 5-inch stringer	2.9	1.5
3. Sheared rock from footwall	0.09	0.1

WHITESAIL LAKE*

Gold-Silver-Tungsten

Harrison (Deer Horn Mines Limited) (53° 127° N.E.) Company office, 44 King Street West, Toronto. J. Ross, engineer in charge. This company holds twenty-six claims and four fractional claims on the north side of Lindquist Lake. This ground includes the former Harrison group, explored in 1945–46 by Pioneer Gold Mines of B.C. Limited.† Travel to the property is by air from Burns Lake, or by river-boat from Ootsa Landing.

Between July and mid-October the entire property was surveyed. All prior drilling was resurveyed, and the core was logged and sampled for tungsten content. A large talus slide was systematically sampled for tungsten content. Additional work is planned in 1953.

ENDAKO*

Molybdenum

Stella (Kennco Explorations, (Canada) Limited).—(54° 125° S.E.) This company reported that during June some bulldozer trenching, mapping, and sampling were done on the Stella molybdenite showings, about 5 miles southwest of Endako. No additional molybdenite-bearing veins were uncovered.

OMINECA‡

Osilinka River-Nina Lake Area (56° 125° S.E.)

In July, 1952, a pack-horse trip lasting three and a half weeks was made into the Osilinka River-Nina Lake region northwest of Germansen Landing. Brief examinations were made of the Vernon group, 3 miles northeast of Nina Lake, and six prospects—the Ruby, Beveley, Childhood Dream, Davies, Gordon, and Weber—near the Osilinka River.

The area is entered most easily from Germansen Landing, 185 miles by fair motor-road north from Vanderhoof via Fort St. James. A winter tractor route, the Aiken Lake road, extends from Germansen Landing by Uslika Lake to Aiken Lake. During the summer of 1952 the British Columbia Department of Mines built a road bridge across the Omineca River at Germansen Landing, made the winter road passable for four-wheel-drive vehicles to Nina Creek, 6 miles west of the landing, and rough-graded the road from Nina Creek to Discovery Creek. Pack-horses could be used on the trails from the Aiken Lake road up Nina Creek to the Vernon group, up Jimmay Creek to the Ruby group, down the Osilinka River to the Beveley group, and, with difficulty, down the Osilinka River to Sharp's cabin, 5 miles east of the Beveley. Nina, Discovery, and May Creeks are difficult to ford except at low water. The Osilinka crossing at Mile 36 on the Aiken Lake road can only be forded at low water, and a cable crossing for people at this point cannot be used when the river is in flood. Floatplanes can land on Uslika, Wasi, and Nina Lakes.

There have never been many prospectors in this area. Placer gold was found on the lower part of Jimmay Creek in 1899. In 1930 the Childhood Dream and Weber groups were recorded. In 1927 The Consolidated Mining and Smelting Company began systematic prospecting in the general area, and prospectors working for them located the Ruby

* By J. W. Patterson.

† *Minister of Mines, B.C.*, Ann. Rept., 1945, p. 71.

‡ By J. W. McCammon.

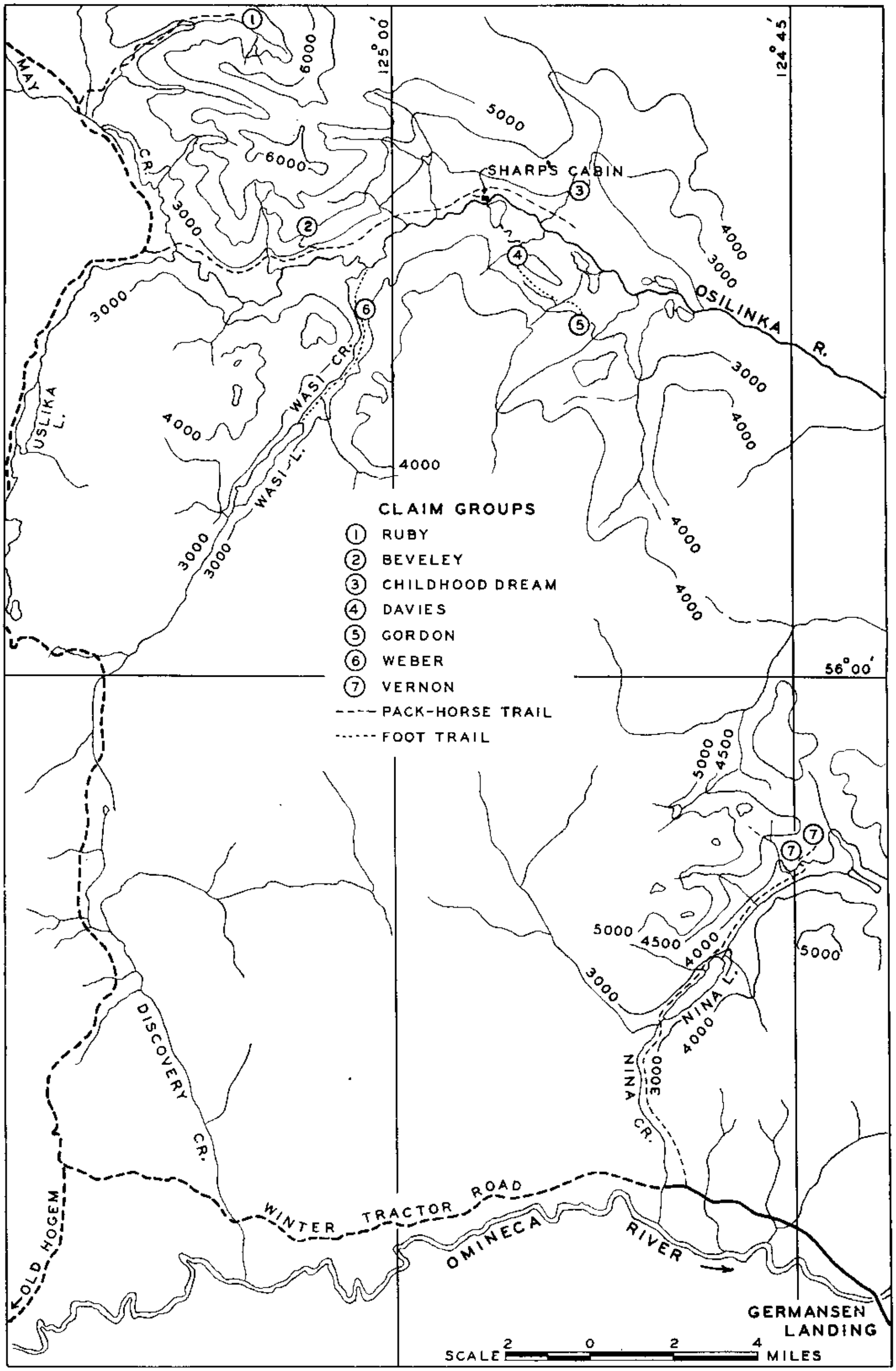


Figure 4. Prospects in Osilinka River-Nina Lake area.

group in 1944 and the Beveley group in 1946. About 1946 Gordon and Ernest Davies began prospecting a limestone belt that stretches from the Osilinka River southeast past the east end of Nina Lake to the Omineca River. Their work resulted in the discovery of the Davies group in 1946, the Gordon group in 1950, and the Vernon group in 1951. Other mineralized areas were discovered, but as yet have had no work done on them. Northwestern Explorations Limited optioned the Davies, Gordon, and Vernon groups in 1951 and have made preliminary examinations of them.

The areal geology around the Ruby, Beveley, and Weber groups is shown on the map of the Geological Survey of Canada, Paper 48-5, Aiken Lake Map-area by Armstrong and Roots. The geology in the vicinity of the Vernon group is shown on the map of the Geological Survey of Canada, Paper 45-9, Manson Creek Map-area by Armstrong and Thurber. The intervening area, containing the Gordon, Davies, and Childhood Dream groups, is not covered by government geological maps.

At the Ruby group, silver-bearing mineralization is found in shears in quartzites and schists. At the other properties there are variable combinations of zinc, lead, and silver mineralization as replacement of and in shears in dolomitized limestone.

Ruby

This group, owned by The Consolidated Mining and Smelting Company of Canada, Limited, consists of four claims, the Ruby Nos. 1 to 4, that straddle the north fork of Jimmay Creek 5 miles by trail up from the Aiken Lake road. The trail leaves the road about half a mile south of Milepost 52. This trail was once used by tractors, but in 1952 its lower half had been badly washed out, all bridges were gone and much windfall blocked the way. A large cabin is at the end of the trail. The mineral showing is one-quarter mile upstream from the cabin at 4,200 feet elevation.

In 1946 and 1947, by bulldozing and hydraulicking, the company stripped along a shear zone that crosses Jimmay Creek at a point where the creek flows from east to west. An area 120 feet wide was stripped for 50 feet along the zone south of the creek, and an area averaging 60 feet wide was stripped for 350 feet north of the creek. Overburden consists mainly of gravel and boulders and is up to 15 feet deep. Three small trenches were seen about 1,000 feet northeast of and 300 feet above the north end of the sluiced-off area. No mineralization was noted in these trenches.

The showing exposed by the stripping consists of sulphide mineralization associated with one main fault and numerous related satellite slips in quartzite and schists injected with sills. The average strike of the main fault is north 40 degrees east, and the average dip is 57 degrees southeast. Numerous minor slips run out from the main fault, chiefly at small angles on the east side.

The country rock is mainly mica schist, quartz-mica schist, and schistose quartzite of Proterozoic age.* Numerous feldspar porphyry sills ranging from a few inches to several feet thick have intruded the schists. Minor folds and contortions are numerous, and, therefore, the attitude of the rocks is variable, but in general the strike is northwesterly and the dip is less than 45 degrees to the northeast. One large and several small quartz veins cut the bedded rocks. These veins strike between north 15 and 20 degrees west and dip steeply west or vertically. The veins are ribboned by shears parallel to their walls and are badly shattered by cross fractures.

Metallic minerals are sparsely distributed in erratic patches and thin films along the main fault, in the minor shears, and in the quartz veins, particularly in the longitudinal shears nearest the southwest vein walls. Pyrite is the most abundant sulphide. It is accompanied by tiny patches of soft lead-grey mineral. A spectrographic analysis of one specimen of the grey mineral indicated it to be composed essentially of lead, bismuth, and silver. Arsenopyrite and ruby silver have been reported from the deposit. Silicification of the wallrock of the faults accompanied mineralization. Graphite has been deposited on many of the slickensided surfaces.

* *Geol. Surv., Canada,* Preliminary Map 48-5A.

A sample across 7 feet of the main quartz vein south of the creek assayed: Gold, 0.01 oz. per ton; silver, 0.3 oz. per ton. A sample across 21 feet of the main vein north of the creek assayed: Gold, *nil;* silver, *nil.* A third sample consisting of solid lumps of sulphide selected from patches from shears on the north side of the creek assayed: Gold, trace; silver, 0.2 oz. per ton. Spectrochemical analyses indicated less than 0.3 per cent lead and zinc in each sample.

[Reference: *Geol. Surv., Canada,* Paper 48-5, p. 45.]

Silver-Lead-Zinc

Beveley

The Beveley group, comprising the Beveley Nos. 1 to 13 claims, is owned by The Consolidated Mining and Smelting Company of Canada, Limited. The showings are on a south slope between 4,300 and 4,700 feet elevation, 1 mile north of the Osilinka River, 3 miles east of the mouth of May Creek. There is a good but steep 2-mile-long pack-trail to the showings from the main trail that leads down the Osilinka River from the Aiken Lake road near Mile-post 46.

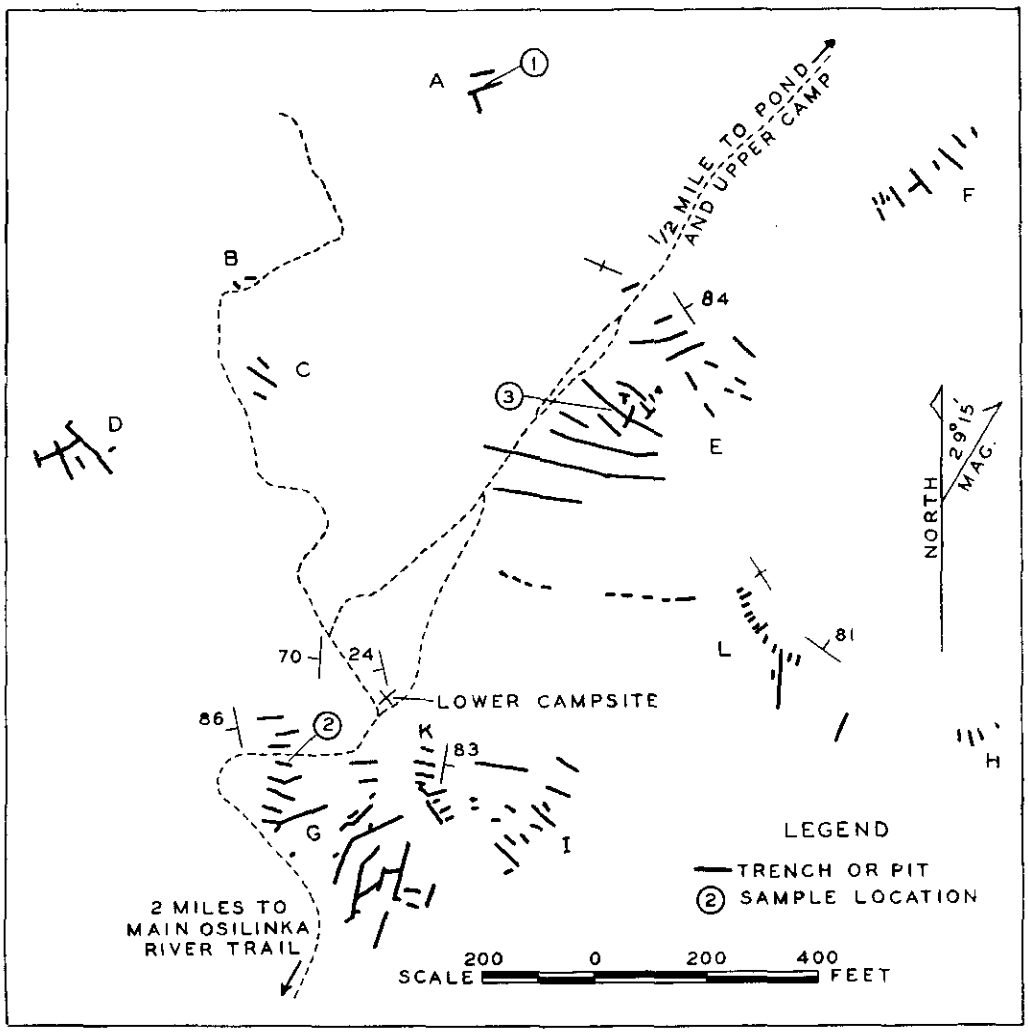


Figure 5. Trenching at the Beveley group.

The claims were recorded in 1946 and 1947. The company then proceeded with an extensive programme of trenching in 1947, a geological survey of the property in 1949, and a limited amount of diamond drilling in 1951.

Trenches were examined in eleven separate areas, grouped as shown in Figure 5. Most of the ground slopes moderately and is covered with bush and trees. To the west it slopes steeply into a gully. There are bluffs of limestone a few hundred feet north of area B and between the trail and area F. Apart from the bluffs, natural outcrops are scarce, although overburden where trenches were dug is generally shallower than 4 feet. Water-supply is meagre, the nearest source being a small creek half a mile north of area F.

The claims are underlain by Lower Cambrian limestone. The limestone varies from dark grey through buff to white, usually being lighter coloured in mineralized areas. The rock is fine grained and massive with bedding indistinct or absent. Fractures are abundant and in some places produce a bedded appearance difficult to distinguish from true bedding; several of the attitudes mapped as bedding may actually be fracture planes. The features that were observed suggest that the structure consists of a major anticline plunging gently northward with its axis striking slightly west of north and located between areas G and L and just east of area C. A few small minor folds and some post-mineral faults occur. In several of the trenched areas the limestone is brecciated, but the structural relationship of this brecciation is not apparent.

Mineralization is of the replacement type. It consists mainly of galena, sphalerite, and barite with minor calcite stringers and occasional pyrite, all accompanied by dolomitization and some silicification. Oxidation seems to be confined to within the top foot or two from the ground surface. Galena, the most conspicuous sulphide, occurs erratically and in three ways: in ribbon-like swarms of one-sixteenth inch thick, short, branching or disconnected stringers in barite apparently roughly paralleling the bedding of the host rock; with barite as disseminated grains and tiny patches scattered haphazardly through the limestone; and as solid isolated masses as much as 6 to 8 inches in diameter with barite in limestone. Most of the trenches shown in Figure 5 showed mineralization to some degree, although not over their entire lengths.

No definite mineralized zoning was recognized, although there may possibly be a series of northeasterly striking bands of alternating mineralized and barren rock. Limestone exposures on the trail between areas K and C, in the bush between areas C and E, and in the bluffs northwest of areas F and B appeared barren. No information was found to indicate the depth of mineralization. Three diamond-drill cores consisting of barren limestone were examined. The cores of the other holes that were drilled had been removed and their nature is not known.

Three samples, meant to be indicative rather than representative, were taken. Sample No. 1 was taken across 33 feet of disseminated mineralization in the main trench at area A. Sample No. 2 was taken along 18 feet of ribbon-type mineralization in the first trench south of the trail in area G. Sample No. 3 was taken across 39 feet of disseminated and patchy mineralization in a long cut near the centre of area E. These assayed as follows:—

Sample No.	Width	Gold	Silver	Lead	Zinc	CaO	MgO	Barium
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
1	33	*Nil*	Trace	1.0	1.3	27.4	18.3	4.9
2	18	*Nil*	0.3	1.3	0.3	12.8	12.5	36.0
3	39	Trace	0.6	2.6	0.7	20.4	11.2	18.1

[Reference: *Geol. Surv., Canada,* Paper 48-5, p. 45.]

Childhood Dream

New Jersey Zinc Explorations Limited leased four reverted Crown-granted mineral claims—the Childhood Dream, Pan Rich, Rosie, and Betsey—in June, 1952. The claims are nearly a mile up a small creek that flows southward into the Osilinka River about 6 miles downstream east of the mouth of Wasi Creek. An overgrown trail extends from the river up the small creek to the remains of two old cabins on the west bank of the creek. The main Osilinka River trail is in bad condition from Sharp's cabin east to this creek. The mineral showings are at water level on the east bank across and upstream from the cabins.

The showings are replacement deposits along rusty shears in dark-grey to mottled creamy-white dolomitic limestone and coarsely crystalline, brownish-grey dolomite. Exposures are small, discontinuous, and show no bedding; hence structural relationships are not readily apparent. The widths of mineralized zones are indefinite. Two short adits and two trenches, one of which may represent the site of a former adit, were seen on the property.

The adit farthest upstream is driven south 43 degrees east for 29 feet along a shear that dips 70 degrees northeast. Several other auxiliary shears are present, all dipping flatly to the north or east. The rock at the portal is light creamy-white dolomitic limestone, but in the adit it is brown from iron stain. A solid lens of massive pyrite extends along the east wall of the adit for 10 feet from the portal. No other metallic minerals were seen.

A second adit, 245 feet downstream from the first, is driven south 65 degrees east for 15 feet. The adit begins on a rusty shear that strikes north 75 degrees east and dips 25 degrees northward. Minute grains of pyrite and galena are sparingly disseminated through the walls of the shear.

Some well-mineralized specimens were lying on the dump at the portal, but nothing resembling them was visible in the adit.

About 100 feet downstream from the second adit and directly across from the cabins there has been a slide over a small bluff of dolomite. A rusty shear that strikes north 10 degrees west and dips 55 degrees eastward is exposed at the base of the bluff. Evidence of a former excavation suggest a short adit may have existed here. A small amount of pyrite and galena is present in the rock near the shear.

Downstream 80 feet from the shear just described is a 15-foot-long trench at the base of another bluff. Nothing of interest was seen here.

All of the rock exposures in which the shears occur pass under deep overburden within a few feet of the creek bed. No signs of mineralization were seen on the west bank of the creek in the vicinity of these showings.

Two samples were taken: No. 1 was a grab sample from the adit farthest upstream; No. 2 was a chip sample across the face of the other adit. These assayed as follows:—

Sample No.	Gold	Silver	Lead	Zinc	CaO	MgO	Barium
	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
1	*Nil*	*Nil*	(1)	(1)	24.7	17.1	Trace
2	*Nil*	*Nil*	(1)	0.4	29.0	19.9	Trace

[1] Spectrograph indicated less than 0.3 per cent.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1930, p. 152.]

Davies

Northwestern Explorations Limited, 626 West Pender Street, Vancouver, optioned the Davies group of nineteen claims from Ernest and Gordon Davies in 1951. The claims are between 3,400 and 4,000 feet elevation a mile up a small creek that flows northeasterly into the Osilinka River about 6 miles downstream from the mouth of Wasi Creek. The showings are best reached by a 1¼-mile-long trail that starts at the southeast tip of a large oxbow slough at Sharp's cabin on the Osilinka River 4 miles east of the mouth of Wasi Creek. A log-jam there provides one of the few means of crossing the Osilinka River in this area.

Bulletin No. 16: Dragline Dredging Methods. (By Stuart S. Holland.) Out of print.

Bulletin No. 17: An introduction to Metal-mining in British Columbia. (By Officers of the Department.) To be reprinted.

Bulletin No. 18: Specimens and Samples—Their Treatment and Use. (By Officers of the Department.)

Bulletin No. 19: The Tuya-Teslin Area, Northern British Columbia. (By K. DeP. Watson and W. H. Mathews.)

Bulletin No. 20: Lode-gold Deposits—

Part II: South-eastern British Columbia. (By W. H. Mathews.) Revised, 1948.

Part III: Central Southern British Columbia. (By M. S. Hedley and K. DeP. Watson.)

Part IV: South-western British Columbia—exclusive of Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part V: Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part VI: North-eastern British Columbia and Cariboo and Hobson Creek Areas. (By S. S. Holland.) Revised, 1946.

Bulletin No. 21: Notes on Placer-mining in British Columbia. (By Officers of the Department.)

Bulletin No. 22: Geology of the Whitewater and Lucky Jim Mine Areas. (By M. S. Hedley.)

Bulletin No. 23: Calcareous Deposits of the Georgia Strait Area. (By W. H. Mathews.)

Bulletin No. 24: Geology and Coal Resources of the Carbon Creek-Mount Bickford Map-area. (By W. H. Mathews.)

Bulletin No. 25: The Squaw Creek-Rainy Hollow Area. (By K. DeP. Watson.)

Bulletin No. 26: Report on the Stanley Area, Cariboo Mining Division. (By Stuart S. Holland.)

Bulletin No. 27: Geology and Mineral Deposits of the Zeballos Mining Camp, British Columbia. (By John S. Stevenson.)

Bulletin No. 28: Placer Gold Production of British Columbia. (By S. S. Holland.)

Bulletin No. 29: Geology and Ore Deposits of the Sandon Area, Slocan Camp, British Columbia. (By M. S. Hedley.)

Bulletin No. 30: Clay and Shale Deposits in British Columbia. (By J. W. McCammon and J. M. Cummings.)

Bulletin No. 31: Geology of the Sheep Creek Camp. (By W. H. Mathews.)

Buletin No. 32: Geology and Mineral Deposits of the Shulaps Range Southwestern British Columbia. (By G. B. Leech.)

Bulletin No. 33: Geology of the Crowsnest Coal Basin with special reference to the Fernie Area. (By C. B. Newmarch.)

SPECIAL REPORTS

Special reports on certain properties were advertised in the Annual Reports 1936 to 1941, inclusive, as available on application. A list of those still available will be supplied on request. The text of a report is either in mimeographed or typewritten form, and ozalid prints can be made of maps or other drawings. Copies of reports still available will be supplied at 10 cents per page of typewritten or mimeographed copy, excepting that the charge for any mimeographed report shall not exceed 25 cents. Additional charges will be made for prints of maps. Requests for these Special Reports, accompanied by the proper sum, should be addressed to the Chief of the Mineralogical Branch.

NOTICES *RE* PUBLICATIONS

Applications are invited from those who wish to receive notices when new publications become available.

Gordon

This group was optioned by Northwestern Explorations Limited from Gordon Davies in 1951. The group consists of six claims, the Gordon Nos. 1 to 6, situated at 3,400 feet elevation on a nose 1½ miles south of the Osilinka River about 8 miles downstream from the mouth of Wasi Creek. The claims are reached most easily by means of a rough trail 2½ miles long that has been blazed southeastward from the Davies group. The trail ends at a camp-site on a small creek. The main showing is in a dry wash 200 feet above and 300 feet west of the camp-site. A spectacular iron gossan is 400 feet higher than and 600 feet southwest of this showing. A minor showing is 250 feet south 75 degrees east from the camp-site.

The main showing is in a dry gully on a 45-degree slope where natural agencies have exposed bedrock for 150 feet down the gully over an average width of 50 feet. A fault breccia zone appears to strike about northeastward down the gully and is at least 50 feet wide. The breccia consists mainly of dark striped limestone fragments, ranging in size from dust to pieces a foot in diameter, cemented by a limy matrix through which sulphide minerals are scattered. The sulphide minerals consist of pyrite in disseminated grains and masses as much as 2 inches in diameter with scattered patches of fine-grained galena and light honey-coloured sphalerite accompanied by a small amount of barite and white calcite. Silicification and dolomitization accompany the mineralization. Limonite and white lead and zinc oxidation products coat the surface of the exposure. Barren, dark striped limestone is exposed in a low bluff parallel to and a few feet west of the showing.

The minor showing east of the camp-site is exposed by two small open-cuts. Here a breccia of dark limestone contains a minor amount of sphalerite and galena disseminated in the matrix. A few tiny patches of a soft dark-grey mineral containing lead, antimony, and arsenic were noticed. Silicification and dolomitization have taken place.

The gossan southwest of the main showing is exposed across a small saddle for a length of 130 feet on a strike of north 45 degrees east and a width of more than 90 feet. It is composed of fairly compact red-brown iron oxide with little admixed rock. A trench about 4 feet deep did not reach the bottom of the material.

Four samples were taken: No. 1 was a chip sample across 46 feet in the centre of the main showing; No. 2 was a picked sample of the more heavily mineralized material from the main showing; No. 3 was a grab sample from the minor showing; and No. 4 was a sample of the gossan. Assays were as follows:—

Sample No.	*Gold*	*Silver*	*Lead*	*Zinc*	*CaO*	*MgO*	*Barium*	*Iron (Total)*
	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
1	Trace	Trace	(1)	2.3	28.1	19.2	0.65	n.d.
2	*Nil*	0.2	0.1	4.5	26.2	18.2	Trace	n.d.
3	*Nil*	0.2	0.3	1.8	24.5	17.2	Trace	n.d.
4	*Nil*	*Trace*	*0.8*	*1.0*	*n.d.*	*n.d.*	*n.d.*	*57.0*

[1] Spectrograph indicated less than 0.3 per cent.
n.d.=not determined.

Weber

A small mineral showing formerly known as the Weber group but now open ground is on the east side of Wasi Creek about 1 mile south of the Osilinka River. A rough blazed trail extends from the Osilinka River up the east side of Wasi Creek past the showings to Wasi Lake.

The main part of the showing consists of a zone of irregular and patchy mineralization along a vertical fissure that strikes north 30 degrees west. Pyrite, galena, sphalerite, and barite occur in thin veinlets and as disseminated replacement in dolomitized and silicified limestone in the fissure walls, particularly on the northeast side. Evidence of mineralization can be traced over an area about 90 feet along the fissure and 15 feet wide. A 15-foot-long open-cut, now caved, has been dug on the fissure at the base of a small bluff. Some lumps of well-mineralized material were piled on the dump of this open-cut, but little like it could be found in place. A second small caved trench was seen 50 feet north of the bluff, but nothing was visible in it. The country rock in the vicinity is white to grey-streaked limestone that strikes north 30 degrees west and dips steeply northeastward. One sample across 7 feet of what appeared to be some of the better mineralization in the wall of the fissure assayed: Gold, *nil;* silver, *nil;* lead, 0.2 per cent; zinc, 0.3 per cent; barium, 18.8 per cent.

[References: *Minister of Mines, B.C.,* Ann. Rept. 1930, p. 153. *Geol. Surv., Canada,* Paper 48-5, p. 46.]

Vernon

The Vernon group of twenty claims, the Vernon Nos. 1 to 20, are controlled by Northwestern Explorations Limited. The group is about 3 miles northeast of Nina Lake up the main stream that flows into the east end of the lake. The mineral showings are at approximately 4,000 feet elevation one-half mile north of the stream on two small knolls forming the south extremity of a ridge that is part of the north wall of the stream valley. A camp-site near the stream below the showings is readily reached by means of a good pack-horse trail about 10 miles long that leaves the Aiken Lake road near Mile-post 6, follows the east side of Nina Creek, along the north shore of Nina Lake, and on up the north side of the stream entering the east end of the lake. Horse feed is available in a large meadow north of the showings. Blazed trails lead from the camp-site to all showings.

When the property was examined, the showings were in four groups—A, B, and C on one knoll, and E, to the east, on a second knoll separated from the first by a dry gully. The original showings, or A group, are 450 feet above and 2,000 feet by trail northwest of the camp-site. The B showings are on the same trail 100 feet lower than and 500 feet southeast of A. The C showings are 100 feet higher than and 600 feet northwest of A. Some newly discovered mineralization, the E showings, were being developed 1,300 feet above and half a mile northeast of camp.

Most of the area around the showings is an old burn now reforested by young pine, spruce, and poplar. Although tree growth is thick, visibility is fair. Outcrops are scarce and as a rule small. Overburden is from a few inches to 6 feet or more deep.

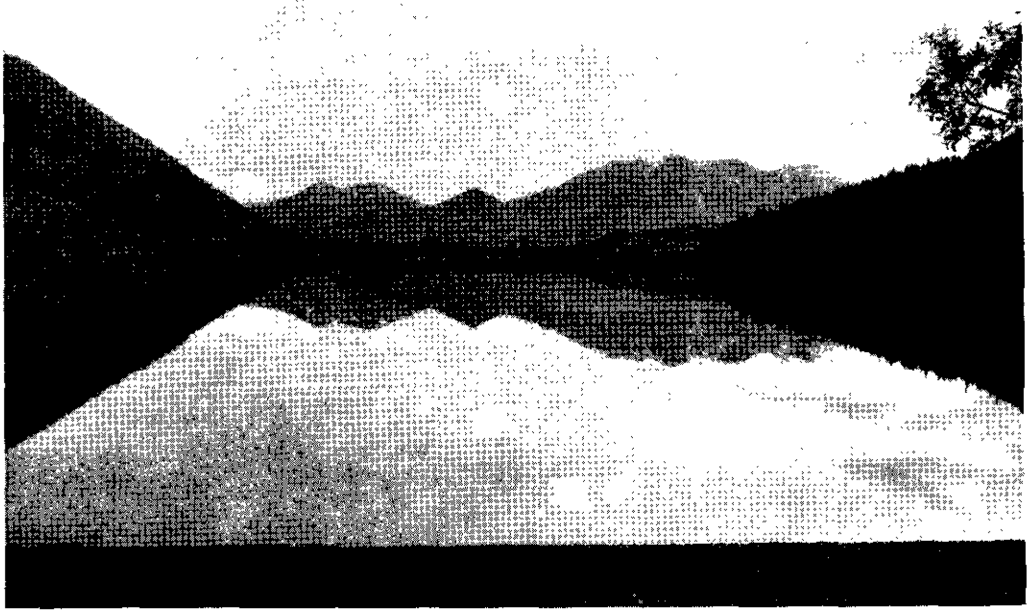
The country rock is part of the bottom massive limestone member of the Carboniferous or Permian Cache Creek group of the Manson Creek Map-area.* The rock varies considerably: in some places it is dark grey and massive; in other places it is almost black with a fetid odour; in some areas it is brecciated; in some parts it is quartzitic; and in a few outcrops it is fossiliferous. In spite of these numerous variations, few single outcrops contain more than one type of rock. The scarcity of outcrops prevents ready structural determinations. The few attitudes seen show the beds to strike north 12 to 35 degrees west with a 30- to 53-degree dip westward.

Joints, mostly near vertical and striking north to northeastward, are well developed in A and C areas. A few small faults of random attitude are present. One larger low-angle fault, almost parallel to the limestone bedding, is visible in the A showings. The possible presence of other low-angle faults is suggested by soft broken rock in other areas. Well cemented and mineralized breccia occurs in B and E areas. Although no definite boundaries are visible, there is a suggestion that the breccia zone trends slightly east of north.

Mineralization consists of replacement of limestone by sphalerite and galena with minor quartz, calcite, and occasionally barite, all accompanied by dolomitization.

The A workings consist of one large many-branched trench and five small trenches. The only sulphides noticed were in the large trench where disseminated sphalerite and scattered irregular masses of galena sparingly replace massive dark limestone. Sphalerite is the more abundant sulphide. The host rock is strongly jointed, and weathering has leached the surface sulphides and deposited white secondary lead and zinc coatings in the joint planes. Near the centre of the large trench a fault strikes north 10 degrees west and dips 30 degrees westward. Joints are abundant above this fault but are not

* *Geol. Surv., Canada,* Paper 45-9.



Uslika Lake, Osilinka River.

View northeast from Richfield Mountain. Barkerville in centre of photograph.

apparent below it. There is mineralization above and below the fault. Much of the rock exposed in the trenches consists of angular limestone fragments an inch or less in diameter, cemented by limonite and carbonate. Some sulphides are contained in this material. This rock may be a breccia related to flat faults, but it appears more likely to be a surface calcrete formed before the deposition of the earthy overburden.

Three trenches were examined in C area. As in the A showings, galena and sphalerite sparsely replace strongly jointed dark limestone. Some barite, quartz, and calcite accompany the sulphides. Galena is the more abundant sulphide. In the most southerly trench a small northerly striking and westerly dipping fault has a 2- to 4-inch streak of solid galena along its footwall. About 250 feet south of the area, stripping has exposed a few irregular veinlets and patches of galena in limestone.

No trenches were seen in B area. Here sphalerite is meagrely disseminated in the matrix of breccia over an indeterminate area of bare limestone bluffs.

At E area eight trenches were examined along a northeasterly trending line 450 feet long. Sphalerite, some galena, barite, calcite, and minor pyrite mineralization is disseminated in the matrix of dolomitized limestone breccia in these exposures. In the two most northeasterly trenches a 3-foot-thick layer of barren dolomite lies between layers of mineralized breccia. A small vertical post-mineral fault striking east-west is exposed in one of the trenches. Earthy oxidized material in one or two of the trenches suggests the possibility of flat faults but may merely be evidence of surface disintegration of bedrock. A series of step-like limestone scarps 200 to 300 feet apart roughly parallel the trenches to the northwest. Some scattered mineralization was seen in a few of these outcrops.

Seven samples were taken at the Vernon property: Sample No. 1 across 24 feet of brecciated dolomite in the most southerly trench in E group; Sample No. 2 of loose, oxidized, earthy material from the next cut to the north; Sample No. 3 across 5 feet of breccia in a long trench 380 feet northeast of Sample No. 1; Sample No. 4 across 8 feet in the most northerly open-cut in area C; Sample No. 5 across 8 feet in the centre open-cut in area C, 50 feet south of No. 4; Sample No. 6 across 15 feet in the main trench in area A; and Sample No. 7 a random chip sample in area B. These assayed as follows:—

Sample No.	Gold	Silver	Lead	Zinc	CaO	MgO
	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent	Per Cent	Per Cent
1	*Nil*	0.7	(1)	2.1	29.6	19.3
2	*Nil*	*Nil*	(1)	(1)	29.0	19.9
3	*Nil*	0.5	(1)	3.8	28.2	18.9
4	Trace	*Nil*	0.8	(1)	30.4	20.8
5	Trace	0.7	7.7	(1)	26.5	18.1
6	*Nil*	Trace	0.2	2.1	28.7	19.3
7	*Nil*	Trace	(1)	0.7	30.2	20.7

[1] Spectrograph indicated less than 0.3 per cent.

CARIBOO*

Wells-Barkerville (53° 121° S.W.)

Gold

Cariboo Gold Quartz Mining Company Limited Company office, 1007 Royal Bank Building, Vancouver; mine office, Wells. W. B. Burnett, president; A. Shaak, general manager; M. Guiget, mine superintendent; W. A. Wall, mill superintendent. Capital: 2,000,000 shares, $1 par value. The Cariboo Gold Quartz mine is half a mile south of the town of Wells, which is 51 miles by road from Quesnel on the Pacific Great Eastern Railway. New development work comprised 1,736 feet of drifting, 2,648 feet of crosscutting, 1,280 feet of raising,

* By J. E. Merrett.

and 538 feet of chute box-holes. A total of 16,602 feet of exploratory diamond drilling was done in 154 holes.

A total of 70,927 tons of ore was mined and 71,138 tons of ore was milled. As in the past two years, the major portion of the ore was obtained from the Tailings zone, west of No. 1 shaft. Increasingly larger tonnages were mined in the Rainbow zone in the No. 2 shaft area. Additional amounts of ore were obtained from the No. 1 and Goldfinch zones. The ore was mined principally by cut-and-fill stoping methods, but some was mined by shrinkage and longwall advance stoping.

Exploration development in the hangingwall of the replacement ore stope on 2000 level disclosed further large increases in ore tonnage, but diamond drilling on 2100 level has not as yet located a downward extension of these orebodies.

The average number of men employed was 193, of which 119 were employed underground.

Island Mountain Mines Company Limited

Company office, 744 West Hastings Street, Vancouver; mine office, Wells. F. W. Guernsey, president; J. A. Pike, mine manager; G. G. Sullivan, general superintendent; J. Stone, mill superintendent. Capital: 1,100,000 shares, 50 cents par value. This company, a subsidiary of Newmont Mining Corporation of New York, owns claims on the south and southeast slopes of Island Mountain and operates the Island Mountain mine immediately west of Wells. The claims are adjoined to the south, east, and north by holdings of the Cariboo Gold Quartz Mining Company Limited.

Development work comprised 936 feet of raising and 4,332 feet of drifting and crosscutting. In addition, 13,436 feet of exploratory diamond drilling was done in a total of 136 drill-holes. The development work was designed for stope preparation as well as exploration for new ore occurrences and was distributed over almost all levels from the surface or 4000 level to the 2550 level. This work was not successful in locating any appreciable amount of new ore and, as a result, in October the president announced that the directors had decided to discontinue all development work except that necessary for stope preparation, and to mine all remaining reserves as long as this can be done at an operating profit. At the end of such time it is the intention to suspend operations.

The average number of men employed was 119, of which 83 were employed underground.

Ore was milled at an average daily rate of 125 tons, and a total of 45,274 tons was milled during the year.

Tungsten

Cariboo-Hudson Gold Mines (1946) Limited

Company office, Royal Bank Building, Vancouver; mine office, Wells. W. B. Burnett, president; R. R. Rose, manager; J. W. Wylie, engineer in charge. Capital: 3,000,000 shares, $1 par value. This property is on Penny and Peter Creeks, tributaries to the headwaters of Cunningham Creek, and is 27 miles southeast of Wells by road. On the initial Peter Creek adit, 200 feet of drifting and crosscutting was completed on a scheelite occurrence. This work disclosed two oreshoots, one of which is 30 feet long and 3 feet wide, and is reported to assay 2.8 per cent tungstic oxide. The other oreshoot is 30 feet long and 2.1 feet wide. It is reported to assay 5.2 per cent tungstic oxide.

Immediately south of the adit, an area 30 by 300 feet was surface stripped by ground sluicing. Tungsten mineralization was indicated along a length of 120 feet in the lime-rich, quartz-injected schist. At the south end of the exposed area a second adit was commenced, in which 200 feet of drifting and 25 feet of crosscutting were done. In this drift good scheelite mineralization occurs near the portal, and only minor amounts were disclosed along the drift length.

Additional scheelite mineralization was disclosed by surface stripping an 18-inch-wide quartz vein, 1,300 feet south of the drift workings.

A new camp comprising six buildings was established above the present drift workings. These buildings and the 550-cubic-feet-per-minute diesel-driven compressor were moved down from the old camp-site on this property.

The average number of men employed was seven.

Yanks Peak (52° 121° N.E.)

Gold

Jim.—F. H. M. Codville, of Duncan, employing two men, did 218 feet of exploratory drifting on the Jim group near Yanks Peak, about 11 miles by road from Keithley Creek Post Office.

Amparo.—E. Taylor commenced two drifts on two galena-bearing quartz veins on this property above the Snarlberg camp on the Yanks Peak road, about 9 miles from Keithley Creek Post Office.

BLUE CREEK*

Gold

Elizabeth, Yalakom (Bralorne Mines Limited) (51° 122° S.E.) This property, comprising fifty-three claims owned by Bralorne Mines Limited, is on Blue Creek, a tributary of Yalakom River. It is reached by 48 miles of road from Lillooet by way of Moha. No. 9 vein drift was extended 450 feet to a total length of 807 feet. Occasional high assays were obtained, but vein widths were too narrow to constitute ore. Surface trenching exposed this vein in two cuts 400 to 600 feet north of and below the portal. Under present conditions the grades and widths of the vein in these two exposures did not represent ore.

The "B" south drift, off the main crosscut, was extended 86 feet to a total length of 180 feet. This work disclosed a quartz vein of good width but low gold content.

Diamond-drill hole No. 9, near the west end of the main crosscut, was extended 271 feet to a depth of 594 feet.

A crew of eleven men was employed from July to October.

BRIDGE RIVER*

Gold

Bralorne Mines Limited (50° 122° N.W.) Company office, 555 Burrard Street, Vancouver; mine office, Bralorne. A. C. Taylor, president; M. M. O'Brien, vice-president and managing director; D. N. Matheson, general manager; C. M. Manning, mine superintendent; C. D. Musser, mill superintendent. Capital: 1,250,000 shares, no par value. Bralorne mine is on Cadwallader Creek, a tributary of Bridge River, and is 51 miles by road from Shalalth on the Pacific Great Eastern Railway.

Development work comprised 11,770 feet of drifts and crosscuts, 2,273 feet of raising, and 3,160 feet of diamond drilling. The major portion of this development work was done between 2100 and 2600 levels and was directed chiefly to the development of the 77 vein, to which crosscuts were completed on all levels except that on 2600, which was completed in 1951.

On 2100 level a total of 955 feet of drifting, of which 670 feet was in ore, was completed east and west of the 77 vein crosscut.

On 2200 level, 347.5 feet of drifting, of which 260 feet was in ore, was completed on the 77 vein, westward from the crosscut.

On 2300 level, 294.5 feet of drifting westward from the crosscut disclosed 213 feet of ore on the 77 vein.

On 2400 level the 77 vein was followed 1,518 feet westward to the vicinity of the Empire Fault, and 107 feet eastward from the crosscut. Of this length, a total of 550

* By J. E. Merrett.

feet constituted ore. A total of 205 feet of drifting was completed on the 51 vein, but none of it constituted ore.

On 2500 level the 77 vein was followed 1,527.5 feet westward from the crosscut. An ore length of 751.5 feet was developed.

On 2600 level a total of 1,777.5 feet of drifting, of which 968 feet was in ore, was completed on the 77 vein. A new cross-over vein, named the 93, was found by diamond drilling the hangingwall of the 77 vein. Drifting on this new vein disclosed it to be narrow but of unusually high grade, and in 315 feet of drifting 230 feet of ore was developed.

Development raises were driven on the 77 vein between the 2300 and 2600 levels, and the Crown shaft waste and ore-pass systems were completed up to 2100 level, with the exception of a section of the ore-pass between the 2100 and 2200 levels.

Diamond drilling of an exploratory nature was done mainly on 2600 level. Eleven holes were completed.

The ventilating system was revised to improve the ventilation of the lower levels. The 48-inch axial-flow fan of 80,000-cubic-feet-per-minute capacity was moved from 2000 to 2600 level, and a 60-inch axial-flow fan of an exhausting capacity of 115,000 cubic feet per minute was installed at the top of the Empire shaft. The air circulation is now downcast through the Crown and Coronation sections of the mine and upcast through the Empire shaft.

A new Ingersoll-Rand air compressor having a rated capacity of 680 cubic feet of free air per minute at 3,000 feet elevation was installed in the Bradian dry-house. Compressed air from this machine is delivered to the main underground air-lines by way of the Empire shaft.

C. D. Musser was appointed mill superintendent in June, following the resignation of A. Almstrom.

The average number of men employed was 431, of which 318 were employed underground. First-aid care was supplied by forty-five members of the crew who held either St. John or Industrial First Aid certificates.

In the stopes, ore was mined principally by cut-and-fill methods and minor amounts by shrinkage stoping. A total of 158,846 tons of ore was mined, and 175,005 tons was milled. A total of 74,415 ounces of gold was recovered.

Pioneer Gold Mines of B.C. Limited

(50° 122° N.W.) Company office, 711 Yorkshire Building, Vancouver; mine office, Pioneer Mine. Victor Spencer, president; H. T. James, managing director; W. B. Montgomery, mine manager; H. A. Rose, general superintendent; E. G. Langille, mine superintendent; T. Bevister, mill superintendent. Capital: 2,500,000 shares, $1 par value. The Pioneer mine is on Cadwallader Creek, a tributary of the Bridge River, and is about 54 miles by road from Shalalth on the Pacific Great Eastern Railway. The property adjoins that of Bralorne on the east.

Development work comprised 8.5 feet of crosscutting, 484 feet of stope raising, 5.5 feet of shaft sinking, 296.5 feet of shaft raising which produced 22,430 cubic feet of waste rock, and 109 feet of ventilation raise from which 184,198 cubic feet of waste rock was slashed. A total of 105,824 tons of ore was mined, and 86,036 tons was milled.

All ore was mined from the 27 vein and its footwall branch, the 29 vein. Mining was by ore-filled rill stoping methods, with scrapers being used to move the ore and waste fill.

Almost all development work was done preparatory to sinking the inclined three-compartment No. 5 shaft which will develop the 27 vein below 2500 level. A pilot raise was driven between 2500 and 2400 levels, enlarged to size, and timbered. Hoisting equipment was installed on 2400 level, and the rope raise above this level was completed. In addition, ore and transfer raises were completed between the two levels.

On the surface a new two-story dry-house, 45 by 75 feet, was completed. This building contains offices, lecture and first-aid rooms, showers, and change-rooms for street and underground clothes.

The average number of men employed was 276, of which 155 were employed underground. First-aid services were supplied by twenty crew members who held either St. John or Industrial First Aid certificates.

Golden Ledge Syndicate

(50° 122° N.W.) Company office, 503 Rogers Building, Vancouver. J. S. Harrison, president and manager. This private syndicate holds four Crown-granted mineral claims and twenty-one located claims astride the Hurley River, half a mile below its junction with Cadwallader Creek. The camp is halfway between Bralorne and B.R.X. mines on the Bridge River road.

A crew of four men completed a total of 835 feet of exploratory drifting and crosscutting in No. 4 adit, the portal of which is on the west side of the Hurley River. This work included extending the main crosscut, crosscutting to the Jupiter and Louise veins, drifting on the Louise vein to north and south, and drifting on the Jupiter vein to the north.

Wayside (L.A.P. Mining Company Limited)

(50° 122° N.W.) Company office, Gold Bridge. L. A. Prosser, manager; W. H. Clarke, general superintendent; J. Marshall, mine superintendent. Capital: 3,000,000 shares, $1 par value. This private company owns seventeen claims and seven fractions astride the Bridge River road, between Gold Bridge and Minto. The property was formerly owned by the Wayside Consolidated Gold Mines Limited.

Exploratory development work on No. 9 level comprised 125 feet of drifting and 65 feet of crosscutting, as well as the opening of a small hoist-room at the south end of the level where it is proposed to sink a winze. To facilitate the handling of ore and waste, a chute and pocket were completed in the shaft at and below No. 9 station. In addition to this, 80 feet of raising was done.

A used Riverside Iron Works single-drum hoist, 3 by 4 feet in dimension, and a 75-horsepower 440-volt General Electric motor were installed in the hoist-room. In the shaft the skip was equipped with a safety crosshead, and guides were installed to permit the hoisting of men.

Repair work was completed on the storage dam and 10-inch pipe-line for the hydro plant on Fergusson Creek.

The development work produced 1,000 tons of ore, of which 900 tons was treated experimentally by flotation and cyanidation in order to establish a satisfactory milling circuit. This work was done under the supervision of P. Schultz, consulting mill operator.

The average number of men employed was eighteen.

Antimony

Gray Rock (Gray Rock Mining Company Limited)

(50° 122° N.W.) Company office, 207 West Hastings Street, Vancouver; mine office, Gold Bridge. G. H. Clark, president. Capital: 3,000,000 shares, $1 par value. This property of twenty claims is near the headwaters of Truax Creek, a tributary of the Bridge River. It is reached by 18 miles of truck-road from Gold Bridge. Bralorne Mines Limited optioned this property early in 1952, and as soon as working conditions permitted the lower crosscut, commenced the previous year, was advanced 1,186 feet. This crosscut intersected No. 1 vein at a distance of 994 feet from the portal. The east drift on No. 1 vein was driven 312 feet and the west drift, 264 feet. The vein exposed by this work ranged in width from a fracture filling to 4 feet, and showed a lower antimony content than in the surface outcrop or in the upper drift. A diamond-drill hole was drilled 217 feet from the south face of the lower crosscut. The drill core revealed a poorly mineralized vein, 1.3 feet wide, at a depth of 152.7 feet.

Copper and Tungsten

Chalco (50° 122° N.W.) This property, owned by Mrs. D. C. Noel, of Bralorne, comprises eleven claims and two fractions on the north side of Piebiter Creek, approximately 1 mile above its junction with Cadwallader Creek. Access to the property is by 6 miles of truck-road and 1 mile of trail, southeast from Pioneer Mine.

In addition to having eight claims surveyed, Mrs. Noel, employing one man, completed 40 feet of timbered crosscut and extended or opened new trenches on chalcopyrite-scheelite bearing lenses.

Tungsten

Tungsten Queen (50° 122° N.W.) This property, owned by E. Phillips, of Gold Bridge, is on the east bank of Tyaughton Creek about 17 miles north of Minto. Surface stripping with the aid of a tractor revealed several narrow frozen-walled stringers of stibnite, scheelite, and calcite in the face of a rock bluff immediately west of the workings completed in 1942.

Tungsten King This property, owned by Gunnar Lundberg, of Minto, is located about 1 mile west of the Tungsten Queen mine workings. Approximately 7 tons of scheelite ore was removed by hand mining and trucked to Bralorne, where it was concentrated. Approximately 1 ton of concentrate was produced.

ANDERSON LAKE*

Gold

Golden Contact Mines Limited (50° 122° N.E.) Company office, 825 Vancouver Block, Vancouver; mine office, McGillivray Falls. M. McGregor, president and manager. Capital: 3,000,000 shares, 50 cents par value. This company owns seventeen claims and holds options on three others on the north slope of McGillivray Creek, 4 miles by pack-trail from McGillivray Falls on the Pacific Great Eastern Railway. It is connected to Marne Station by 5 miles of tractor-trail.

Between May 15th and August 20th, 1952, a crew of eight men was employed in completing a total of 150 feet of raising from two points on the Pep level. The first raise, approximately 15 feet high, was driven at No. 1 fault, where spectacular free gold showings were found in 1950. Additional rich specimens were disclosed by this work. The second raise, located in the faulted east vein segment, was driven to a height of 135 feet. Work was suspended because of an early power shortage.

KAMLOOPS†

Copper

Iron Mask (Kamloops Copper Company Ltd.) (50° 120° N.E.) Company office, 210 Victoria Street, Kamloops. Eric Larsen, president; A. M. Affleck, vice-president; R. A. Krenke, mine foreman. This company was incorporated late in 1951 to take over the property of the Kamloops Copper Syndicate. The property includes most of the original holdings of the Iron Mask mine, and several recorded claims about 4 miles southwest of Kamloops. Early in 1952 the property was optioned by Berens River Mines Limited, which did some surface and underground exploration. The inclined shaft on the Night Hawk Fraction, half a mile northwest of the Iron Mask, was deepened to a slope depth of 100 feet. The first level station was cut at 90 feet, from which a drift was driven 65 feet westerly. Four hundred feet of diamond drilling was done underground and 2,000 feet on the surface. The exploratory work is reported to have failed to indicate sufficient ore of

* By J. E. Merrett.
† By E. R. Hughes.

commercial grade, and underground work was discontinued on May 28th. Surface diamond drilling stopped on June 10th.

Pothook

The former Pothook claim is about 9 miles by road west of Kamloops. The claim was Crown-granted in 1901, and later a shaft was sunk 330 feet, but no work was done for many years and the survey was cancelled. Kennco Explorations, (Canada) Limited, holding fifty-eight claims, including the former Pothook, conducted a geological, geophysical, and diamond-drilling programme during the spring and summer months. Fourteen holes totalling 4,000 feet were drilled. According to old reports, mineral zones 4 to 20 feet wide containing bornite and chalcocite were found in this area, but the exploration in 1952 was disappointing and the work was stopped on August 12th.

LEMPRIERE*

Uranium

Verity, Paradise, etc.

(52° 119° S.E.) The O. E. French family recorded five claims on a vermiculite showing near Lempriere in 1950.† Subsequent investigation by the Frenches resulted in the discovery of uranium-bearing pyrochlore, and they staked more claims. In the spring of 1952 the St. Eugene Mining Corporation optioned the French's property that then consisted of the Verity, Counter, and Paradise groups. During the summer the company put a crew on exploration work and additional claims were located. At the time of writing, this company controls forty-eight full claims and eight fractional claims in the area.

The ground covered by the claims is east of the Canadian National Railway tracks between the 109- and 110-mile posts, 4 miles south of Lempriere flag-stop. Lempriere is on the east bank of the North Thompson River 169 rail-miles north of Kamloops.

The claims can be reached by taking the local way-freight from Blue River and detraining at French's home at Mile-post 109. From this point, trails lead to the showings. Alternatively, weather permitting, a 25-mile drive north from Blue River on the road to Yellowhead Pass takes one to a cable crossing that provides access to the tracks at Mile-post 109.

The property was visited in the first week of August. Then all activity by St. Eugene Mining Corporation Limited had been concentrated on the Verity and Paradise groups.

The Verity group of seven claims is immediately adjacent to the railway tracks. The Paradise group of four claims is at the ridge top 4,000 feet above and 3 miles east of the tracks. The original Counter group of five claims spanned the intervening ground in a single line. Recently claims have been recorded to consolidate the area around the Counter group. A rough steep trail about 4½ miles long extends from the track at French's to the Paradise showings. On this property uranium-bearing pyrochlore is found with numerous other minerals in crystalline, dolomitized limestone interbedded with gneisses that have been injected with pegmatite sills.

Verity Group.—At the time of examination the work on the Verity group had been confined to the Verity Nos. 1 and 2 claims. Here the deposit lies on a northwestern hillside with an average slope of 35 to 40 degrees. There is a heavy growth of large cedar, spruce, and hemlock trees accompanied by thick underbrush consisting of devil's-club, huckleberry, and buckbrush. Large windfalls are numerous. Several step-like scarps give fair exposures of gneiss, particularly on the Verity No. 1 claim, but natural exposures of carbonate rock are rare, and it is usually only by trenching or digging pits that this rock can be found in place. The dense tangle of roots in the overburden makes digging a slow and laborious task.

* *By J. W. McCammon.*
† *Minister of Mines, B.C.,* Ann. Rept., 1950, pp. 229–230.

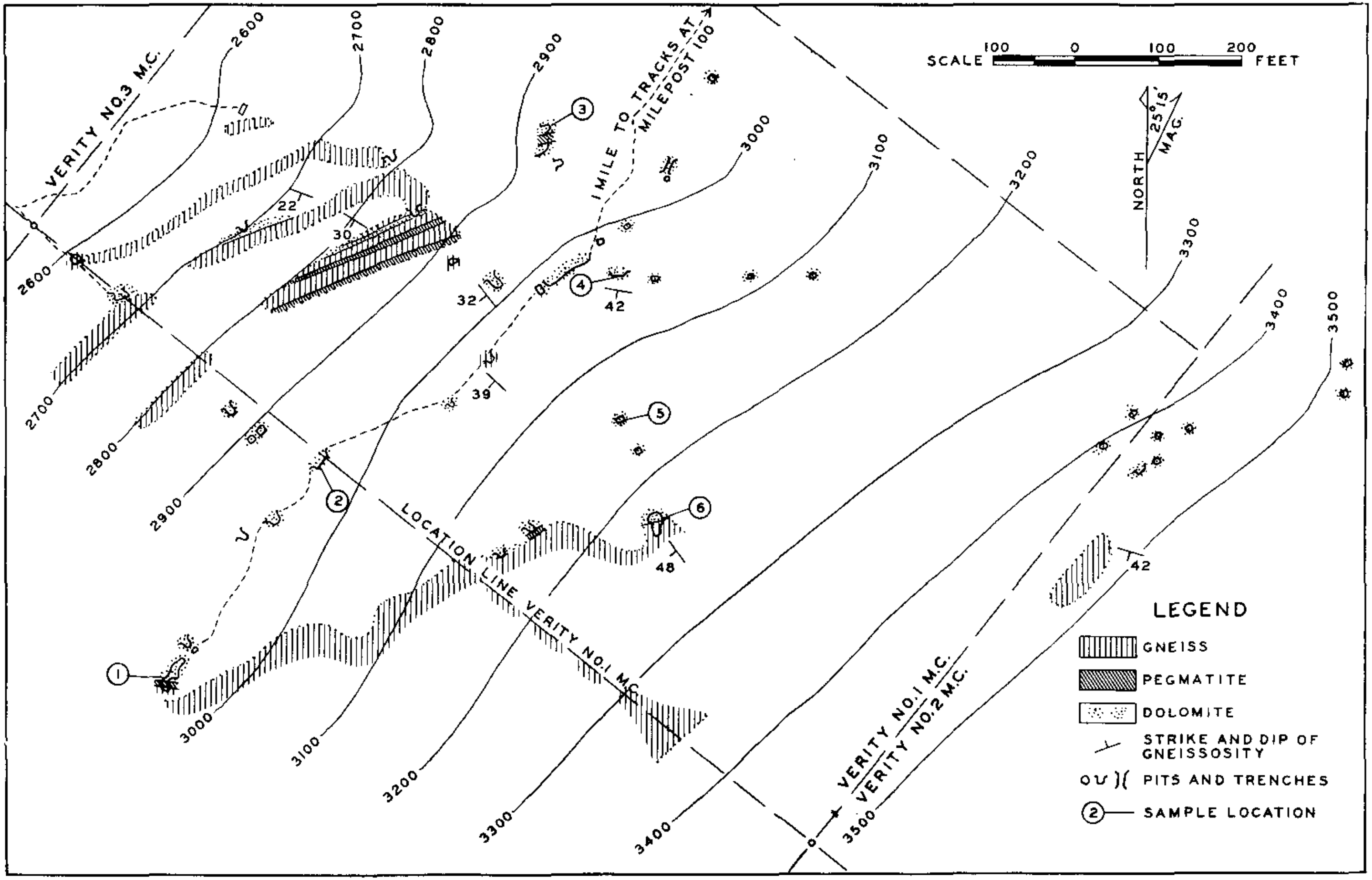


Figure 6. Tape and compass survey on Verity claims.

Showings on the Verity claims appear to indicate that the deposit consists of one major and several minor layers of carbonate rock interbedded with sedimentary gneisses that have been injected with thin pegmatite sills. The attitude of the rocks varies locally, in general the strike being between north 40 and 75 degrees west and the dip between 20 and 48 degrees southwestward. Development work on the major carbonate zone suggests that it has a stratigraphic thickness of about 150 feet and a continuity along the strike of more than 1,000 feet. No doubt the length is much greater, but insufficient work has been done to prove this.

Basically the carbonate rock is dolomitized limestone with accessory vermiculite, apatite, magnetite, olivine, ilmenite, green amphibole, zircon, pyrrhotite, and pyrochlore. These accessory minerals are not all present in every exposure, and they vary in relative abundance. Olivine seems to be most abundant toward the bottom of the carbonate zone, while pyrochlore and green amphibole are concentrated nearer the top contact. The vermiculite content varies from less than 1 to more than 10 per cent. It occurs as books, with diameters ranging from one-sixteenth to 4 inches, scattered through the limestone and as solid lenses up to 4 feet wide and 25 feet long. Apatite occurs in smooth greenish-white tear-drop-shaped grains from one-sixteenth to three-sixteenths inch in diameter and makes up from 4.3 to 11.3 per cent of the rock. Magnetite is widely dispersed but in relatively small quantities. It is found as small grains and irregular lumps as much as 6 inches in diameter. The magnetite is peculiar in that it invariably exhibits well-developed octahedral parting. The olivine has a brown to green colour and varies in grain diameter from one-sixteenth to 1 inch or more. Ilmenite and green amphibole occur in small disseminated grains. Zircon is not common. It is found in irregular masses and well-formed crystals up to half an inch long. Pyrrhotite is scarce. Difficulty was encountered recognizing pyrochlore in the field, and, as a result, its actual distribution is not too well known. It was assumed that all the pyrochlore was uraniferous, and samples were taken where Geiger counts proved greatest. Subsequent assaying of samples, however, showed that only three out of the eleven samples taken contained appreciable pyrochlore. Two of these samples were along the top contact of the carbonate zone, and the third was toward the centre of the zone. The pyrochlore occurs in three distinct forms: as small octahedral crystals, usually penetration twins; as irregular lumps as much as an inch in diameter; and as disseminated small grains. Its colour grades from dark brown to blackish, and the lustre is dull on weathered surfaces, to resinous and almost metallic on fresh surfaces. Frequently a tiny reddish halo surrounds the smaller grains and thus aids in locating them.

The surface of the carbonate rock is highly weathered, and to depths up to 8 or 10 feet it consists of a crumbly light-brownish material easily pulverized. The fresh rock below this layer has a light grey-white background with the dark minerals standing out in sharp contrast. Usually there is a marked linear arrangement of the dark minerals paralleling the gneissosity of the country rock. The fresh rock is tough, although relatively soft. It has a deceptively igneous appearance.

Other thin carbonate beds, a few inches to 5 feet thick, were noted below the main zone. None of these gave abnormal reactions on the Geiger counter.

The rocks that make up the rest of the exposures examined on the Verity claims are quartz-mica and hornblende gneisses with injections of pegmatite that vary from a few inches to 8 feet or more thick. In a few places coarse-grained hornblende-calcite veins cut the carbonate rock.

Ordinarily the carbonate rock gave a Geiger count of about twice the background count. In some spots the count was three or four times the background. Samples were taken wherever the greater counts were recorded. Spectroscopic analyses indicated the presence of columbium in all samples. However, only in the three included in the following table was the amount greater than 0.1 per cent. Yttrium and lanthanum in amounts less than 0.1 per cent were indicated in Samples Nos. 1 and 6. No tantalum was detected in any sample. Geiger counter analyses indicated radioactivity in all samples, but except for those included in the table the equivalent U_3O_8 values were less than 0.01 per cent. Chemical analyses were as follows:—

0.033

Sample No.	Width	Cb_2O_5	U_3O_8	CaO	MgO	P_2O_5
	In.	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
1	5	0.38	0.039	. . .		
2	60	0.37	.....	27.6	12.4	1.88
3	39	.....	.....	36.8	5.7	2.75
4	31	.....	0.33	42.4	4.7	2.02
5	54	.....	0.017	.	. .	.....
6	44	0.60	0.101	33.3	12.5	4.85

Sample numbers correspond to those on Figure 6.

Paradise Group.—The Paradise claims are on the south slope near the crest of an east-west trending ridge. They extend from 6,200 feet elevation to the ridge crest at 7,200 to 7,500 feet elevation. Timberline is at about the 6,500-foot level.

Natural rock exposures observed were restricted to an area along the ridge crest, to cliffs along the western limit of the group of claims, and to a few small scattered outcrops among the trees. Above timberline, bedrock, apart from the exposures just mentioned, is covered by talus. Near the ridge crest the talus is bare, while lower down it is hidden under grass, moss, and heather. Where pits had been dug below timberline, overburden was from 1 to 6 feet deep.

The geological setting at the Paradise group is similar to that at the Verity group. At least one major bed and other minor beds and lenses of dolomitized limestone are interbedded with quartz-mica and hornblende gneisses that have been injected with thin pegmatite sills. Garnet and some kyanite were noted in certain layers of the gneiss. Veins of black hornblende and calcite cut the carbonate rock in several places. The mineral suite in the carbonate rock is similar to that found on the Verity claims.

The regional structure was not studied, but an impression was gained of major folding along a northeasterly trending axis with possibly a southwesterly plunging synclinal axis near the ridge crest northwest of the claims. The showings would then be considered as being on the southeast limb of this syncline. The attitude of the rocks examined varies locally. The strike ranges from 10 degrees west of north to 25 degrees east of north and the dip ranges from 8 to 50 degrees westward.

Some open-cuts had been dug at the northwest corner of Paradise No. 4 claim, and exploration was proceeding in the southwest part of Paradise No. 3 claim when the property was visited. Development was being directed toward establishing the size of the major carbonate zone. This zone may consist of a single bed, but there is the possibility of there being at least two beds separated by a thin layer of gneiss.

The diggings on the Paradise No. 4 claim are on the steep open sidehill above timber and near the ridge crest. In this area the carbonate rock is exposed by natural outcrops and by trenches for about 600 feet along strike with a variable stratigraphic thickness of between 50 and 130 feet. Lenses and layers of micaceous and gneissic-looking material are visible in some of the trenches, so it is possible that the zone may represent more than a single bed of carbonate, but the non-carbonate zones are very minor. Quartz-mica gneiss outcrops on either side of the carbonate zone. Some small veins of coarse black hornblende-calcite rock cut the main carbonate zone.

The pits on the Paradise No. 3 claim are about 1,800 feet south of those on the Paradise No. 4 claim in steep, relatively thickly wooded country where outcrops are scarce. It was found that the radioactive content of the carbonate zone in general was sufficiently high that a Geiger counter could be used to locate likely spots for test-pit digging to trace the carbonate rock. Rock relationships here appear similar to those on the Paradise No. 4 claim. The carbonate zone is indicated for about 900 feet along strike and across a stratigraphic thickness of as much as 150 feet. Here, as in the previous location, lenses or zones of micaceous and gneissic material can be seen in some pits within the carbonate zone, so that more than a single bed of carbonate may be present. Gneiss is exposed parallel to and on both sides of the carbonate rock.

A 1,600-foot expanse of talus and grassy drift-covered ground devoid of outcrops separates the carbonate exposures on the two claims, but the attitude of the rocks suggests that they possibly are part of the same zone.

A few small lens-shaped bodies of carbonate rock as much as 8 feet thick and 20 feet long were noticed in the cliffs west and north of the Paradise claims on the other side of the ridge. This indicates that other beds of carbonate rock may be expected in the area.

Geiger counts taken on exposures of carbonate rock varied somewhat, but greater than background counts were recorded in all cases. Only two samples were taken—one from the main cut on the Paradise No. 4 claim and one from the largest pit on the Paradise No. 3. These samples were thought to represent better grade of material. Spectrographic analyses, however, indicated columbium present as less than 0.1 per cent, and radiometric analyses indicated U_3O_8 equivalent as less than 0.01 per cent.

All of the samples taken during this examination were small, averaging 3 to 4 pounds apiece. Now that the nature of the distribution of the pyrochlore in the host rock is a little better known, it is felt that the results shown do not necessarily indicate the true content of the deposit and that large bulk samples would be required for a better over-all picture.

NICOLA*

Copper

Copperado (Guichon Mine Limited).—(50° 120° S.W.) Company office, 119, 744 West Hastings Street, Vancouver. J. D. Ferguson, mine manager. This mine is 5 miles by road northeast of Nicola. The mine was closed on November 23rd, 1951, and work has not since been resumed.

TULAMEEN RIVER†

Gold

El Alamein Mines (1950) Limited.—(49° 120° N.W.) Company office, 607 Rogers Building, Vancouver. R. C. Cragg, manager. This mine is on the south bank of the Tulameen River, 4½ miles upstream from Tulameen. The mine was closed on September 9th, 1951, and work has not since been resumed.

Summit Camp (49° 121° S.E.)‡

Summit Camp is near the upper Tulameen River in the Similkameen Mining Division. It contains several silver-lead-zinc prospects. A mill treated ore from the Silver Chief for a few months in the 1930's, and ore shipments have been made from it and one other property. The Silver Chief workings have been reopened and some development work has been done recently.

The area mapped is at the head of Amberty and Sutter Creeks, tributaries of Vuich Creek, one of the main forks of Tulameen River. It is reached by 22 miles of motor-road that extends southwestward from Tulameen, which is on the Kettle Valley line of the Canadian Pacific Railway and on a highway between Princeton and Merritt. Most of the prospects are reached by good trails from the end of the road.

The area mapped includes the west end of Treasure Mountain and the ridge which extends westward from it toward the height of land between the Tulameen and Coquihalla

* By E. R. Hughes.
† By E. R. Hughes, except as noted.
‡ By J. M. Black.

drainage systems. It also includes the north and west slopes of the basin at the head of the south fork of Sutter Creek. Amberty Creek heads in a cirque basin which is separated from the main part of the valley by a distinct threshold.

Most of the slopes have been burnt off and second growth has not yet become established. Most slopes are moderately steep, and bedrock is well exposed on them. However, the west slopes of Sutter basin, the pass between Amberty and Sutter Creeks, and much of the north and east part of the mapped portion of Treasure Mountain have not been burnt and are covered with a fairly dense growth. In these latter parts, outcrops are scarce. The valleys of Sutter and Amberty Creeks just east of the map-area are well timbered, and some of this timber is suitable for construction and mining purposes.

The area is in the Cascade Mountains and has a moderate rainfall and fairly heavy snowfall.

A rusty outcrop near the base of the south slope of Treasure Mountain attracted the attention of early prospectors, and the Eureka claim was located on it in 1894. Veins containing galena and sphalerite were found in 1895 in the upper part of Sutter basin, and several claims were located. However, little exploratory work was done until 1906, when the Silver Chief lode was found on Treasure Mountain. During the next six years this lode and the veins in upper Sutter basin were explored on the surface and underground. Exploration of the lode was continued from 1925 to 1930, and a mill on the Silver Chief was operated for a few months in 1930, 1931, 1932, and 1934. In 1950 Silver Hill Mines Ltd. optioned the Silver Chief and Eureka groups of claims. This company rebuilt parts of the road, re-established the camp, cleaned out some of the old workings, and carried on some underground exploration. The total extent of mine workings in the camp is about 1 mile.

The gross contents of ore and concentrates from the properties in the area to the end of 1952 are set forth in the following table:—

Property	Silver	Lead	Zinc
	Oz.	Lb.	Lb.
Eureka (43 tons)	873	12,825	13,624
Silver Chief (tonnage not available)	39,558	379,532	88,455
Totals	40,431	392,357	102,079

An area, including the camp, was mapped in 1922 by Cairnes.* This area is also shown on the Hope Sheet.†

The properties have been described briefly in Annual Reports of the Minister of Mines for the years in which they were developed.

During two months of 1952 the writer, with one assistant, mapped the geology and topography of an area of about 1 square mile and examined the prospects in it. A map on a scale of 1 inch to 200 feet was prepared by plane-table surveying. Two claim posts were found, and the plane-table survey was adjusted to conform to the claim surveys. The extreme western part of the area mapped is not shown in Figure 7.

Geology.—The Summit Camp area is underlain by volcanics and sediments of the Dewdney Creek and Pasayten formations, intruded by numerous dykes and sills. The Dewdney Creek formation comprises volcanics and a minor amount of sediments; the Pasayten formation is sedimentary. The general features of the geology are shown on Figure 7.

The Dewdney Creek formation outcrops extensively in the western part of the area. It contains a considerable variety of volcanic rocks, including tuff, breccia, and agglomerate, constituting possibly 75 per cent of the formation. Most of these rocks are some shade of green and weather to a light grey; their fragmental nature generally is apparent

* *Geol. Surv., Canada,* Sum. Rept. 1922, Pt. A, pp. 95–107.
† *Geol. Surv., Canada,* Map 737A, 1944.

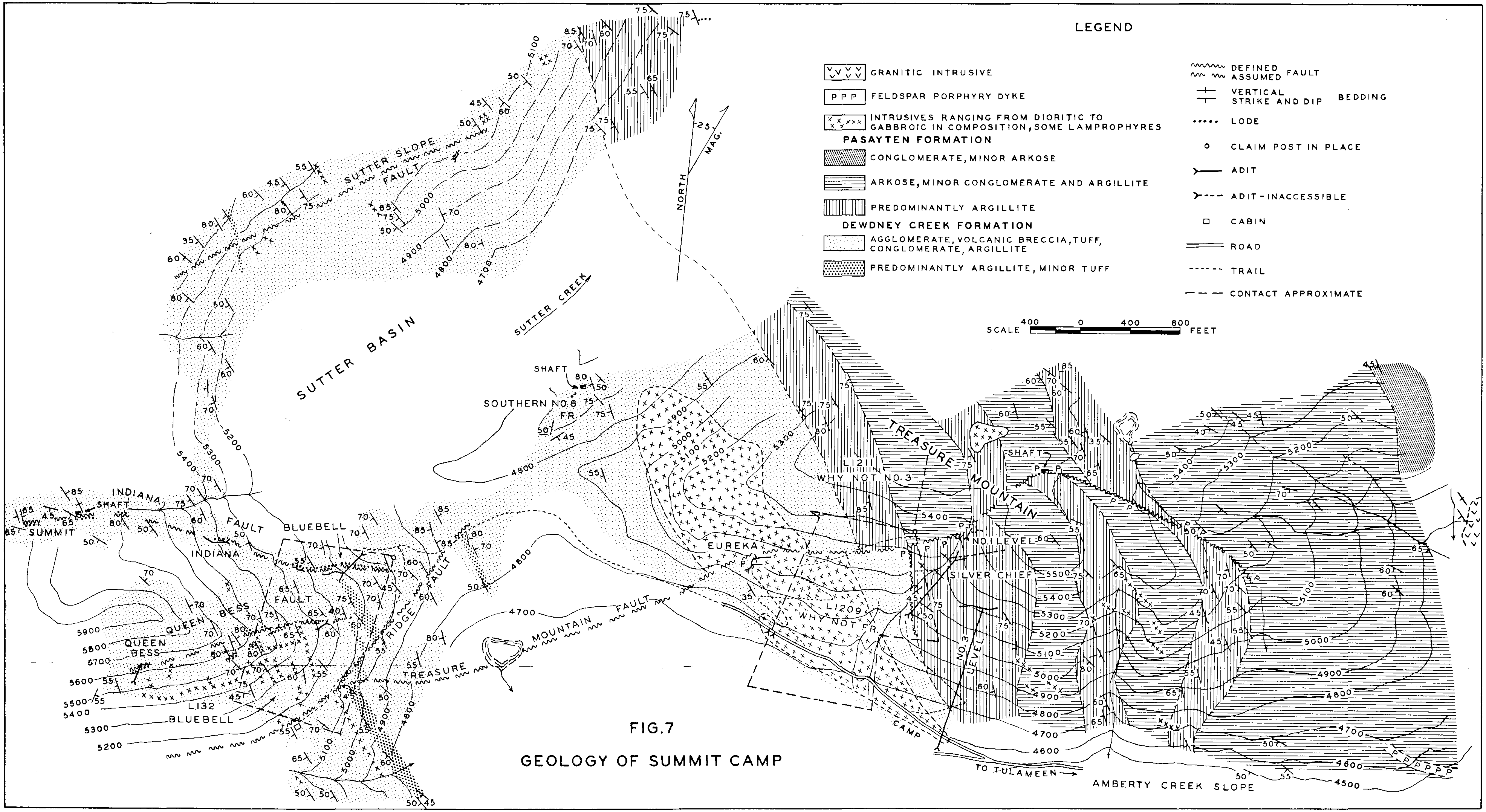


FIG. 7

GEOLOGY OF SUMMIT CAMP

only on weathered surfaces. Most of the beds are at least several feet thick, but thinner one were noted. Fragments range in size from a fraction of an inch to as much as several inches; most are angular, but some, especially the larger ones, are rounded. Fragments about one-eighth to one-quarter inch across are most common. The larger fragments are fine grained, and most of them consist of tuff or other volcanic rock. The fragmental beds have a tuffaceous groundmass, and in some the groundmass includes sedimentary material.

Sediments interbedded with the volcanics include argillite and conglomerate. The argillite is generally dark, nearly black in colour, but weathers to a light grey, and some of it to nearly white. It is characteristically thin bedded, and many beds are less than one-tenth of an inch thick. Generally, the thinner beds are in groups a few inches thick. In a few places the argillite is thick enough to constitute mappable units which are shown on Figure 7.

The conglomerates are common only in the eastern part of the formation close to the contact with the Pasayten formation. Most are greenish, but some have a distinctive purplish cast. They consist of rounded and subangular pebbles and cobbles as much as several inches across, in a tuffaceous groundmass. The pebbles and cobbles consist mostly of tuffs, flows, and fine-grained intrusives and include a comparatively small proportion of sediments.

The members of the Dewdney Creek formation are considerably altered. Pyrite is commonly present, and many outcrops, particularly in the west, are rusty.

The Pasayten formation includes arkose, argillite, and conglomerate, and differs markedly from the Dewdney Creek formation. Arkose predominates; most of it is relatively coarse grained and consists of readily recognizable grains of quartz and feldspar, and minor amounts of mica. Small pebbles are common. It is grey and weathers to a light-grey colour. In a few places, bedding planes are discernible, but most of it is massive. The arkose closely resembles a medium-grained granitic rock and is hard and resistant to weathering.

The argillites are thin bedded like those of the Dewdney Creek formation but, unlike them, do not weather to light grey and are quite dark on weathered surfaces. They tend to break down to a rubble on weathering and do not outcrop prominently. These argillites form belts as much as several hundred feet wide and are shown on Figure 7.

The conglomerates consist largely of cobbles and of a minor proportion of pebbles in a sandy or arkosic matrix. Most of the cobbles, many of which are over 1 foot in diameter, consist of medium- and coarse-grained granitic rock; a small proportion of the cobbles is volcanic, or sedimentary, or gneissic. The conglomerates occur in the northeast and, to a lesser extent, in the west, where they are interbedded with argillite and arkose.

In the Dewdney Creek formation, Cairnes found numerous fossils that have been considered to be of Upper Jurassic or Lower Cretaceous age. The Pasayten formation contains fossils of Lower Cretaceous age, and it is generally concluded to be younger than the Dewdney Creek formation. It is obvious that considerable time must have lapsed between the deposition of the Dewdney Creek formation and the Pasayten formation, during which time granitic masses were unroofed.

The two formations are intruded by numerous sills and dykes and one stock. These vary considerably in composition, but most of them range between diorite and gabbro. Some of the sills are lamprophyres. The intrusive bodies range from fine-grained, nearly glassy, to medium-grained types, with crystals in the largest bodies attaining lengths of one-quarter inch. The intrusive bodies are much alike in both formations, with the exception that those in the Pasayten formation are somewhat darker and do not include any sills. The dykes in the Dewdney Creek formation strike westward, and those in the Pasayten formation strike west-northwestward.

The intrusive bodies range in colour from grey to green to nearly black. Many of them are much altered, and chlorite and carbonate have partly replaced the original minerals. They generally are veined, especially near their margins, by irregular veinlets of quartz about one-quarter inch wide and a few feet long. On weathered surfaces they have a greater range in colour; many of them are brown and, particularly near their margins, are rusty. They are more resistant to erosion than the rocks they intrude, and outcrop prominently; they are jointed and break into massive blocks. Most of the intrusive bodies range from a few inches to as much as 30 feet wide and from a few feet up to 1,000 feet long, and pinch out abruptly. Many are about 5 feet wide and less than 200 feet long. The largest sill, which is much larger than any other, is about three-quarters of a mile long and as much as 700 feet thick.

In the eastern part of the area a feldspar porphyry dyke has been traced across Treasure Mountain. A similar porphyry is exposed in the southeast part of the mapped area, approximately aligned with the dyke on Treasure Mountain, and if part of the same dyke, it is more than 1 mile long (*see* Fig. 7). It strikes westward and dips southward and occupies a major fault crossing both formations and the largest sill in the Dewdney Creek formation. This dyke is as much as 70 feet wide in the east but narrows toward the west; for most of its known length it is between 10 and 20 feet wide, and in the west is about 5 feet wide. It is characterized by rectangular crystals of feldspar one-quarter inch long and generally weathers to a dark grey-green, but in places to a light grey. The dyke has been sheared and much altered, the feldspar being carbonatized and the groundmass chloritized. Mineralizing solutions which circulated along the fault hydrothermally altered the dyke at its margins to a soft carbonate rock.

The dyke is younger than the largest sill in the Dewdney Creek formation and presumably is younger than the other sills and dykes, but is older than vein matter in the fault.

Moderately coarse-grained granitic rock with a distinctive rubbly appearance is exposed at the east edge of the area. It is presumably part of a larger mass and is similar to granitic rocks exposed on the road to Tulameen, just east of the map-area.

The feldspar porphyry dyke is widest in the east where it approaches the granitic area, and it is possible that dyke and granitic rock were derived from the same magma.

Structure.—The two formations trend northwestward and dip at moderate to steep angles southwestward, but there are many local divergencies in attitude. These divergencies are not known to be parts of recognizable folds, but the failure to recognize folds may be due to lack of outcrops at critical points. Southwest of the mapped area, on the south slope of Amberty basin, several closed folds were noted in which the attitude of the bedding at most points was parallel to the regional attitude. Folds a few inches across were noted in thin beds of the Dewdney Creek formation; these folds plunge southward.

Cairnes mapped a fault separating the Dewdney Creek and Pasayten formations, and although he suggested that the Pasayten is faulted against the Dewdney Creek,* he did not report having actually seen a fault.

No contact fault is exposed on the slopes of Sutter basin or on the ridge south of Amberty Creek, but a section of the contact on the south slope of Treasure Mountain is marked by a gully, and beds of the Pasayten formation near it are contorted. In the crosscut on No. 3 level of the Silver Chief property the contact is faulted, the fault zone consisting of 2 to 3 feet of gouge, broken argillite, and quartz stringers. The fault strikes northwestward and dips 30 to 50 degrees northeastward; argillites in its hangingwall are dragged around parallel to the fault, possibly as a result of the hangingwall having moved up relative to the footwall. Conglomerates exposed at the surface but not underground at this point presumably are cut off by the fault, the indicated displacement being possibly several hundred feet.

* *Geol. Surv., Canada,* Sum. Rept. 1922, Pt. A, p. 97.

The two formations are undoubtedly separated locally by a fault, and if by a major fault it might be postulated that the Pasayten formation has been dropped down by this fault, possibly thousands of feet, to its present position, where it appears to dip under the older Dewdney Creek formation. This postulation is improbable because, first, there is a general lack of evidence of movement along the contact and, second, at the only point where the fault was seen the direction of movement appears to be the reverse of the postulated direction. Therefore, it seems improbable that the fault is of major importance. Considering the near conformability of the two formations as a whole, it is probable that the contact between them is at most slightly discordant, and that movement at the contact was probably to a large extent bedded. The fault in the Silver Chief workings is certainly not a bedding-plane fault, but it is possible that its attitude at the only point seen is a deviation from the general attitude.

It appears that the Pasayten was laid down on the Dewdney Creek formation after a considerable interval of time with near conformity, and that the contact relations were not markedly disturbed by faulting. Since the younger Pasayten formation dips under the older Dewdney Creek formation, then the formations are here overturned and presumably are on the limb of a major anticline overturned to the northeast.

An important fault crosses Treasure Mountain. It markedly offsets the formations and possibly represents a displacement of more than a thousand feet. The most important mineral occurrences in the area have been found along this fault, and the feldspar porphyry dyke is localized by it. It is referred to here as the Treasure Mountain fault.

The fault has an arcuate trace across Treasure Mountain, and its continuation westward is marked by an offset of beds of the Dewdney Creek formation at the north end of the threshold of Amberty valley. The course of the fault is possibly marked by two ponds in upper Amberty valley, and farther west a break is discernible in the bed of a small creek at the head of the valley. Its continuation eastward, beyond offset belts of argillite, has not been found, but outcrops of feldspar porphyry at the east edge of the mapped area may be in the fault and show that it extends at least that far. This fault is assumed to be continuous at least from the threshold of Amberty valley to the offset argillite belts, a total distance of 7,600 feet and possibly much farther.

In underground workings the Treasure Mountain fault is well exposed by many drifts driven along it. At Treasure Mountain it strikes about north 80 degrees east and dips southward, in places as much as 65 degrees but generally less; in places the dip is possibly as low as 30 degrees. In the workings the fault is a zone as much as 30 feet wide between smooth walls. The feldspar porphyry dyke generally occupies a central position in the zone, but in places the dyke is on one wall or the other of the fault and at one point is in the hangingwall of the fault zone. The walls of the dyke are sheared, and it appears that movement continued after intrusion.

On Treasure Mountain the formational offset is as much as several hundred feet to the left. If the fault movement was one of dip-slip alone, then the offset represents a normal displacement on the fault plane of about 1,000 feet. In the southwest it is obvious that members of the Dewdney Creek formation are offset, though the amount and direction are not apparent. However, the proportion of sills and dykes in the segment north of the fault is much greater than the proportion in the segment south of the fault, and this distribution suggests that there was a vertical displacement. If the proportion of intrusive rocks is directly related to nearness to the same magma source, then it is probable that at the time of intrusion the southern segment was farther from the source and has since been depressed relative to the segment north of the fault. The available data give no measure of the amount of displacement, but the considerable difference in proportion of intrusive material on either side of the fault suggests that possibly there was vertical movement of several hundred feet. Whatever the displacement on it may be, the Treasure Mountain fault is the major fault in the area.

Several other faults with somewhat similar attitudes may be related in origin to the Treasure Mountain fault. Two of these crossing the southwestern part of the area strike westward and dip steeply southward for the most part, but one strand of one fault dips northward. The more northerly of the two, along which are the Bluebell and possibly the Indiana and Summit prospects, may be continuous for more than 3,000 feet and will be referred to as the Indiana fault. The southern one appears to continue across the Bluebell claim and the adjoining claim on the west. The Queen Bess prospects occur along it, and it will be referred to as the Queen Bess fault. These two faults diverge to the west from the Treasure Mountain fault, but their points of junction with it are not exposed. Both consist of subparallel strands separated by shattered rock; the Queen Bess fault splits into two branches that diverge toward the west. Vein matter has been introduced along these faults.

At points along the Queen Bess fault, on the Bluebell claim, sills are offset a few feet to the right. The amount of offset along the Indiana fault was not determined, but because the two faults are similar in appearance, the offsets produced by them are believed to be about the same.

Another fault is mapped on the low ridge between Amberty and Sutter Creeks and is termed the Ridge fault. It was not seen, but its presence is indicated by an offsetting of members of the Dewdney Creek formation. It diverges eastward from the Treasure Mountain fault.

Still another, the Sutter slope fault, is mapped in the northwest. It is not exposed, but a prominent lineament on the steep north slope of Sutter Creek valley can be followed for more than half a mile. If it is part of the same system of faults as the others, it probably dips southward. Beds north and south of it are offset not more than a few feet.

Ore Deposits.—The mineral occurrences in the area are lodes in the Treasure Mountain fault and in and near the subsidiary faults. The lodes consist of one or more stringers or veins, together with vein material in pockets and disseminations in the walls of the veins, and on the whole contain a comparatively small amount of gangue. The veins branch and split and vary considerably in width and attitude. Because of the variation in size and number of veins and in the amount and distribution of vein material in the walls, the lodes are irregular. For the most part, they are less than 2 feet wide; one has been followed for hundreds of feet, but most of them have been followed for much shorter distances.

The ore minerals include sphalerite, galena, pyrite, arsenopyrite, tetrahedrite, stibnite, pyrrhotite, and possible some less common silver-bearing minerals. The gangue consists of quartz and carbonate.

Eighteen samples were taken by the writer from the main lodes at widely spaced, irregular intervals. These samples were not representative of the grade of ore of any section of any lode, but they did provide an indication of the general range of grade in the accessible parts of the lodes. The assay returns are contained in property reports that follow this section. An arithmetical average of the lead assays is 2.2 per cent, and that of the zinc is 12.5 per cent. Although this does not demonstrate that these metals are present generally in this proportion, it does confirm the observation that lode material on dumps and exposed in workings contains considerably more sphalerite than galena. The silver average is 5.5 ounces per ton and is roughly proportional to the lead content, and in most of the assays is between 2 and 3 ounces per unit of lead. The samples were assayed for gold; seven assayed 0.01 ounce per ton, and the remainder assayed trace or *nil*.

Spectrochemical analysis showed that in most of the samples cadmium was present in appreciable amounts, roughly proportional to the zinc content. Eleven samples assayed for cadmium contained amounts ranging from 0.02 per cent to 0.26 per cent, the arithmetical average being 0.11 per cent. The arithmetical average of the zinc content in the same samples was 11 per cent, indicating a ratio of 1 to 100. The cadmium-zinc ratio was close to this figure in the individual samples.

Manganese was present in appreciable amounts in most of the samples, as shown by spectrochemical analysis. In sixteen of the samples the approximate amount of acid-soluble manganese as determined by semi-quantitative methods ranged from 0.2 to 6.4 per cent, and seven contained between 1 and 2 per cent. These figures were subject to an experimental error of 20 per cent. Two samples contained, by assay, 11.5 and 18.5 per cent acid-soluble manganese. The highest amount was from a manganese-stained outcrop on Treasure Mountain that presumably contained more manganese than the unweathered lode. No primary manganese minerals were noted, and it is probable that the manganese occurs as manganiferous siderite.

The main fault has been prospected for possibly one-third its length at the surface on Treasure Mountain, but elsewhere there has been little exploration along it.

The faults and the lodes contained in them occur in every type of rock except the "granite," but on the properties on Treasure Mountain that have been most intensively developed it appears that changes in width and grade of the lode may be related to changes in wallrock. Along some parts of the fault, argillite appears to be a favourable host rock and in other parts possibly is less favourable than some more massive types. Apparently the members are not all equally favourable to ore formation, but on the basis of the work done, the most favourable members are not known.

[References: *Geol. Surv., Canada,* Sum. Rept., 1922, Pt. A, pp. 95–107; Hope Sheet Map 737A, 1944.]

Silver-Lead-Zinc

Silver Chief (Silver Hill Mines Ltd.) Company office, 402 Bank of Nova Scotia Building, Vancouver. E. Borup, president; Dale Rumball, secretary. Capital: 3,000,000 shares, no par value. The company has under option eight Crown-granted claims and fractions (Lots 1209 to 1216, inclusive), and holds by record eleven adjacent claims and fractions. The original name of the property was the Silver Chief, but at other times it has been known as the Mary E or Silver King.

The property is on the south slope of Treasure Mountain and extends from Amberty Creek to the summit. The slope is moderately steep, and most of it has been burnt over. The main workings are east of a small creek gully.

The camp, comprising cook-house, bunk-house accommodating about ten men, store-house, power-house, and dry is just below the road near its end. Power is developed by a diesel plant. An old mill, from which most salvageable material has long since been removed, is at the base of the slope, near Amberty Creek. The property was not being worked at the time of examination.

The Silver Chief lode was found in 1906. The lode lies within the Treasure Mountain fault and was first explored by a series of trenches at an elevation of 5,500 feet and was followed part way across the top of the mountain; a shaft was sunk about 65 feet. From 1910 to 1912 two crosscut adits, Nos. 1 and 2, at elevations of 5,336 and 4,912 feet respectively, were driven northward to the lode. From each crosscut, drifts were driven along the lode; and from No. 2 level, raises were driven upward but were not continued to No. 1 level. In 1925 a new company was formed that was reorganized in 1926, and at 4,534 feet elevation a third crosscut adit was driven, and the lode was explored by drifts. In 1929 a new company was formed, three carloads of ore were shipped, and in 1930 a gravity mill was built, which was changed to a flotation mill the following year. The mill was operated for a few months in 1930, 1931, 1932, and 1934.

In 1951–52 Silver Hill Mines Ltd. drove a raise up from No. 3 level for 290 feet. Work was then suspended.

Most of the surface trenches are caved, and little can be seen in them. The shaft is full of water. The portal of No. 1 level is covered with overburden. No. 2 and No. 3 levels can be entered, but parts of drifts on each of them are caved. The total length of workings is about three-quarters of a mile. Most of the production has come from stopes above No. 2 level.

Members of the Dewdney Creek formation and the largest sill outcrop in the southwest part of the property and are exposed in the outer parts of the crosscuts on Nos. 2 and 3 levels, but most of the property is underlain by the Pasayten formation, and the workings on the lode are all in this formation.

In the workings the Pasayten formation includes arkose, argillite, and minor amounts of conglomerate. The argillites, which are well exposed in the crosscuts on No. 2 and No. 3 levels, are black and thin bedded, and dip consistently southwestward, except near the Treasure Mountain fault zone and the fault contact with the Dewdney Creek formation. At these places the beds are contorted or dragged into near parallelism with the faults. In the workings examined on No. 3 level, argillites form the hangingwall and the eastern part of the footwall of the lode; on No. 2 level they form the western part of the hangingwall.

The arkose is massive, grey, and moderately coarse grained. Interbedded with it are some conglomerate beds and a few dark argillaceous laminæ. In the workings examined on No. 3 level, arkose, with minor amounts of interbeds, forms the western part of the footwall of the lode; on No. 2 level it forms the footwall and the eastern part of the hangingwall.

Conglomerate beds exposed east of the portal of No. 2 level can be followed at the surface for about 800 feet but are not seen on No. 3 level, about 300 feet down the dip. They are close to the Dewdney Creek contact, and it is possible that they have been displaced by the contact fault. A thrust movement along the contact fault of possibly several hundred feet seems necessary to account for the non-appearance of the conglomerate.

The lode includes the mineralized parts of the Treasure Mountain fault zone, the trace of which is shown on Figure 7. The lode consists of stringers and veins and of vein matter disseminated in the walls of the veins. A feldspar porphyry dyke which occupies the fault has divided it into hangingwall and footwall sections and mineralization occurs in both sections, and consequently where the faults are mineralized there are hangingwall and footwall lodes. They range from a fraction of an inch to as much as 20 feet wide but for the most part are about 2 to 4 feet wide. Prospectors at an early stage of exploration, realizing that lodes occurred in the walls of the dyke, dug numerous trenches in an effort to trace both dyke and lode across the mountain top. In most of the trenches only some rusty or dark-stained feldspar porphyry can be seen. In some trenches dark manganese-stained wallrock is exposed, but fresh mineralization is seen in only one trench. This is west of No. 1 level, where the dyke has been stripped and mineralization is exposed in its hangingwall.

In a report,* written about the time the trenching was done, the possibility is mentioned that there are two and possibly three lodes. The two lodes mentioned are probably those on each wall of the dyke. No trenches that might have exposed a possible third lode were found. The dyke, as exposed in outcrops and trenches seen by the writer, appears to be aligned as shown on Figure 7, and it is probable that there is only one such dyke, and that it is more or less confined to the Treasure Mountain fault, at least near the workings. The dyke is present wherever mineralization has been found, but the dyke was intruded prior to the mineralization and is not an indicator of it. The marked curve of the trace of the fault-dyke zone across the top of the mountain may be the result of decrease in the dip of the zone.

* *Minister of Mines, B.C.*, Ann. Rept., 1913, p. 230.

The horizontal offset along the fault is not exposed in the accessible parts of the drifts, but on No. 3 level it is at least 250 feet to the left and may be considerably greater. The amount of displacement in the plane of the fault was not determined. Post-intrusive movement along the fault has sheared the dyke which ranges from 5 to 20 feet wide. On No. 3 level it passes into the hangingwall of the fault. In part it has been hydrothermally altered and is creamy white in colour and is soft and clay-like.

The veins in the lodes are as a rule less than 2 feet wide, and many are much less; some extend for only a few feet, but others can be followed for more than 50 feet. Numerous stringers or veinlets are only a fraction of an inch wide and continue for a few feet. Some pockets of mineralization are a few inches in extent. The amount of mineralization disseminated in the vein walls is of minor importance, and is confined to a distance of a few inches from a vein. In places an aggregate width of mineralized veins or stringers separated by gouge and broken rock constitutes a lode as much as 5 feet wide. The fault zones may be 10 to 20 feet wide and be only sparsely mineralized. The general aspect of the lodes, caused by the multiplicity of veins and mineralization associated with them, is one of irregularity.

Cavities in the lodes are common. Generally, these are narrow, less than 1 inch wide, but some several inches across were seen. Most of the cavities are lined with crystals of ore and gangue minerals, of which the largest seen were quartz crystals one-quarter inch long.

Sulphides constitute the greater part of the vein matter, and gangue minerals are present as a rule in minor amounts. Sphalerite, generally dark brown and coarsely crystalline, is the most abundant sulphide. Galena and pyrite are less abundant, and chalcopyrite and tetrahedrite are present in minor amounts. The gangue consists of milky and glassy quartz and light-coloured carbonate. Some of the carbonate is probably manganiferous siderite, and outcrops near the lode are generally manganese-stained. Samples taken from the unweathered lode contain as much as 5.8 per cent manganese (subject to experimental error of 20 per cent).

The amount of silver varies considerably and is more nearly related to the amount of galena than of sphalerite. Cairnes believes that the silver may be contained in a silver mineral, possibly argentite, in the galena. The amount of silver present does not seem to be related to the presence of tetrahedrite; three samples taken from the raise up from No. 3 level, the only working in which tetrahedrite is commonly seen, did not contain much more silver than samples from other workings. The amount of gold present is very small. Of seven samples, only one assayed 0.01 ounce per ton, and the remainder assayed trace or *nil.*

At the surface, fresh mineralization was seen only west of the portal of No. 1 level, on the hangingwall of the dyke. Several parallel stringers form a lode which is at least 20 inches wide and possibly wider because its hangingwall has been removed. A sample across it assayed: Silver, 10.9 oz. per ton; lead, 2.0 per cent; zinc, 0.9 per cent.

The most extensive workings are on No. 2 level, where the hangingwall lode has been followed for 100 feet and the footwall lode for 800 feet. Most of the ore mined has come from stopes above this level. Only short sections of the drifts are now accessible, and in these only short segments of the lodes are exposed because the backs are timbered. At the crosscut the footwall lode consists of a vein 27 inches wide. A sample taken across the lode at this point assayed: Silver, 9.6 oz. per ton; lead, 3.0 per cent; zinc, 4.5 per cent. At the main crosscut and in a branch north from it, the hangingwall zone comprises only a few inches of gouge. Immediately east of the crosscut the hangingwall lode is not exposed, but a section about 30 feet long has been prepared for stoping. Along this section, argillites form the hangingwall. Between this section and the east face of the drift the fault zone is only a few inches wide and contains gouge but no mineralization.

On No. 3 level the workings are less extensive but more of them are accessible. Here the dyke has been intruded along or in the hangingwall of the fault, and possible ore mineralization has been found only in the footwall zone. In the crosscut, on the hangingwall, there is a mineralized quartz stringer a few inches wide. The footwall fault is 20 feet wide and contains two lodes separated by sparsely mineralized broken argillite and gouge. The northern lode has been followed eastward for 120 feet, and for this length it is about 1 foot wide and is moderately well mineralized. Two samples were taken from it. The first, 14 feet from the east face, across 9 inches, assayed: Silver, 19.3 oz. per ton; lead, 7.4 per cent; zinc, 23.4 per cent. The second, 56 feet from the east face, across 19 inches, assayed: Silver, 3.5 oz. per ton; lead, 0.4 per cent; zinc, 26.7 per cent.

For 60 feet west of the crosscut the full width of the fault zone is not exposed, but farther west the full width, which is as much as 5 feet, is exposed and is moderately well mineralized. This western section may be at the east end of an oreshoot because the lode has been followed by a drift westward for an additional 100 feet, although that part is not now accessible. A raise has been driven up from a point 90 feet west of the crosscut for 290 feet, of which 175 feet was accessible. In the lower 100 feet of the raise a well-mineralized vein is as much as 1 foot wide, and flanking it are numerous veinlets, making a lode as much as 2 feet wide. Three samples were taken in the raise, at the No. 3 level, and 50 and 100 feet above, across widths of 18 inches, 10 inches, and 21 inches respectively. These samples assayed as follows:—

Sample No.	Width	Silver	Lead	Zinc
	In.	Oz. per Ton	Per Cent	Per Cent
1	18	4.0	0.6	23.5
2	10	6.0	1.1	31.3
3	21	2.7	0.6	12.6

In the upper 75 feet the lode narrows to a few inches in width.

The wide fault, sparsely mineralized at the crosscut, narrows and is more abundantly mineralized toward the east and west, and possibly there are what may be regarded as two oreshoots. The eastern oreshoot occurs where both walls are argillite, and at the extreme east pinches where the dyke swings into the fault and forms the hangingwall of the lode. The western oreshoot occurs where the footwall of the lode is arkose, but the lower section of the shoot is entirely within a sheet of argillite which has been dragged into the fault zone. In the upper part of the raise the argillite sheet pinches out, and the arkose and dyke are separated by a few inches of gouge and very little mineralization.

It appears on No. 3 level that the lode is higher in grade between argillite walls than where arkrose or dyke rock form one or both walls. Argillite is therefore a favourable host rock whose distribution is difficult to foretell because it tends to be dragged into and along the fault and may occur along much of the fault, beyond the limits of the argillite belts.

On the other hand, the arkose is a massive, competent rock which probably would maintain cavities created during movement, and so might also be favourable to ore formation. On No. 2 level, where arkose probably forms the walls of the footwall lode, the widths and grades are not known, but presumably compare favourably with the samples taken elsewhere on the lode.

The exploratory work that has been done demonstrates that mineralization of commercial interest occurs in a major fault at widely spaced points, as much as 1,000 feet apart horizontally and vertically, but continuity between the several showings has not been demonstrated. In the workings the footwall lode has been explored to a greater extent than the hangingwall lode because at the crosscuts on No. 2 and No. 3 levels it is wider and higher in grade. However, where the footwall lode pinches, the hangingwall lode may be wider. The fault continues beyond the limits of the explored area and crosses members that may be favourable host rocks.

Eureka (Silver Hill Mines Ltd.)

The Eureka Crown-granted claim (Lot 1210) is part of the group of claims under option to Silver Hill Mines Ltd. It is commonly referred to as the Jensen property. The Eureka was the first claim located in the area in 1894. A rusty capping that had early attracted the attention of prospectors was first explored and later some northerly striking veins. In more recent years the Treasure Mountain fault zone has been explored.

The rusty capping occurs near the Treasure Mountain fault, and the west contact of the largest sill in the Dewdney Creek formation. The formation near the fault contains pyrite and weathers rusty, but no other sulphides were noted.

Trenches exposing the northerly striking veins have sloughed. According to Cairnes,* an adit was driven northward from just below the road for 280 feet, of which 230 feet was a drift, but veins explored in it are narrow and for most of their length are less than 3 inches wide. The adit is caved at the portal. These veins evidently occur in and near a tongue of intrusive rock that extends from the largest sill westward into the Dewdney Creek formation.

In the late 1920's an adit driven northward for about 100 feet from a point just above the road reached the Treasure Mountain fault and followed it for about 150 feet eastward. A parallel fault about 50 feet from the portal was followed eastward for about 75 feet.

The Treasure Mountain fault is not well exposed at the surface, but a feldspar porphyry dyke, presumably the same as that which occurs in the fault on the Silver Chief property, is exposed, and beds of the Dewdney Creek formation near it are broken and contorted. Underground, the fault zone consists of two faults, each to some extent mineralized, separated by the feldspar porphyry dyke which is about 5 feet wide. Both hangingwall and footwall faults are exposed at the east and west ends of the drift, but in the central part only the hangingwall fault is exposed. The mineralized parts of the faults, the lodes, range from a fraction of an inch to more than a foot wide, the hangingwall lode being as a rule the wider of the two. Both lodes narrow toward the east.

The footwall lode occurs between the largest sill in the Dewdney Creek formation and the feldspar porphyry dyke. A lens in it about 30 feet from the east face is 10 inches wide, and a sample taken across it assayed: Silver, 1.5 oz. per ton; lead, 0.7 per cent; zinc, 25.3 per cent. The other exposed sections of this lode are only a few inches wide or less.

The hangingwall lode is between the feldspar porphyry dyke and argillites, volcanics, and conglomerate of the Dewdney Creek formation. The hangingwall consists of thin-bedded argillites at both ends of the drift, and massive breccia and conglomerate in the central section. The lode consists of a quartz vein and several stringers and is about a foot wide, except at the east, where it is a few inches wide. Pyrite is more abundant than in other lodes along Treasure Mountain fault; at both ends of the drift, sulphides are sparse, and only pyrite is present in appreciable amounts. Samples taken across the lode where it is 10 and 13 inches wide, at the east and west ends of the drift respectively, assayed as follows:—

Sample No.	Silver	Lead	Zinc
	Oz. per Ton	Per Cent	Per Cent
1	0.5	0.2	0.7
2	0.4	0.2	0.4

* *Geol. Surv., Canada,* Sum. Rept. 1922, p. 105.

In the central part of the drift, sphalerite and galena are abundant, and a sample taken across a width of 10 inches in a stope assayed: Silver, 8.9 oz. per ton; lead, 5.7 per cent; zinc, 11.8 per cent.

The parallel break 50 feet south of Treasure Mountain fault is in argillites. It is partly occupied by a quartz vein that ranges from a fraction of an inch to 10 inches wide. It strikes about north 75 degrees east and dips 35 to 65 degrees southward. A sample taken across the lode where it is 6 inches wide, 20 feet from the east face, assayed: Silver, 2.6 oz. per ton; lead, 2.3 per cent; zinc, 12.2 per cent.

On this property, where a fault is narrow, as is the footwall of the main break, little mineralization occurs. The hangingwall fault is wider, and some parts of it are more abundantly mineralized. Where this lode has a hangingwall of argillite, as at the ends of the drift, the lode contains only minor amounts of ore minerals, but where the hangingwall is breccia and conglomerate, as in the central part of the drift, ore minerals are abundant. Argillites comprise a minor part of the Dewdney Creek formation, and the projected extension of the lode where it crosses other formations apparently has not been prospected.

Southern No. 8 Fraction

This claim is held by record by Evan Thomas, of Princeton. It is northwest of the Eureka claim and lies across the valley of the small tributary of Sutter Creek that drains the north slope of the low part of the divide between Sutter and Amberty Creeks. This ground was originally located in the 1890's but has since been relocated under several names. Several trenches and cuts have been made, but most of them are at the edge of the creek and are almost completely filled with water and debris. A shaft on the projected continuation of the lode, reported to be 40 feet deep, is filled with water. The ground is underlain by massive and thin-bedded members of the Dewdney Creek formation. Agglomerate predominates, but black argillites are abundant near the workings.

Dumps by the creek contain abundant specimens of well-mineralized vein matter, but the veins or lodes from which this material has come are not exposed near the dumps. However, indications of old pits suggest that a lode may have been followed northeastward along the creek. Where the creek turns from this course to flow more nearly to the north, a vein 4 to 6 inches wide is exposed in the creek bed, at an elevation of 4,630 feet. It strikes north 20 degrees east and dips steeply eastward, and consists of white carbonate, coarsely crystalline galena, and minor sphalerite, chalcopyrite, quartz, and pyrite. A sample taken across the vein where it is 5 inches wide assayed: Silver, 99.4 oz. per ton; lead, 50.3 per cent; zinc, 5.0 per cent.

Seventy-five feet northeast of this showing is a shaft that is near the projected extension of the lode that may have been traced by the open-cuts along the creek shaft. Mineralization on the dump is similar to that seen on the dumps along the creek and appears to have come from a stringer zone. This shaft is probably on the Vigo (Lot 91), which adjoins the Southern No. 8 Fraction on the east.

Southwest of the creek showing, at an elevation of 4,730 feet, a cut in argillites exposes a vein composed of bedded quartz veinlets separated by laminæ of argillite. The vein strikes north 20 degrees east and dips about 50 degrees eastward. The width of quartz and laminæ is as much as 19 inches. No sulphides were seen in place, but on the dump are numerous blocks consisting largely of stibnite. A grab sample of this stibnite mineralization assayed: Gold, *nil;* silver, trace.

Bluebell

This reverted Crown-granted claim is leased by Gerald I. Burr, of Princeton. It is at the lower end of the ridge between Amberty and Sutter Creek basins, and is reached by about three-quarters of a mile of trail from the end of the road from Tulameen. The trail has a gentle grade along the top of the low divide between Amberty and Sutter Creeks and at one time was used as a wagon-road.

The property was one of the first locations in the area, and two lodes on it were explored by open-cuts and by adits. The claim is underlain by volcanic and sedimentary members of the Dewdney Creek formation that are intruded by numerous sills and some dykes. Most of the beds and sills strike northwestward and dip at steep to moderate angles southwestward. Four faults cross the claim; the two northerly ones are mineralized, and most of the exploratory work has been done on them (*see* Fig. 7).

The most northerly of the faults in places consists of one slip and elsewhere of two or more. It has a variable strike ranging between 5 degrees north of east and 20 degrees south of east; the slips dip southward between 70 and 85 degrees. Dragging of some beds at the fault suggests that the segment north of the fault may have been offset westward relative to the south segment. This mineralized fault or lode has been followed across the northern part of the claim by several open-cuts and two adits for a distance of almost 800 feet. Most of the cuts are now partly filled, but both adits are open.

The lode is well exposed at one point where a stream flows across it at 5,115 feet elevation. A quartz vein about 1 foot wide in a fault zone containing about 4 inches of gouge is separated on the north by 4 feet of argillite from a quartz stringer zone about 1 foot wide. The vein is moderately well mineralized, particularly with sphalerite, and the stringer zone is sparsely mineralized. A sample taken across the vein assayed: Silver 1.8 oz. per ton; lead, 1.1 per cent; zinc, 14.4 per cent. A sample taken across the stringer zone assayed: Silver, 2.1 oz. per ton; lead, 0.6 per cent; zinc, 1.7 per cent.

In the upper adit at 5,205 feet elevation the lode has been followed for 90 feet. The wallrock is mostly agglomerate. Several branching faults are exposed, but only two quartz lenses were seen in the drift. Each is less than 3 inches wide and continues for only a few feet. They contain some sulphides but are not of ore grade.

In the lower adit at 4,990 feet elevation a crosscut has been driven southwestward for 225 feet to the lode and 75 feet beyond it. The lode has been followed by a drift for 175 feet westward. The crosscut northeast of the lode is in conglomerate and breccia, but much of the crosscut southwest of the lode and about half the drift is in argillite.

The lode in the drift is narrow and for most of its length is marked only by about an inch of gouge. In the western part of the drift a sparsely mineralized vein accompanies the gouge. Most of the vein is about an inch wide, but in places it is as much as 6 inches wide.

In the central part of the Bluebell claim another lode can be traced by means of several open-cuts for 700 feet. It strikes west-southwestward and appears to continue on to the adjoining claim on the west. In the east it is confined to one or several closely spaced subparallel fractures, but about 300 feet east of the west boundary of the claim it branches and two lodes continue westward. The fractures in this fault lode dip steeply, some northwestward, others southeastward.

The lode is exposed in several open-cuts and two adits. For the most part it is inconspicuous because it is very narrow and in some exposures appears to be little more than a joint. Elsewhere as much as an inch of gouge is present and in places some vein matter. An offset of sills and beds of less than 10 feet to the right was noted at several points along the lode.

Quartz has been introduced along the fault, but the veins are not more than a few inches wide. Small amounts of sulphides accompany the quartz, and the wallrock near the veins is bleached. Some of the exposures are manganese-stained.

At the upper adit at 5,435 feet elevation the lode has been followed 15 feet, but in that distance it is not mineralized. At the lower adit at 5,250 feet elevation a drift has been driven 125 feet along the unmineralized fault. Agglomerate is encountered near the portal, but most of the drift is in argillite. The beds strike northward and dip about 65 degrees westward and are not much disturbed. In the fault there is about 2 inches of gouge but no mineralization. Two sills seen in the adit are offset 3 feet to the right.

The Treasure Mountain fault is not exposed on the Bluebell claim, but a belt of argillites and a prominent sill have been offset, indicating the approximate location of the fault. The approximate trace is marked by a slight draw. Two holes were drilled to test the possibility that this section of the fault might be mineralized. These were drilled northwestward from points south of the fault—one for 56 feet at −40 degrees and the other for 95 feet at −60 degrees. The holes were started close to the assumed trace of the fault and drilled toward it. The longer hole was drilled from near an outcrop of the sill shown on Figure 7, and the shorter one from a point about 75 feet to the west. According to Fred J. Garbutt, who was in charge of the drilling, some stringers of quartz were encountered, but no mineralization of interest, gouge, or shattered rock was cored.

Queen Bess

The ground previously covered by this claim is held now by record as the Tex No. 1 by Fred J. Garbutt, of Vancouver. The claim is west of the Bluebell and is on the steep slope above Amberty basin. Mineral occurrences on this claim were explored during the 1920's, when a crosscut adit was driven, but since then little work has been done.

On the eastern part of the claim a lode exposed by a few open-cuts strikes southwestward and dips northwestward. For most of its exposed length it is about 1 foot wide, but at one point several subparallel stringers form a zone 3 feet wide. The stringers consist largely of quartz, but minor amounts of sphalerite, galena, and pyrite are present. The walls are bleached, and the showings are stained dark by a coating of manganese oxides. This lode probably is the continuation of the south branch of the central lode on the Bluebell claim.

On the western part of the claim another lode is exposed by open-cuts and an adit. Directly above the adit a fault zone about 3 feet wide is exposed. It consists of several slips and contains a vein as much as 6 inches wide. The vein contains a moderate amount of sulphides, and pyrite is abundant in the walls of some of the slips. This zone strikes north 65 degrees east and dips steeply.

At 5,530 feet elevation a crosscut adit driven northward cuts this zone about 150 feet from the portal. The rock in the crosscut is massive breccia and agglomerate, but north of the fault it is thin-bedded argillite and tuff striking northward and dipping at about 95 degrees eastward. The change in rock type indicates a considerable displacement, the amount and direction of which were not determined. A dyke 3 feet wide has been intruded along the footwall of the fault which strikes north 65 degrees east and dips about 65 degrees northwest. The fault zone has been followed by a drift for 65 feet. It includes several slips, and the central part, as much as 12 inches wide, consists of lode matter and pyritized wallrock. Sphalerite and galena are abundant. A sample taken at the east face of the drift across 10 inches assayed: Silver, 7.6 oz. per ton; lead, 3.9 per cent; zinc, 15.2 per cent. Toward the west the lode splits and is less abundantly mineralized. This mineralized fault is roughly aligned with the northern branch of the central fault on the Bluebell claim, although continuity has not been established.

Indiana

This property includes the Sutter Crown-granted claim Lot 93, and one other claim near by, and is owned by Star Exploring and Mining Company, Terre Haute, Indiana, U.S.A. The claim is on the steep wooded slope, where there are few outcrops, at the head of the south fork of Sutter Creek. The country rock is tuff, breccia, and argillite of the Dewdney Creek formation.

The Sutter claim was recorded in 1895. Little work was done until 1906, when active development was started, and by 1913 several open-cuts had been made and a drift-adit had been driven about 240 feet. Since 1913 there has been no development. Numerous trenches are now sloughed and overgrown and yield little information. The lode is partly exposed for nearly 100 feet up the slope from the portal of the adit at 5,360 feet elevation.

The lode consists of several narrow stringers separated by gouge and by bleached and pyritized rock. The stringers consist of sulphides and minor amounts of quartz and carbonate. The lode strikes north 75 degrees east and dips 70 degrees southward. It is nearly 4 feet wide at the portal but is narrower to the west. A sample taken at the portal across 41 inches of the highest grade of mineralization assayed: Silver, 5.8 oz. per ton; lead, 3.6 per cent; zinc, 7.6 per cent.

The lode has been followed by a 240-foot drift westward from the portal. For most of this length it is only a few inches wide and in places only a gouge-filled slip is present. Toward the west the lode changes strike and at one point curves abruptly to strike north 60 degrees west. At this point a lens 17 inches wide contains abundant pyrrhotite in addition to other sulphides. A sample taken across the lens assayed: Silver, 8.5 oz. per ton; lead, 4.2 per cent; zinc, 5.3 per cent.

About 12 feet from the face the lode widens to 2 feet, with widths of 7 inches on the footwall and 3 inches on the hangingwall moderately well mineralized. A sample taken here assayed: Silver, 2.6 oz. per ton; lead, 1.9 per cent; zinc, 5.0 per cent.

A sample of 1,700 pounds of selected ore from this adit shipped before 1910 is reported by Camsell* to have contained 215 ounces of silver.

Three short crosscuts driven northward from the drift cut veins about parallel to the lode. These veins contain sulphides but are only a few inches wide.

This lode and a series of trenches on the course of it to the east are aligned with the northern lode on the Bluebell claim. However, the trenches are almost obliterated and sulphide mineralization is not in evidence, and continuity of the lode from the Bluebell to the Sutter claim is not demonstrated.

Summit

This old property retains the name of Summit, although much of the ground is now covered by the Evening Star claim, held by record by James K. Thomas, of Princeton. It is west of the Sutter, on the upper part of the Sutter Creek slope. The lower ground is timbered, but the upper slope is open and heather-covered.

Showings on this property were among the earliest discoveries in the camp and were explored around the beginning of the century by a series of trenches and open-cuts and a shaft. Since that time little has been done, and most of the trenches are almost filled. The ground near the showings is underlain by massive agglomerate, interbedded with thin beds of tuff and argillite.

At the shaft at 5,790 feet elevation a 15-inch lode consisting of several stringers strikes north 70 degrees east and dips 70 degrees southward. Although the stringers contain abundant sulphides, they are narrow and constitute only about half the lode, the rest being wallrock and gouge. Quartz crystals are common.

The lode can be traced westward for about 500 feet by four open-cuts. In most of these it is only a few inches wide and in places is only a gouge-filled fracture. The wallrocks are bleached. At the western end the lode is narrow and possibly branches.

About 300 feet east of the shaft a lode with a similar attitude is exposed in an open-cut that is approximately on the projected extension of the lode. It consists of narrow stringers widely separated and is as much as 3 feet wide. This occurrence suggests that the lode extends eastward at least as far as this open-cut and raises the possibility that the Summit lode is a continuation of the lode that may extend across the Bluebell and Sutter claims.

North Slope of Sutter Basin

Within about 100 feet of the projected extension of the fault on the north slope of Sutter basin there are three mineral occurrences on which work has been done. The ground is now open and at one time may have been part of the Morning Star property that extends along the ridge north of Sutter basin. The work was probably done about 1910.

* *Geol. Surv., Canada,* Sum. Rept., 1910, p. 119.

At the most westerly occurrence, at 5,330 feet elevation, a shaft has been sunk 15 feet. Thin-bedded argillite and tuff that are slightly contorted strike southeastward and dip steeply northeastward or southwestward. Some bedded quartz stringers form a zone about 3 feet wide, but no sulphides were seen in them.

At the central occurrence, at 5,070 feet elevation, an open-cut exposes a shear zone crossing agglomerate and tuff. The shear zone is about 2 feet wide, strikes northeastward and dips steeply southeastward. In it are numerous quartz stringers, each about one-eighth of an inch wide. These contain pyrite and minor amounts of sphalerite and galena.

At the most easterly of the three occurrences, at 4,600 feet elevation, two trenches expose a curving shear zone. The area is underlain by arkose. The shear zone in one trench strikes north 65 degrees east and dips steeply southward, but farther east at the second trench it strikes eastward and dips southward. The shear is about 2 feet wide and contains several veinlets. These consist largely of pyrite, sphalerite, and galena, but together they form only a minor part of the shear zone.

COPPER MOUNTAIN*

Copper

Copper Mountain (The Granby Consolidated Mining Smelting and Power Company Limited)

(49° 120° S.W.) Company office, 675 West Hastings Street, Vancouver. Julian B. Beaty, president, New York, N.Y.; L. T. Postle, vice-president and general manager, Copper Mountain; W. I. Nelson, assistant general manager, Allenby; J. A. C. Ross, mine superintendent; H. L. Armes, mill superintendent. This company operates the Copper Mountain mine at Copper Mountain, 12 miles south of Princeton. The company's steam-electric power plant in Princeton supplies power to the mine and to the concentrator at Allenby, 3½ miles south of Princeton. A branch line of the Kettle Valley Railway from Princeton serves the power plant, mine, and concentrator.

The main development of the mine is from No. 6 adit level, two vertical shafts, and an auxiliary raise. No. 1 shaft is a service shaft that extends from surface at the mine camp to the No. 6 or main haulage level. No. 2 is used to service No. 7 and No. 8 levels and is an internal shaft with the hoist on No. 5 level. An auxiliary raise connects Nos. 3, 4, 5, and 6 levels with the surface at a point 350 feet southwest of the collar of No. 1 shaft. This auxiliary raise is equipped with a manway and skipway and is used chiefly as a means of entrance into the mine for the electric cables and compressed-air pipes. All ore is passed to No. 6 level and taken from the mine in Granby-type cars, hauled by electric-trolley locomotives. After it is crushed in the coarse-crushing plant on the surface near the portal of No. 6 level, the ore is hauled 8 miles by rail to the concentrator at Allenby.

Two new entrances to the mine were made in 1952. These are the No. 3 shaft and the 4-260 service raise. No. 3 shaft is inclined at 45 degrees and was raised 1,026 feet from No. 6 level to the surface near the camp mess-house. Permanent timbering was completed from the surface down to No. 4 level at the year-end, and the shaft-house, head-frame ramp, and hoist foundations were installed. The 4-260 service raise was completed and equipped with a ladderway, skipway, and compressed-air pipe-line. This new raise completes a system of service raises extending from No. 6 level to the surface and provides access to the new development at the east and north ends of the main mine workings where underground exploration and development is now concentrated. The top of the 4-260 raise, at an elevation of 4,130 feet, is 1,340 feet northeasterly from No. 1 shaft and is at the approximate elevation of the old No. 1 level. The exploratory drift on No. 6 level, which was started from the extreme south end of the mine in 1951, was driven another 290 feet, making a total of 490 feet, and this development was then

* By E. R. Hughes.

discontinued. Substantial additions were made to ore reserves as the result of exploratory work done during the year.

One of the most outstanding developments of the year was the commencement of open-pit mining. No. 1 open pit is between the Princess May glory-holes and the main highway through the camp. Preliminary work is being done on two other surface deposits. Stripping was started in May on an experimental basis, and the results achieved were sufficiently satisfactory that this type of mining has become an established part of the operation. The maximum production from open-pit mining reached 1,000 tons daily. The broken ore is loaded by power-shovel on to trucks and hauled to the Princess May glory-holes, where it is dumped. The ore is then transported on No. 6 level to the crusher. To facilitate the handling of surface ore, a new storage bin on the hillside adjacent to the crusher is being cut in the solid rock and will have a storage capacity of 20,000 tons. At the end of 1952, roads were being built from the various open pits to the new bin.

A new adit, known as the Wolf Creek tunnel, was started early in 1952 west of Wolf Creek and about 1½ miles southeasterly from the No. 1 shaft. This adit is for exploratory purposes and was advanced 697 feet in a westerly direction. It is proposed to drive this heading 1,500 feet and carry out an extensive diamond-drilling programme to test a mineralized zone located by surface drilling in 1951.

Compressed air for the mine is supplied by three Ingersoll-Rand compressors and one Sullivan compressor, the four units having a total capacity of 8,600 cubic feet of air per minute. The drilling-machines used at the open-pit operations are supplied with compressed air from the mine compressors. A Canadian Ingersoll-Rand portable compressor is used at the Wolf Creek tunnel.

During the latter part of 1952, experiments were carried out using rock-drills fitted with extension drill-steel and tungsten-carbide bits for drilling blast-holes up to 100 feet in length, and averaging 70 feet. For this purpose 3½-inch-diameter leyner machines were used in conjunction with Gardner-Denver alloy extension drill steel and using Timken and Canadian Ingersoll-Rand tungsten-carbide bits. At the year-end, plans were being made to replace all diamond-drill blast-hole machines with this type of equipment. Twenty-seven jackleg machines and nineteen Holman Silver Bullet stoping-machines, all using tungsten-carbide tipped steel, were used in development and in breaking ore. Because of the more friable nature of the ground now being mined, most of the slusher-drifts are reinforced with a concrete lining. Ventilation raises, equipped with auxiliary fans, provide each slusher unit with fresh air. Diamond drilling during the year comprised 97,819 feet of exploratory and 421,134 feet of blast-hole drilling.

Additions to equipment included two Eimco compressed-air locomotives, each with a 3-ton automatic dump car. This equipment was found to be advantageous in development work. A new high-pressure 100-horsepower electric pump was purchased as a replacement for pumping water from the Similkameen River to the mine camp at Copper Mountain. This new pump was being installed at the end of the year. A new machine-shop was built at the mine camp. There were no additions to the living accommodation.

Safety committees make regular tours of inspection of all surface and underground workings, and their recommendations are discussed at subsequent meetings. The company employs a safety engineer. An innovation during 1952 was the starting of a system of merits and demerits for shiftbosses, whereby each shiftboss is credited or penalized for conditions found in the part of the mine under his jurisdiction. Financial awards are made each month to the shiftbosses with top ratings. This system has no doubt been partly responsible for the improvement noted in the company's frequency rating for accidents involving over six shifts of lost time; for 1952 this was 0.12 per thousand man-shifts worked. An emergency hospital with the customary equipment and supplies, including a supply of blood plasma, is maintained at the camp. A trained nurse and industrial first-aid attendants are available at all times. Aluminium-dust therapy is available for employees. A doctor visits the Copper Mountain camp twice a week and is available in emergencies. An ambulance is maintained for transporting sick or injured persons to the Princeton General Hospital, 12 miles from the mine. Two trained mine-rescue teams competed in the Similkameen Valley Mine Safety Association's annual competition held in Princeton on June 21st.

The mine was operated continuously throughout 1952. In order to cut production costs, most long-term development work was curtailed near the end of the year; thus while the underground crew at the beginning of the year was 470, in December it had been reduced to 368. For the whole year the crew at Copper Mountain averaged 560, with 431 employed underground. The total crew at the Copper Mountain, Allenby, and Princeton operations was 853 at the end of 1952. The average daily production of ore shipped from the mine was 4,895 tons on 358 days. The total ore milled was 1,751,703 tons, having an average grade of 0.889 per cent copper.

JELLICOE*

Gold-Silver-Copper-Lead-Zinc

Lucky Strike (Siwash Development Co. Ltd.) (49° 120° N.E.) Company office, c/o Norman Littlewood, Princeton Hotel Block, Harold Avenue, Princeton. Capital: 10,000 shares, $1 par value. E. Mullin, president; W. Lore, mine manager. This company was formed in 1952 and owns the Siwash group, which is a relocation of part of the Snowstorm group and consists of the Lucky Strike, Diamond, Blue Grouse, Judy, Rain Fraction, Raft Fraction, Camp Robber Fraction, and Raven Fraction mineral claims on Siwash Creek, about 8 miles by road from Jellicoe on the Kettle Valley Railway, and about 34 miles by road northeasterly from Princeton. Development in 1952 was confined to the Lucky Strike and Diamond claims. From the intersection of the No. 1 and No. 2 adits on the west side of Siwash Creek the adit was driven 50 feet, making a total distance of 215 feet from the portal of No. 1 adit to the face. Drifting was done on the vein, which ranged from 10 to 20 inches of siliceous material containing gold, silver, copper, and zinc. About 550 feet downstream on the east side of the creek a new adit was started and was driven 30 feet eastward on a vein 9 feet wide mineralized with sphalerite.

Two miles of new road was built and other parts widened so that it is now possible to drive a truck or jeep over the rough road to the property. An old Gardner compressor, belt-driven from a six-cylinder Chevrolet gasoline engine, supplied compressed air, and mining was done with a Copco jackleg machine. No ore was shipped, and that which was mined was stored at the property. A crew of from two to four men worked during week-ends and holidays in the summer and fall months.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1925, p. 210; 1927, p. 247; 1928, p. 264; 1929, p. 277; 1951, p. 130. *Geol. Surv., Canada,* Mem. 243, pp. 108–109.]

HEDLEY*

Silver-Lead-Zinc-Gold

Iota (Hedley Yuniman Gold Fields Limited) (49° 120° S.E.) Company office, 45 Kingsway, Vancouver. J. W. Gallagher, president. The Iota property is on Stemwinder Mountain, about 3 miles northwest of Hedley. Underground work was confined to extending the adit started in 1951 to a length of 424 feet from the portal. A Canadian Ingersoll-Rand double-drum slusher-hoist with a 30-inch scraper was used to scrape the muck from the face on to a loading ramp, from where the muck was hand-trammed in a mine car to the portal. A 210-cubic-foot-capacity Schramm portable compressor supplied compressed air, and a Copco jack-leg machine was used for drilling. Two men were employed. No ore was

* By E. R. Hughes.

shipped. Operations were suspended on November 10th and had not been resumed at the end of the year.

Gold

Nickel Plate and French (Kelowna Mines Hedley Limited)

(49° 120° S.E.) Company office, Room 2630, 630 Fifth Avenue, New York 20, N.Y.; British Columbia office, 640 West Pender Street, Vancouver; mine office, Hedley. George L. Mill, manager; E. W. Johnson, mill superintendent; J. Biggs, mechanical superintendent. This is a private company operating the Nickel Plate mine and the French mine at Hedley.

Nickel Plate Mine.—C. T. Williams, mine superintendent; P. C. B. Emery, chief engineer; R. E. C. Richards, mine captain. Full descriptions of the operation have appeared in previous Annual Reports. The 4150 winze was equipped for handling men and material, and three stations were established at elevations of 4,050 feet, 3,950 feet, and 3,850 feet. A connection was made between the bottom of the winze, elevation 3,810 feet, and the 3710 raise in the old Mascot mine; this connection provides ventilation and drainage facilities for the lowest workings of the Nickel Plate. There were no major additions to plant or equipment at the mine, and there were no major underground developments.

Mining is done with Copco and Gardner-Denver drilling-machines using Copco steel and Timken and Craig bits, the type of machine and bits used depending on the type of work to be done and the hardness of the ground to be drilled. A new departure in drilling practice was the use of leyner machines to drill long holes for ring blasting in the stope area between the main adit and the surface glory-holes. The maximum length of hole drilled was about 60 feet, the average being about 40 feet. Total development consisted of 4,069 feet of drifting, raising, and crosscutting, of which 3,028 feet was done in the Dickson or Nickel Plate section and the remainder was distributed throughout other parts of the mine. Diamond drilling amounted to 11,472 feet, of which 10,095 feet was exploratory and the remainder was for stope preparation. At the end of the year 233 men were employed, of whom 110 worked underground.

The percentage production of ore from the main parts of the mine was: Nickel Plate, 69.6 per cent; Morning, 16.9 per cent; Sunnyside, 11.3 per cent; and Bulldog, 2.2 per cent. Production: Ore milled, 120,786 tons.

Hedley Mill.—The ore from the Nickel Plate mine is transported by the surface tramway to the company's mill at Hedley for treatment. The mill operated throughout the year at its rated capacity of 350 tons daily. Because of the company's inability to dispose of its arsenical concentrates following the expiry of its contract with the Tacoma smelter, it was necessary to revise the mill flow-sheet in order to eliminate the arsenic and produce a concentrate satisfactory for outside marketing. Investigations indicated that a complete revision of the basic flow-sheet in use since 1934 would be necessary in order to arrive at the optimum extraction. These major changes to the mill were made during the last few months of 1952 and involved a capital expenditure of $30,000. As the result of this revision, all gold recovery (after January 12th, 1953) will be in the form of a cyanide precipitate which will be refined subsequently to bullion. The precipitate has been shipped to the United States for refining.

French Mine.—Brian T. Stephens, mine foreman. This mine is on the Oregon claim, about 8 miles by road from Hedley, and 1½ miles east of the Hedley–Nickel Plate road. As far as is known at present the ore occurs in a shallow deposit. The mine was developed from an adit at an elevation of 3,910 feet, with two open stopes, one on each side of the adit, and the broken ore was scraped from the underground workings along the adit to a storage bin outside the portal. As mining progressed, the two stopes were connected, and it was found that the faces had advanced too far from the portal to permit economical transportation by scraping alone; consequently in 1952 a new adit, 120 feet long, was made about 300 feet east of the original portal and at an elevation of 3,917 feet. At the face of the new adit an ore-pass was raised to connect with the south end of the stopes. The broken ore is scraped into the new ore-pocket and from there is hand-trammed to the outside storage bin.

A small crushing and sampling plant is installed at the mine. A 500-cubic-foot Holman belt-driven air compressor powered by a 100-horsepower General Electric motor provides compressed air for the mine. Electrical power is obtained from the West Kootenay Power and Light Company Limited. Ore mined at the rate of 30 to 40 tons per day was trucked to the company's mill at Hedley for treatment. Diamond drilling amounted to 1,091 feet, all of which was done from the surface. Six men were employed. Operations were suspended on December 20th for the winter. Production: 6,753 tons during the production period from April 24th to December 18th.

PENTICTON*

Gold-Silver-Lead-Zinc-Copper

Okanagan

(49° 119° S.W.) This mine is on the east shore of Okanagan Lake, approximately 1 mile northeast of Penticton city hall. It is an old property, including the Okanagan Crown-granted claim, on which work has been done intermittently for about fifty years. The workings consist of an adit driven eastward about 90 feet from the lake-shore and a shaft 100 feet deep sunk from the adit level. On the 100-foot level, workings extend east and west. In the summer of 1952 W. J. Armstrong, K. Armstrong, and J. Trombley unwatered the shaft and cleaned out the workings. Six tons of ore was mined from the lower level and shipped to the Trail smelter.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1918, p. 211, under the heading of " Torpedo "; and 1934, p. D 33, under the heading of " Lakeside Mines Ltd."]

FAIRVIEW CAMP*

Silica-Gold

Fairview (The Consolidated Mining and Smelting Company of Canada, Limited)

(49° 119° S.W.) G. E. Clayton, mine superintendent. This mine is about 5 miles west of Oliver. No. 6 is the haulage level, and mining is done from two shrinkage stopes, one between No. 6 and No. 5 levels, and the other above No. 5 level. No. 6 level was driven westward on the vein 250 feet, and at the end of the year was approximately 3,000 feet long. Electrical power is obtained from the West Kootenay Power and Light Company Limited. Quartz is mined and is shipped to Trail for use as flux in the smelter. The quartz contains a small amount of gold and other metals. Nine men were employed underground and five on the surface. Operations were continuous throughout the year, with an average production of 1,500 tons per month.

BEAVERDELL*

Silver-Lead-Zinc-Cadmium

Highland-Bell Limited

(49° 119° S.E.) Company office, 844 West Hastings Street, Vancouver; mine office, Beaverdell. K. J. Springer, president; D. F. Kidd, director and consulting geologist; O. S. Perry, mine manager; F. Tinsley, mine foreman; G. W. West, mine engineer; P. R. Clarke, mill superintendent. The Highland-Bell mine on Wallace Mountain is 4 miles by road east of the main camp at Beaverdell. No. 4 adit, at 3,976 feet elevation, is the main haulage level. Compressors, power plant, and steel-shop are at the portal of No. 4 level. The 34-degree main winze connects No. 4 level with No. 7 and No. 8 levels.

* By E. R. Hughes.

A second winze connects No. 8 level with No. 10 level. Most of the ore mined in 1952 came from the No. 7 level workings.

The mine was closed because of a strike of employees during May, June, and July, and operations were not resumed until September 8th. Between the end of the strike and the resumption of underground work a new 1,350-cubic-foot-capacity Inglis air compressor was installed at the surface, and a 6-inch air-line was laid in the main adit. Normal operations were continued after September 8th until December 1st, when a mechanical breakdown at the mine forced a suspension of mining until December 23rd. There were no other major additions to plant or equipment, and there were no major underground developments.

The ore from the mine is trucked down the mountain to the company's 50-ton mill, which is adjacent to a spur of the Canadian Pacific Railway at Beaverdell. During the autumn months, rock from old mine dumps was trucked to the mill for treatment. The company dwellings, office, bunk-house, staff-house, community hall, curling rink, and mess-hall are in the valley bottom near the West Kettle River at Beaverdell. On the average, forty-seven men were employed, of whom twenty worked underground.

Silver-Lead-Zinc

Wellington (Silver Bounty Mines Limited)

(49° 119° S.E.) Company office, 208 Pacific Building, 744 West Hastings Street, Vancouver. G. S. Eldridge, president; John Broatch, manager; G. A. Day, mine superintendent. This mine is on Wallace Mountain, near Beaverdell. No. 5 level, at 3,506 feet elevation, is the main haulage adit, and a winze connects this level with Nos. 6, 7, and 8 levels. A crew of from five to six men was employed during the first seven months of the year, and about 130 tons of ore was mined from a stope between the No. 8 and No. 7 levels. This ore was trucked to the Trail smelter. The mine was closed on August 15th.

On November 15th E. Wanke, O. Johnson, and J. S. Kleman, all of Greenwood, obtained a lease, and at the end of the year were employed in mining remnants of ore from various parts of the mine. No ore was shipped before the end of 1952.

ROCK CREEK*

Silver-Lead-Zinc

Crown Point (Caladian Mines Ltd.)

(49° 119° S.E.) This property, comprising the Crown Point Crown-granted claim and fourteen recorded claims, is on James Creek about 3 miles by road west of the Rock Creek–Beaverdell road, 8 miles north of Rock Creek. In 1952 arrangements were made by Caladian Mines Ltd. (W. W. Geminder, president) to purchase the claims from the owner, G. E. White, of Oliver. The Crown Point is an old property on which work has been done intermittently since 1897. During the summer and autumn months three men were employed on surface work, and a car of ore was mined from the open pit and shipped to the Trail smelter. After cleaning out part of the old underground workings, operations were suspended for the winter.

[References: *Minister of Mines, B.C.*; Ann. Rept., 1897, p. 596; 1900, p. 897; 1905, p. 181; 1921, p. 184; 1949, p. 148.]

Emeline

(49° 118° S.W.) This Crown-granted claim is on the east side of the Kettle River, 4 miles by road north of Rock Creek. It is under agreement of sale to Thomas Bingham, of Trail. A 6- by 7-foot shaft was sunk 30 feet from the surface in an endeavour to reach the vein previously worked on the adjoining Imperial claim. The vein was not found in the shaft. Gus Johnson was in charge of the work, most of which he did himself.

* By E. R. Hughes.

LIGHTNING PEAK*

Silver-Lead-Zinc

Waterloo, Dictator (Paycheck Mining and Development Company Limited) (49° 118° N.E.) Company office, 302 Baker Street, Nelson. H. A. McKen, managing director. Capital: 4,000,000 shares, no par value. This private company controls the principal mineral discoveries in the Lightning Peak area, including such old groups as the Waterloo, Dictator, Rampalo, and Pay Day. The Waterloo camp, used as the base of operations, is 18.5 miles by rough road from Inonoaklin Crossing on the Monashee Highway. Most of the claims lie between the headwaters of Rendell Creek and Granby River on a plateau terrain with an average elevation of 5,900 feet.

Due to the closing of the Monashee Highway, operations were at a standstill from November, 1951, to June, 1952. Mill construction, which began in 1951 about 1,000 feet north of the Waterloo workings, was then carried forward, and by November the 75-ton mill was ready for tune up. The main mill machinery consisted of a 9- by 16-inch jaw crusher, 24- by 24-inch rolls, 5- by 5-foot ball mill, classifier, six lead cells, and air-agitated zinc cells built on the site. Two jigs are also included in the circuit. Power is supplied by a 250-horsepower diesel driving a 150-kva. generator. Mill construction was supervised by G. Kvist. The number of men employed averaged fourteen. Because of water shortage the mill did not operate, but the ore-bins were filled with dump ore from the Waterloo workings. Operations then ceased for the year.

GREENWOOD†

Gold-Silver-Lead-Zinc

Providence (49° 118° S.W.) W. Madden, owner. This mine is 1½ miles north of Greenwood and has been worked intermittently for more than fifty years. During 1952 work was done by lessees in different parts of the mine. Leo Madden, Mark Madden, and Gwyn Jones did some exploratory and development work in the No. 2 shaft workings. The raise started in 1951 on the 600-foot level at a point 320 feet southerly from No. 2 shaft was driven to 125 feet above the level, and drifting was started to the north and south on a narrow vein. No ore was shipped.

E. Wanke and O. Johnson made two small shipments, totalling 14 tons, from the workings in the inclined shaft about 150 feet northerly from the old No. 1 shaft. Eighty-five feet from the surface the inclined shaft was connected to an old stope in the old No. 1 shaft workings.

Silver-Zinc-Lead

Dynamo (49° 118° S.W.) This property at the south end of the City of Greenwood is owned by a syndicate represented by J. McDonell and M. M. Butorac. The adit on the Mamont claim, which was driven to 255 feet in 1951, was not extended in 1952. Seventy-five feet down the hill another adit was started for the purpose of reaching the extension of the vein found in the underhand stope in the level above. The new adit was driven 50 feet. No ore was shipped. Two men were employed.

Phoenix Camp (49° 118° S.W.)

Copper-Gold

Stemwinder (Columbia Copperfield Mines Ltd.) Samuel Ciglen, president; E. H. Kellner, vice-president; F. L. James, manager; A. F. Roberts, resident engineer. This company is a reorganization of the Brooklyn-Stemwinder Gold Mines Limited. The Stemwinder mine was closed in November, 1949, and was reopened by the present company in July, 1952. The workings were unwatered and rehabilitated, and 2,000 feet of exploratory

* By J. W. Peck.
† By E. R. Hughes.

diamond drilling was done. Other development work included 150 feet of drifting on No. 2 level and 250 feet of raising, including the making of a second connection from No. 2 level to No. 1 level. No ore was shipped. Twelve men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1949, p. 149.]

Attwood Copper Mines Limited Company office, 330 Bay Street, Toronto; British Columbia office, 844 West Hastings Street, Vancouver. D. F. Kidd, president. This company controls a large block of ground in the Greenwood district, including the old Granby holdings in Phoenix. A small crew under the direction of R. H. Seraphim continued the programme of geological work and diamond drilling that was started in 1951.

EHOLT (49° 118° S.W.)

Zinc-Lead

Silver Chief (Silver Chief Mines) Leo Madden, manager. This property, consisting of the Silver Chief and Cyclops claims, is half a mile southerly from the old B.C. Junction between Greenwood and Grand Forks. The claims are owned by W. Cudworth and W. Trombley, and arrangements were made to develop the property by Greenwood interests, under the registered name of Silver Chief Mines. About 1,600 feet of diamond drilling was done in 1950, and several thousand tons of predominantly zinc ore was then indicated. In July, 1952, a six-man crew started doing underground work and erecting surface buildings. An adit level was driven 130 feet in a southerly direction. At a point 100 feet from the portal a raise was driven 18 feet to connect with the bottom of an old shallow shaft. From this development work, 285 tons of ore was mined and trucked to the Providence mill at Greenwood for treatment. Owing to difficulties concerning disposal of the concentrates, it was decided to discontinue further development until satisfactory arrangements could be made for smelter treatment, and so underground work was stopped in October. The vein ranged from 2 to 12 feet in width, and the ore milled averaged 5.9 per cent zinc, with a small content of lead.

CORYELL*

Silver-Lead-Zinc

W.S. (Cascade Lode Mines Limited) (49° 118° S.E.) Registered office, 913 Vancouver Block, 736 Granville Street, Vancouver. C. J. L. Lawrence, president; Leo H. Bettin, manager; R. E. Renshaw, geologist. This property in Burnt Basin consists of the W.S. group of eight claims and the P.V. group of four claims. The main workings on the W.S. are about 1 mile northwest of Coryell, a flag-stop on the railway, 8 miles northeast of Christina Lake on the McRae Creek road. A syndicate of Powell River men did some work on the property in 1952, and on December 4th Cascade Lode Mines Limited was incorporated to take over the property. About 1,500 feet of new road was built between the McRae Creek road and the lower W.S. tunnel, so that it is now possible to drive a car to the portal. This lower adit is 400 feet long in a northwesterly direction and has two short crosscuts driven to the southwest and one to the northeast. Near the face of the adit is a winze 15 feet deep and a 20-foot raise from which some stoping has been done. The adit was cleaned out and track laid to the face. The raise was retimbered and a chute was built in preparation for further development. Galena and sphalerite in narrow bands are visible in several places in the adit. The equipment at the mine includes a Le Roi 105-cubic-foot air compressor and a Copco drilling-machine. On the P.V. group some pits were cleaned out and the trail to the claims was slashed out. A crew of from two to six men was employed. No ore was shipped.

* By E. R. Hughes.

ROSSLAND*

Gold-Copper

Velvet

(49° 117° S.W.) This old gold producer is on the Cascade Highway 13 miles west of Rossland. The mine is owned by H. F. Kenward, of Vancouver, and W. W. Sweet, of Seattle, Wash., but the mill machinery has been purchased by Hamil Silver-Lead Mines, Limited. The mine has been idle since 1942, except for some diamond drilling in 1946. In 1952 J. C. Urquhart, H. W. Lefevre, and R. Lefevre obtained a lease and commenced surface mining on remnants of ore where the vein outcrops about 150 feet south of the shaft. As the ore contains copper as well as gold, shipments were made to the Tacoma smelter. A small shipment was also made to the Trail smelter from a clean-up in the old mill building.

The heavy mill machinery remained on the property after it had been removed from the mill building in 1951 by Hamil Silver-Lead Mines, Limited. Late in 1952 the lessees obtained the Towser mill machinery from the Silver Cup mine at Ferguson, and most items, except the 5-foot by 22-inch cone-type ball mill, had been transported to the Velvet by December.

A sublease was given to A. Kraft and A. MacDonald, of Ymir. A small tumble-screen was erected below the mill with the intention of washing all the old wood refuse. About 25 tons of concentrate was obtained but was not shipped by the sublessees because the grade was disappointing.

Gold

Midnight and I.X.L. (Kootenay Central Mines Limited)

(49° 117° S.W.) This company, which owns the Midnight and I.X.L. mines 1 mile south of Rossland, has remained inactive since 1949. Leasing operations, however, have since been carried out intermittently under the direction of J. Gill, who lives on the property. During 1952 small shipments were made to the Trail smelter, most of the ore being obtained from the footwall vein in the Midnight mine. Underhand stoping was done on the adit level 50 feet north of the main winze, approximately 300 feet from the portal.

Gold-Silver-Lead-Zinc

Bluebird (Rossland Mining Co. Ltd.)

(49° 117° S.W.) Company office, 1408 Royal Bank Building, Vancouver; mine office, Rossland. V. McDowall, manager. Capital: 3,000,000 shares, no par value. This company was formed to develop the holdings of Rossland Mines Limited in the South Belt, adjacent to Rossland. Work was done in 1950 and 1951 by the L.B.B. mining partnership, and the development programme of this partnership was accelerated by the new company.

All work in 1952 was done in the Bluebird workings. In 1951 an old adit at an approximate elevation of 3,000 feet had been extended to investigate an orebody explored in 1950 and 1951 by a shaft 50 feet deep. At 400 feet from the portal the adit reached the downward projection of this orebody, approximately 70 feet below the bottom of the shaft, and encountered a lead-zinc mineralized zone as much as 20 feet wide. During 1952 this zone was further explored by three short crosscuts to the north at 290, 430, and 450 feet respectively from the portal. At 530 feet from the portal a raise was driven in the ore zone to break through to surface 50 feet west of the shaft headframe. The adit was also driven westerly a total distance of 790 feet from the portal. Twenty diamond-drill holes, from 12 to 164 feet long, were drilled at intervals along the length of the adit. At 100 feet from the portal a crosscut to the south leads to an old, nearly vertical shaft; this was explored and surveyed.

* By J. W. Peck.

A new adit, No. 2, was collared 210 feet to the southeast and 100 feet lower than No. 1. This was driven northwestward for 880 feet to reach the downward projection of the ore zone in No. 1 adit, but no similar mineralization was encountered, and diamond drilling in this area was also disappointing. Some mineralization was found in drilling to the north, and in November a drive to investigate it was started 770 feet from the portal. At 120 feet from the portal, another ore zone, lying about 30 feet north of and parallel to the main drift, was investigated by 280 feet of drifting and crosscutting. The drift on this zone also connects with the main drift at 320 feet from the portal. The orebody was vein-like, about 2 feet wide, and diamond drilling below No. 2 level was encouraging enough for the sinking of a two-compartment winze. This winze had reached a depth of 90 feet by the end of 1952. Thirty-four diamond-drill holes from 32 to 209 feet long were drilled from No. 2 adit. At 470 feet from the portal the adit also intersected the old shaft which, although filled with debris below the level, was not suspected to be much deeper.

On the surface near the No. 2 portal a compressor-house, repair-shop, change-house, and explosives' magazine were built. No living quarters were built as the mine is only 1 mile from Rossland. A maximum of twenty-two men was employed during the first half of the year, but the number had dropped to six by November.

Union

(49° 117° S.W.) This property, 3 miles north of Rossland, is owned by M. Gach and H. Persson, of Rossland, but was operated under lease by J. Densky, A. Nelson, J. Gach, and S. Martin, of Rossland and Trail. It is an old claim, Crown-granted in 1896, from which the latest records of shipments were in 1937 and 1946. Two small shipments totalling 9 tons were trucked to the Trail smelter in July and October, 1952.

Silver-Lead-Zinc

Sunset

(49° 117° S.E.) This Crown-granted claim lies just north of the International Boundary, about one-half mile by rough road west of Paterson. It is owned by Warren Crowe, of Waneta. The workings range in elevation between 2,550 and 2,800 feet. They consist of a few open-cuts and one 30-foot adit, which investigate east-west fractures in argillite near the contact with Rossland volcanics. The lead-zinc mineralization in these fractures, where seen, decreased sharply within a few feet from the contact. In the adit, which is the lowest working, mineralization is 1 foot wide for a distance of 20 feet from the portal, but the fracture is then faulted and is tight for the remaining 10 feet to the face. At the portal a dyke 30 inches wide is at right angles to the bedding. At the uppermost workings an open-cut made many years ago near the contact with the volcanic formation probably encountered similar mineralization. Very little mineralization could be observed when the property was visited in November, but the dump contained high-grade samples of galena and sphalerite. The owner, Mr. Crowe, built a road to this dump during the summer, hand-sorted the best ore, and made a shipment to the Trail smelter. This shipment weighed 3,070 pounds and assayed: Gold, trace; silver, 12.8 oz.; lead, 37.5 per cent; zinc, 3.8 per cent.

NELSON*

Eagle Creek (49° 117° S.E.)

Silver-Lead-Zinc

Kenville Base Metals Concentrator (Emerald Glacier Mines Limited)

Company office, 1408 Royal Bank Building, Vancouver; mine office, Box 390, Nelson. G. Blaney, mill superintendent. This concentrator is located at the Granite Poorman mine, 7 miles by road west of Nelson. It was purchased in 1952 from Kenville Gold Mines, Limited. The mill had been converted from a cyanide gold mill in 1949 and enlarged in 1951 to handle 200 tons per day of silver-lead-zine ore. The concentrator operated intermittently throughout 1952 treating custom ore as well as Emerald Glacier ore.

* By J. W. Peck.

Ore milled: Emerald Glacier, 2,908 tons; New Jerusalem of Ainslo Mining Company Limited, 246 tons; Black Fox of Ainsworth Base Metals, Limited, 177 tons; Moonshine of B.C. Metal Mines Ltd., 38 tons; Caledonia of G. E. McCready, 60 tons; Goodenough of Pacific Mining Services Limited, 732 tons; Scranton Mines Limited, 474 tons.

Hall Creek (49° 117° S.E.)

Gold

Sun Fraction

This property is owned by W. Rozan, J. Haines, J. Morrison, N. E. Morrison, and R. Gauthier, of Nelson. It is on the summit between Fortynine and Hall Creeks and is reached by 15 miles of road from Nelson up Fortynine Creek. After ceasing work for the winter, W. Rozan and R. Gauthier returned after the snow had gone and continued their development of a quartz vein. The lower adit was extended as a drift on the vein to a total length of more than 310 feet from the portal. Between 190 and 210 feet from the portal the vein was 1 foot wide and a stope was carried up for 28 feet until the vein pinched. Some underhand stoping to a depth of 6 feet was also done in this section, producing a total of 16 tons for shipment. No stoping was done beyond this point because the vein was not encouraging, but when the property was visited in October, the vein between 300 and 310 feet from the portal had widened to 16 inches and contained soft sulphides. Two samples taken here, 8 feet apart, gave assays of: Gold, 3.90 and 1.70 oz. per ton; silver, 0.5 and 0.2 oz. per ton, respectively. The partners also worked in the upper adit removing available ore amounting to 12 tons. This latter shipment was reported to be the better grade. Machinery consisted of a Gardner-Denver 105-cubic-feet-per-minute compressor. The ore was moved from the mine by wheelbarrow and then trucked to the Trail smelter.

Production: Ore shipped, 28 tons. Gross content: Gold, 26 oz.; silver, 22 oz.; lead, 386 lb.; zinc, 111 lb.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, p. 136.]

YMIR*

Gold-Silver-Lead-Zinc

Goodenough (Protection)

(49° 117° S.E.) This mine, on the north slope of Ymir Creek valley 5½ miles by road from Ymir, is owned by J. Turk and F. Patula, of Ymir. It was optioned in November, 1951, by Pacific Mining Services Limited (company office, 640 West Pender Street, Vancouver), but this company dropped its option in March, 1952, after stoping about 800 tons in a known ore section above No. 3 level, about 1,700 feet from the portal. This ore was milled at the Kenville mill at Nelson, and the concentrates trucked to the Trail smelter.

After the property reverted to its owners, the partners made use of the air-line and track installed by Pacific Mining Services Limited. A portable compressor was obtained, and the former hand-steel methods abandoned. Ore mined was trucked to the Trail smelter, but late in the year it was necessary to stock-pile because of curtailment of operations at the smelter.

Yankee Girl, Dundee (Yankee Dundee Mines Limited)

(49° 117° S.E.) Company office, Suite 207, 445 Richards Street, Vancouver. A. B. Goodridge, president; L. Belliveau, vice-president; Ralph A. Sostad, managing director. Capital: 4,000,000 shares, 50 cents par value. This company was formed late in 1952 to develop the Yankee Girl and Dundee mines east of Ymir. The company plans to extend the Wildhorse Creek adit to the projected position of the Yankee Girl vein system, 765 feet vertically below the 1235 level of the old Yankee Girl mine. This adit was driven in 1928 and 1929 for

* By J. W. Peck.

a length of about 3,000 feet, with an estimated 1,800 feet still to be driven to reach the objective. No work was done in 1952.

[References: *Minister of Mines, B.C.,* Ann. Repts., 1928, pp. 327–330; 1929, p. 349.]

Dewey.—(49° 117° S.E.) This claim, reverted to the Crown in 1948, was under lease in 1952 to S. Nelson and H. Erickson. Thirteen tons was shipped to the Trail smelter.

Zinc

Jack Pot, Oxide, Last Chance (New Jersey Zinc Explorations Limited)

(49° 117° S.E.) Company office, 714, 525 Seymour Street, Vancouver. R. C. Macdonald, manager. This company owns a group of claims extending northerly from the summit between Hidden and Porcupine Creeks to the summit between Oscar and Ymir Creeks. The main showings are reached by roads branching from the Porcupine Creek road. The underground and surface development programme at the Jack Pot, intensified in 1951, was halted at the end of that year, and no work other than diamond drilling for purposes of assessment was done during 1952. This amounted to 888 feet in one hole. Late in the year a small crew was engaged to advance the Ox 4 adit on the Oxide group. In 1950 this adit was collared 500 feet vertically below and 1,130 feet south 15 degrees east of the "International" portal, and was driven for a short period in 1951 until running silt was encountered about 400 feet from the portal. In 1952 a branch was started at 292 feet from the portal and driven due north. By the end of December the face of the branch was 390 feet from the portal and about 30 feet east of the face of the caved heading. Close timbering was necessary.

On the Last Chance property, open-cuts were made by bulldozer as assessment work on one group of claims.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1951, pp. 136–137.]

Tungsten

Stewart (Arrow Tungsten Mines Limited)

(49° 117° S.E.) Head office, Room 1008, 330 Bay Street, Toronto; British Columbia office, c/o W. A. Sutton, 900 West Pender Street, Vancouver. S. A. Perry, president. Capital: 3,000,000 shares, $1 par value. This company was formed in 1951 to develop the Scheelite and N.H. groups of claims on Stewart Creek, 4 miles by road from Porto Rico on the Nelson–Nelway Highway. The property was at one time known as the Stewart. The adit, started in 1951 on a narrow band of skarn, was driven in a southerly direction for a total length of 460 feet. The skarn band, containing spotty scheelite and powellite, was followed for 205 feet, when it became indistinguishable. The country rock is an argillaceous quartzite with the inner 180 feet of the adit in quartzite. The first 25 feet of adit is timbered. At 190 feet from the portal a raise was started to a 20-foot adit, 90 feet above, but although the raise was reported to be within a few feet of breaking through, it is not known if a connection was made. Diamond drilling was done at intervals along the adit at right angles to it; three holes were drilled to the east and seven to the west, but no mineralization was reported to have been encountered. Operations ceased in March, 1952, and all equipment was removed from the property.

SALMO*

Erie Creek (49° 117° S.E.)

Gold-Silver-Lead-Zinc

Arlington (New Arlington Mines Limited)

Company office, 609 Baker Street, Nelson. J. A. Russell, president; A. Shrieves, secretary-treasurer and manager; A. Lakes, consulting engineer. Capital: 3,500,000 shares, $1 par value. This company was formed in December, 1951, to develop the Arlington mine on Rest Creek, 7 miles by road from Salmo. The small mill built by the former owners was operated chiefly on ore obtained from the old dumps. A small development crew was employed underground, and 100 tons was mined and milled. A bulk concentrate was made and was trucked to the Trail smelter.

On the surface a new cookhouse-bunkhouse building was erected. The only additional equipment was a new diesel-driven Ingersoll-Rand compressor to supply air to the mine. The property was operated on a reduced scale in the latter half of the year, but in December a development crew was engaged to advance an old adit about 130 feet below the 80 level. This adit had been extended from 200 feet to 350 feet in length by the end of 1952. During the first half of 1952 as many as twenty men were employed, but the crew had been reduced to six by the end of the year.

Sheep Creek (49° 117° S.E.)

Gold

Sheep Creek Gold Mines Limited

Company office, c/o Robertson, Douglas & Symes, Bank of Montreal Building, 640 West Pender Street, Vancouver; mine office, K. W. C. Block, Nelson. A. E. Jukes, president; H. E. Doelle, managing director. Capital: 2,000,000 shares, 50 cents par value. The Queen mine was abandoned in 1951 and allowed to flood. In 1952 a clean-up was made in the refinery and about 4 tons of slag shipped to the Trail smelter.

Silver-Lead-Zinc

Iron Cap (Salmo Prince Mines Limited)

Company office, 850 West Hastings Street, Vancouver. E. D. H. Wilkinson, president. Capital: 3,000,000 shares, 50 cents par value. This company was formed in 1951 to develop a group of claims on the east side of Fawn Creek. The group includes the following Crown-granted claims: Edward D, Collins, Iron Cap, Dew Drop Fraction, Bunker Hill, Yip Fraction, United No. 2, Falls No. 2, and Gold Bug No. 2. The property is accessible from the Reno road. Little work was done in 1952 other than exploratory surface work and some diamond drilling. Conwest Exploration Company Limited held an option for a short period.

Amco†

The Amco group of twenty-seven claims and fractions, owned by American Metal Company of Canada Limited, is on the south side of Sheep Creek about 6 miles east of the Nelson–Nelway Highway. In general, the claims cover ground between Billings and Bennett Creeks and extend about 2 miles south of Sheep Creek. They are adjoined on the east by ground of Sheep Creek Gold Mines Limited and on the west by claims of the Victory group. Between early July and mid-September detailed geological mapping and prospecting on the Amco claims and adjoining ground were done under the direction of S. S. Alderman.

Tungsten

Victory (Victory Tungsten Ltd.)†

Head office, 2671 West Ninth Street, Vancouver. R. Hodson, president; V. Dolmage, consultant. Capital: 3,000,000 shares, no par value. The Victory group is owned by J. Sapples, of Salmo. It was under option to Boleen Mines Limited in 1951 and to the

* By J. W. Peck, except as noted.
† By J. T. Fyles.

present company in 1952. The claims are west of Bennett Creek and south of Sheep Creek, adjoining the Canadian Exploration holdings on the northeast. During 1952 the property was diamond drilled to determine the grade and extent of tungsten mineralization in a zone of skarn. The claims are underlain by black argillite locally containing beds of grey, finely crystalline limestone and intruded by tongues of granite. Near granite, calcareous sediments have been converted to skarn that contains scheelite and molybdenite. About twenty diamond-drill holes totalling about 4,000 feet had been completed by the beginning of October, 1952. The holes in general were collared in limestone, intersected skarn, and ended in granite. They were drilled along a southerly trending belt between elevations of about 3,000 and 3,300 feet on the steep west slope of Bennett Creek. The drilling was still in progress at the end of 1952.

Silver-Lead-Zinc

Black Rock

The Black Rock group of claims lies astride Sheep Creek, adjoining Canadian Exploration ground on the north and H.B. ground on the west. Twenty-one Crown-granted claims in the group form a north-south strip 15,000 feet long with an average width of 2,500 feet. The part south of Sheep Creek covers the west bank of the south fork of Annie Rooney Creek and is traversed by the Emerald mine road. D. I. Hayes, of Metaline Falls, Wash., holds an option on the group from L. R. Clubine, of Salmo. Operations during 1951 and 1952 were restricted to surface diamond drilling. Seventeen holes totalling 8,588 feet were drilled in 1951, and sixteen holes totalling 7,678 feet were drilled by December, 1952. All but two of these holes were drilled to the west of the H.B. holdings. Drilling was continuing at the end of 1952, but no noteworthy ore intersections had been reported. The work was directed by H. I. Mills, of Metaline Falls.

Aspen Creek (49° 117° S.E.)

Silver-Lead-Zinc

H.B. (The Consolidated Mining and Smelting Company of Canada, Limited)

The H.B. mine is on the west side of Aspen Creek, a southerly flowing tributary of Sheep Creek. The main camp and mill are located on the north side of Sheep Creek, about 6 miles by road from Salmo. Development continued throughout the year to prepare the mine for an operation of 1,000 tons per day. In the 2800 or main haulage adit, 3,500 feet of drifting was accomplished. A vertical two-compartment interior shaft was raised 710 feet to the 3500 level (No. 4) from a point 3,100 feet from the portal of the 2800 level (No. 8). Stations were cut for the 3000, 3200, and 3300 levels. The hoist-room was cut on the 3500 level and a single-drum electric hoist installed. Two inclined ore-passes were also driven between the 2800 and 3500 levels. Development was in progress on the 3300 level at the end of 1952. A second Ruston 48-horsepower diesel locomotive was obtained for the main haulage.

Near the portal of the 2800 adit the mill of 1,000-tons-per-day capacity was almost complete at the end of 1952. A new office was erected and five dwellings were completed. The number employed rose from 115 during the early part of 1952 to 225 during the construction period, falling to 165 in December. J. E. McMynn was superintendent in charge of operations.

Iron Mountain (49° 117° S.E.)

Lead-Zinc-Tungsten

Emerald, Jersey, Dodger (Canadian Exploration Limited)

Head office, Royal Bank Building, Vancouver; mine office, Salmo. H. Lakes, manager; G. A. Gordon, assistant general manager; G. W. Walkey, general mine superintendent; J. D. Little, mine superintendent, Jersey mine; W. F. Atkins, mine superintendent, Dodger mine; H. Maxwell, mine superintendent, Emerald and Feeney mines; E. A. Erickson, superintendent, lead-zinc concentrator; V. McDermid, superintendent, tungsten concentrator. This company is a wholly owned subsidiary of Placer Development Limited. The main office and original mine camp are at 4,070 feet elevation on the summit between Sheep Creek and Lost Creek, 8 miles by road from Salmo. The Emerald tungsten mine and mill are 3,600 feet south, with the lower or mill adit at 3,785 feet elevation. The Jersey lead-zinc mine is 6,000 feet south, with the lower or main haulage adit at 4,010 feet elevation. The Feeney tungsten mine is south of and adjacent to the original camp, while the Dodger tungsten mine is 2,400 feet northeast at 4,400 feet elevation. The abandoned Emerald lead-zinc mine is above the camp and 1,700 feet southeast. The lead-zinc concentrator, originally the tungsten mill, is served by tram-line and road from the mine and is on the Nelson–Nelway Highway, 5 miles south of Salmo. The number of men employed at all operations averaged 750.

Emerald.—This tungsten mine was operated for the Federal Government until October 1st, 1952, when the company repurchased all Federal holdings. During the year the mill capacity was increased to 650 tons per day in order to treat also the Dodger and Feeney ores. The Emerald mine produced steadily at more than 200 tons per day, except for the month of July. During this month the 3800 main haulage level was enlarged and extended to a point 340 feet vertically below the portal of the 4200 Dodger. A crushing chamber was made here and an ore-pass system driven to surface. The enlarged main haulage is designed for installation of a conveyor system above the conventional track haulage. When the project is completed, the conveyor will move tungsten ore to the Emerald mill and lead-zinc ore to another conveyor system leading to the lead-zinc mill.

Jersey.—Operations continued to expand to attain a production of 950 tons per day by the end of 1952. Since the start of mining operations in 1949, the flat-lying orebodies known as "A," "B," "C," and "D" have been mined in an area 1,800 feet long and 800 feet wide. The orebodies are formed in close proximity to one another in folded dolomitized limestone beds which rise gently to the north. The main development was the driving of a ventilation raise 600 feet long from the 4100 level to surface, 400 feet vertically above. This raise also connects with the new 4200 Jersey adit which was driven 800 feet east from a point 1,200 feet south of the Dodger 4200 adit. The 4200 Jersey is an adit 14 by 15 feet in cross-section, and the ore above this horizon is removed by use of diesel trackless equipment. On the 4000 level a northwesterly drive 1,400 feet long was started from the north end of the workings to connect with the raise system above the crushing chamber on the 3800 Emerald level.

From the mill a series of conveyor adits and raises were driven so that, when completed in 1953, the ore will be moved from the underground crushing chamber at the Emerald mine to the mill, 1,500 feet lower, by a conveyor system totalling about 7,000 feet in length.

On the surface an open pit was started where the "D" zone outcrops, 120 feet east of the 4100 portal. From 15 to 40 feet of overburden was removed, and when operations ceased for the winter, a pit 400 feet long and 100 feet wide had been made on the ore to a depth of 25 feet. About 18,000 tons of ore was mined in 1952, with a reported grade of 8 per cent combined lead and zinc.

Dodger.—The 4400 Dodger adit was driven south as a 14- by 15-foot drift in the ore zone for 1,050 feet from the portal. Further advance was suspended, and efforts were concentrated on mining a tungsten ore zone about 50 feet above the adit. Milling started in June, and a production of more than 100 tons per day was maintained. The grade, however, was lower than in the Emerald mine. The 4200 Dodger, 5,000 feet southeast, was driven as a 14- by 15-foot crosscut easterly for 2,500 feet. At 2,350 feet from the portal an 8- by 8-foot drift was driven north for 700 feet, with diamond-drill stations cut at 50-foot intervals. Diesel trucks were used in the crosscut, but the use of diesel shovels was suspended in favour of electric slushers.

Feeney.—The Feeney tungsten orebody is developed by about 650 feet of adit workings. During 1952 the ore was mined to surface and most of the known ore was removed. After milling started in May, production fluctuated between 100 and 300 tons per day.

Underground Diesel Equipment.—In the development of the Dodger tungsten ore zone, trackless mining methods were employed. The 4400 adit was driven downgrade at about 7 per cent along the strike of the orebody, while the 4200 adit was driven as a crosscut on a slight upgrade. Both these adits were 14 by 15 feet in cross-section. The drilling jumbos were built round Caterpillar D-7 and International TD 14 tractors equipped with locally manufactured scrubbers. Canadian Copco jack-leg machines were used on the drilling platforms. Mucking was done by Eimco 104 overhead loaders powered by 48-horsepower Caterpillar diesels. In the haulage, Dart trucks of 6.3-cubic-yard capacity and powered by 100-horsepower Cummins diesels were used. The scrubbing device on the loaders and trucks was manufactured by the Landis Machine Company of Pennsylvania. Eight trucks and three loaders were obtained. As the trucks were forced to back into the face, slashes were required in the adits for " turn arounds " at 500-foot intervals.

With two trucks and one loader in an adit at one time, a minimum ventilation requirement of 18,600 cubic feet per minute was necessary, as per the regulations of 75 cubic feet per minute per horsepower. This was provided through 30-inch-diameter fan pipe by two Joy 20-horsepower axivane fans mounted in parallel at the portals. In the 4200 adit a Joy 50-horsepower axivane fan was installed as a booster at 1,300 feet from the portal. Both ventilation systems had an intake of 21,000 to 25,000 cubic feet per minute with a design loss of 1 to 2 per cent per 100 feet. Considerable difficulty was encountered in providing the required ventilation, however, owing to greater leakage than expected. Providing sufficient ventilation to the loader at the face was also a difficult problem, although some use was made of flexible tubing at the end of the fan pipe. Later in the year the use of diesel loaders at the face was abandoned in favour of a scraping ramp powered by a 3-drum Canadian Ingersoll-Rand 50-horsepower electric hoist pulling a 60-inch scraper.

The 4200 Jersey adit was also driven by means of trackless diesel equipment. The trucks, loaders, and fans were the same as those used in the Dodger adits. Mining of the lead-zinc orebody commenced in the latter part of 1952, and diesel equipment continued to be used. An Allis Chalmers H.D. 9 front end Tracto shovel of 75 horsepower was obtained for this mining.

All tests on the diesel equipment showed no dangerous amounts of carbon monoxide. It was found, however, that close maintenance on the motors and scrubbers was necessary or else the atmosphere became objectionable due to aldehydes and free carbon set loose.

Conveyor System.—The lead-zinc ore is at present transported from mine to mill by aerial tramway and truck haulage, but to increase the capacity and lower the cost of transportation, construction of a belt conveyor system began in 1952. From above the mill on the Nelson–Nelway Highway, No. 7 conveyor adit was driven 370 feet, and from the end of the adit a vertical ore-storage raise was driven 210 feet to surface. No. 6 conveyor adit was driven from the top of this raise for 900 feet on a 12-degree slope, and from the end of the adit a vertical storage raise was driven 300 feet to a point 100 feet inside the portal of No. 5 conveyor adit. No. 5 conveyor adit was driven 625 feet from the portal on a 12-degree slope, and from the end of the adit a vertical ore-storage raise was driven 360 feet to the portal of No. 4 conveyor adit. No. 4 conveyor adit was driven 150 feet to break through to surface on the opposite side of a knoll. From this point the conveyor was built on surface 2,500 feet to the portal of No. 3 conveyor adit. No. 3 conveyor adit was driven 850 feet, and from the end of the adit a vertical ore-storage raise was driven to break through to surface 190 feet above. From this point on surface one conveyor extends 200 feet to the tungsten mill and another extends about 1,350 feet in two sections to the underground crushing chamber, 800 feet inside the 3800 level of the Emerald mine.

Ore-storage raises to surface above the crushing chamber on the 3800 level can store both Jersey lead-zinc ore and Dodger tungsten ore, and thus the conveyor system will move both of these ores to their respective mills. The 24-inch-wide conveyors will have a total length of 7,150 feet. The lead-zinc ore will be lowered about 1,500 feet by the conveyors and raises to the mill. The storage capacity of the broken lead-zinc ore in transit can amount to 19,250 tons. By the end of 1952 most of the development work had been completed, but it is expected to be May of 1953 before the conveyors will all be installed and operating.

LOST CREEK*

Silver-Lead-Zinc

Truman

(49° 117° S.E.) The Truman group of nineteen claims lies astride Lost Creek, just northeast of its confluence with the South Fork of Salmo River. D. I. Hayes, of Metaline Falls, Wash., holds an option on this ground from L. R. Clubine, of Salmo. Work in 1952 was restricted to geological examination and a small amount of bulldozer stripping preparatory to diamond drilling.

Kontiki Lead & Zinc Mines Limited

(49° 117° S.E.) Company office, 330 Bay Street, Toronto. Capital: 3,500,000 shares, $1 par value. D. A. Keith, Toronto, director; J. Cormie, manager. During the first half of 1952 this company did some speculative diamond drilling on the Kontiki group of claims which lies south of Lost Creek and north of the South Fork of Salmo River. A drill-site was selected late in 1951 on Wilson Creek, 4 miles by road from the Nelson–Nelway Highway. A total of 3,200 feet was drilled in four holes; one hole was abandoned in overburden at 190 feet. Argillite, containing narrow limestone bands, was encountered in the holes. No work was done in the latter half of 1952.

NELWAY†

Silver-Lead-Zinc

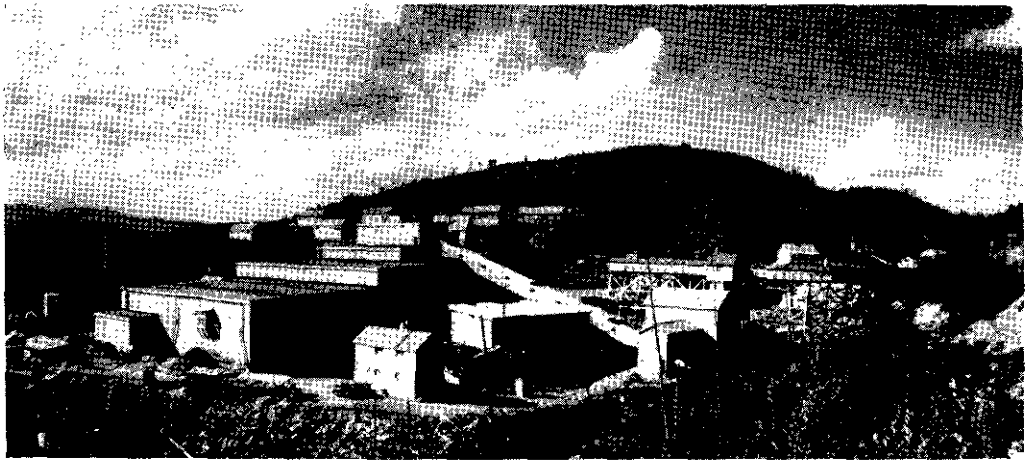
International Lead and Zinc Mines Ltd.‡

(49° 117° S.E.) Company office, Vancouver. E. G. Brown, president; A. Lakes, consulting geologist. Capital: 5,000,000 shares, no par value.

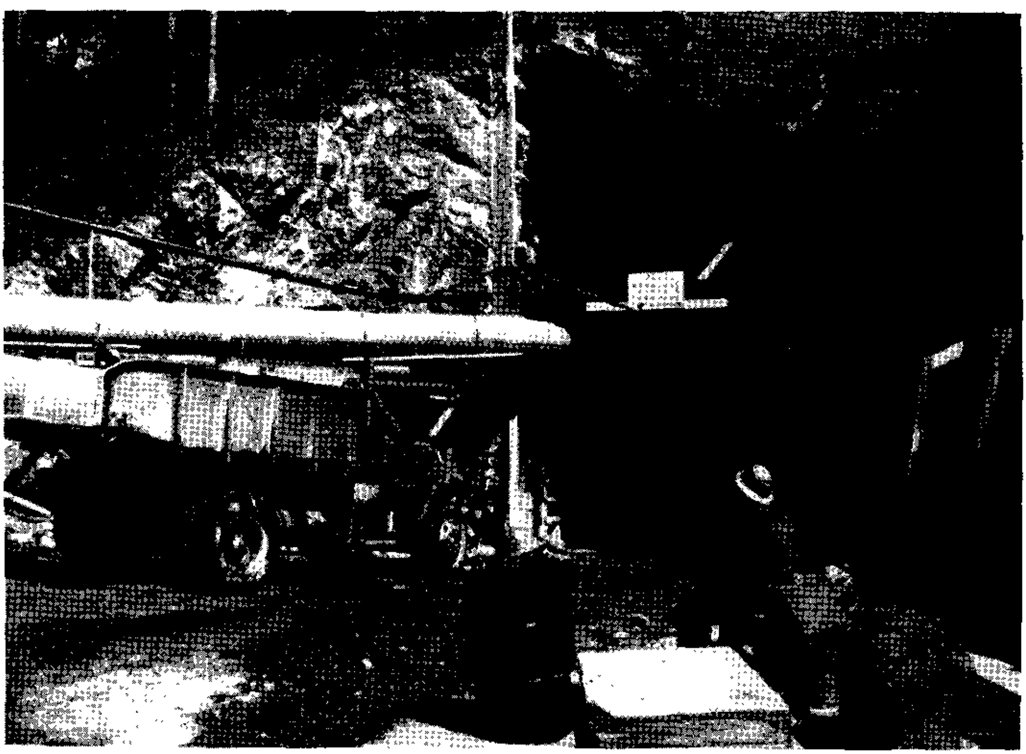
International Group.—About eighteen claims between Reeves MacDonald ground and the Alps property are owned by International Lead and Zinc Mines Ltd. The group was formerly known as International Lead and Iron and was owned by Mrs. Shallenberger, of Nelson. Shallenberger's camp, on the Nelway–Waneta road about 2 miles west of Nelway, was enlarged to include office, bunk-house, and cook-house, and was used as headquarters for work on the International group as well as for work on the company's claims on the South Fork of Salmo River. Geological mapping and prospecting on the International group were carried on under the direction of A. Bullis, and several limonitic gossan zones in dolomite of the Nelway formation were explored by bulldozer cuts. The work was discontinued early in the summer in order to explore more fully lead-zinc mineralization discovered on the company's claims on the South Fork of Salmo River.

South Fork of Salmo River.—The company holds more than seventy claims, extending about 2 miles north from the International Boundary, between 4 and 6 miles east of Nelway. The main showings are on both sides of a westerly and northerly flowing creek,

* By J. W. Peck.
† By J. W. Peck, except as noted.
‡ By J. T. Fyles.

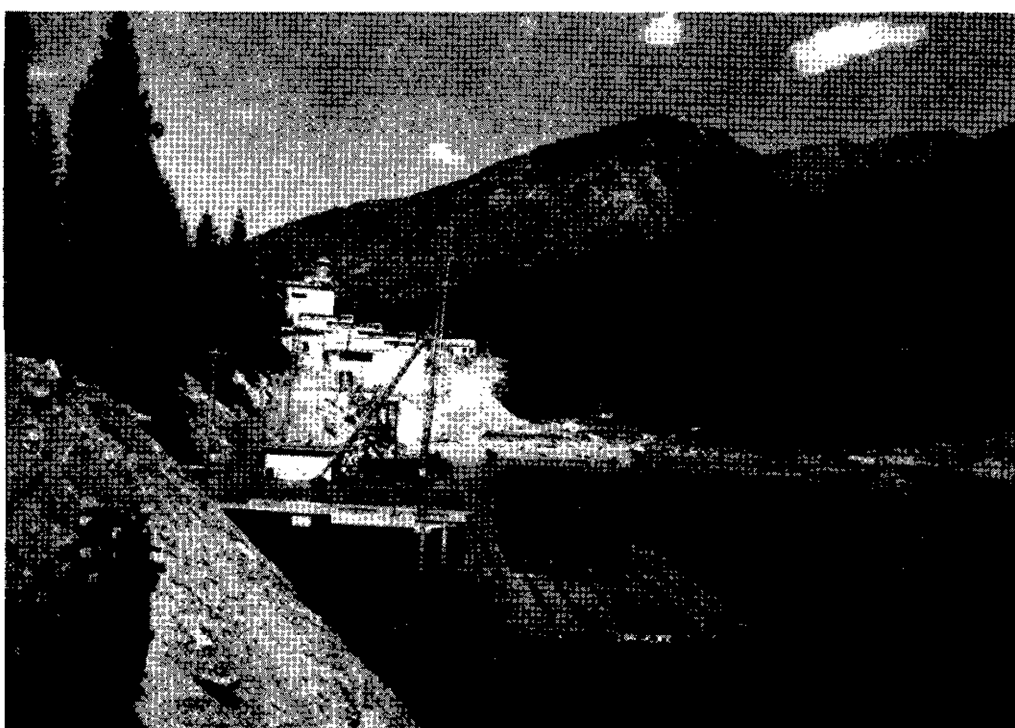


Emerald Tungsten mill.



Dodger 14- by 15-foot trackless adit.

Bluebell shaft headframe. Fine-ore bin at lower left.



Bluebell mill and dock, Galena Bay on Kootenay Lake.

locally known as Lead Creek, that enters the South Fork of Salmo River about three-quarters of a mile downstream from Stagleap Creek. The claims are reached by following the South Fork road about 6½ miles from the Nelson–Nelway Highway. During the summer the company built about 1 mile of road from the South Fork road to a temporary camp on Lead Creek at 3,550 feet elevation. Jeep-roads were built from the camp to the main showings. Exploration consisted of prospecting and geological mapping on all the claims, stripping by bulldozer close to old prospects south of Lead Creek, and exploration of lead-zinc mineralization discovered north of Lead Creek.

Mineralization consists of galena and sphalerite disseminated in cherty dolomite of what is thought to be the upper part of the Nelway formation. The showings north of Lead Creek are 1,500 to 2,000 feet northwest of the Lead Creek camp on the crest and steep south slope of the ridge between Lead Creek and the South Fork. Cherty and brecciated dolomite at these showings, containing disseminated pale sphalerite and galena, is exposed over an area 600 to 700 feet from east to west and about 500 feet from north to south. The sulphides occur in a number of relatively small, low-grade, irregularly spaced areas. Similar mineralized dolomite occurs south of Lead Creek near the International Boundary, and has been explored by old open-cuts and recent bulldozer strippings. The Nelway formation strikes north and dips steeply in all the mineralized area, but the attitudes of the mineralized zones within it are uncertain.

Alps (The Granby Consolidated Mining Smelting and Power Company Limited)*

(49° 117° S.E.) This company controls a group of about sixty claims along the International Boundary between holdings of International Lead and Zinc Mines Ltd. and Nelway, and extending about 3 miles north from the boundary. During the first seven months of 1952, eight diamond-drill holes were drilled "blind" in the hope of discovering lead-zinc mineralization in limestone and dolomite of the lower part of the Nelway formation. A total of more than 5,500 feet was drilled. The holes were steeply inclined, three were about 1,000 feet deep, and the remainder less than 500 feet deep. A few sections of the core contained finely disseminated pyrite and are reported to have assayed very low in zinc.

Reeves MacDonald Mines Limited

(49° 117° S.E.) Company office, 413 Granville Street, Vancouver; mine office, Remac. L. P. Larsen, Spokane, Wash., president; W. L. Zeigler, Metaline Falls, Wash., general manager; G. F. Camroux, superintendent. The company is capitalized for 3,000,000 shares at $1 par value, of which 2,338,000 are outstanding. Pend Oreille Mines and Metals Company owns 1,389,000 shares. This company operates the Reeves MacDonald mine on the Pend d'Oreille River on the Nelway–Waneta road, 4 miles west of Nelway. A zinc-lead limestone replacement orebody has been developed by two connected adits 766 feet apart vertically. The lower adit is the 1900 level, and the upper is the 2650 level.

Steady production of slightly more than 1,000 tons per day was maintained throughout 1952. The Reeves orebody adjacent to the shaft was fully developed, and ore was produced from most levels. Wagon drills and conventional leyners, both using sectional steel for drilling the 35-foot horizontal pillars, were employed to full advantage so that four drill crews were able to supply most of the mill tonnage. The 58-manway raise system in the pillar to the west of the shaft was completed, and a fan of large capacity was installed to relieve the serious dust condition which developed during 1951. Further development was done on the 1900 level, which was advanced to a length of about 6,000 feet from the portal. At the end of 1952, preparations were under way to develop the Reeves orebody below the 1900 level.

On the surface, further development was done on the limestone bluff on the Pend d'Oreille River. In a new crushing plant a jaw crusher was installed ahead of the Holland breaker, which had experienced difficulty with large aggregate. This additional crushing

* By J. T. Fyles.

plant was so built that it could be served by truck from the Nelway–Waneta road as well as by the main haulage from the mine. The number employed averaged 190.

SOUTH KOOTENAY LAKE*

Summit Creek (49° 116° S.W.)

Gold-Silver-Lead-Zinc

Spokane

This mine is on Wall Mountain, 18 miles by rough road from Tye. The group consists of five claims, held by record since 1911. The owner, K. K. Laib, of Bayonne, shipped one 35-ton carload to the Trail smelter.

Pilot Bay (49° 116° N.W.)

Pilot Bay Concentrator and Smelter*

The old plant-site on Pilot Point, 3 miles south by road from Kootenay Bay, is owned by Mr. and Mrs. H. T. Stearns, of Hope, Idaho. G. L. Green, working on a royalty basis with the owners, operated this property from June to October, at which time the current low metal prices caused a suspension of milling. The concentrator, located on the shore of the lake near the old smelter, during this period treated 30 tons per day of jig tailings deposited in the bay by the early operators. The tailings are scraped from the bay and truck-hauled a short distance to the mill. The management estimates that 35,000 tons, having a metal content of 12 to 14 per cent zinc and 2 per cent lead, is readily available for treatment. Concentrates are shipped to the Trail smelter. Operations are expected to resume early in 1953. An average number of five men was employed.

Sanca (49° 116° S.W.)

Lakeview†

This mine, near Sanca and midway on the highway between Kootenay Bay and Creston, has come under the control of E. G. Timmons, of Grey Creek. Mr. Timmons worked the property singly and on an intermittent basis from May until October, when low metal prices made this work unprofitable. Lead-zinc ore from the south face of the upper level and from a small underhand stope on the same level was hand-sorted and hauled by truck to the Trail smelter.

NORTH KOOTENAY LAKE*

Riondel (49° 116° N.W.)

Bluebell (The Consolidated Mining and Smelting Company of Canada, Limited)†

D. S. Campbell, superintendent; J. B. Donald, assistant superintendent; D. A. York, mill superintendent. This property is at Riondel on the east shore of Kootenay Lake, about 6 miles north of Kootenay Bay. It is reached by a road that leaves the highway a short distance from the ferry landing. With the completion of the power span across Kootenay Lake south of the property, sufficient electrical energy became available, and the concentrator began production on April 15th. This production, coming entirely from the Kootenay Chief ore zone, has been steadily maintained at 500 tons per day.

Development during the year was directed toward deepening No. 1 production shaft and preparing stopes in the Kootenay Chief ore zone. A connection to the Comfort ore zone on the 225 level was completed, and an exploration drive south on the 375 level from No. 1 shaft is continuing. This work included 2,006 feet of drifting, 574 feet of crosscutting, 2,070 feet of raising, and 245 feet of main shaft sinking. In addition, 1,243 feet of workings were timbered, 2,120 cubic feet was cut for shaft

* By J. W. Peck, except as noted.
† By H. N. Curry.

stations, and 64,653 cubic feet of slashing was done. Underground diamond drilling to delimit known oreshoots and to explore newly opened ground amounted to 8,237 feet, and blast-hole diamond drilling amounted to 16,389 feet. A total of 3,086 yards of gravel and 310 yards of mine waste was used for backfill.

The three-compartment No. 1 production shaft, between the Bluebell and Kootenay Chief orebodies, has over-all dimensions of 7 by 21 feet and is driven on a 35-degree slope. The muck skip has a capacity of 5 tons, and eighteeen men can be carried on the man skip. This shaft has been used for production down to the 225 level since milling started, and by the end of 1952 had been deepened to the 525 level. A further deepening to the 675 level is to be followed by lateral development and the establishment of a main pumping station at the 525 level. The Bluebell shaft was used solely for handling development muck, and only diamond drilling was done from the Comfort shaft.

Production was obtained from stopes on the 0, 75, and 225 levels. Mining was done in one blast-hole diamond-drill stope, six open bench-type stopes, and two horizontal cut-and-fill stopes. These stopes were laid out to suit local conditions, cut-and-fill stoping being done in the wide flat-lying sections of the orebody and open stoping in the narrower and more steeply dipping sections. Roof-bolting of the hangingwall in the open stopes is standard practice. Gravel backfill for the cut-and-fill stopes is obtained from a moraine at the north end of the property.

A 50,000-cubic-feet-per-minute ventilating fan was installed in the Kootenay Chief 0 adit. Pumping stations on the 300 and 375 levels discharge mine water up the Bluebell shaft at the rate of 750 gallons per minute. This pumping is continuous.

The mill flow-sheet is as follows: From a 500-ton coarse-ore bin the ore is fed by a Ross chain feeder over a 4-inch grizzly to a 25- by 36-inch Telesmith jaw crusher. Both undersize and crushed product are carried on a 30-inch belt-conveyor over a double-decked Ty-Rock screen and thence through a 4-foot Symons cone crusher. A second 30-inch belt-conveyor leads to an 800-ton fine-ore bin. The fine ore is fed to a 6- by 12-foot Dominion rod mill in open circuit with a 78-inch Akins classifier which in turn is in closed circuit with an 8- by 7-foot Dominion ball mill. The classifier overflow goes to double banks of eight Denver flotation cells in parallel, and the resulting lead concentrate is thickened in a 28-foot Dorrco thickener and then pumped to a 5- by 5-foot Feinc string filter. Tailings from the lead circuit are fed to an 8- by 8-foot Denver conditioner and thence to similar double banks of Denver flotation cells where the zinc is floated. The zinc concentrates go to a 30-foot Dorrco thickener and are then pumped to a 6- by 6-foot Eimco disk filter. The filters feed the concentrates directly into trucks for transportation to the loading dock a few hundred feet away. An average of two barges, each containing nine 65-ton cars of concentrate, is shipped each week.

Additional surface installations in 1952 consisted of a 200-horsepower Ingersoll-Rand hoist for No. 1 production shaft and two compressors, one of 1,350- and one of 1,750-cubic-feet-per-minute rating, housed and put into operation. The launder for tailings disposal was put into service, and the concentrate loading dock with loading crane was completed at Galena Bay.

A steel-shop, carpenter-shop, core-shed, and powder magazine were built, as well as two new residences. Employees' dwellings, about ninety in number, have been built or are in the course of construction in a zoned townsite, a new school has been built, and a field hospital with a full-time nurse is in operation.

First-aid and mine-rescue training were carried on steadily during the year, and teams from the Bluebell mine, competing in the Department of Mines first-aid and mine-rescue competition at Kaslo, won the majority of the awards. A full-time safety officer was appointed to the mine in September.

The average number of employees in 1952 was 270, and a total of 136,212 tons of ore was milled.

AINSWORTH (49° 116° N.W.)

Lamac* This property is astride the Nelson–Kalso highway 1 mile south of Coffee Creek. It consists of four claims held by record by T. Lane, of Ainsworth. Trenching at the top of a small bluff, west of the highway, has exposed 5 feet of mineralized rock in the footwall part of a band of brecciated schist. This brecciated band is underlain by 5 feet of unbrecciated quartz-mica schist, dipping 45 degrees northwest, and this in turn by hornblende schist forming the bluff face. Within the band of mineralized rock the combined lead-zinc content is estimated to exceed 6 per cent over a width of 18 inches. The hangingwall of the brecciated band is covered.

An adit crosscut had been driven 67 feet from the base of the bluff by early September, and was still in hornblende schist.

This discovery is significant in its location south of Coffee Creek, which formerly was thought to mark the south boundary of mineralization in the Ainsworth camp.

Black Diamond-Townsite Area* This area adjoins the west edge of the Highlander-Hot Springs area which was mapped in 1951. It includes the Black Diamond-Spokane vein system in the west and the Townsite mine in the northeast (*see* Fig. 8). Mineral claims cover the entire area, and are all owned or controlled by Yale Lead & Zinc Mines Limited. Access from Ainsworth is by a good mining road which zigzags up past the Highlander, Banker, and Black Diamond mines. A branch road leads to the Spokane mine. A short road was built in 1952 from the lower part of the Spokane road to the Townsite mine.

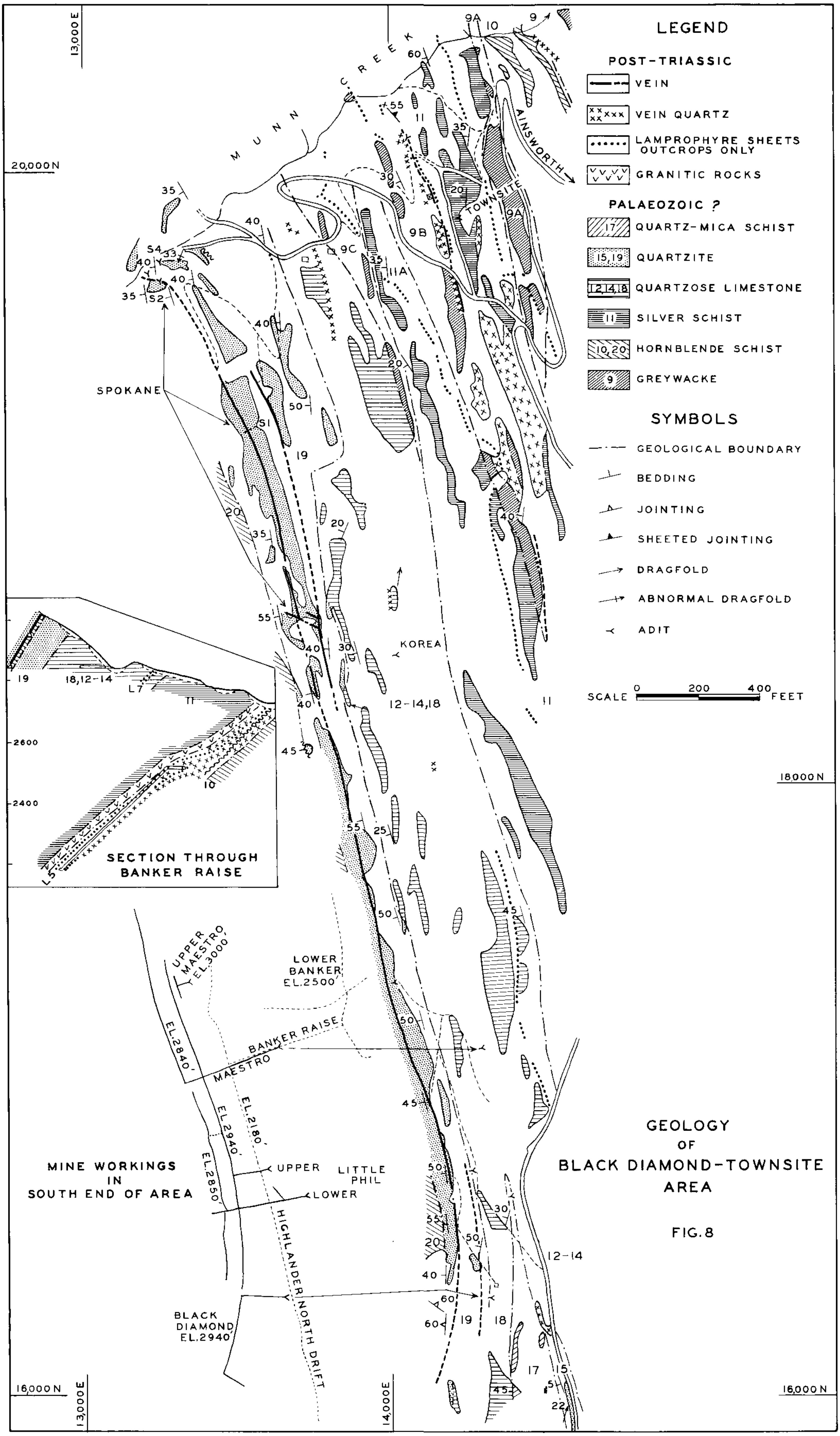
In general, the surface slopes east-northeast. A bench underlain by limestone trends north-northwest through the middle of the area. Slopes above and below the bench are moderate to fairly steep. At the north end of the area, Munn Creek occupies a valley 40 to 100 feet deep.

History.—Development and mining in this area began in the period 1889–99. A slump was followed by resumption of small-scale mining in the period 1906–11. The Consolidated Mining and Smelting Company of Canada, Limited, operated the Maestro together with the Banker in 1913–17 and again in 1927–28. Lessees mined high-grade ore intermittently in the intervening period. The Maestro has not been worked since 1928, except that low-grade ore was trucked from the dump to the Florence mill in 1947 and to the Yale mill in 1952. The Black Diamond lay idle from 1906 to 1949. Lessees mined about 150 tons of high-grade ore from the Little Phil in 1917–20, after which the mine lay idle until 1952. The Spokane has had the most continuous production record of the mines in this area. It was actively developed in the period 1915–20, and more than 1,200 tons of ore was shipped. From 1921–29 lessees mined an average of 50 tons per year. The Trinket claim, adjoining the Spokane on the north, was grouped with it for much of the time, but contributed only an insignificant amount of ore.

Maestro Silver Lead Mines Limited was formed in 1937 to develop the Maestro and Spokane, but no work was done, and the company became defunct in 1940. Ainsworth Mines Limited, formed in 1936 to operate the Banker, gained control of the Spokane, and development was resumed in 1941. In 1942 Ainsmore Mines Limited and its successor, Ainsmore Consolidated Mines Limited, were formed to operate the Spokane. Extensive development and small-scale mining of high-grade ore continued through 1945, when the company transferred its mining operations to the Kootenay Florence. Low-grade ore amounting to several thousand tons was trucked from the Spokane dump to the Florence mill in 1946–47. Lessees mined nearly 300 tons of high-grade ore from the Spokane from 1948 to the early part of 1952.

Yale Lead & Zinc Mines Limited gained control of all the Ainsmore Consolidated holdings in the area in 1949. Lessees mined from the Black Diamond in 1949–50,

* By G. E. P. Eastwood.



GEOLOGY OF BLACK DIAMOND-TOWNSITE AREA

FIG. 8

but the company also did some development. The company mined from the Black Diamond in 1951 and the early part of 1952, and from the Little Phil for the balance of 1952. Low-grade ore amounting to several thousand tons was trucked from the Black Diamond, Little Phil, Maestro, and Spokane dumps to the Yale mill in 1951 and 1952.

The Townsite mine is on the Jean Fraction claim, which is essentially a relocation of the Old Jeff claim, also known as the Jeff Davis. Considerable development was done in 1892–94, but there is no record of production. The mine was dormant from 1894 to 1952. The claim was purchased in 1949 by Yale Lead & Zinc Mines Limited, and in 1952 the west drift was extended 180 feet south.

Minimum total gross production from the area through 1950 is tabulated below. For some years production returns from some of the mines were grouped with those from mines outside the area, but the actual total gross production from the area was probably not more than 10 per cent greater than tabulated. No gold, zinc, or cadmium was reported in the grouped returns; therefore, the following table gives the actual total for these metals.

Tons shipped		4,789	Lead	lb.	4,974,510
Gold	oz.	2	Zinc	lb.	60,354
Silver	oz.	97,231	Cadmium	lb.	58

General Geology.—The sequence of layered and intrusive rocks in the area is tabulated below, and the distribution of these units is shown in Figure 8. The upper part of the quartzose limestone grades northward along strike to quartzite by a decrease in the carbonate content. Four sheets of lamprophyre are present, 5 to 15 feet thick, in addition to a dyke swarm in and near the Townsite mine.

Unit No.	Description	Thickness
		Ft.
X	Quartz-carbonate veins	
L	Lamprophyre sheets and dykes	
V	Aplitic granite and quartz monzonite	
— — —	— — — — — — — Intrusive contact — — — — — — — —	— — —
20	Hornblende schist	
19	Thin-bedded quartzite, containing thin bands of hornblende schist	130–500
18	Quartzose limestone	0–100
17	Quartz-mica schist	0–130
16	(Not represented in this area)	
15	Thin-bedded quartzite, slightly calcareous in part	0– 50
14	Quartzose limestone	40
13	Carbonaceous limestone	20– 50
12	Quartzose limestone	40
9c	Greywacke tongue	0– 80
11a	Silver schist	30–200
9b	Greywacke tongue	0– 80
11	Silver schist	150–300
9a	Greywacke tongue	0– 60
10	Hornblende schist	110+
9	Greywacke	

Structural Geology.—The major structure of the area is a slightly warped regional dip to the west-southwest at 20 to 60 degrees. The principal warps are gentle cross-synclines at the Little Phil and Spokane mines. The Little Phil warp is apparently related to gentle cross-folding at the Banker mine, but cannot be traced as an individual structure and lacks the vertical variation in dip observed in the Banker (*see* section on Fig. 8). This warp marks a change in strike from north-northeast at the Black Diamond to north-northwest over the rest of the area. The Spokane warp is centred about 800 feet southeast of the portals of the main adits. A slight curve in strike at the Townsite mine suggests a northeastward continuation of this warp. Two pairs of minor folds were observed in the central part of the area, trending north and north-northeast.

There may be a large isoclinal dragfold at and south of the Black Diamond, but mapping has not been continued far enough south to clarify relations. Small dragfolds are scattered through the area and plunge in various directions. Some of them indicate the ordinary up-dip movement of overlying beds, but others indicate an abnormal down-dip movement. An anomalous rectangular dragfold in the upper part of unit 19 plunges 60 degrees west-southwest.

Shears are fairly common. Four in the western part of the area appear to follow the bedding rather strictly, but a group in the Townsite mine cuts the rocks at various attitudes, and three small cross-faults strike west-northwest. The most westerly bedded shear is seen at intervals along the upper contact of unit 19. It consists of a narrow band of intensely schistose rock rather than breccia, and is not appreciably mineralized. The next bedded shear toward the east is a gouge and breccia band, 2 to 15 feet thick, almost continuously exposed along the hangingwall of a thin sheet of hornblende schist for the entire length of the area. It dips 55 to 60 degrees on the average, but flattens to 35 degrees in the south faces of the Black Diamond and lower Little Phil drifts. The third bedded shear is well exposed at two places in the northern half of the area, and is exposed in pits near the Black Diamond and Little Phil mines, where it is only a few feet above the lower contact of unit 19. The fourth bedded shear is to be seen only in the Spokane road-cut as an 18-inch band of gouge and breccia, veined by some quartz and carbonate but containing no appreciable mineralization.

At least three small cross-faults have displaced the second and third bedded shears. All three are more or less mineralized. The most southerly does not outcrop but is followed by a drift at the south end of the Black Diamond mine. It strikes north 60 degrees west and dips 60 degrees southwest. It has displaced the second shear about 4 feet left, but appears to feather out about 75 feet to the southeast. The other two cross-faults are exposed, 30 feet apart, in two prospect pits near the south end of the Spokane claim. They strike north 50 degrees west and dip 40 to 45 degrees southwest. The southwesterly of the pair has displaced the second bedded shear about 15 feet to the right and the third shear about 4 feet right. Displacement on the northeast fault appears to be only a few inches. The southwest fault is mainly a 3-foot band of brecciated and altered quartzite, containing highly schistose material and some lenses of vein quartz. Some galena and sphalerite occur along the contacts of the quartz lenses. The northeast fault is a narrow band of gouge and schistose material, bounded by a tight hangingwall but grading to a brecciated footwall zone. This brecciated zone contains pods of vein quartz and carbonates, and disseminated galena over a width of 1 to 3 feet.

Jointing is fairly common in the less schistose rocks. Sheeted jointing is restricted to the vicinity of the Townsite mine.

Economic Geology.—The principal mineralization in the area is in the Black Diamond-Spokane and Townsite vein systems. Minor amounts of galena and sphalerite are sparsely disseminated in limestone and calcareous quartzite, and in some quartz veins.

Sparse mineralization in limestone has been prospected by a small pit 300 feet south of the loop in the Spokane road. A similar occurrence is in limestone in the hangingwall of a lamprophyre 850 feet south of the Spokane road. Farther north along the strike, galena and sphalerite are sparsely disseminated in calcareous quartzite over a width of 1 foot and an exposed length of 40 feet. A sample of this last occurrence assayed 1.2 per cent combined lead and zinc, with traces of gold and silver.

A quartz vein, 10 feet thick, cuts greywacke at an acute angle in the footwall of unit 10 in the northeast corner of the area. It contains numerous open vugs and traces of sulphides. Widely separated outcrops of another large quartz vein, or system of veins, are in limestone from Munn Creek south to the portal of the Little Phil lower adit. It is 10 to 20 feet thick in the two places where both walls are exposed. It is generally massive, although locally sheeted with limestone inclusions, and appears to be entirely devoid of mineralization. Galena is present in a small quartz vein in a road-cut southeast of the Black Diamond.

Black Diamond-Spokane Vein System.—This system includes the second and third bedded shears and the three small cross-faults, all of which are more or less mineralized. It is covered by the Black Diamond, Little Phil, Maestro, Korea Fraction, and Spokane mineral claims. The principal drifts and crosscuts on the first three claims are shown in an inset to Figure 8. From the Black Diamond and upper Little Phil drifts, most of the west vein has been stoped to surface. The Maestro and upper Little Phil workings were not entered, and information on them was supplied by W. M. Sharp, of Yale Lead & Zinc Mines Limited. The Korea adit was apparently short, and is now caved. On the Spokane claim the east vein and the cross-veins have been opened by pits, trenches, and at least two inclined shafts. The west vein has been opened by four adits, designated S1 to S4 in Figure 8, and by numerous surface workings. The first adit is a 50-foot crosscut to the vein, whereas the second and third are drifts. The fourth, 20 feet lower than the third, starts in the vein footwall but follows the vein for most of the adit's length. The second adit is only 45 feet long and was mapped in detail, but the third and fourth are 1,400 and 1,100 feet long respectively, and were visited only very briefly.

The third bedded shear, or east vein, is sparsely mineralized in the Black Diamond and Little Phil, but is reported to have yielded some ore in the Maestro. A drift, now caved, followed it for some distance in the Black Diamond. Some ore was apparently mined from the east vein on the Spokane claim.

The second bedded shear, or west vein, contains at least three orebodies in addition to small lenses of ore minerals and a general sparse mineralization. One orebody is a small chimney at the intersection between the south cross-fault, or cross-vein, and the west vein, with ore extending a short distance each way along each structure. Farther north in the Black Diamond a larger orebody is shaped roughly like the blade of a table knife, bent around the cross-warp and raking gently north into the Maestro. It is about 150 feet deep and has been opened for a length of 1,400 feet. The lower edge is somewhat irregular, raking down from surface above the middle of the Black Diamond drift to the Little Phil lower adit, then rising above the Little Phil lower drift and entering the north end of the Maestro drift. The upper edge of the orebody appears to pass through surface a short distance north of the Upper Maestro adit; its outline is unknown. On surface on the Spokane claim a narrow band of galena and sphalerite, 6 to 18 inches wide, is almost continuously exposed in the west shear for 850 feet north from the two cross-veins to 400 feet south of Munn Creek. It seems probable that this is a single orebody, although there are lean to barren stretches in the third and fourth adits. In the second adit the shear contains only a narrow quartz vein and very sparse pyrite, with no ore minerals; this adit is probably above or north of the orebody.

The gouge and breccia band along the west shear is only 2 to 4 feet wide on surface, but varies considerably in width underground. It is 20 feet wide at the Black Diamond and lower Little Phil adits, but narrows to 2 or 3 feet at the faces of the respective drifts. The most intense shearing is against the relatively solid quartzite hangingwall, decreasing through a zone of brecciation to the hornblende schist footwall. The gouged and brecciated quartzite is much darkened by carbonaceous material. Veins, veinlets, and blebs of both white and yellow carbonate, and less quartz, are profusely distributed and have variable attitudes. The larger and more continuous veins are nearly all bedded and are composed largely of yellow carbonate, probably siderite. The veins are all rather small in the Black Diamond drift and in the south part of the Little Phil lower drift, but increase in size and continuity in the north part. Galena and sphalerite occur largely in and beside the larger veins of yellow carbonate and hence are more abundant in the north drift.

A northwest drift from the Little Phil lower adit is in a soft zone in limestone, and presumably followed pockets of ore minerals. A lagged section of the drift along the west vein may indicate a continuation of the soft zone.

Six samples were taken across the best-looking part of the shear beneath the orebody at intervals along the north part of the Little Phil lower drift, and assays are tabulated below. Location figures give distances north of the adit.

Sample No.	Location	Width	Gold	Silver	Lead	Zinc
	Ft. North	In.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1	0	10	Trace	3.6	0.4	12.2
2	87	33	Trace	0.7	0.4	2.7
3	150	45	*Nil*	*Nil*	Trace	*Nil*
4	193	18	*Nil*	0.6	0.05	2.4
5	245	14	*Nil*	Trace	0.04	*Nil*
6	330	10	Trace	0.8	Trace	9.0

Higher values in the first two samples listed are from a lobe in the lower edge of the orebody that was stoped down to the drift for a length of 40 feet. A lens of sphalerite 330 feet north of the adit has been stoped for a short distance. Other metals, identified spectrochemically, include 0.3 to 5 per cent manganese and traces to small amounts of copper, tin, and cadmium, increasing roughly with the zinc content.

Townsite Network.—Mineralization in and near the Townsite mine occurs in complex association with small lamprophyre dykes, large quartz veins, subparallel shears, and sheeted jointing. Surface exposures suggest a fairly continuous mineralized shear extending about 600 feet along the silver schist-greywacke contact from south of the Spokane road nearly to Munn Creek, but underground the relations are much more complex (*see* Fig. 9). A small mass of white aplitic granite occurs in the upper part of the silver schist and may be an extension of a larger mass to the south. It closely resembles aplitic granite in the hangingwall of the Highlander vein that is believed to

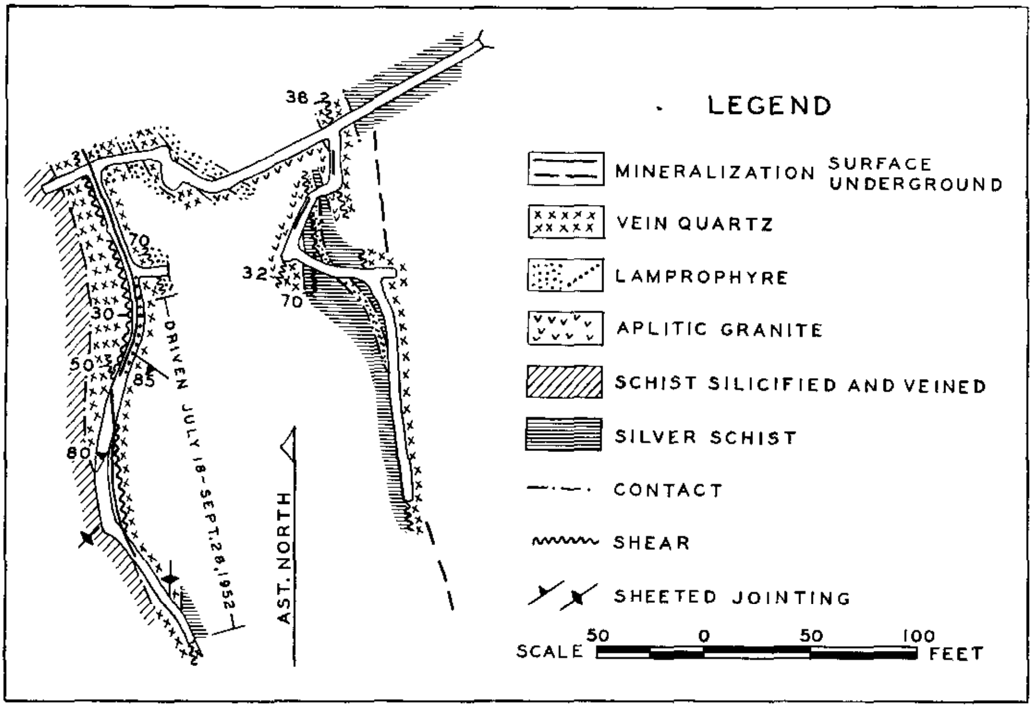


Figure 9. Geological plan of Townsite mine.

have formed by complete granitization of silver schist. Vein quartz and lamprophyre cut schist and aplitic granite and are in turn cut by shears and are locally mineralized, but their relative ages are uncertain. General relations suggest that lamprophyre has intruded quartz, but quartz veinlets cut the dykes.

The quartz seems to be in two distinct but rather irregular veins, roughly following bedding in the schists, and separated by granite and silver schist. The veins consist mostly of coarse-grained quartz, with some carbonates and scattered dark fragments. These fragments are equidimensional and unaligned, and suggest inclusions of granite or of silicified schist into which carbon has been introduced. The marginal parts of the veins are sheeted with tabular inclusions of aplitic granite and silicified schist, and grade into quartz veinlets cutting granite and schist at a slight angle to the foliation. The schist in the hangingwall of the west quartz vein has been extensively silicified.

Lamprophyre is present as a swarm of small discontinuous dykes, all dipping west, but commonly at an angle different from the dip of foliation in granite and silver schist. In plan the dykes are somewhat sinuous, alternately following and angling across the strike of foliation. Near Munn Creek two larger sheets emerge from the swarm and appear to follow the foliation northward. There is no clear relation between the dykes and either shearing or mineralization.

The shears are marked by gouge and breccia bands up to 3 feet thick, all west-dipping but varying considerably in attitude. The thicker and longer bands are shown in Figure 9. The north shear in the west drift dips less steeply than the south shear, but has steep branches. Two small shears, not shown, in the short crosscut from the west drift, dip 10 degrees. A radial pattern of shears in the east drift conforms roughly to the angle between the aplitic granite body and the east quartz vein. There is no definite evidence for displacement on any of the shears, even where two are in contact as in the west drift, but it is possible that shearing is responsible for complications in the lithological pattern.

Sheeted jointing is conspicuous in isolated parts of the quartz vein along the west drift. The fractures are strictly parallel, 2 to 6 inches apart, separated by rather crumbly quartz.

Galena-sphalerite mineralization occurs in the following associations:—

(1) In the footwall of a lamprophyre dyke, 30 feet east of the west drift; it is sparse.
(2) In a shear along the contact between granite and vein quartz. The two occurrences in the east drift are of this type, and are sparse.
(3) Along the footwall of a shear in vein quartz, in part in the hangingwall of a small lamprophyre, in the north half of the west drift.
(4) Along the hangingwall of a shear in vein quartz and concentrated at intersections with sheeted jointing, in the south half of the west drift.

The third association resembles the type most commonly seen in the Highlander mine. Samples were taken from the north wall of the adit, from 11 feet south, and from 62 feet south. Together they illustrate the average grade of this length of vein.

Sample No.	Location	Width	Gold	Silver	Lead	Zinc
	Ft. South	In.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1	0	27	*Nil*	Trace	0.1	1.6
2	11	5½	*Nil*	7.7	48.1	4.4
3	62	6	*Nil*	0.5	0.2	17.7

The fourth association includes two pockets of abundant sphalerite and traces of galena extending back along sheeted jointing from the hangingwall of the shear. Two other pockets of sheeted jointing in the shear footwall are but sparsely mineralized.

No definite correlation can be made between the mineralized shear on surface and any of the shears underground. The surface shear resembles the shear in the north half of the west drift, but its downward projection at 30 degrees places it midway between the drifts. It is traceable with assurance from south of the Spokane road to a short inclined shaft northwest of the main adit, but northward its extension is indefinite. It is represented by 2 to 3 feet of gouge and brecciated vein quartz with some carbonaceous material, containing a few inches of galena and sphalerite along the footwall. Sparse mineralization extends about a foot into a lamprophyre that forms the footwall north to the shaft. Two samples were taken in sequence across the mineralization in the north wall of the shaft:—

Sample No.	Description	Width	Gold	Silver	Lead	Zinc
		In.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1	Shear footwall	2½	Trace	3.16	23.2	5.6
2	Lamprophyre	9½	*Nil*	0.3	0.3	0.7

Farther north a short adit has been driven on a pair of narrow curving shears in vein quartz, which are sparsely mineralized. Some sheeted jointing in vein quartz near Munn Creek is not mineralized.

Traces of copper, cadmium, and tin were found spectrochemically in most of the samples from the Townsite area.

Highlander, etc. (Yale Lead & Zinc Mines Limited)*

Company office, 525 Seymour Street, Vancouver; mine office, Ainsworth. H. W. Knight, president; H. D. Forman, manager. Capital: 3,000,000 shares, $1 par value. This company controls most of the claims lying between Coffee and Cedar Creeks in the Ainsworth camp. The mine plant and sink-float plant are above, and the mill is below, the Nelson–Kaslo Highway, about three-quarters of a mile south of Ainsworth.

In the Highlander mine only the Highlander orebody was mined, and this at a reduced rate at the end of 1952, but the north drift on the 2150 level was extended to 2,100 feet from the adit crosscut, and a twin raise was driven from 1,600 feet north of the adit up to the Banker 2500 (adit) level.

The Highlander orebody rakes north from surface to the 2150 level in the footwall of a shear dipping 45 degrees west. It varies considerably in width and grade. The average mining width is 7 feet, made up of about 2 feet of nearly barren hangingwall gouge and sheared material, 2 to 3 feet of galena and sphalerite in quartz and carbonate, and a 2- to 3-foot footwall zone consisting of irregularly spaced veinlets of sphalerite in quartz. The following assays are of samples taken in the 2350 sublevel drift, where the ore is believed to be average for the orebody. Sample No. 1 is from the hangingwall zone, and the remaining samples are from the central zone. The footwall zone is estimated to contain from one-third to one-half as much metal as the central zone. The samples are located with respect to a through ore-pass from the 2450 level.

Sample Number	Location	Width	Gold	Silver	Lead	Zinc
	Ft. South	In.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent
1	29	27	*Nil*	0.1	0.1	*Nil*
2	29	33	*Nil*	3.2	5.4	2.8
3	39	29	0.01	1.5	1.6	2.4
4	49	23	Trace	2.4	5.3	6.1
5	99	27	*Nil*	1.0	4.5	0.7
6	119	31	0.01	2.0	4.2	2.4

* By J. W. Peck and G. E. P. Eastwood.

The Highlander orebody is serviced by the Albion raise, extending from the main haulage (2150) level to the Albion adit (2600) level, and by sublevel drifts at 2300, 2350, and 2450 levels. Most of the orebody has now been mined from the 2150 level to 80 feet above the 2450 level, for about 400 feet along the strike. Mining is by open-stope method, with numerous pillars left to support the hangingwall. Roof bolting was tried with minor success. On the main haulage level a 20-horsepower Ruston diesel locomotive was used.

Contract crews of three men each were employed at the Eden-Crescent, Black Diamond, Little Phil, and Spokane mines. A new road was built from the Nelson–Kaslo Highway at Coffee Creek for 1½ miles to the Eden-Crescent, where an oreshoot on the bottom level was mined. The Spokane mine was leased in the latter part of 1952 to T. Hawes and S. McLellan, who shipped 40 tons to the Trail smelter.

The mill operated throughout the year at close to 200 tons per day, with a decrease in the last quarter. About 60 per cent of the mill feed came from the Highlander mine, and the rest came from underground at the Spokane, Eden and Crescent, Little Phil, and Black Diamond mines, and from the dumps at the Krao, United, Spokane, Little Phil, and Maestro mines. Custom milling, amounting to 1,605 tons, was also done for the Vigilant mine on Woodbury Creek. The sink-float plant was not operated during 1952. The lead and zinc concentrates were shipped to the Trail and Anaconda smelters respectively.

One new dwelling was built in Ainsworth. Sixty men were employed in November, compared with ninety in June.

Silver-Lead-Zinc

Kootenay Florence (Western Mines Limited)

Company office, 1768 East Hastings Street, Vancouver; mine office, Ainsworth. H. M. Wright, president; W. J. Bull, mine manager. Capital: 3,000,000 shares, $1 par value. This company acquired the Kootenay Florence property in 1951. The mine plant and mill are on the Nelson–Kaslo Highway, 2 miles north of Ainsworth. The mine is serviced by the mill haulage level (No. 9) and by road to No. 5 level, 350 feet vertically above. A raise, completed in 1951, connects the two levels in the east orebody.

With improvement in natural ventilation in the east end of the east orebody, mining was placed on a two-shift basis. Two sublevels known as 2240 and 2165 were established in the raise below No. 5 level, and open stoping was done on the vein from these levels. On No. 9 level, open stoping was also done in the west end of the east orebody and a raise was driven about halfway to No. 5 level. Operations in this section were hampered by high temperatures and deficiency of oxygen. Some ore was mined on No. 5 level in the 506 stope, but operations were on a restricted scale because of bad air.

A road was built to the old Lakeshore mine and the workings rehabilitated. A portable compressor was set up at the main adit and a loading ramp built. Mining was done in a broad zone of shearing, alteration, and replacement in limestone in the crosscut adit about 750 feet from the portal, and in a sublevel 45 feet above. The sublevel was at one time connected with workings at the bottom of an old shaft, but these are now inaccessible (see *Minister of Mines, B.C.*, Ann. Rept. 1923, p. 208). All ore obtained was trucked to the Kootenay Florence mill.

The Florence No. 1 level was leased by T. Lane, of Ainsworth. Some surface replacement ore to the north of an old shaft on the road to the Daisy Bell group was mined and trucked to the Kootenay Florence mill. Production: Ore milled, 405 tons. Gross content: Silver, 793 oz.; lead, 46,930 lb.; zinc, 38,140 lb.

The mill operated on an average of 1,900 tons per month. Most of the ore came from the Kootenay Florence mine, but in the latter half of 1952 the tonnage rate became increasingly difficult to maintain. By December, operations were reduced to a haulage crew handling lessees' ore, and the mill was dependent on this and ore from outside sources. One new dwelling was built at the mine. Employment reached a peak of forty-five men.

Ore was purchased and milled as follows: Nameless Fraction lease, 1,161 tons; Buckeye mine of Guichon Mines Limited, 100 tons; Scranton mine of Scranton Mines Limited, 1,123 tons; Carey Fraction lease, 621 tons; Noah lease, 385 tons; Nicolet lease, 629 tons; Florence No. 1 level lease, 405 tons; Twin lease, 220 tons. About 600 tons obtained from the Lakeshore mine is included in the production for the Kootenay Florence mine.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 156–159.]

Noah

This Crown-granted claim, lying just north of the Kootenay Florence mine, continued to be operated under lease from Western Mines Limited by M. Perdue and R. Watson, both of Ainsworth. An adit, started in 1951 about 20 feet below the Nelson–Kaslo Highway, was extended 135 feet to a total length of 165 feet. It is a drift on a narrow fissure vein, from zero to 10 inches wide, containing galena in quartz. Replacement of the intersected limestone beds provided mining widths as much as 2 feet. Ore obtained by drifting and overhand stoping was trucked to the Kootenay Florence mill. Air for drilling was supplied by a small gasoline compressor. A short access road was built to the portal site. Production: Ore milled, 385 tons. Gross content: Silver, 502 oz.; lead, 32,400 lb.; zinc, 20,820 lb.

Nicolet

This claim is part of Western Mines holdings in the Ainsworth camp. In the first half of 1952 it was under lease to Messrs. Doney, Morgan, and Tutant. These partners stripped a narrow westerly trending fissure vein for about 100 feet. Local, wider sections of the vein constituted galena ore, which was hand-sorted. The vein crosses a limestone bed along which replacement mineralization can be traced southward for 400 feet. At the southernmost exposure of this replacement an open pit was made in 1951, and shipments were made to the Trail smelter.

During 1952 the fissure vein was mined, and the ore trucked to the Kootenay Florence mill. To facilitate handling of ore, an ore-bin was built and a slide extended from the top of the bin to the open-cut.

In the latter part of 1952 the lease was taken over by Messrs. Augustine and Linn. Production: Ore milled, 629 tons. Gross content: Silver, 986 oz.; lead, 60,580 lb.; zinc, 35,456 lb.

Twin

This Crown-granted claim is part of Western Mines holdings in the Ainsworth camp. It was leased by Messrs. Glasspool and Hartland. All ore mined was trucked to the Kootenay Florence mill. Production: Ore milled, 220 tons. Gross content: Silver, 440 oz.; lead, 13,200 lb.; zinc, 16,720 lb.

Carey Fraction

This claim is part of the Western Mines holdings in the Ainsworth camp. It was leased by W. Baker, of Ainsworth, who, with the aid of a partner, extended a crosscut adit to a length of 60 feet to explore beds of mineralized limestone that were mined on the surface in 1951. The limestone beds were found to be well mineralized with galena and sphalerite, and where first encountered the zone was 8 feet wide. This was mined through to the old open-cut, and the ore trucked to the Kootenay Florence mill. A small compressor was on site. Production: Ore milled, 621 tons. Gross content: Silver, 1,305 oz.; lead 85,516 lb.; zinc, 66,344 lb.

Ayesha

This Crown-granted claim is part of the Logan McPhee group of claims on Cedar Creek. It is controlled by Seattle businessmen acting through W. S. Hamilton, of Nelson. During 1952 a road connection was made to the Buckeye camp, so that the property is now accessible either by a 4-mile road from the Kootenay Florence camp or by a 2½-mile road from Ainsworth. Two large prefabricated buildings were erected on site, but no work was done underground by the owners. T. Lane, of Ainsworth, worked under lease and made shipments totalling 43 tons to the Trail smelter.

Libby and Highland

These claims are on Cedar Creek, 2 miles by road from Ainsworth. They are owned by The Consolidated Mining and Smelting Company of Canada, Limited, but were under lease to B. Sterna and E. Meyer, and then to E. Meyer and C. D. Burns. Ore was obtained from the vein on No. 2 level, about 180 feet from the portal and above the stope that was mined by underhand methods in 1951. Some raising was also done on No. 3 level. Former work was by hand-steel, but a compressor of 160-cubic-feet-per-minute capacity was obtained in 1952. All ore was trucked to the Trail smelter.

Buckeye (Guichon Mine Limited)*

Company office, Room 502, 751 Granville Street, Vancouver. A. Jessen, president; J. D. Ferguson, manager. Capital, 2,000,000 shares, no par value. This company owns the Buckeye and Buckeye No. 2 claims and holds an option on the Silver Bell, Ellen Glen, Free Silver, Harrison, and Silver Glance. All claims are Crown-granted. The main workings are on the Buckeye and are accessible by 3½ miles of road from the Kootenay Florence camp. There is also a road connection to the Highland mine road. Except for some development work in 1918, the property has been inactive for about fifty years. The Buckeye adit is at 3,549 feet elevation on the west boundary of the Josephine claim (The Consolidated Mining and Smelting Company of Canada, Limited) and extends westward for a total 400 feet of drifting and crosscutting. There are two shallow shafts about 100 feet higher than the adit, about 250 feet northwest of the portal. The adit appears to follow the easterly of three narrow cross-fissure veins in echelon to the northwest. Two narrow, bedded fissure veins appear to displace the cross-fissure a few feet at 40 and 240 feet respectively from the portal. Some sphalerite replacement ore occurs at these intersections.

During 1952 the portal of the adit was retimbered, but otherwise the workings were found in good condition. At 240 feet from the portal a raise was driven 80 feet to connect with the bottom of one of the old shafts, 30 feet deep. A sublevel was started at 40 feet below the surface and replacement ore mined adjacent to the shaft. About 100 tons was mined and milled at the Kootenay Florence mill by the end of 1952.

On the surface a cook-house, bunk-house, ore-bin, and compressor-shed were built. Diamond drilling amounted to 942 feet in nine holes. Seven men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1931, pp. 143–144.]

Hercules (Pataha) (Asbestos Corporation (Explorations) Limited)†

Company office, Thetford, Que. This group of claims comprises the Hercules, Sullivan, and Noranda, formerly known respectively as the Pataha, Ellen, and Bugaboo. The claims extend in a line north from the Buckeye claim, beside the new road from the Kootenay Florence camp. They were optioned by S. McLellan and T. and J. Hawes to Asbestos Corporation in August, 1952. Approximately 3,000 feet of drilling was done in about thirty holes in September through November, with A. Storey in charge. Water for drilling was obtained by collecting seepage in pits. A tent camp was used.

Overburden is thick, and there are only a few small outcrops of the underlying limestone and chlorite schist. Five westerly cross-fissures have been exposed in prospect pits in and near the small outcrops. Left-hand displacement on one cross-fissure has brought chlorite schist into contact with limestone in a pit 15 feet long. The other fissures are exposed only in limestone. The cross-fissures are all more or less mineralized with sphalerite and galena, and some replacement mineralization extends from them along certain limestone beds.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, p. 160.]

* By J. W. Peck and G. E. P. Eastwood.
† By G. E. P. Eastwood.

Star (Privateer Base Metals Limited)*

Company office, 207 Ford Building, 193 East Hastings Street, Vancouver. Hill, Legg and Hemsworth, consultants. Capital: 3,000,000 shares, $1 par value. This company, a subsidiary of Privateer Gold Mines Limited, held an option on seven claims about 6 miles by road from Ainsworth. Of these claims, the Star, Sunlight, and Ruth are Crown-granted and owned by D. H. Norcross, the Star Fraction is held by record by Norcross, the Ruth Fraction by Bert Wilson, and the Nancy M and Michael M are held by F. W. Miller, all of Nelson. Surface diamond drilling was resumed on the Star and Sunlight from May to September, with D. H. Norcross in charge. Total diamond drilling by the company in 1951–52 was 3,500 feet in thirty holes. In September the option was dropped and the claims reverted to the owners.

Published figures on ore shipped prior to 1949 total 35 tons. A. G. Norcross purchased the Star and Sunlight in 1948, and D. H. Norcross inherited the claims in 1950. Mining in 1949–51 was from small stopes on the sublevel and upper adit.

Year	Ore Shipped	Gold	Silver	Lead	Zinc
	Tons	Oz.	Oz.	Lb.	Lb.
1949	5	----	91	2,266	906
1950	135	3	1,422	37,530	36,965
1951	466	13	3,293	82,927	76,730
Totals	606	16	4,806	122,723	114,601

Privateer Base Metals Limited optioned the claims in 1951 and did some exploratory diamond drilling.

Most of the workings are on and near the northwest part of the Sunlight claim. One old shaft, now completely caved, was sunk in 1899 and yielded a few tons of ore. Three inclined shafts are on the east brow of a low ridge running through the middle of the area of the accompanying map (*see* Fig. 10). The north shaft descends about 30 feet to a sublevel which follows a northwesterly cross-fault for about 80 feet then connects by a short raise with the face of an adit, 65 feet lower than the shaft collar. This adit was started north of the cross-fault, intersected it at 200 feet from the beginning of bedrock, and followed the fault for a further 50 feet. The sublevel could not safely be entered in 1952 without ropes, and it is omitted from the map. A second adit, not shown, was driven from 1904 to 1911 for about 800 feet from a point about 400 feet east-southeast of the first and 190 feet lower. It was inaccessible in 1952, but is reported to have struck no ore. Two old shafts south of the area of Figure 10 were not examined.

The country rock consists of interbedded limestones and metamorphosed argillaceous rocks, complexly folded, intruded by a sheet of fine-grained quartz diorite, and displaced by an ore-bearing cross-fault. Details of the stratigraphy are obscured or rendered uncertain by the complexity of the folding. In general, there appears to be at least 150 feet of limestone, sandwiched between argillaceous rocks which have been metamorphosed to variable degrees. Beds and lenses of schist, phyllite, and argillite in the limestone are common in drill cores but are not noticeable on surface or in the mine openings. The limestone is mostly medium grained and medium grey in colour, but for a thickness of about 50 feet near the middle it is very fine grained, thin bedded, and cherty looking. This fine-grained limestone has largely been contorted, brecciated, and cemented with coarse-grained white calcite. Near the cross-fault it is minutely and intricately dragfolded, with some suggestion of pulverization.

The quartz diorite body intrudes medium-grained limestone at surface and in the upper adit. The dip of the west contact is 45 degrees west where exposed, but drill-hole evidence indicates steepening of the hangingwall past the vertical at about 50 feet below

* By G. P. Eastwood.

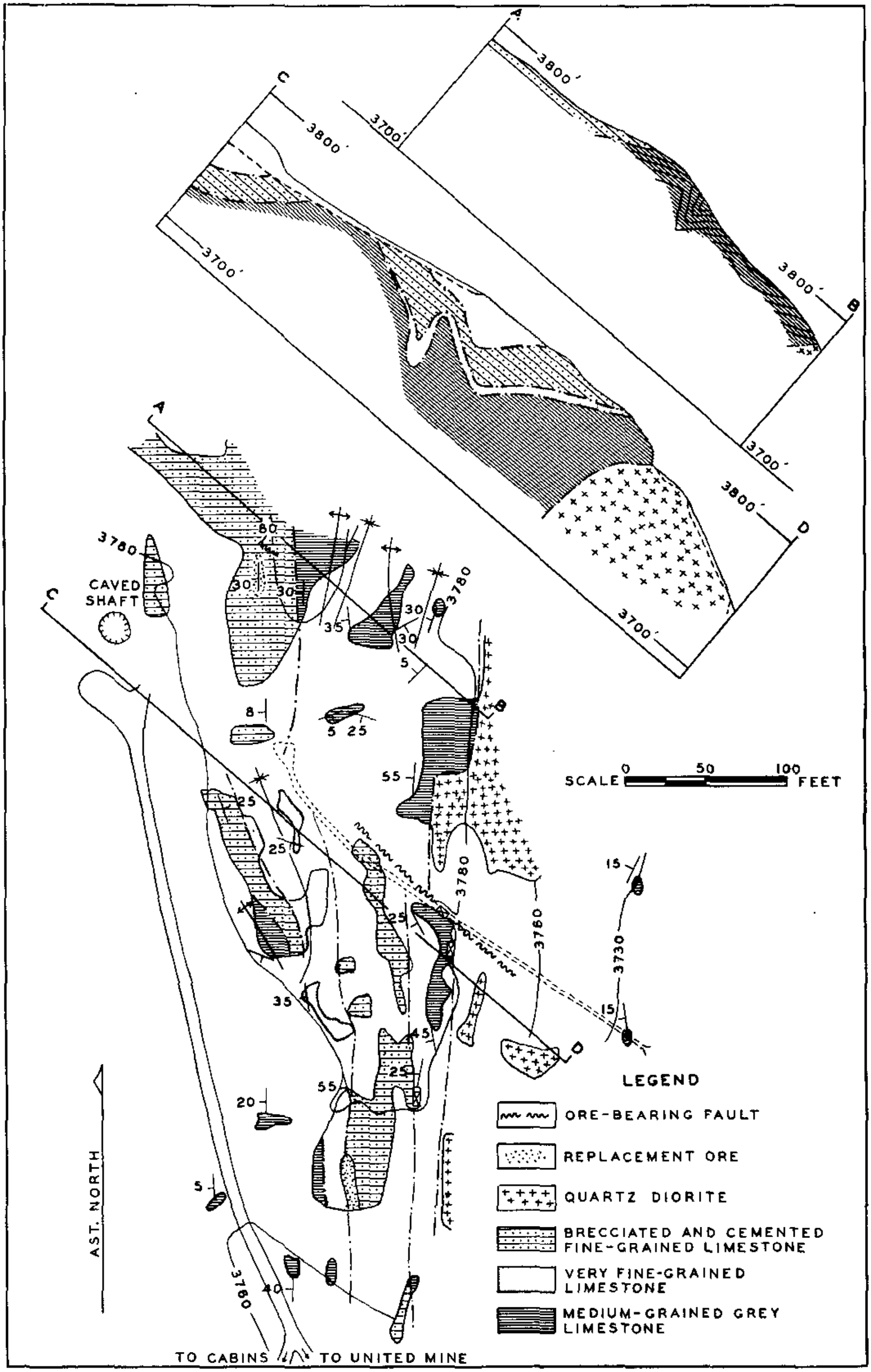


Figure 10. Geological plan and sections of Star mine.

the adit level. The cross-fault cuts the quartz diorite along one of two jogs in the hangingwall contact, but it is not known whether this jog is a measure of displacement.

The pattern of folding is incompletely known, but appears to be exceedingly complex in detail. Nearly every drill core shows wide variations in the angle between core and bedding, and small dragfolds are common. On surface south of the fault the pattern of attitudes and of exposures of the fine-grained limestone suggest a small syncline and anticline dying out southward. North of the fault, attitudes in the medium-grained limestone suggest two anticlines and synclines; one anticlinal crest is vaguely discernible. Underground there is a reversal of dip south of the fault, suggestive of a syncline. No other folds were seen underground, but some must be assumed to explain the occurrence of fine-grained limestone south of the fault at the head of the raise from the adit face. The pattern of section C-D is an interpretation of the available data. Underground north of the fault the beds dip steeply into the quartz diorite hangingwall.

The fault is exposed only in the north shaft, sublevel, and inner part of the upper adit. It strikes north 50 degrees west and dips 75 to 87 degrees southwest, steepening downward. It is filled with a sheeted vein of coarsely crystalline white calcite, 2 to 4 feet thick. Both walls of the calcite vein contain veins of sphalerite and galena which thicken and thin in complementary fashion, so that the aggregate thickness of ore minerals is roughly constant at 10 to 12 inches. Some of the drilling was designed to pick up the continuation of the fault to the northwest, but evidence of the fault was less and less conclusive at increasing distances from the north shaft. One hole intersected two 2-foot veins of coarsely crystalline white calcite and a narrow zone of friable oxidized material, all widely separated from each other; and another hole, farther to the northwest, cut three 1-foot calcite veins and several narrow oxidized zones. It seems probable that the fault feathers out to the northwest, but there is no surface evidence bearing on this. The direction and amount of movement on the fault are unknown.

Sphalerite and galena are in places disseminated in the limestone, and in at least three places have made replacement ore. One small replacement orebody is in medium-grained limestone in the fault footwall, at the west end of the sublevel. The only suggestions of ore control are a steepening of bedding and proximity of the overlying very fine-grained limestone. Two replacement orebodies are in brecciated fine-grained limestone on surface, respectively north and south of the fault. The south one has been opened by a small open-cut at the hangingwall of brecciation. Veinlets of ore minerals extend from it up into the unbrecciated very fine-grained limestone. The north orebody appears to follow a lens of definite and uniform bedding within the brecciated unit. A few feet farther north a minor shear contains a little calamine. The two south shafts along the brow of the ridge appear to have followed lean replacement mineralization.

Most of the diamond drilling was directed toward finding additional replacement orebodies in either wall of the fault. Two holes cut a 12-inch band of replacement ore at a point north of the fault and east of the first-mentioned replacement body. A third hole cut 16 inches of replacement ore which may be a continuation of the north orebody in the brecciated limestone. Small amounts and traces of sphalerite, galena, and chalcopyrite were intersected at least once in ten of the eighteen holes. In general, there seemed to be a decrease in occurrence of ore minerals toward the northwest.

[References: Ingalls, W. R.—Report of the Zinc Commission, *Can. Dept. Int., Mines Br.*, 1906, p. 164; Schofield, S. J.—Geology and Ore Deposits of Ainsworth Mining Camp, British Columbia, *Geol. Surv., Canada,* Mem. 117, 1920, p. 55.]

New Jerusalem (Ainslo Mining Company Limited)

Company office, K. W. C. Block, Nelson. G. W. Cameron, president; P. Lincoln, secretary-treasurer. Capital: 500 shares, $100 par value. This company owns the New Jerusalem, Yankee Girl No. 2, and Sara Kay claims on the south bank of Cedar Creek, 2 miles by road from Ainsworth. The mine is developed by about

300 feet of adit workings and a raise on a vein to surface. During the summer four men were employed benching down the raise from surface. The ore from this work amounted to 246 tons, and was taken out of the adit below to an ore-bin and then was trucked to the Kenville mill at Nelson. A building for living quarters was erected. Air was supplied by a portable compressor.

Woodbury Creek (49° 116° N.W.)

Daisy Bell, Budwiser No. 2 (Woodbury Mines Limited)

Company office, 850 West Hastings Street, Vancouver; mine office, Ainsworth. H. D. Forman, consulting engineer. Capital: 3,000,000 shares; 50 cents par value. This company owns a group of claims south of Lendrum Creek and west of its confluence with Woodbury Creek. In 1952 the group was extended to the shore of Kootenay Lake by acquiring the Budwiser No. 2, Amazon, Superior, and Superior Fraction claims from Kaslo Base Metals, Ltd.

During the first three months of 1952, underground development was done in an old 160-foot adit on the south bank of Lendrum Creek. This adit is at 2,500 feet elevation and follows the limestone bedding south 16 degrees west. A vein, intersected at 130 feet from the portal, was followed by drifts to the east and west to investigate diamond-drill results obtained in 1951. The west drift was driven 93 feet and the east drift 105 feet. The first 25 feet of the west drift is timbered and is reported to contain a small ore section, but the remainder of the drift follows a narrow quartz-filled fissure. The adit was then extended, and another vein was explored at 235 feet from the portal. It was followed 8 feet to the east, but a drift to the west had to be abandoned at 11 feet because of a running mud seam. At 260 feet from the portal the adit was swung to the west and extended another 65 feet to explore the second vein past the bad ground. The results of this work were not seen. Diamond drilling underground amounted to 520 feet in four holes. Nine men were employed during this period under D. Davidson. At the mine a change-house and a compressor-shed were erected. Air was supplied by a Le Roi 105-cubic-feet-per-minute compressor. The crew was transported the 2 miles from Ainsworth, where the company owns a bunk-house and an office-warehouse building.

After this work the company was inactive until October, when the Budwiser-Amazon group was obtained. An adit was collared on the Superior claim on the south bank of Woodbury Creek, 20 feet above the Nelson–Kaslo Highway. This adit will investigate several veins at a depth lower than that of previous exploration. By the end of 1952 it had been driven westward 195 feet of a proposed 1,200. The work was contracted by Kootenay Mining Service, of Ainsworth, with W. Hogg in charge.

Woodbury (Nameless)

Dr. L. D. Besecker, of Ainsworth, owns the Woodbury group of claims at the mouth of Woodbury Creek. The Vigilant claim was sold during 1952. The only activity was on the Nameless Fraction, which continued to be operated under lease by C. A. McLeish and W. McCulloch, both of Kaslo. The workings are on the shore of Kootenay Lake and are accessible by 750 feet of narrow-gauge railway blasted out of the precipitous bluffs along the lake-shore. Development has been on two fissure veins known as " B " and " C." In 1952 the adit on " C " vein was extended until it joined the adit on " B " vein at about 100 feet from either portal. The adit on " B " vein was extended to a length of 250 feet from the portal. Near the end of this drift two raises were driven, and about 450 tons was stoped between the raises. The remainder of the ore was mined by underhand stoping by means of an incline that starts just inside the portal of " B " adit. This incline is about 120 feet long at an angle of 25 degrees. All ore was sent to the Kootenay Florence mill.

Production: Ore milled, 1,161 tons. Gross content: Silver, 2,014 oz.; lead, 133,724 lb.; zinc, 86,614 lb.

Vigilant*

This claim was purchased in 1952 by J. A. Cooper from Dr. L. D. Besecker, both of Ainsworth. It has been mentioned in previous Reports under "Woodbury." The workings are on the east bank of Woodbury Creek, about one-half mile by road from the Nelson–Kaslo Highway. An easterly fissure vein is developed by two adits 100 feet apart vertically. The lower is 290 feet long, the upper 315 feet. In 1952 all production came from shrinkage stopes on the upper level. This ore was trucked to the Yale concentrator for milling, and the concentrates sent to the Trail smelter. Five men were employed. All work ceased in October.

The vein fissure traverses a 200-foot band of impure limestone, which dips about 30 degrees west. The upper contact is exposed just above the bottom of Woodbury Creek valley, and in surface workings about 250 feet east of the upper portal. A stope was carried through to surface for ventilation, just east of this contact, and the vein fissure was found to decrease to an unmineralized crack through 5 feet of interbedded schist and limestone. This crack is in echelon to other surface exposures of the same fissure. Two bedded shears, 5 feet apart, displace the vein fissure 4 feet left in both adits. The fissure is occupied by a 2- to 3-foot quartz-calcite vein, with galena and less sphalerite along both walls. At 280 feet from the portal of the upper adit a 6-inch vein of massive galena, dipping 85 degrees east, extends south from the fissure but is not recognizable to the north.

Can-Amer Mining & Milling Company Ltd.

Company office, 609 Baker Street, Nelson. G. Forsythe, Richland, Wash., president. Capital: 120 shares, $500 par value. This private company was formed in 1952 to erect a custom mill on Dr. L. D. Besecker's property at the mouth of Woodbury Creek. Work began in November. A mill with a capacity of 75 tons per day is planned. S. D. Wheeler, of Kennewick, Wash., is in charge of the project, with H. Thielman as mill superintendent.

Gold-Silver-Lead-Zinc

Scranton (Scranton Mines Limited†)

(49° 117° N.E.) Company office, 1519 Marine Building, 355 Burrard Street, Vancouver; H. L. Jestley, president. Capital: 3,000,000 shares, $1 par value. This company owns the Scranton mine in Kokanee Glacier Park on Pontiac Creek, a northerly flowing tributary of Woodbury Creek. The mine camp is at 5,500 feet elevation, 11 miles by private road from the Nelson–Kaslo Highway. Operations were continuous, ore being mined from the Sunset and Pontiac workings.

In the Sunset the oreshoot near the portal was developed by sinking a 73-degree winze 65 feet and establishing a sublevel 50 feet below the adit level. The sublevel was driven as a drift on the quartz vein to the northeast for 150 feet, until the vein ended against a fault. The vein maintained an average width of 4 feet, and one 50-foot section, well mineralized with galena and sphalerite, was stoped through to the adit level. Beyond the fault to the southeast a vein was encountered that was narrow and contained little mineralization.

In the Pontiac the lower adit was extended on the flat-lying vein to where it pinched at about 300 feet from the portal. The best section of vein is between 180 and 215 feet from the portal. Underhand and overhand stoping was done in this section, and a raise 111 feet long was driven through to the adit 22 feet vertically above. Some exploratory drifting was also done in the upper adit, but no worth-while mineralization was encountered.

On the surface at the Sunset a large ore-bin with an inclined ramp was built. Crude ore was at first shipped direct to the Trail smelter but was later concentrated at the Kenville and Kootenay Florence mills. The number of men employed averaged ten.

* By J. W. Peck and G. E. P. Eastwood.

† Scranton Consolidated Mining Company prior to December 31st, 1951.

Baltimore (Victoria Mines Limited) (49° 117° N.E.) Company office, 510 Maclean Block, Calgary, Alta. N. J. Briscoe, managing director; J. Bull, consulting engineer; C. K. Hansen, manager. This company controls the Baltimore group of claims situated on Silver Spray Creek, a southeasterly flowing tributary of Woodbury Creek. The Baltimore group now consists of the Crown-granted Grafton and Maple Leaf claims optioned from W. English of Kaslo, the Crown-granted Granite claim leased from the Crown, the recorded Connection and Foothill claims optioned from W. English, and the recorded C.K. group of three claims. The property has been inactive since 1907. Late in 1952 a road 2 miles long was built to the property from a point on the Scranton mine road, 9 miles from the Nelson–Kaslo Highway.

KEEN CREEK*

Silver-Lead-Zinc

Cork Province (Base Metals Mining Corporation Limited) (49° 117° N.E.) Head office, 62 Richmond Street West, Toronto. A. P. Earle, president; E. J. Gleason, manager; C. S. Ney, mine superintendent; C. Anderson, mill superintendent. The property is on Keen Creek, about 10 miles by road from Kaslo. The main level is the No. 3 adit, which is connected by raise to the No. 1 adit above and by a 70-degree winze to Nos. 4, 5, and 6 levels below. The mill operated throughout the year at full capacity of 110 tons per day. Grade averaged 2.5 per cent lead and 8.5 per cent zinc. Most of the ore came from shrinkage stopes on Nos. 5 and 6 levels. On No. 6 level, high-grade zinc ore was mined in the stopes to the west of the shaft. The 606 stope was as much as 20 feet wide. Stopes to the east of the shaft were nearly mined through to No. 5 level by the end of 1952. On No. 5 level, production came from east of the shaft, where a raise was driven to the bottom of an old underhand stope on No. 4 level. Small quantities of ore were also obtained from Nos. 4, 3, and 1 levels. The main development was the sinking of a new interior shaft from the No. 3 crosscut adit in the footwall side of the ore zone. This vertical shaft, consisting of three 5- by 5-foot compartments, was down 190 feet below No. 3 level by the end of December, 1952. It is the intention of the company to drive two new levels, Nos. 7 and 8, from this shaft. A Bertram electric hoist with two 45-inch-diameter drums was installed.

On the surface some diamond drilling was done to the east above the Keen Creek Road, and also at the Dublin, 1,900 feet south of No. 3 adit. Three new prefabricated eight-man bunk-houses were erected at the camp. Difficulty was encountered with tailings disposal as the mill tailings being released into Keen Creek affect the City of Kaslo hydro and drinking water. The number of men employed averaged sixty-five.

Black Fox (Ainsworth Base Metals, Limited) (49° 117° N.E.) Company office, 902, 470 Granville Street, Vancouver. W. A. Rutledge, president; H. F. Kenward, managing director. Capital: 3,000,000 shares, 50 cents par value. This company controls a group of claims on Keen Creek, adjoining the Cork Province mine to the southwest. In the group are four Crown-granted claims—the Black Fox, Daisy, California, and Patrick. The main workings are on the Daisy claim, about half a mile along the Keen Creek road southwest of the Cork Province mine. They consist of a 325-foot crosscut and a total of about 600 feet of drifting on two veins known as "A" and "D," intersected at 100 feet and 290 feet respectively from the portal.

Work was on a small scale during 1952. Drifting and overhand stoping was done on "A" vein, and on "D" vein a raise connection was made to the bottom of an old shaft. On the surface a small jig plant was erected under direction of the consulting firm of Hill, Legg and Hemsworth. The flow-sheet was as follows: Coarse-ore bin to

* By J. W. Peck.

jaw crusher to jig cell to fine-ore bin. The plant was not enclosed and only operated for a few weeks. About 20 tons of the product was trucked to the Kootenay Florence mill at Ainsworth, but all except a few tons was unacceptable. The jig was then dismantled to protect it from the weather. Most of the ore produced in 1952 did not go through the jig plant but was trucked direct to the Whitewater mill at Retallack and the Kenville mill at Nelson. About three men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, p. 165.]

B.N.A. (B.N.A. Mines Limited Liability) (49° 117° N.E.) Company office, 614–615 Central Building, 620 View Street, Victoria. Capital: 1,000,000 shares, $1 par value. This company owns the B.N.A. group of five Crown-granted mineral claims on the east side of Keen Creek north of Kyawats Creek. The mine is reached by a 2-mile tractor-road from the Keen Creek road. Sixty-eight tons was shipped to the Trail smelter during the summer, but most of this was mined in 1951. W. E. Newton, of Penticton, was in charge.

Silver Bear.—(49° 117° N.E.) This property is on Keen Creek, 14 miles by road from Kaslo. It was under lease to S. Hallgren, of Ainsworth, who made a shipment of 13 tons to the Trail smelter.

RETALLACK-THREE FORKS*

Silver-Lead-Zinc

Doherty, Caledonia (50° 117° S.E.) The Doherty claim and the Caledonia group extend along the Kaslo–New Denver Highway from Rossiter Creek to Lyle Creek. The Caledonia group is owned by G. E. McCready, of Retallack, who also owns a half interest in the Doherty with L. N. Garland, of Ainsworth. This ground was optioned late in 1951 by Pioneer Gold Mines of B.C. Limited and Alaska Gold Dredging Corporation. Under Pioneer management, surface diamond drilling was done on the Doherty, but this work ceased early in 1952 and the options were dropped.

G. E. McCready carried on operations at the Caledonia, making shipments to the Kenville mill at Nelson. Sixty tons was milled in 1952.

Whitewater (Kootenay Belle Gold Mines Limited) (50° 117° S.E.) Company office, 475 Howe Street, Vancouver; mine office, Retallack. J. L. Trumbull, president; R. E. Legg, consulting engineer; J. B. Magee, manager; D. Sloan, mine superintendent; C. Garrett, mill superintendent. Capital: 750,000 shares, 50 cents par value. Kootenay Belle Gold Mines Limited owns 60 per cent of the stock of Retallack Mines Limited, which owns the Whitewater mine and mill at Retallack. Only the lower levels have been worked in recent years. The mine is serviced by No. 14 (mill haulage) level, which is connected by service raises to No. 9 level adit. The No. 10 level is blocked at the portal, and the levels above No. 9 are caved and inaccessible.

Production up to 150 tons per day was obtained from stopes above Nos. 12, 13, and 14 levels. All three types of ore were mined: (1) The Whitewater vein or lode produced 4,000 tons; (2) spathic replacement of limestone in the hangingwall of the lode produced 25,000 tons; (3) magnetic replacement of dyke rock produced 11,000 tons. Most of the spathic replacement stopes were flat lying, necessitating careful mining procedure, such as the leaving of pillars and some roof bolting. No development was done, except for a small amount of drifting and diamond drilling at the southeast end of the ore zone on No. 14 level. Diamond drilling totalled about 2,200 feet. On No. 14 level a diesel-electric locomotive, designed by Moran Engineering Company of California, was installed, the first of its type in British Columbia.

The mill operated at about 200 tons per day. In addition to Whitewater ore, stockpiled ore was milled from the Monitor and Altoona mines. Custom milling was done

* By J. W. Peck.

for the Black Fox mine of Ainsworth Base Metals, Limited. The largest outside shipments came from the company's operation at the Richmond-Eureka mine at Sandon, which was producing nearly 2,000 tons per month by the end of 1952. The sink-float plant, which is capable of increasing the mill's capacity, did not operate.

The company ceased all operations on December 15th. The number of men employed averaged eighty.

Production: Ore milled, Whitewater mine, 40,668 tons; Richmond-Eureka, 13,476 tons; Monitor, 1,868 tons; Altoona, 830 tons; Black Fox, 530 tons.

Jackson (Jackson Basin Mining Co. Ltd.)

(50° 117° S.E.) Company office, 800 Hall Building, 789 West Pender Street, Vancouver. B. I. Nesbitt, managing director; H. Hewat, superintendent. Capital: 3,000,000 shares, no par value. This company owns the Jackson mine on Stenson (Jackson) Creek, 5.7 miles by road from Retallack. The 45-degree inclined shaft was rehabilitated throughout its 235-foot length. This shaft is intersected 80 feet from the collar by No. 5, the lowest adit, at a point 200 feet from the portal. No. 6 level, 220 feet below the shaft collar, was a stub drift started by former operators. During 1952 this drift was driven northeastward to investigate the lode beneath No. 5 level between the shaft and the adit portal.

On the surface a small headframe was erected, a hoistroom built, and an air hoist installed. Three new prefabricated eight-man bunk-houses were erected. Erection of a 50-ton mill was started and was nearing completion when operations ceased in the autumn of 1952 because of financial difficulties. About twenty-five men were employed on the surface and four underground.

Winona Boon

(50° 117° S.E.) This group of eight Crown-granted claims is in the Jackson Basin, accessible by trail from the Jackson mine road. It is owned by L. N. Garland, of Ainsworth, who mined and shipped ore from the same workings on the Winona claim from which ore was mined in 1951. Production amounted to 3 tons which was trucked to the Trail smelter.

Lucky Jim (Zincton Unit, Sheep Creek Gold Mines Limited)

(50° 117° S.E.) Company office, Room 209, 413 Granville Street, Vancouver; district office, K.W.C. Block, Nelson; mine office, Zincton. J. S. McIntosh, general superintendent; G. Avison, mill superintendent. This company owns and operates the Lucky Jim mine at Zincton. The mine is serviced by two main adits; No. 9 is the lowest adit and main haulage to the mill, and No. 3 adit is reached by an outside road and tram-line and is also connected underground by a series of raises with No. 9 level. Nos. 10 and 11 levels are reached by inclined winzes. Production during 1952 was close to the mill capacity of 350 tons per day. Most of the ore came from No. 10 level, and from No. 9 level in the southwest part of the mine. Minor amounts came from Nos. 1, 3, 5, and 11 levels. Development was done to the west on No. 9 level and to the southeast on Nos. 3 and 7 levels. The number of men employed averaged 100. More than half the underground crew was immigrant labour.

Development: Drifting, 1,818 feet; raising, 1,413 feet; diamond drilling, 9,234 feet.

Monitor

(50° 117° S.E.) This property is at Three Forks, on the south side of Carpenter Creek. At the end of 1951 it was under option to Kootenay Belle Gold Mines Limited. At that time ore was being mined by shrinkage stoping on No. 5 level and trucked to the Whitewater mill at Retallack. Little underground work was done in 1952, but 1,800 tons, mined in 1951, was milled at the Whitewater mill during April and May.

A lease was obtained on the No. 4 dump by L.P. Gormley, of Nelson. Seven tons was removed and trucked to the Trail smelter.

SANDON*

Silver-Lead-Zinc

Silversmith, Ruth Hope (Carnegie Mines of British Columbia, Ltd.)

(49° 117° N.E.) Head office, 276 St. James Street, Montreal; mine office, Sandon. C. Notar, Montreal, president; T. R. Buckham, mine manager; R. E. Renshaw, mine superintendent. Capital: 3,000,000 shares, no par value. This company controls the old Silversmith mine south of Sandon. Mine rehabilitation and development continued throughout most of the year. Some drifting and raising was done in the Rabbit Paw section on No. 10 level, while stopes were prepared on Nos. 3 and 5 levels in the Slocan Star section. A road was built to these upper portals, and service buildings and ore-bins were erected.

The Ruth Hope mine was purchased in 1952, and a drive started on No. 5 level toward the Silversmith mine. This drive will connect by a 20-foot ore-pass with No. 10 level of the Silversmith in order to shorten the outside trucking route to the mill.

On the western outskirts of Sandon the old Silversmith mill building was torn down and a new mill erected on site. Some of the old equipment, such as the jaw crusher, ball mills, disk filter, pumps, etc., was put to use and new equipment obtained to provide a mill of 140-tons-per-day capacity. Electrical power was obtained from the company's hydro plant at the eastern end of Sandon. Milling started in October. As many as 135 men were employed during the construction period.

In December the option on the Richmond-Eureka property was obtained from Kootenay Belle Gold Mines Limited. The ore from this mine was then trucked to the Silversmith mill instead of to the Whitewater mill.

Richmond-Eureka (Kootenay Belle Gold Mines Limited)

(49° 117° N.E.) During most of 1952 this property was under option by the Kootenay Belle Gold Mines Limited from R. Crowe-Swords, of Vancouver. The mine is south of Sandon, accessible by about 2 miles of road. Ore was recovered between Nos. 6 and 5 levels. This ore was hand-trammed about 1,000 feet on No. 6 level, transferred to an ore-bin at the portal, then trucked to the Whitewater mill at Retallack. Production ranged between 50 and 100 tons per day.

Surface plant consisted of a small change-house and portable compressors, set up near No. 6 portal. The sink-float plant, built in 1951 below No. 6 dump, did not operate. The building remained on site, but most of the machinery was removed.

In December the option on the property was transferred to Carnegie Mines of British Columbia, Ltd. Operations continued, but the ore was trucked to the Silversmith mill at Sandon. During operations by Kootenay Belle Gold Mines Limited, twenty men were employed under D. Edwards.

Noble Five, Slocan Sovereign, Deadman, Jessie (Cody Reco Mines Limited)

(49° 117° N.E.) Head office, 721 Eastern Avenue, Toronto. James A. Taylor, president; D. M. Kline, consultant; W. Maybank, manager. This company owns a group of claims north of Cody. Included in the group are old mines such as the Noble Five, Slocan Sovereign, Last Chance, and Deadman. The only underground work in 1952 was in the Noble Five workings, in which some rehabilitation was done and the winze to No. 19 level unwatered. A raise was also started on No. 19 level in the winze section.

At Cody a mill of estimated capacity of 200 tons per day was erected. Equipment installed consisted of a 10- by 36-inch jaw crusher, Hardinge 6- by 7-foot ball mill, 36-inch Aikins spiral classifier, Denver filter, six lead cells, eight zinc cells, G.M. 312-horsepower diesel, D-13000 Caterpillar diesel-electric set. In addition, an Ingersoll-Rand 615-cubic-feet-per-minute compressor was installed in the mill building for supplying air to the mine. A new road was built to the Noble Five-Slocan Sovereign camp and

* By J. W. Peck, except as noted.

extended to the Deadman and Last Chance. Ore from the Slocan Sovereign dumps was hauled by truck as well as by the tram-line, which was repaired in 1951. A road was built to a showing on the Jessie, and ore from an open-cut was trucked to the mill. The mill commenced operation in July but ceased before the end of 1952. In August forty-three men were employed on the surface and seven underground.

Bluebird (Bluebird Slocan Mines Limited)

(49° 117° N.E.) Company office, 507 Stock Exchange Building, 475 Howe Street, Vancouver; mine office, Sandon. C. Rutherford, consultant; J. Mollard, manager. Capital: 2,500,000 shares, 50 cents par value. The Bluebird property is northeast of Cody and crosses the divide between Carpenter and Stenson (Jackson) Creeks at an elevation of about 7,000 feet. The Idaho No. 2 adit, in which work has been done recently, starts at an elevation of 6,250 feet on the Idaho No. 2 claim and extends northeastward into the Rawdon claim for a distance of 1,180 feet. During 1952, at a point 400 feet from the portal, a branch was driven to the northwest a distance of about 80 feet. For about 50 feet of this distance a lode is exposed, ranging from 2 to 3 feet wide and containing abundant sphalerite. At 600 feet from the portal a crosscut was driven 20 feet to the northwest to intersect another lode, also containing abundant sphalerite, but the relationship between these two ore occurrences was not established.

Because the old camp near the portal is in a precarious position, new camp buildings were erected on a site about 500 feet lower, near the Grey Copper workings. Considerable road work was done during the year to improve the jeep-road built in 1951. As many as ten men were employed.

Vulture (Slocan Lode Mines Limited)

(49° 117° N.E.) Company office, 913 Vancouver Block, Vancouver. W. T. Fairgrieve, president. Capital: 3,000,000 shares, no par value. This company was formed in 1952 to develop the Vulture claim, 1½ miles east of Cody. Most of the underground workings on the claim were driven prior to 1900. Two adits have been driven in a northerly direction at elevations of 5,000 and 5,180 feet. In the upper adit a mineralized lode from zero to 24 inches wide can be seen for a distance of 90 feet from the portal, but from that point to the face at 245 feet no important mineralization was observed. A small stope in the best section near the portal shows zinc mineralization more abundant than lead. Additional development in this adit includes a small stope and a reported raise to the surface at 65 feet from the portal; a winze filled with water at 85 feet; a 10-foot crosscut in a northeasterly direction at 95 feet; a 20-foot crosscut to the west at 115 feet; and a 10-foot crosscut to the west at 175 feet. The lower adit was not examined, but the mine plans show the north drive to be 175 feet long, with the face approximately under the winze in the upper adit. At 50 feet from the portal there is a 130-foot drift in a northeasterly direction. No worth-while mineralization is reported in this lower adit.

On the surface a compressor and utility shed were erected at the upper portal and the track extended from the portal to a truck-loading site. Machinery consisted of a Jaeger 210-cubic-feet-per-minute compressor. Underground the mine was rehabilitated and a stope prepared near the portal. Some ore was hand-sorted from the old dump at the upper portal. In the latter part of 1952 three men were employed under W. Kinhincki.

Altoona

(49° 117° N.E.) This property is about 1 mile northwest of Sandon. It was operated during 1950 and 1951 by Kootenay Belle Gold Mines Limited. In the fall of 1951 it was reported that excessive soluble silica in the ore made the zinc concentrates unacceptable at the Trail smelter. The property was inactive during 1952, but ore mined in 1951 was milled in May at the Whitewater mill. This amounted to 830 tons, with a reported grade of 2 ounces of silver per ton, 1.4 per cent lead, and 6.9 per cent zinc.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1951, pp. 170–171.]

Wonderful (Silver Ridge Mining Company Limited)

(49° 117° N.E.) Company office, 373 Baker Street, Nelson; mine office, Sandon. J. R. Kenney, managing director. Capital: 5,000,000 *shares, 50 cents par value. This company owns a* large group of claims west of Sandon, including the Wonderful. Work in 1951 had exposed a mineralized lode in the Wonderful No. 2 adit (named Pearson adit in Bulletin 29 and in the 1951 Annual Report). Two new adits were driven in 1952 to investigate this lode at depth. No. 3 adit was collared at 3,932 feet elevation, 450 feet north 70 degrees east of No. 2 portal, and driven southwestward to intersect the lode at about 500 feet from the portal. More than 1,000 feet of drifting in a westerly direction was done on the lode. Little mineralization was encountered until a point 870 feet from the crosscut was reached. Here the lode splits, but mineralization east of the split was as much as 4 feet wide. A raise was put up here to No. 2 level, 145 feet vertically above, but appeared to follow the ore only in the first few feet. Most of No. 3 adit needed to be timbered. No. 4 adit was collared north of No. 3 portal at 3,775 feet elevation. About 500 feet of a projected 1,200-foot drive had been completed by the end of 1952. Little timbering was required in this adit.

At the No. 4 portal a large building was erected and compressors installed. A road connection was made between the Violamac mine road and the Silver Ridge mine road. The new No. 4 portal was one-quarter of a mile from the Violamac mine road. The number of men employed ranged from five to fifteen. J. R. Kenney, Jr., was in charge.

New Springfield.—(49° 117° N.E.) This old claim at Sandon, Crown-granted in 1902, has been worked intermittently since 1942 by Eugene H. Peterson. In May, 1952, Mr. Peterson made a shipment to the Trail smelter.

Sylverite (Slocan Base Metals Limited)

(49° 117° N.E.) Company office, 904 Hall Building, 789 West Pender Street, Vancouver. W. H. Johnson, managing director; L. N. Smith, manager. Capital: 3,000,000 shares, no par value. This company owns the Silver Ridge, Silver Ridge Fraction, Speculator, Consolidated Virginia, Elk, and G. Fraction claims northwest of Sandon. The group is adjacent to the Queen Bess and Violamac groups.

In 1951 an adit was collared at an elevation of 4,428 feet in the northeast corner of the Silver Ridge claim. In 1952 this was driven in a westerly direction for 290 feet to the Violamac boundary. At 150 feet from the portal a fracture was followed 125 feet to the southwest, and at 90 feet from the start of the drift another fracture was followed to the west for 120 feet. All workings were heavily timbered. It is reported that no worthwhile mineralization was encountered. All work ceased early in 1952. Three men were employed.

Victor (Violamac Mines (B.C.) Limited)*

(49° 117° N.E.) Head office, 67 Yonge Street, Toronto; mine office, New Denver. Mrs. Viola R. MacMillan, president; J. C. Black, mine manager. This company, a wholly owned subsidiary of Violamac Mines Limited, owns the Victor mine, 2½ miles by road northwest of Sandon. Crown-granted claims held are the Provident, Hidden Treasure, Clair, Victor, Archie, and Cinderella. The mine workings are mostly on the Archie claim. The main development in 1952 was the extension of the lowest or No. 7 level to a total length of more than 1,600 feet. The vein was encountered at 1,050 feet from the portal, and in this vicinity a winze from No. 5 level, started in 1951, made connection with No. 7. A sublevel was driven 30 feet above No. 7 level. On No. 5 level, drifting was done on both ends of the known ore block, and additional ore, though lower in grade, was indicated. Most of the 1952 production came from Nos. 5 and 7 levels.

The winze between Nos. 5 and 7 levels demonstrated the existence of a recumbent fold with an amplitude of about 150 or 200 feet. The southwest-dipping beds on No. 5

* By J. W. Peck and M. S. Hedley.

level steepen downward and roll under to a northeast dip, and a resumption of the southwest dip is obscured by faulting in the vicinity of the bottom of the winze. This fold has a plunge of 10 to 20 degrees to the northwest and an axial plane dipping 20 degrees or less to the southwest. It has the form of a dragfold produced by a relative movement of the overlying beds down the dip, in conformance with the regional structure. This fold is important, inasmuch as the major ore zone between No. 4 and No. 7 levels appears to be directly related to it and to lie in the zone of curvature of the fold, a situation presumed favourable to maintenance of open fissures which, like the Victor vein, are at right angles to the axis of folding. (For additional discussion, see *B.C. Dept. of Mines*, Bull. 29, 1952, pp. 53, 97–98, 117–120.)

A new road, 2½ miles long, was built from the mine to Three Forks. A mill-site was cleared at Three Forks, and a mill of 150-ton-per-day capacity was planned, but the project was shelved when arrangements were made in November to use the Western Exploration mill at Silverton.

The small mill at No. 7 portal operated throughout most of 1952 at its capacity of 30 tons per day. In addition, crude ore was shipped to the Trail smelter at an average rate of about 100 tons per month. The number of men employed averaged forty-five.

Lone Bachelor (Lone Bachelor Mines Limited)

(49° 117° N.E.) This company was formed by Violamac Mines (B.C.) Limited to develop the Lone Bachelor, D. Fraction, and Keyser Fraction Crown-granted claims adjacent to the Victor group. The new No. 4 adit, started in 1951 at an elevation of 4,200 feet, was driven in a northwesterly direction to a total length of 700 feet by September, 1952. The adit was driven to investigate the downward continuation of the Lone Bachelor vein, reported to be exposed in the inaccessible No. 3 adit, approximately 135 feet vertically above. Two veins were intersected at 380 and 465 feet from the portal. The second vein exposed galena as much as 2 feet wide, and this was investigated by driving an angle crosscut 35 feet to intersect the vein on the northeast side of the adit. The vein, where intersected, was a few inches wide. Four men were employed in this work.

SLOCAN LAKE*

Silver-Lead-Zinc

Rosebery Surprise

(49° 117° N.E.) J. Kelly and R. Welch conducted a salvage operation on the old Rosebery Surprise mill tailings located below the surface of Slocan Lake at Rosebery. This mill, now demolished, was built in 1905 and operated intermittently until 1925. During that period, ores were treated from the Bosun, Surprise, Monitor, Ivanhoe, Canadian, Ajax, Whitewater, and Lucky Jim mines. In salvage operations the tailings were scraped by a dragline scraper up a ramp into a hopper. From this hopper the tailings were elevated by a belt conveyor into a trommel-screen above an ore-bin. The trommel-screen removed the fines, which were sold to Western Exploration Company Limited at Silverton. About 1,870 tons was milled, with an average grade of 2.5 per cent zinc and 2.8 oz. silver. The operation was idle during the latter part of 1952, except that there was some production for use as road material.

Bosun (New Santiago Mines Limited)

(49° 117° N.E.) Company office, Suite 4, 423 Hamilton Street, Vancouver; mine office, New Denver; W. Postlethwaite, superintendent. Capital: 1,500,000 shares, 50 cents par value. The Bosun mine is on the east shore of Slocan Lake, 1½ miles south of New Denver, on the Nelson–Nakusp Highway. The main haulage level, No. 6 adit, is driven beneath the highway from a site 40 feet above the lake. Operations were on a small scale during 1952. Most of the work was in the vicinity of the main winze. A high-grade pillar was removed from the hangingwall of the winze on No. 7 level station. The number of men employed averaged three.

* By J. W. Peck, except as noted.

Mammoth, Standard, Enterprise, Monarch (Western Exploration Company Limited)*

(49° 117° N.E.) Company office, 38 South Dearborn Street, Chicago, Ill.; mine office, Silverton. M. P. McCulloch, Chicago, president; A. M. Ham, Silverton, managing director; R. A. Avison, mine superintendent; T. Leask, mill superintendent. Capital: 2,000,000 shares, 50 cents par value. This company owns the Mammoth and Standard mines near Silverton and the Enterprise mine on Enterprise Creek, 12½ miles by road south of Silverton.

Mammoth.—This mine is serviced by a narrow 2-mile road from the Standard camp and by a 16,000-foot aerial tram to the mill at Silverton. Electricity and compressed air are supplied from the company's hydro plant on Silverton Creek. The camp consists of bunk-house, cook-house, change-house, and tram terminal building. The main haulage level is No. 7 adit, which is connected by a 45-degree raise to No. 9 adit level, 340 feet below. Throughout most of the year, mining was done in the square-set stope above No. 8 level, a sublevel off the raise, and the stope was carried up seven floors to the seventeenth floor. On the fourteenth floor the orebody pinched out and a sublevel had to be driven to get directly under the ore block which has been mined out on No. 7 level. Some development was done on No. 9 level, to the east of the main raise.

Monarch.—In 1944 the Monarch adit was started about 900 feet west of the Mammoth mine at 5,215 feet elevation, approximately the same elevation as the Mammoth No. 5 level. The adit was driven as a crosscut for 570 feet and crossed the Mammoth lode 490 feet from the portal. The lode was bedded; it was essentially unmineralized both at the crosscut and where intersected by several short diamond-drill holes. No further work was done at that time.

In 1951 C. C. Starr, the company's consulting engineer, made a detailed study of the local structure that substantiated the findings of the Department of Mines (*see* Bull. 29, pp. 86–89) and demonstrated the presence of compressed recumbent folds plunging to the southeast and south. It was considered that the structural situation west of the Monarch adit was favourable to the occurrence of ore, and a westerly drift was started in the hangingwall of the lode in 1952. The drift was 760 feet long by November, when the company ceased operations.

The drift crossed easterly dipping beds throughout much of its length, a fact that indicated the structure to be even more complicated than at first believed. The lode was reached by short crosscuts at 170, 410, and 665 feet west of the main crosscut, and in these the lode was seen to be a broad, essentially unmineralized shear zone with a strike of north 75 degrees west and a southerly dip of 45 to 70 degrees.

Standard.—Operations were on a reduced scale, with most of the ore coming from three stopes on No. 7 level. The camp remained closed and the men were transported the 2 miles from Silverton.

Enterprise.—A steeply dipping quartz vein is developed by several levels, the lowest being No. 9, a sublevel off the old Iron Horse shaft. In the current mining on Nos. 6 and 8 levels the vein has an average width of 10 inches. On No. 8 level the main ore section was mined through to the sill pillar on No. 6 level, but another section southwest of this block was being opened up in the latter part of 1952. On No. 9 level the vein was followed by a drift to the southwest for about 450 feet, but mineralization was less than on No. 8 level above.

Standard Mill.—The mill at Silverton treated ore from the three mines—about 50 tons per day from the Mammoth, 20 tons per day from the Standard, and 15 tons per day from the Enterprise. In addition, Rosebery Surprise tailings and Galena Farm ore was purchased. About 50 tons of Standard mill tailings was scraped out of Slocan Lake and treated. The sink-float plant did not operate.

All operations ceased in November, 1952, but in December the mill was rented to Violamac Mines (B.C.) Limited. On the average, forty men were employed at the

* By J. W. Peck and M. S. Hedley.

Mammoth, eighteen at the Enterprise, and twelve at the Standard. The total number employed at all operations averaged ninety-five.

Buck (Silver Hoard Mines Limited) (49° 117° N.E.) Company office, 355 Burrard Street, Vancouver. H. F. Kimber, Toronto, president. Capital: 3,000,000 shares, no par value. This company optioned from E. C. Wragge, of Nelson, the Buck group of claims, lying west of the Emily Edith claim of Western Exploration Company Limited; the group consists of six claims—the Buck Fraction, Silverton Boy, Mohawk, and Crescent are Crown-granted, and the Tram Fraction and Binks Fraction are held by record. The workings, consisting of open-cuts and short adits, are on the Buck Fraction and Silverton Boy claims, accessible from the Standard mine road. During the summer months, surface diamond drilling was undertaken with A. Walker in charge. The option was later dropped.

Van Roi, Hewitt (Van Roi Consolidated Mines Ltd.)* (49° 117° N.E.) Company office, 1519 Marine Building, 355 Burrard Street, Vancouver; mine office, Silverton. K. G. Nairn, director; D. R. Wilson, manager; J. Currie, mill consultant. Capital: 3,000,000 shares, no par value. This company, controlled by Transcontinental Resources Limited, owns the Van Roi and Hewitt mines near Silverton. From Silverton the mine camp is 6½ miles southeast by road, and the mill is 1 mile south on the Nelson–Nakusp Highway.

At the Van Roi most of the production came from No. 5 (main haulage) and No. 3 levels. In general, the grade of the veins did not stand up to expectation, and the lenticular nature of the ore necessitated the driving of short raises and sublevels. On No. 5 level the 545 stope was started on the west end of the "south vein" from the 544 crosscut driven in 1951. This stope proved disappointing, and a raise was put up to start a sublevel 90 feet above. On the "north vein," just west of the 544 crosscut, a high-grade pillar was mined up to No. 4 level. A small stope adjacent to the main ore-pass to No. 3 level was mined from the west end of No. 4 sublevel up to No. 3 level. On No. 3 level some raising was done in the southeast oreshoot, and to the west the vein was followed by a drift to the Van Roi fault at a point above the 545 stope. A good ore section was found near the end of this drift, but it was considered to be mined out after stoping up 65 feet over a length of 60 feet. In the Cunningham section on the "south vein," mining was done in 352 stope, but after this proved disappointing a sublevel was started 125 feet above No. 3 level; good mineralization was observed for a length of 120 feet. On No. 1 level in this same area a raise was put through to A level, the level was rehabilitated, and the A-52 stope prepared.

Underground geological mapping by the company strongly indicated that the main ore zone of former operations was localized in a large dragfold in the sedimentary rocks, and that other ore zones might similarly be localized. Mapping was not carried to completion, and detailed surface mapping, although started, was not finished by the time the mine closed down. Consequently, a good deal of information was not available that could have aided exploration, and the ore-yielding possibilities of the greater mine area are not yet understood.

At the Hewitt, production on a small scale was maintained from the 1046 square-set stope on No. 10 level. This stope was mined to about 110 feet above No. 10 level and a second raise connection made with No. 9 level.

Mining operations ceased in July, but milling continued until the end of August. The sink-float plant only operated during the early part of 1952. The lead concentrates were sent to the Trail smelter, but the zinc concentrates were not acceptable there and had to be sold to a foreign buyer. During full operations of the company about 100 men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 176–177.]

* By J. W. Peck and M. S. Hedley.

Galena Farm

(49° 117° N.E.) Frank S. Mills, of Silverton, continued to operate this mine under lease. During most of 1952 ore was sold to the Western Exploration Company Limited at Silverton and a few tons was trucked to the Trail smelter. Production was as high as 100 tons per month. Mr. Mills was assisted by W. D. Pengelly, also of Silverton.

Dumac Mines Limited

(49° 117° N.E.) Company office, 106, 413 Granville Street, Vancouver. G. A. McPherson, mine manager; H. D. Forman, consulting engineer. Capital: 3,000,000 shares, no par value. This company owns the Mount Royal and Royalite groups of three claims each, located on Enterprise Creek, to the west of the Enterprise mine of Western Exploration Company Limited. The company was formed in 1947 to develop this property, but work has been intermittent. A few open-cuts have been made on a strong shear zone on the east side of Bondholder Creek, a northeasterly flowing tributary of Enterprise Creek. There is also a short inaccessible adit. In 1952 a new adit was collared about 300 feet northeast of the open-cuts. It was driven southerly as a crosscut for 40 feet until the projected shear was intersected and then turned southwest as a drift on the shear. About 100 feet of drifting was done, but no ore was encountered. Another 200 feet of drifting would extend the adit to a point below the open-cuts. All work ceased in June. Two men were employed.

SPRINGER CREEK*

Silver

Ottawa (Harrison Drilling & Exploration Co. Ltd.)

(49° 117° N.E.) Company office, P.O. Box 230, Noranda, Que.; British Columbia office, 1408, 675 West Hastings Street, Vancouver; mine office, Slocan City; P. Harrison, Noranda, Que., president. Capital: 800 shares, $50 par value. This company has under option the Ottawa mine, which is north of Springer Creek, about 5 miles by road from Slocan City. Intermittent operations were carried on during 1952. In the No. 6, or lowest, adit a raise was started from "B" stope at an angle of about 25 degrees toward the underhand Cameron stope on No. 5 level, the vertical distance between the two levels being 280 feet. A 1,100-foot drive on No. 6 level was started from the south end of the east part of the workings toward a point on the surface near the old Morris workings. This development work was stopped in June. About fifteen men were employed during the first half of 1952 under M. H. McLeod.

Production: Ore shipped, 69 tons. Gross content: Silver, 15,535 oz.

Silver-Lead-Zinc

Little Tim or L.T. (Bondholder)

(49° 117° N.E.) The Little Tim group at the head of Little Tim Creek, a tributary of Springer Creek, is a relocation of the cancelled Crown-granted claims of the Bondholder group. Eight claims held by D. B. O'Neail, of Slocan City, are under option to Harrison Drilling & Exploration Co. Ltd. (later known as Hardex Mines Limited). The claims are at elevations of about 6,600 feet and are reached by a steep road, completed in 1952, 2.7 miles from the Ottawa mine. Most of the workings are on the V Day and Victory V claims, corresponding to the cancelled Graphic and Rosebud claims respectively.

Two narrow fissure veins, dipping steeply in granite, have been developed in the past by four adits and a shaft. During 1952 the lower adit, No. 4, at 6,624 feet elevation, was extended 360 feet to a total length of 440 feet. Near the face a raise was put up to break through near the face of No. 3 adit, 75 feet vertically above. On No. 4 level the vein was only a few inches wide but contained high silver values. Two small stopes were started on this level. A new adit, No. 5, was started at 6,519 feet elevation, 400 feet southwest of No. 4 portal. This adit was 20 feet long when the property was visited at the end of

* By J. W. Peck.

August, and should intersect the old shaft sunk about midway between the two portals. Another adit, at about the same elevation as No. 5, was collared a few hundred feet southeast to investigate a parallel vein.

On the surface a bunk-house was erected to replace the old log building and tent camp used previously. Air for drilling was supplied by a portable Ingersoll-Rand 550-cubic-feet-per-minute compressor. Twenty men were employed in August under N. Harrison.

Production: Ore shipped, 51 tons. Gross content: Silver, 6,660 oz.; lead, 9,662 lb.; zinc, 4,472 lb.

Republic No. 2 (49° 117° N.E.) This property is at the headwaters of Climax and Scorpion Creeks, two southerly flowing tributaries of Springer Creek. It is owned by C. B. Tipping, of Slocan City, and was under option to Harrison Drilling & Exploration Co. Ltd. The road was repaired to the mine, but, apart from sampling and mapping, little work was done underground. Four tons of ore was salvaged and shipped to the Trail smelter.

LOWER ARROW LAKE*

Silver-Lead-Zinc

Renata (49° 117° S.E.) The Renata group of four claims, owned by R. W. Cook, of Castlegar, is on the east side of Dog Creek, 1 mile by road southeast of Renata. The claims adjoin the old Mountain Chief property on the south and cover ground that was at one time held as the Peggy and Rickward claims. The Minister of Mines Annual Report for 1918 briefly mentions that these latter claims were worked at that time because of "copper indications." The workings are at an approximate elevation of 1,500 feet.

The workings consist of several open-cuts exposing metamorphosed limestone adjacent to a north-south contact with intrusive granite. Recent work indicates that in one open-cut limestone is locally replaced by galena and minor amounts of sphalerite, chalcopyrite, and pyrite. The mineralization follows numerous fractures adjacent to the granite and is quite irregular. No zone could be delineated or effectively sampled. A grab sample of the best grade of material assayed: Gold, 0.01 oz.; silver, 0.5 oz.; lead, 4.3 per cent; zinc, 2.9 per cent. Tungsten was indicated in this sample.

UPPER ARROW LAKE*

Zinc

Big Ledge (50° 118° N.E.) The Consolidated Mining and Smelting Company of Canada, Limited, continued diamond drilling during the summer on this property on Pingston Creek. Two sections were drilled: one west of Pingston Creek and the other about 1 mile west of Arrow Lake on the extension of the mineralized zone. Sixteen holes were drilled to a total length of 3,355 feet.

Lakeshore and Sampson, Young Canuck (Samson Mines, Limited) (50° 117° N.W.) Company office, 120A McKenzie Avenue, Revelstoke. George Fyten, director. Capital: 200,000 shares, $1 par value. This company was formed in 1951 to develop a group of claims about a mile north of Whisky Point on the north-east arm of Upper Arrow Lake. Under the direction of A. E. Peterson a short road was built to upper showings and a small amount of open-cut work was done.

* By J. W. Peck.

NORTH LARDEAU*

Silver-Lead-Zinc

Spider (Sunshine Lardeau Mines Limited)† (50° 117° N.W.) Head office, 525 West Pender Street, Vancouver; mine office, Camborne. H. E. Holcombe, president; W. J. Scorgie, vice-president; P. L. Clark, manager; J. Currie, mill consultant. Capital: 3,000,000 shares, no par value. In the autumn of 1952 an agreement was made whereby Berens River Mines Limited provided additional funds for development and assumed control of the operation. The company operates the Spider mine on Pool Creek, 2 miles by road from Camborne. The main camp is at Camborne, where a new combined cook-house and bunk-house was completed in 1952. Ore from the mine is hauled by truck and dumped into a raise, from the bottom of which it is trammed by mine car a short distance to the ore-bin at the mill. The flotation mill, having a capacity of 50 tons per day, occupies the old Meridian mill building.

The mill was put into operation in May and by the end of the year was treating 1,700 tons per month. At first, trouble was encountered with oxidized ore, and a conditioner and additional cells were installed to overcome it. Lead concentrates and high-grade crude ore were shipped to the Trail smelter, but the zinc concentrates were not accepted and were sold elsewhere. During the year the mill treated 6,319 tons of ore, producing 692 tons of lead concentrate and 581 tons of zinc concentrate. Gross content of concentrates: Silver, 89,370 oz.; lead, 849,368 lb.; zinc, 748,583 lb.

The early production of the Spider mine, from ore mined mostly from Nos. 1 to 4 levels, is as follows:—

Year	Tons Shipped	Gold	Silver	Lead	Zinc
		Oz.	Oz.	Lb.	Lb.
1911	6		1,051	4,153	....
1912	12	16	9,909	4,137	....
1917	6	....	307	1,633	....
1926	137	8	9,314	35,786	32,260
1927	28	1	1,863	8,652	7,687
1929	6		470	2,434	....
1937	90	8	6,784	34,019	29,838
1941	12	1	1,294	8,132	3,122
1949	26	3	942	9,839	7,028

Two parallel vein zones are exposed in the underground workings. The eastern vein zone is explored by four old levels, Nos. 1 to 4. The western vein zone is the one currently being mined and is developed by three adit levels, Nos. 5, 6, and 8. A crosscut on No. 5 level is driven across to the eastern zone a distance of about 325 feet in a southeasterly direction. The veins and underground workings are in a band of green chlorite schist which strikes north 30 to 50 degrees west. The full width of the band is not known but must be at least 500 feet. Foliation of the schist dips 70 to 80 degrees northeast, and small dragfolds observed underground and on surface plunge 10 to 20 degrees southeast. Some dragfolds southeast of the No. 4 adit suggest that the axial planes of adjacent folds are only about 200 feet apart. The implication is that the chlorite schist may be rather closely folded.

Within the chlorite schist there are seemingly irregular zones of carbonate alteration in which the schist is partly or almost completely altered to ankerite. On surface such ankerite rock weathers to a rich reddish-brown colour, whereas underground it is grey to light buff. Some carbonate zones appear to lie parallel to the foliation of the schist; others cut across it and seem to be related to fractures. The carbonate alteration is thought to have accompanied an early stage of vein mineralization.

* By J. W. Peck, except as noted.
† By S. S. Holland.

The veins occupy northerly striking fractures dipping 60 degrees or more to the east. The fracturing is rather light, and there is no indication of appreciable movement. The eastern vein zone is explored on four levels through a vertical range of about 240 feet, and from it came most of the ore mined before 1949. At present, this vein is not being mined.

The western vein zone is providing about 60 tons of ore per day. It is developed on three levels—on No. 5 at elevation 3,372 feet, on No. 6 at elevation 3,264 feet, and on No. 8 about 270 feet below No. 6.

On No. 5 level the hangingwall shear of the vein zone is followed by a drift for 100 feet, and on No. 6 level a length of 185 feet is indicated. No. 8 level crosscut was driven in the summer of 1952 and encountered the vein zone 560 feet from the portal. The vein was followed by drifts to both north and south for a length of 240 feet. On 8 level the mineralized zone had a maximum width of 18 feet.

The mineralization consists largely of pyrite, sphalerite, galena, and grey copper, occurring mainly as a replacement of carbonate rock. The mineralization lies along a northerly striking fracture and consists of sulphides in irregular masses, disseminations and narrow veinlets, accompanied by narrow stringers of mineral along joints and foliation planes in the rock. Only a small amount of quartz accompanies the sulphide mineralization. During the year some mining was done in the No. 1 zone, where a stope was mined through to surface from No. 4 level. Diamond drilling amounted to 725 feet in four holes. The number of men employed averaged forty-five.

[References: *Geol. Surv., Canada,* Mem. 161, pp. 85–88. *Minister of Mines, B.C.,* Ann. Rept., 1914, p. 258; 1926, p. 270; 1929, p. 340.]

Gold-Silver-Lead

Silver Dollar (Monterey Mining Company Limited)

(50° 117° N.W.) Company office, 321 Pemberton Building, Fort Street, Victoria. J. W. Dalziel, president; C. G. Beeching, managing director. Capital: 3,000,000 shares, no par value. This company owns the Silver Dollar mine near the head of the east fork of Mohawk Creek, a northerly flowing tributary of Pool Creek. A small camp, reached by 4 miles of narrow tractor-trail from the end of the truck-road at the Spider mine, was established near the old mine workings. In the summer of 1952 a few holes were drilled to test the veins to the north of the old underground workings. Northwest Drilling Limited contracted the drilling and the work was laid out by W. L. Sebolt. The total crew reached a maximum of twelve.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1914, pp. 263–266.]

Teddy Glacier (Columinda Metals Corporation Limited)

(50° 117° N.W.) Company office, 1519 Marine Building, 355 Burrard Street, Vancouver. J. G. Edison, Toronto, president; W. Blair, manager. Capital: 5,000,000 shares, no par value. This company purchased the Teddy Glacier mine at the head of a branch of the south fork of Sable Creek. A base camp was established at Ten-mile, 4 miles north of Camborne. The road to the camp was improved and then built up Sable Creek. Due to a fortunately late season a rough road to the mine was almost finished before winter conditions forced a shut-down.

Tungsten

Lucky Boy and Copper Chief (Major Explorations Limited)*

(50° 117° N.W.) Company office, 402 Ford Building, 193 East Hastings Street, Vancouver. R. L. Foster, president. Capital: 3,000,000 shares, no par value. Major Explorations Limited holds seventeen mineral claims on the north slope of Trout Mountain and lying due west of the settlement of Trout Lake. Four recorded claims are held by the company, and six Crown-granted

* By S. S. Holland.

claims and seven other recorded claims are under option. The two principal claims are the Lucky Boy, an old Crown grant (Lot No. 4743), and the Copper Chief, a relocation in 1939 of ground that was originally held under the same name. These two, as well as other old claims such as the Willow Grouse, Ruffled Grouse, and Molybdenum, are briefly mentioned in various Annual Reports of the Minister of Mines between 1898 and 1943.

The various claims were originally located on narrow, flat-lying quartz veins, from which small shipments of high-grade silver-lead ore were made. The following production is officially recorded:—

Date	Tons	Silver	Copper	Lead
Lucky Boy		Oz.	Lb.	Lb.
1903	181	45,788	3,294	93,838
1904	125	24,659	....	81,207
1905	55	7,899	....	24,205
1906	23	4,096	....	8,877
1912	49	7,358	....	13,054
Copper Chief				
1905	2	423	....	549
1917	12	1,513	....	2,123
Ruffled Grouse				
1901	6	917	....	1,117
1902	3	529	....	568

During 1942 and 1943 the Lucky Boy and adjoining claims attracted some attention because of the occurrence of scheelite in the quartz vein on the Lucky Boy and in skarn bands on the Copper Chief. No scheelite was mined at the Lucky Boy, but in 1942, 23 tons sorted from the old dump and shipped to Ottawa for treatment produced 650 pounds of concentrates assaying 69 per cent tungstic oxide. No further work was done on the properties until they were taken up by the present company in 1951.

Currently, work is concentrated on exploring showings of scheelite-bearing skarn on the Copper Chief. No examination of the Lucky Boy was made at this time, and for a description of that property the reader is referred to British Columbia Department of Mines Bulletin No. 10 (Revised), 1943, pages 131 to 133.

The company established a camp at the old cabins on the Lucky Boy claim. The camp is at an elevation of about 4,200 feet and is reached by 3 miles of narrow road on a moderate grade from the head of Trout Lake.

The claims lie mostly to the south of the camp and extend from Wilkie (Trout) Creek, at an elevation of about 3,000 feet, up the southeast side of the valley to the top of the ridge at an elevation of about 6,000 feet. The showings of scheelite-bearing skarn are on this steep slope that from top to bottom averages almost 40 degrees.

The claims are underlain by a succession of quartzites having one or more interbeds of limestone a few tens of feet thick. The quartzite, originally a grey and rather granular rock, over much of the area is silicified, fine grained, and contains finely disseminated pyrite and pyrrhotite which, on weathering, produce a variety of rusty-brown stains. The stained quartzite in places is difficult to distinguish from skarn.

Bedding in the quartzite is very seldom seen, but a steep northeasterly dipping foliation is common and a few small dragfolds were noted.

Grey limestone is interbedded with the quartzite and outcrops in a number of bands to the southwest of the camp. One band outcrops a few hundred feet southwest of the camp and lies on the hangingwall and southwest side of the Lucky Boy vein. Its full extent along strike to the northwest or southeast is not known. About 600 feet farther southwest on the Copper Chief another band of limestone, now very largely altered to skarn, is exposed through a vertical range of several hundred feet and may extend considerably farther along strike to northwest and southeast, although definite continuity between skarn outcrops has not been established. The old Copper Chief main adit and other workings are in this skarn. Two other limestone bands lie southwest of the Copper Chief skarn band and not more than 500 to 600 feet across strike from it; the first is largely altered to skarn, and the one farthest southwest has skarn along its northeast contact. Several other limestone bands outcrop on the top of the ridge leading southward to Trout Mountain. Along strike, bands of grey limestone are seen outcropping in prominent bluffs on the northwest side of Trout Creek. On the map accompanying Memoir 161 of the Geological Survey of Canada, the quartzite is mapped as part of the Lardeau series and the limestone is correlated with the Badshot limestone.

In some exposures the alteration of limestone to skarn is complete, and in others a small lens of unreplaced limestone may be completely surrounded by skarn. In the southwestern limestone band a 25-foot width of skarn is developed along the northeastern side of the limestone which is locally thickened along the crest of an anticlinal fold.

The skarn varies somewhat in appearance, though in all places it is composed mostly of diopside, epidote, and light-brown garnet. Skarn in the lowest showing consists very largely of calcite and light-brown garnet and is very light in colour. A common variety is extremely dark coloured from having a high percentage of diopside and epidote and little or no garnet. It is commonly heavily mineralized with pyrrhotite. Such rock constitutes the skarn band at the Copper Chief adit and at one time* was described as a "bedded vein of pyrrhotite." Other old reports refer to a diorite dyke which cuts across the formation and along which some molybdenite was found. It is possible that the skarn was mistakenly called diorite, because no dyke is known on the property.

No intrusives were seen on the claims, and the contact of the Kuskanax batholith lies several miles to the south. The alteration of limestone to skarn does not appear to be related to the exposed contact of any known intrusive.

The strike of the beds across the claims is rather uniformly about north 30 degrees west. Bedding within the quartzite is obscure, but it and most limestone or skarn contacts dip from 65 degrees to very steeply northeast. In several places small dragfolds plunging 20 to 30 degrees northwest were seen. At the lowest known showing the skarn occupies the crest of an anticlinal dragfold plunging 20 degrees northwest.

The form of the dragfolds and the parallelism of bedding and foliation are interpreted as meaning that the rocks are involved in close repetitive isoclinal folds whose axes plunge 20 to 30 degrees northwest. This kind of folding, combined with gentle northwesterly plunging fold axes, seems typical of the area which extends 15 miles across strike to the head of Gainer Creek.

The skarn is mineralized with pyrrhotite in varying amounts and with rather fine-grained scheelite. As a consequence of its fine grain, the scheelite is almost impossible to detect by unaided eye, and the use of an ultra-violet lamp is necessary. Although molybdenite has been reported, none was seen or detected by assay.

The known skarn occurrences all are on the southeast side of Trout Creek. The lowest exposure is at an elevation of 3,570 feet, about 500 feet above the creek, and the highest showing, at a short adit just below the top of the ridge, is at 5,350 feet. At the time of examination, sixteen different skarn occurrences were known. They appear to lie along three parallel lines, but a survey of the exposures is necessary, and continuity between them should be established. A possible interpretation is that all the exposures are outcrops of a single limestone bed that was rather intricately folded before being altered to skarn.

Five exposures of skarn lie on the southwest side of a steep gully that extends from the old Copper Chief adit at 4,830 feet elevation down to creek level. The lowest showing, 3,570 feet elevation, is about 500 feet below an old low-level trail that leads south-

* *Minister of Mines, B.C.*, Ann. Rept., 1914, p. 316.

west from the old Lucky Boy camp along the side of Trout Creek. The skarn is rather light coloured and is composed mainly of calcite, with small amounts of garnet and diopside. It occurs on the northeast side of, and close to the top of, a band of grey limestone that extends uphill from the creek. The skarn is about 8 feet wide and is moderately well mineralized with scheelite. The skarn lies below an anticlinal fold of quartzite whose axis plunges 20 degrees northwest. As a consequence, the extension of the skarn uphill from this point does not appear in the gully and must lie on the southwest side covered by overburden.

The four other exposures of skarn are close to the point where a high-level trail from the Lucky Boy camp to the Copper Chief adit crosses the same gully at an elevation of 4,735 feet. In one exposure below the trail at 4,620 feet elevation, dark-coloured skarn is 11 feet wide and, although well mineralized with pyrrhotite, contains little scheelite. At 4,750 feet elevation on the southwest side of the gully, the skarn band is 52 feet wide. It is dark coloured because of the high proportion of diopside and epidote, and near its northeast side encloses a narrow lens of grey limestone. Scheelite is sparingly disseminated throughout the skarn, and a 12-foot width near the limestone lens displays a moderate amount of scheelite mineralization. At an open-cut at 4,820 feet elevation the band is cut by a few narrow quartz stringers, and the otherwise granular dark skarn is silicified. The skarn band is about 20 feet wide and contains finely disseminated scheelite, but near the quartz stringers the rock is well mineralized with scheelite across a width of about 8 feet.

At the portal of the Copper Chief adit at 4,840 feet elevation, the skarn is 2 to 4 feet wide and encloses several lenses of unaltered grey limestone. Both skarn and limestone are mineralized with scheelite, and a sample across 4 feet assayed 1.06 per cent tungstic oxide. Several hundred feet of underground work was done at the Copper Chief adit, which was driven on a narrow quartz vein dipping 10 degrees northeast. Underground the vein is cut off by a strong fault striking north 30 degrees west and dipping 85 degrees northeast, and most of the underground work was in search of the faulted segment of the vein. The fault cuts off the skarn band whose extension on the east side of the fault is not visible. The Copper Chief quartz vein and other narrow, flat-lying veins near by are rather sparsely mineralized with scheelite. These four skarn occurrences are believed to be exposures of a single band extending through a vertical range of 220 feet.

Uphill from the Copper Chief adit at 5,250 feet elevation, an isolated exposure of dark-coloured skarn is well mineralized with finely disseminated scheelite. A sample taken across a 4-foot width assayed 1.18 per cent tungstic oxide.

Farther uphill and across strike to the southwest is the highest of the main showings at 5,350 feet elevation. The skarn is 8.5 feet wide where it is crossed by an old adit 18 feet long. The skarn is dark, quartzose, heavily mineralized with pyrrhotite, and well mineralized with finely disseminated scheelite. Two samples taken on the north wall of the adit across widths of 4 and 4.5 feet assayed 1.62 and 1.02 per cent tungstic oxide respectively. Geological conditions around the showing are obscure, and its relation to the other showings is not immediately apparent.

Southwest of this first line of showings are three exposures that appear to be aligned. In one the skarn is 18 feet wide, and a sample across a 12-foot width, taken by Hedley in 1942, assayed 0.54 per cent tungstic oxide. The two other showings contain moderate amounts of disseminated scheelite across widths of 8 feet.

Farther to the southwest are three more skarn exposures which may be aligned. The skarn in one is 25 feet wide and lies on the northeast side of a considerable thickness of limestone. The true thickness of the limestone bed is obscured by flowage and intricate folding in the axial region of an anticline. Scheelite is disseminated through the skarn near the intersection of a narrow quartz vein.

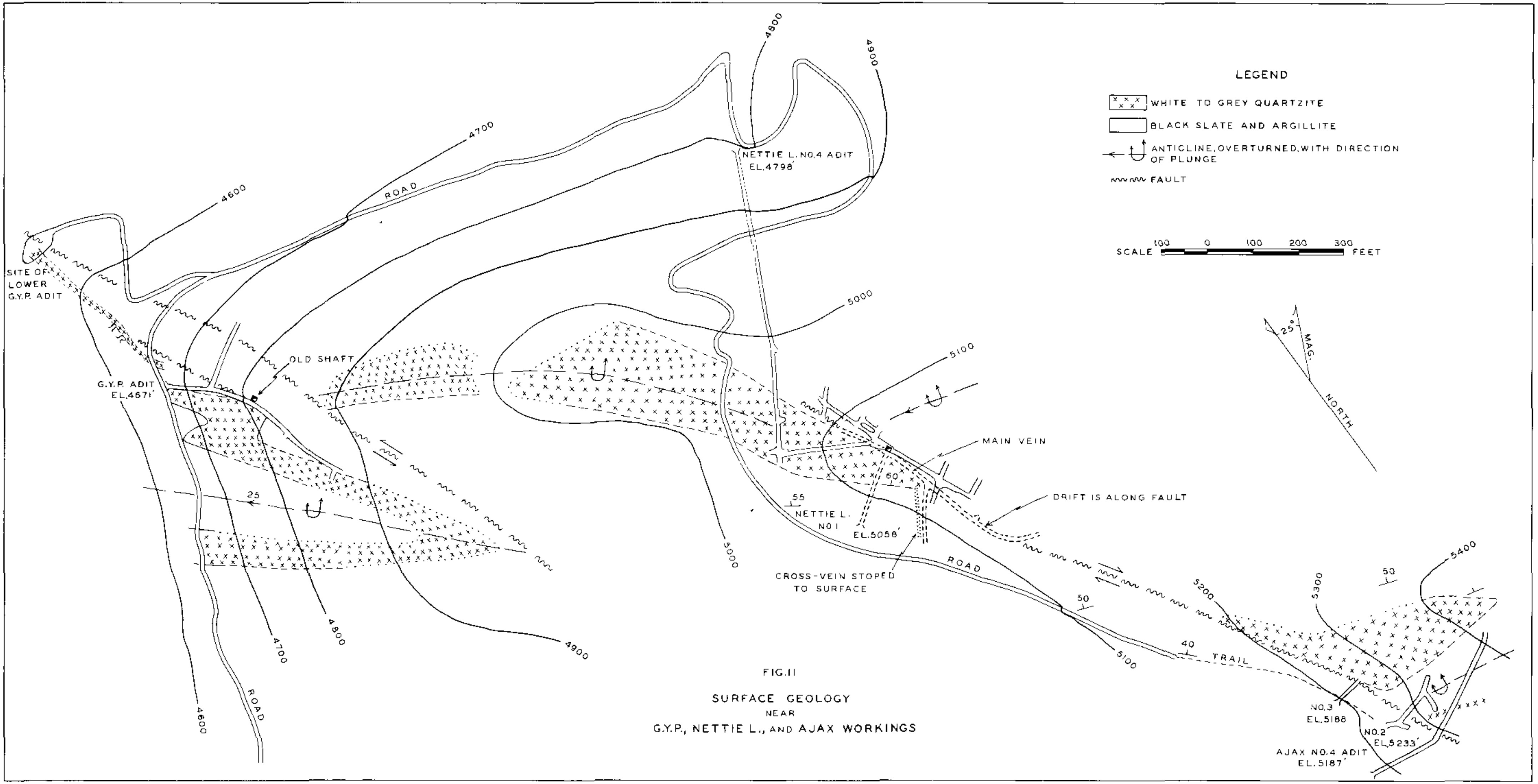


FIG.11

SURFACE GEOLOGY
NEAR
G.Y.P., NETTIE L., AND AJAX WORKINGS

In August, 1952, the showings were sampled by an examining engineer. The arithmetical average of ten samples taken by him at various showings is 0.78 per cent tungstic oxide.

Present information indicates that much of the skarn is mineralized with scheelite and that the scheelite mineralization is not related in amount to the intensity of the pyrrhotite mineralization. The presence of scheelite in quartzose skarn, in skarn cut by quartz veins, and in the narrow, flat quartz veins emphasizes the association between scheelite and quartz and suggests possibilities for the localization of scheelite mineralization. The possible effect of folds and of crosscutting faults remains to be determined, and much additional exploratory work remains to be done.

[References: *Geol. Surv., Canada,* Sum. Rept., 1903, Pt. A, pp. 71–72; Mem. 161, pp. 83–84. *B.C. Dept of Mines,* Bull. No. 10 (Revised), p. 131. Also references to Lucky Boy, Copper Chief, Molybdenum, Ruffled Grouse, and Willow Grouse in Annual Reports of the Minister of Mines, 1898 to 1943.]

Silver-Lead-Zinc

G.Y.P., Nettie L., and Ajax (Trout Lake Mines Limited)*

(50° 117° N.E.) Company office, 214 Burns Building, Calgary, Alta. R. M. Patriquin, president; Brian Woolfe, manager; W. S. Hamilton, consulting engineer. This company holds ten recorded mineral claims and a number of Crown grants on the southwest slope of Nettie L. Mountain. The workings, which comprise the old Nettie L. mine, the several Ajax adits, and the G.Y.P. adit, are on the Nettie L. (Lot 4954), Ajax (Lot 4955), May Bee (Lot 4953), and G.Y.P. Fraction (Lot 5691). The camp, at an elevation of about 4,500 feet overlooking the town of Ferguson, is reached by about 1½ miles of road from Five-mile on the Lardeau Creek road.

The Nettie L. mine was one of the old producers in the Lardeau, and the following metal production is recorded from it:—

Year	Tons	Gold	Silver	Lead	Zinc
		Oz.	Oz.	Lb.	Lb.
1899	14	......	7,000	2,800	....
1900	179	23	13,627	39,364	....
1901	699	114	84,312	240,392	....
1902	528	95	85,590	232,452	....
1903	1,019	149	151,120	435,607	....
1904	10,168[1]	362[1]	87,316[1]	261,487[1]	....
1912	28	6	4,308	8,618	....
1916	48	12	7,694	42,057	....
1917	50	5	4,062	9,179	28,239
1918	31	6	5,510	15,434	....
1920	18	4	4,015	10,869	....
1921	18	3	2,907	8,609	....
1922	20	2	1,792	3,000	....

[1] In 1904 ore from both the Nettie L. and Silver Cup mines was treated in the concentrator at Five-mile, and for that year the production of both mines is combined.

Most of the production came from the Cross Vein, which was discovered in 1900 during the course of drifting southward along the Main Lead on No. 1 level. The Main Lead occupies a strong fault having a large displacement. The Cross Vein was mined below No. 1 level and is said to have swung into and merged with the Main Lead on the No. 4 level.

During 1951 the company did about 2,000 feet of diamond drilling underground on the Nettie L. to test the Cross and Main veins in unstoped areas. No other work was done underground on the Nettie L. in 1952.

* By S. S. Holland.

The Ajax workings are about 500 feet southeast of the Nettie L. workings. Of the original five Ajax adits, only Nos. 2, 3, and 4 are now accessible. Shipments of sorted ore were made from the Ajax and the following production is recorded:—

Year	Tons	Gold	Silver	Lead
		Oz.	Oz.	Lb.
1912	31	. .	851	23,379
1913	457	13	16,510	467,736
1914	51	......	1,540	61,581

The present company has done no work at the Ajax.

In 1952 the company started work at the old G.Y.P. adit, corrected the grade, and enlarged the size of the working. This adit is in about 470 feet in a southerly direction.

In July, 1952, a site was prepared and an adit was collared about 150 feet lower and about 400 feet north of the portal of the G.Y.P. adit. This adit was driven about 250 feet.

The claims are underlain by black slate and dark argillite, and interbedded dense grey to white quartzite. The argillaceous rocks show only small variations and are widely distributed on the property. Hard grey quartzite outcrops in several ribs on the road at the portal of the G.Y.P. adit and extends uphill to the No. 1 level of the Nettie L. From there it is faulted southward to the Ajax workings, where a large mass extends uphill from the Ajax No. 2 level.

The rocks strike north 30 to 50 degrees west and for the most part dip about 60 degrees northeast. Small dragfolds plunge 25 degrees northwest. Only one bed of quartzite is exposed in the main crosscut of the Nettie L. No. 4 level, and it is believed that all the surface exposures of quartzite are outcrops of a single bed intricately folded. The major fold structure is an isoclinal anticline which is overturned to the southwest with its axial plane dipping 60 degrees northeast, and which plunges about 25 degrees northwest, somewhat flatter than the slope of the hillside.

The anticline is displaced by two steep northerly striking faults. One, with a left-hand displacement, lies just east of the G.Y.P. adit. It strikes about 15 degrees west of north, appears near the face of the north crosscut of the G.Y.P. adit and near the portal of the lower G.Y.P. adit. The horizontal separation of the anticlinal axis parallel to the fault is about 600 feet. The second fault displaces the anticline between the Nettie L. and Ajax workings. This fault appears underground in the Nettie L. workings, where it is known as the Main Lead. It also appears underground in the Ajax Nos. 2, 3, and 4 levels. The horizontal separation along the Nettie L. fault, measured parallel to the fault, is about 1,200 feet. The fault strikes about 20 degrees west of north.

In the Nettie L. No. 1 level the fault has been followed by a drift for about 500 feet, although at present only a length of about 220 feet is safely accessible. The fault is occupied by vein quartz which is sheared and only sparsely mineralized. Trenches on surface to the south of No. 1 level expose the fault and quartz vein for about 300 feet south of the Cross Vein. Part of the workings on No. 4 level are along the Nettie L. fault, and there, too, the vein quartz is very much sheared and only sparsely mineralized.

The Cross Vein strikes north 30 degrees east and dips steeply southeast. It has been stoped from the surface down to No. 4 level and contributed all the high-grade silver ore mined before 1904. The vein occupies a tension fracture probably related to the right-hand movement along the Nettie L. fault. Early reports describe* the Cross Vein as swinging into and merging with the Main Vein. This can be interpreted as dragging of the vein along the fault. The possibility of other veins occupying tension fractures striking northeast and associated with the Nettie L. fault should not be overlooked, either between the Nettie L. and Ajax workings or along the fault to north and south.

* *Geol Surv., Canada,* Sum. Rept., 1903, p. 65A.

An examination of the Ajax workings was made only to verify the position in them of the Nettie L. fault.

The G.Y.P.-adit is driven southeastward more or less parallel to the formation between several bands of grey quartzite for about 130 feet and then follows a southeasterly striking fault a further 320 feet. It is reported* that the adit was originally driven along a quartz vein which was 3 to 4 feet wide and that a narrow streak of galena and sphalerite extended along the footwall side for a length of about 100 feet, in places swelling to form small lenses of ore. Little can now be seen of vein or mineralization, but it is said that a strong quartz vein well mineralized with galena was seen when the bottom of the adit was being taken up.

Two open-cuts 150 feet north of the adit expose vein quartz mineralized with galena. A new adit 400 feet north is intended to explore the vein at a depth of 150 feet. It is reported that the adit was driven 250 feet and that no worth-while mineralization was encountered. The crew ranged from nine to fourteen men. All work ceased in November.

[References: *Geol. Surv., Canada,* Sum. Rept., 1903, p. 65; Mem. 161, pp. 67–70. *Minister of Mines, B.C.,* Ann. Rept., 1900, pp. 820–821; 1903, pp. 120–121; 1914, pp. 299–300; 1924, pp. 208–209.]

True Fissure (50° 117° N.E.) This old property, north of Ferguson, was under development during the summer by The Granby Consolidated Mining Smelting and Power Company Limited for Toronto interests. The camp, at an elevation of 5,200 feet, was rehabilitated, and about 3,000 feet of diamond drilling done on No. 2 and No. 3 levels. Stations were established 50 feet apart in these adits, and 50-foot holes drilled at right angles to the strike of the vein. At 300-foot intervals the holes were drilled 200 feet long. E. H. Pickard was in charge of this work.

Blue Jay (50° 117° N.E.) The Blue Jay group is at the head of McDonald Creek, an easterly flowing tributary of the Westfall River. The property is reached by about 14 miles of trail from Ferguson. The first 7 miles of the trail up Ferguson Creek to Circle City is on an easy grade, but from that point the trail climbs 2,900 feet to the divide at an elevation of 6,800 feet between Ferguson Creek and McDonald Creek. The property has been inactive for about twenty-five years but was optioned in 1952 by The Consolidated Mining and Smelting Company of Canada, Limited, from Blue Jay Mining Syndicate of Victoria. A nearly vertical band of limestone, averaging 50 feet in width and striking north 40 degrees west, has been traced up the steep mountain slope on the north side of McDonald Creek. In it lead-zinc replacement mineralization occurs at intervals, the best exposure being in an open-cut at an elevation of 6,150 feet, where the mineralization is 20 feet wide.

A tent camp was established in McDonald Creek basin at an elevation of 5,500 feet, and a stripping and sampling programme was carried out. The limestone band was trenched at intervals along the strike for a distance of 1,500 feet. Winter conditions forced a shut-down in September. R. G. McEachern was in charge of the work, with about seven men employed.

Silver Cup (50° 117° N.E.) During the latter half of 1952 this old producer on Silver Cup Mountain was under development by The Granby Consolidated Mining Smelting and Power Company Limited for Toronto interests. A camp was established at the old Towser mill-site, 6 miles from the base of operations at Ferguson. A steep road 1.2 miles long was built from this camp to the No. 7 portal (6,312 feet elevation). The No. 7 adit was rehabilitated for 1,200 feet to the main winze. This inclined winze, which extends to No. 12 level, was unwatered to No. 9 level by December. Diamond drilling to test for parallel structure

* *Minister of Mines,* B.C., Ann. Rept., 1924, p. 209.

was done in No. 7 adit. Nine holes, from 200 to 250 feet long, were drilled at right angles to the main drift from stations established 300 feet apart along the drift. Fourteen men were employed in December under E. H. Pickard.

The Towser mill machinery was purchased by lessees of the Velvet mine at Rossland. It was dismantled, and most of it had been moved by December.

Triune

(50° 117° N.E.) The Triune group of claims is at the head of Triune Creek, a northeasterly flowing tributary of Lardeau Creek. It is owned by J. Miller, of Vancouver. No work was done in 1952, other than building a road from Ten-mile on the Lardeau Creek road. Grades on this road are as much as 35 per cent.

Mollie Mac Mines Limited*

(50° 117° N.E.) Company office, 744 West Hastings Street, Vancouver. G. E. McCuaig, president; C. S. Parsons, managing director. The company holds five recorded claims, Erica Nos. 1 to 5, and has an option to purchase four Crown grants, Molly Mac No. 1 (Lot 10653), Molly Mac No. 2 (Lot 11421), Molly Mac No. 3 (Lot 14014), and Milner Fraction (Lot 14015). The claims extend uphill on the northwest side of Gainer Creek valley, about 2½ miles upstream from Ten-mile. The camp is at the end of the road, about 9 miles from Ferguson. It is at an elevation of about 4,800 feet, approximately 500 feet above Gainer Creek and on the very steep northwest side of the valley.

In 1951 the road was built to the property up Gainer Creek from Ten-mile and a tent camp established, a considerable amount of trenching was done on the property, and the mineralized showings were extensively sampled. In 1952 some additional trenching was done and about 2,000 feet of short-hole diamond drilling completed.

A belt of limestone, interbedded with micaceous quartzite and pale-green chlorite schist, crosses Gainer Creek at the Molly Mac and runs northwestward through the head of Bunker Hill Creek. The mineralized showings are galena-pyrite replacements in limestone. They extend from an old adit about 250 feet below camp uphill to the top of the ridge, 6,000 feet elevation, about 1,200 feet above.

The limestone is fairly uniform and light grey in colour. It has a thickness of only a few tens of feet, and on its northeast side a few feet of thinly bedded limestone and argillaceous rocks are succeeded by light-grey, platy, micaceous quartzite. On its southwest side the rocks are pale-green chlorite schist. The rocks strike about north 50 degrees west, dip steeply to the southwest, and are isoclinally dragfolded. Several acres of completely exposed rock show the limestone to be involved in tight isoclinal dragfolds whose amplitude is at least five times the distance between the limbs. The dragfolds plunge 5 to 10 degrees northwest. The showings are thought to lie along the complexly dragfolded southwest limb of a tightly folded anticline of limestone below a hood of chlorite schist.

At a small spring about 300 feet above the camp a fault, striking about north 40 degrees east and having a left-hand displacement of about 25 feet, crosses the dragfolded limestone. Chlorite schist beside the fault is dragged along it in the direction of movement.

Metallic mineralization consists mainly of galena and pyrite; sphalerite is uncommon and silver values are low. The mineralization appears to be mainly on the hanging-wall (southwest) side of the limestone against the chlorite schist, or localized in cigar-shaped bodies in the crests of dragfolds hooded by chlorite schist. It is believed that the ore mineralization plunges about 10 degrees northwest parallel to the plunging folds. Accompanying the mineralization is a fairly intensive ankeritic alteration of the limestone, but not all ankeritization is accompanied by sulphides. Bluff exposures show bleaching of the grey limestone spreading outward from fractures, and the bleached lime-

* By S. S. Holland.

stone in turn partly or completely ankeritized. The ankeritized rock then apparently was fractured, and narrow, irregular quartz veins were introduced, accompanied by disseminated galena and pyrite.

This mineral occurrence is of interest in showing the structural localization of replacement mineralization in the crests of anticlinal dragfolds in limestone near the intersection of a crosscutting fault.

[References: *Geol. Surv., Canada,* Mem. 161, p. 96; *Minister of Mines, B.C.,* Ann. Rept., 1927, p. 294.]

White Quail (Abco Mining Corporation Limited)

(50° 117° N.E.) Company office, 425 Baker Street, Nelson. H. W. C. Blythe, president; W. S. Hamilton, managing director. Capital: 1,000,000 shares, 50 cents par value. This company holds an option on the White Quail Crown-granted claim, on the south side of Gainer Creek, about 3 miles from Ten-mile on the Lardeau Creek road. A short access road was built to the property from the Mollie Mac road, and a camp established on Gainer Creek. The showings, which consist of open-cuts and one 40-foot adit, were cleaned out, but no further work was done. Four men were employed.

Wagner (Sheep Creek Gold Mines Limited)

(50° 117° N.E.) The Wagner group, at the headwaters of Hall and Healy Creeks, is under option to Sheep Creek Gold Mines Limited. The property is reached by 17 miles of road, completed in 1952, from a point on the Lardeau–Gerrard road 3 miles southeast of Gerrard. A quartz vein, exposed in a knoll jutting out of the Wagner glacier, has been developed in the past by an adit and winze. A vein presumed to be the same is exposed below the Wagner glacier, about 1,700 feet to the southeast along the strike. This latter vein is exposed for about 700 feet, mostly on the Lardeau claim. In September a portal site was chosen to the south of this vein at an elevation of 7,300 feet. A crosscut was driven to the vein, which was then followed by a drift to the northwest, a total distance of 605 feet from the portal when work ceased in November. It is estimated that an additional 2,400 feet of drifting is required to reach a point under the downward projection of the vein exposed in the knoll on the Duncan claim.

A base camp, consisting of one large building, was erected at Fourteen-mile in the Healy Creek basin. Living quarters were also built at the portal-site. Air for drilling was supplied by portable compressors. As the upper camp is in an exposed area, most of the equipment was removed when winter conditions forced a shut-down. In September eighteen men were employed under R. MacRae.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 192–193.]

SOUTH LARDEAU*

Silver-Lead-Zinc

Lucky Jack (Nelson Lardeau Mines Ltd.)

(50° 117° S.E.) Company office, K. W. C. Block, Nelson. I. G. Nelson, president; T. R. Thompson, managing director. Capital: 100,000 shares, 50 cents par value. This company was formed to develop a group of about forty claims situated between Poplar and Cascade Creeks south of Poplar. The group contains several Crown-granted claims, including the Lucky Jack and Bullock properties. These properties were worked many years ago for their gold content, but the present company reports assays have been obtained indicating the presence of lead and zinc as well as nickel and uranium. During 1952 efforts were restricted to surface stripping and road work.

* By J. W. Peck, except as noted.

J.G. (Lardeau Lead & Zinc Mines Ltd.)† (50° 116° S.W.) Head office, 744 West Hastings Street, Vancouver. J. A. Pike, president. Capital: 3,000,000 shares, $1 par value. The property consists of forty-six claims on the east side of Duncan Lake, extending from a short distance south of Glacier Creek to about halfway up the peninsula on the lake. A road from Howser and Argenta follows the lake-shore to the east arm. A branch road extends up Glacier Creek to the Surprise mine and passes the southern, or Glacier Creek, showings 1.5 miles from the turn-off.

This property was once known as the Amato-Ruby and Glacier groups. It is located on the course of a prominent band of limestone which continues northward along the peninsula. Lead-zinc mineralization is known just north of Glacier Creek, on the crest of the ridge, at the lake-shore, and on the peninsula. The Glacier Creek showings were diamond drilled by The Consolidated Mining and Smelting Company of Canada, Limited, in 1927. The group was located by Joe Gallo and associates and optioned in 1951 to Lardeau Lead & Zinc Mines Ltd. who, in 1951, did some diamond drilling at Glacier Creek and on the lake-shore, and later, at Glacier Creek, drove an adit and did more drilling. In September, 1952, operating control was taken over by Berens River Gold Mines Limited, which company holds an option on the balance of the treasury stock.

At the Glacier Creek showings the limestone in which the mineralization occurs is about 400 feet in horizontal width. It is for the most part a banded rock, lying between limy schist below and black argillite above, and dips rather steeply to the east. Local contortions are seen in old open-cuts above the present workings and in a few places farther up the hillside, and it is presumed that mineralization may be localized in such zones of contortion, but these are poorly exposed and have not been mapped.

There are several old shallow workings on lead-zinc showings between elevations of 2,400 and 2,730 feet. The upper showings were diamond drilled in 1927, and Lardeau Lead & Zinc Mines Ltd. put down seven holes of an aggregate length of about 1,500 feet in 1951, on the upper showings and on the lower, adjacent to the main Surprise road.

An adit was driven in 1952 from a short access road at an elevation of 2,515 feet. The adit is driven 650 feet in an average direction of north 15 degrees east, and had an aggregate length of 1,015 feet in August when diamond drilling was in progress. At 150 feet from the portal a well-defined mineralized zone was encountered in the eastern wall, and the adit was turned slightly to follow it. The zone is 2 to 5 feet wide, with additional sparse mineral in the walls to a total width, locally, of 10 feet. It was followed for 250 feet, but weakened and split in the last 30 feet. A second, less well mineralized zone 8 feet in the eastern or hangingwall of the first, was encountered at this last point, 385 feet from the portal, and was followed northwestward for about 200 feet. The adit was continued an additional 65 feet to a diamond-drill station. At a crosscut driven 70 feet east, 385 feet from the portal, the workings disclose streaky mineralization across a total width of 90 feet, comprising 20 feet in the western zone, about 12 feet in the eastern zone, and additional, weaker mineralization farther east. A crosscut, driven 160 feet to the northeast, 200 feet from the portal and another, driven 65 feet east, 610 feet from the portal, failed to prove continuity of the eastern part of the mineralization.

In August, diamond drilling was in progress to demonstrate what grade and continuity of mineralization could be expected. At that time insufficient work had been done to prove more than that the first or western zone might assay about 10 per cent metal, dominantly zinc, and other zones or aggregate widths considerably less.

A new mining plant on the surface consisted of warehouse, change-house, compressor-house, and explosives' magazine. Compressed air was supplied by a Schramm 315-cubic-feet-per-minute compressor driven by a G.M. 85-horsepower diesel motor. The old Surprise camp, 2 miles upstream, was used for living quarters. Ten men

* By J. W. Peck and M. S. Hedley.

under A. Lee were employed during the first part of 1952. A total of 3,880 feet of underground diamond drilling was done in twenty-four holes.

When Berens River Mines Limited took over operating control, four showings on the Duncan Lake side were explored by diamond drilling. This surface drilling amounted to 5,901 feet in twenty-six holes. M. R. Keyes was in charge of this latter work, which ceased in November.

St. Patrick (Hamil Silver-Lead Mines, Ltd.)*

(50° 116° S.W.) Company office, 902 Rogers Building, 470 Granville Street, Vancouver. H. F. Kenward, managing director. Capital: 3,000,000 shares, 50 cents par value. The St. Patrick mine is near the ridge summit on the north side of Hamil Creek and is reached by 3 miles of steep road from a point on the Argenta–Howser road, 6 miles from Argenta. The workings consist of an old inclined shaft at 4,045 feet elevation and an adit 500 feet to the southeast at 3,880 feet elevation.

* By M. S. Hedley.

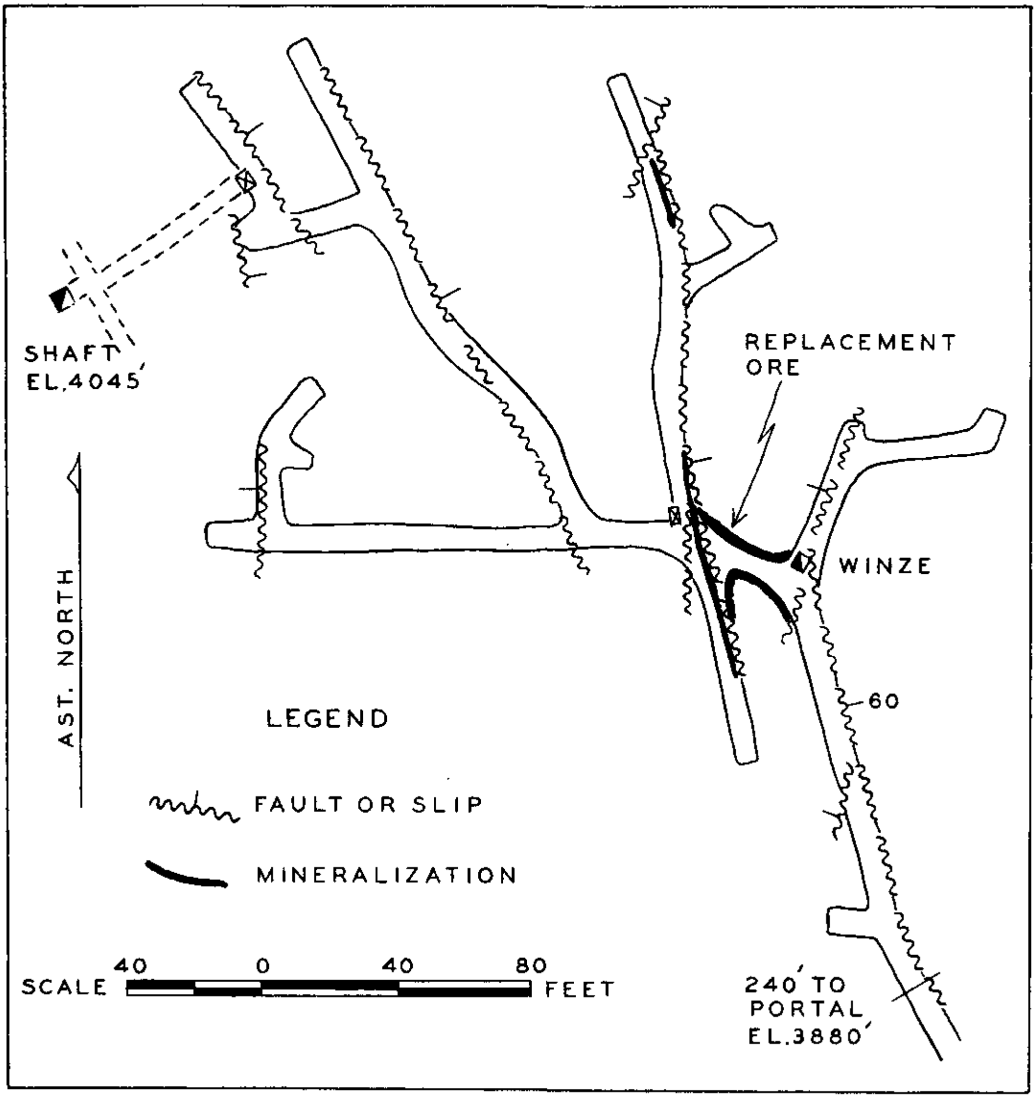


Figure 12. St. Patrick adit.

The property was first developed in 1912 and has been worked at intervals. From 1917 to 1919 it was held by the British Alberta Mining Company, who shipped 21 tons of ore. In 1937 and 1938, 20 tons was shipped. Altogether, production has been 42 tons, containing an average of 30 ounces of silver per ton, 36 per cent lead, and 17.5 per cent zinc. The present company built an access road in 1950 and rehabilitated the camp and workings. In 1951 a raise connection was made with the shaft, a winze was sunk to a depth of 66 feet, and a small amount of drifting was done in the winze.

The rocks are schists and limestone with a steep regional dip to the east. The local structure is complex and not fully understood. Flat attitudes in the adit workings indicate a dragfolded or crumpled zone on the major structure, but the form and extent of the crumpling are not known. Lead-zinc mineralization is related to fissures and fractures with a northerly to northwesterly trend and a rather steep dip to the east, conforming in general with the general formational dip. Steep westerly dipping minor fractures strike a little east of north. In one place in the adit, flat limestone beds are replaced for an east-west distance of about 30 feet, and additional mineralization in fissures brings the distance to 40 feet. The replacement extends to the base of the limestone 28 feet below the adit, and neither the upper limit nor the north-south extent are known.

Figure 12 shows the workings. The adit is driven on a fissure zone from a point 50 feet from the portal. This fissure weakens in the vicinity of the winze. A second fissure zone is encountered 35 feet to the west and is followed a total distance of about 200 feet. The second fissure is mineralized in a 75-foot section at the crosscut and an additional 40-foot section near the northern end of the drift. A short raise and a small drift 24 feet above the adit explore the best showing. A third fissure, 35 feet west of the second, is mineralized where first encountered and is followed to the north for 160 feet. A fourth fissure, 25 feet farther west, is followed by a raise up to the bottom of the old shaft. This raise and the shaft were inaccessible, but it is reported that interesting mineralization was not encountered in the raise until a short distance below the bottom of the shaft.

Mineralization in the fissures ranges from scattered grains to veins a foot or more in width, including material of shipping grade. The replacement mineralization has been repeatedly sampled by examining engineers and is reported to average between 10 and 11 per cent combined zinc and lead.

The winze is 66 feet deep and contained water. A level at 28 feet depth was accessible and provided a 50-foot east-west section at the base of flat-lying crumpled limestone above green schist. The limestone in this level is not as well mineralized as in the adit.

It seems obvious that replacement is localized in a flat-lying crumple in the limestone between two fissure zones of undetermined displacement. It continues down for about 30 feet and an unknown distance upward. The north-south extent, or the plunge, is not known. Limestone and limy strata elsewhere in the workings are not replaced.

Surface stripping done in 1952 disclosed showings 55 and 70 feet to the south and 50 and 90 feet to the north of the old shaft, apparently on the shaft vein. The best showing contained 6 inches of galena 55 feet south of the shaft.

The mill machinery at the Velvet mine near Rossland was purchased but, although it was dismantled, it was not transported to the St. Patrick. All work ceased in September. No more than five men were employed at any one time.

Moonshine, Right Bower (B.C. Metal Mines Ltd.)

(50° 116° S.W.) Company office, Suite 207, 445 Richards Street, Vancouver. M. C. Macpherson, president; W. D. Sutherland, manager. Capital: 3,000,000 shares, $1 par value. This company obtained an option on a group of claims including the old Crown-granted Moonshine (or Moonstone) and Right Bower claims, about three-quarters of a mile south of Lardeau. The old workings consist of an adit at 2,226 feet elevation driven on a narrow fissure vein in limestone for 172 feet in a southwesterly direction. There is also an inclined shaft filled with water 130 feet to the south at 2,300 feet elevation. In 1951 the vein was stripped about 30 feet above the portal of the adit to expose a width of 2 feet heavily mineralized with galena. In 1952 a raise was driven at a point 35 feet from the portal, and a sublevel 38 feet long was established at 2,250 feet elevation. The vein was stoped from this sublevel almost to the open-cut on surface. Galena was found close to surface, with crystalline sphalerite at depth. At the end of the adit a crosscut was driven 25 feet to the south to intersect a subparallel fissure vein zero to 18 inches wide. Forty feet of drifting was done here and also some overhand and underhand stoping. Sphalerite was the dominant mineral.

On the surface a small general-purpose building was erected. Compressed air was supplied by a LeRoi 105-cubic-feet-per-minute compressor. About one-quarter of a mile of road was built to the Kaslo–Lardeau Highway. Accommodation for the crew was obtained in Lardeau. Ore was trucked to a loading ramp at Lardeau. One car of lead ore was sent to the Trail smelter, and one car of zincy ore was sent to the Kenville mill. Five men were employed when operations ceased in October.

CRESTON*

Silver-Lead

Alice (49° 116° S.W.) The Alice mine, owned by K. C. Constable and R. B. Staples, is on the west slope of Arrow Mountain, 2 miles from Creston. A lease on the property, held by R. Welloff and J. S. Mains, was dropped in the early spring, and no further work was done.

Delaware (49° 116° S.W.) This property is at 4,500 feet elevation on Rolf Mountain, north of Creston. It is reached by about 7 miles of road from a point 5 miles from Creston on the Creston–Cranbrook Highway. It is owned by J. W. Hill, of Tucson, Ariz. A total of 1,700 feet of diamond drilling was done in early summer to explore the extension of the vein below the lower adit. The drilling provided interesting but inconclusive information; a limited amount of stripping uncovered the vein about 1,500 feet north of the workings.

Copper

Creston Hill (49° 116° S.E.) This property is on the south range of mountains 10 miles east of Creston and 1 mile from the Creston–Cranbrook Highway. In 1936 a 400-foot adit was driven by the Creston Hill Mining Syndicate and several open-cuts were made on outcrops showing copper mineralization. In midsummer of 1952 the Bon Ton Mining Syndicate was formed locally to carry out exploration on the property. A 2-mile access road to the adit was built, the old open-cuts were cleaned out, and stripping operations carried on. This work was inconclusive and in November was suspended for the season. A crew of three under R. Seneseal was employed.

MOYIE*

Silver-Lead-Zinc

Society Girl (49° 115° S.W.) The Society Girl mine is at an elevation of 5,200 feet, on the east side of lower Moyie Lake, 3 miles by road south of Moyie. The property is bounded on the north, west, and south by claims held by the St. Eugene Mining Corporation Limited.

The Society Girl claim (Lot 4405) covers the principal mine workings. From June until mid-September the property was operated by the Society Girl Mining Syndicate of Vancouver. The old wagon-road to the mine was rehabilitated, thus providing a shorter and less steep truck-road, and five cars of lead-carbonate ore from an underhand stope on the upper level were shipped to the Trail smelter. J. Sullivan, with a crew of five men, was in charge of this work.

Returns were somewhat less than expected, and the property was again leased to J. Sullivan, who shipped two additional cars, but the curtailed acceptance of custom ore at

* By H. N. Curry.

the Trail smelter forced a suspension of work on November 1st. Sullivan plans to resume in the spring.

ST. MARY RIVER*

Silver-Lead-Zinc

Boy Scout (Thomas Consolidated Mines Incorporated)

(49° 116° N.E.) Head office, 640 Peyton Building, Spokane, Wash.; mine office, Marysville. David E. Watson, secretary-treasurer. This property, consisting of the Warhorse, two other Crown-granted claims, and twenty-four located claims, is on Hell-roaring Creek, 5 miles by new road from St. Mary Lake. The showing is in a broad shear zone striking north 50 degrees west and dipping on the average between 60 and 65 degrees southwest. It is mineralized with pyrrhotite, pyrite, sphalerite, galena, arsenopyrite, and a little chalcopyrite.

The early operators partly explored the zone by three adits, the highest one being at an elevation of 5,400 feet, but the present company decided to drive a new adit at a lower elevation. This 4600 adit is at an elevation of 4,500 feet, about 360 feet above the creek and 475 feet below the lowest of the old adits.

Approximately 1,500 feet of drifting during the year extended the 4600 adit to a total length of 2,300 feet. This work is continuing, and the mineralized zone has looked more promising in the last 200 feet. A total of 700 feet of diamond drilling was done.

Equipment consists of a Universal air trammer, an Eimco air trammer, a Neyman side-stepper, a Sullivan mucking-machine, a UD-4 International diesel, and a 210-cubic-foot-per-minute Gardner-Denver compressor.

A temporary change-house, office, garage, and compressor-house are located at the portal. A powder magazine and a residence for the foreman were erected.

A crew of six men was employed under the direction of W. N. Campbell.

KIMBERLEY

Silver-Lead-Zinc

Sullivan (The Consolidated Mining and Smelting Company of Canada, Limited)

(49° 115° N.W.) Company office, 215 St. James Street West, Montreal; mine and smelter office, Trail. R. E. Stavert, Montreal, president; R. W. Diamond, vice-president and general manager. Sullivan mine office, Kimberley. B. E. Hurdle, general superintendent; J. R. Giegerich, mine superintendent; H. R. Banks, mill superintendent. Capital: 4,000,000 shares, $5 par value. The company owns and operates the Sullivan mine on Mark Creek, near Kimberley, and the Sullivan concentrator at Chapman Camp. The following report, prepared by the management, is a synopsis of the 1952 operation:—

"Safety.—Accident-prevention at the Sullivan mine was once again to the fore during 1952, with all employees taking a keen interest and giving their fullest co-operation in this work.

"The highlight of the year was the new Sullivan safety record of 329 days without a lost-time accident (to the end of December) established by the Surface Section. The 329 days represent 727,600 man-hours of exposure. The previous section record of 230 days without a lost-time accident was established by the West Section during 1951.

"Other highlights were the presentation for the second successive year of the Ryan Regional Award to the Sullivan operations for the year 1951, and the National Safety Council recognition of their highest award—the Award of Honour—to the Sullivan mine for an outstanding safety performance in 1951.

"The Underground School of Instruction again played an important part in accident-prevention work. All new underground employees attended the school whether they had had previous underground experience or not. Any underground employees who had a

* By H. N. Curry.

lost-time accident since the previous class also attended the school. The school is of four days' duration, and all matters pertaining to accident-prevention are thoroughly explained. The Instruction School is under the direction of a member of the Safety Department, and for each class he is assisted by a different supervisor from the Operating Department. A total of 57 employees attended the school during 1952. Since the school started in 1946, a total of 1,765 employees have received training.

" St. John Ambulance Association first-aid classes were held for employees during the year, and 227 senior awards were granted by the association.

" The East Kootenay mine-rescue and first-aid competitions were held in Kimberley during 1952, and the mine first-aid teams won the Department of Mines Cup and Rotary Shield.

" Mine-rescue training was actively carried out during the year. Twenty-three supervisors successfully completed the Department of Mines course. Two teams from the mine entered the East Kootenay mine-rescue competition and placed first and second.

" For the second year a local mine-rescue competition was held, with five teams from the Sullivan and one team from the Bluebell mine taking part. The Chemox apparatus only was used in this local competition. A total of 44 employees took part in competitive work during the year.

" Mine-rescue personnel were on duty in fume-control areas during the year.

" VENTILATION.—(*a*) *General*.—The mine air intakes continued through the same sources as previous years, being from the south and southwest, and from two forced draughts via Nos. 24 and 28 Shafts.

" The primary exhausts remain unchanged from the previous year other than fan alternations on the fume-control circuit. The general flow through the mine was maintained on south to north direction with the exception of the upper part of the plus 3900 division. Considerable emphasis was placed on secondary circuits for their function on working conditions. Total primary air flow is 380,000 c.f.m. by mechanical draught.

"(*b*) *Developments*.—Two rubber-coated fan units, Buffalo 36 vaneaxials, were received and placed in service on fume control.

"A major programme of ventilation revision was completed and approved, whereby the required extensive development was started for the new primary airways consisting chiefly of 12- by 16-foot subs and raises of a 9,500-foot outline. The system is a combined forced and exhaust type with variable control and pressure-volume characteristics up to the installed brake-horsepower of the new fan drives. The new units were selected, and design endorsed, for installation of Jeffrey and Joy late-model vaneaxial types. Purchase of two units was made in 1952, and the other four units are to be acquired in 1953. The planned drives on primary ventilation will then consist of four units of 125-horsepower drive, four units of 150-horsepower drive, two units of 100-horsepower and one unit of 75-horsepower drive for a future total of 1,375 installed horsepower on a mine volume of 760,000 cubic feet per minute under various pressure splits as designed for each circuit.

"(*c*) *Miscellaneous*.—Routine work was carried out on mine air sampling, dust sampling, temperatures, and fume control. Average mine sample dust counts were 302 per cubic centimetre by Konimetry.

" The two exhaust systems operated on the 2850 and 3800 underground crushing plants. The discharge of these plants is direct to surface return shafts, and no contamination of mine airways exists.

" The control of sulphur dioxide from the float-filled stopes functioned through a separate return system and operated satisfactorily. Numerous gunnite seals were constructed, and along with the maintenance of former seals and doors, this contamination was routed to surface by forced draught.

"All gas analyses were done locally on test work for both mine air and sulphur fumes.

"GENERAL HIGHLIGHTS.—Work was started on the new mine ventilation system, which entails 9,545 feet of development and the installation of six main fan units. This will provide ventilation for all the mine workings down to and including the 2850 level. The development work for this scheme was 61.5 per cent complete at the end of 1952.

"To the southeast of No. 1 Shaft, 1,940 feet of drifting was done on the 3050, 3200, and 3350 levels to explore the vein in that area.

"The largest pillar blasted during the year was S-10-2; 180,000 tons of ore was broken in one blast by 30,000 pounds of 75 per cent Forcite powder loaded in 69,000 feet of blast-holes. The blast was set off by short-period delay electric blasting-caps.

"The open-pit operation, which accounted for 22 per cent of the total mine production, operated throughout the year. Vertical holes are drilled to a maximum depth of 30 feet with four wagon drills. Blasting is done electrically with short-period delay detonators. The ore is loaded by 6½-yard electric shovel into 12-yard end-dump diesel trucks and transported to a 600-foot raise in the lower end of the pit. The ore is transferred from the raise to the main underground crushing plant on the 3900 haulage level.

"Approximately 21,000 feet of surface core drilling was done to investigate other areas for open-pit mining.

"A new blacksmith-shop started in June was 90 per cent complete by the end of the year. It is of reinforced-concrete, concrete-block, and glass-block construction. Rubber-tired lift trucks will replace an overhead crane for servicing.

"During the year 331,100 cubic yards of float fill was placed in five stopes below the 3900 level.

"Production from pillars was 38 per cent of the total mine production.

"*Personnel.*—The total number of men employed at mine and mill averaged 1,900.

"*Development.*—Drifting and crosscutting, 6,574 feet; raising, 23,838 feet; sub-levels, 13,972 feet; and winze sinking, 226 feet."

Production: 2,699,533 tons.

SAND CREEK*

Silver-Lead-Zinc

Burt

(49° 115° S.E.) This property is north of Sand Creek, about 2½ miles northeasterly from Dumont Siding on the Crowsnest branch of the Canadian Pacific Railway, about 17 miles east of Wardner. A complete report on this group and the adjoining Rex and Dean groups is given in the Annual Report for 1937.

The groups have remained in the control of John Powelson, of Cranbrook, who optioned them to Stephen Johnson and H. Creelman in July, 1952. Johnson and Creelman did a limited amount of stripping on both the Rex and Dean groups and built a road to the site of the lowest adit on the Burt group. The adits and the entire near-by mountainside have become covered by an extensive rockslide, making exploration difficult. The work was stopped for the winter months.

FORT STEELE*

Silver-Lead-Zinc

Kootenay King (Kootenay Base Metals Limited)

(49° 115° N.W.) Company office, 525 Seymour Street, Vancouver. Mine office, Fort Steele. J. D. Mason, president; L. G. White, mine manager. Capital: 3,000,000 shares, 50 cents par value. The property is on the north side of Wild Horse River, 10 miles from Fort Steele. The mill-site is 4 miles from Fort Steele, near the end of the old road up the creek. A road constructed in 1951 leads from mill-site to mine camp, a distance of 7 miles, and to the mine half a mile beyond.

* By H. N. Curry.

The workings, consisting of three adits, are on a steep slope about 1,000 feet below the ridge crest. No. 3 adit is at an elevation of 7,100 feet and the camp is at 6,700 feet.

A 50-ton concentrator, designed by Wright Engineering Limited, was brought into production in March, 1952. A stockpile of development ore supplied the mill-feed until underground stopes were prepared. Development during the year consisted of 394 feet of drifting and crosscutting, 231 feet of raising, and 1,346 feet of diamond drilling.

The service raise, driven in 1951 from No. 3 level to No. 2 level, was continued to No. 1 level and a connection made to the old No. 1 adit. Shrinkage stopes on No. 1 level supplied most of the mill-feed. On the south end of the ore zone, raises were driven to surface, and the outcrop was mined by underhand benching for a distance of 80 feet along the strike. Limited amounts of drifting and diamond drilling were done in the north end of No. 1 level. A small shrinkage stope south of the service manway was opened up on No. 2 level, and an ore-pass was driven to connect the two upper levels on the south end. All ore was trammed to the service manway and drawn through No. 3 adit for truck hauling to the mill.

Construction was completed on the compressor-house, machine-shop, and change-house at the mine and on the cook-house and bunk-houses at the mine camp. An assay office and four houses for married personnel were built at the mill-site.

The mill flow-sheet is as follows: From a 180-ton coarse-ore bin the ore is conveyed by a 24-inch by 7-foot feeder over a 1-inch stationary grizzly to a 10- by 16-inch Denver type H jaw crusher and thence by a 16-inch by 66-foot belt conveyor to a 200-ton fine-ore bin. The fine-ore bin feeds to a 5- by 6-foot Denver type A ball mill in closed circuit with a 30-inch Akins classifier. The classifier overflow goes to six Denver flotation cells, and the resulting lead concentrate goes to a 4-foot Denver disk filter. Tailings from the lead circuit go to a 5- by 5-foot Denver conditioner and then to eight Denver flotation cells in which a zinc concentrate is made. This concentrate is pumped to the above-mentioned filter, where three disks are used for the zinc product and two for the lead. Concentrates are drawn from twin 65-ton bins and hauled by truck to the company's loading ramp at Rampart on the Crowsnest branch of the Canadian Pacific Railway, 10 miles east of Cranbrook. Lead concentrates are shipped to Trail and zinc concentrates to Anaconda Mining and Smelting Company, Black Eagle, Mont.

The curtailment at the Trail smelter and the current low metal prices forced a suspension of this operation early in December, 1952. A watchman was left in charge, and it is planned to reopen in the spring. Sufficient broken and known ore remains for a year's operation. The average number of men employed was forty.

Production: Tons milled, 13,362. Average grade: Lead, 5.5 per cent; zinc, 8.7 per cent.

WASA*

Silver-Lead-Zinc

Estella (Estella Mines Limited) (49° 115° N.W.) Company office, 736 Granville Street, Vancouver; mine office, Wasa. E. J. Chapman, president; Griffith Annesley, managing director; Evan Harris, mine manager. The mill-site is at Wasa, 11 miles north of Fort Steele, and the mine, at an elevation of 6,000 feet, is about 5 miles to the east, in a basin at the head of Tracey Creek in the Rocky Mountains.

The mill is on the edge of the Kootenay River flat and is connected to the railway by a spur about half a mile long. Ore is hauled from mine to mill by truck over a good road 17 miles in length.

The mill operated steadily during the year at a rate of 150 to 160 tons per day. The mill-feed averaged 15 per cent combined lead and zinc in an approximate ratio of 1:2. Lead concentrates were shipped to the Trail smelter and zinc concentrates to the National Zinc Company smelter at Bartlesville, Okla.

* By H. N. Curry.

Ore was obtained from stopes on both the Rover and Estella levels. On the Rover level, 6,250 feet elevation, four stopes were operated. Open stoping was employed in the south end of the orebody where the vein is flat-lying, and shrinkage methods were used in the steeper sections at the north end. Development on this level consisted of a 1,000-foot drive southerly to explore promising ground indicated by surface diamond drilling, and a 250-foot raise to connect with the bottom of the old No. 2 shaft. This shaft, sunk from surface by the early operators, is 70 feet deep and is reported to be in good ore throughout. Neither of these workings was completed.

Stopes on the Estella level, 125 feet below the Rover, were similarly mined, mucking-machine drawholes being successfully employed in the large No. 1 shrinkage stope. Stope development at the north end of the level proved very disappointing because the ore failed to extend for more than 30 feet below the upper level. All ore is drawn out through the Estella level.

Toward the end of 1952 the available ore reserves approached exhaustion. This fact, combined with the current low metal prices and insufficient development, placed the operation in a precarious position. Additional financing was obtained, and a programme designed to explore the ground below the Estella level was started. A prospect winze was sunk on the vein from this level, and for the first 90 feet followed ore of better than average grade and width. The work is continuing.

Development: Drifting, 1,104 feet; crosscutting, 244 feet; raising, 2,798 feet; diamond drilling, 298 feet; sinking in winze, 90 feet.

Construction was completed at both mine and mill camps. A new power-house was built at the mine. The average number of men employed was 100.

WINDERMERE*

Silver-Lead-Zinc

Paradise (Sheep Creek Gold Mines Limited)

(50° 116° S.E.) Company office, Room 209, 413 Granville Street, Vancouver. F. R. Thompson, mine superintendent. The company owns the Paradise mine at the head of Spring Creek, at an elevation of about 7,800 feet. The mill-site is at Jackpine Flat on Toby Creek, 12 miles from Lake Windermere Station. The ore is hauled from the mine 7½ miles to the mill by truck.

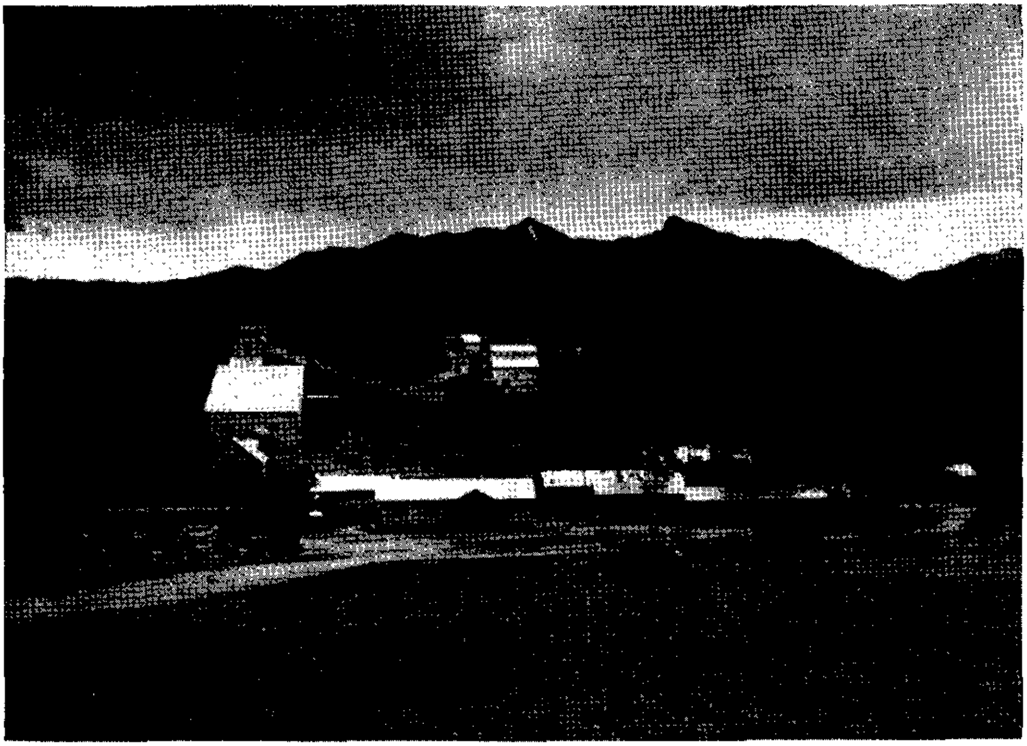
Square-set stoping with waste rock fill is employed exclusively, and all the ore is drawn out through the 7800 level. No. 2 winze was completed in March, 1952, and the 7700 level established 150 feet below the main level. Drifting on the 7700 level disclosed an 80-foot length of ore, and stoping of this ore accounted for most of the mill-feed in 1952. Stoping was also done from the 7800 and 7900 levels. At the year's end an ore zone, 25 feet in the hangingwall of the main orebody and in the same area as the new winze, was being prepared for mining.

Development: Drifting and crosscutting, 562 feet; raising, 654 feet; sinking in winze, 70 feet; diamond drilling, 821 feet.

A new filter and classifier installed in the concentrator permitted an increase in the tonnage treated from 60 to 80 tons per day. A 375-horsepower 250-kva. low-speed diesel generator is being installed to replace the three small high-speed units now in place. Additional quarters for married personnel were built.

The curtailment at the Trail smelter and the current low metal prices forced a suspension of milling in early December, 1952. A small crew was subsequently engaged in deepening No. 2 winze an additional 125 feet. The average number of men employed was forty.

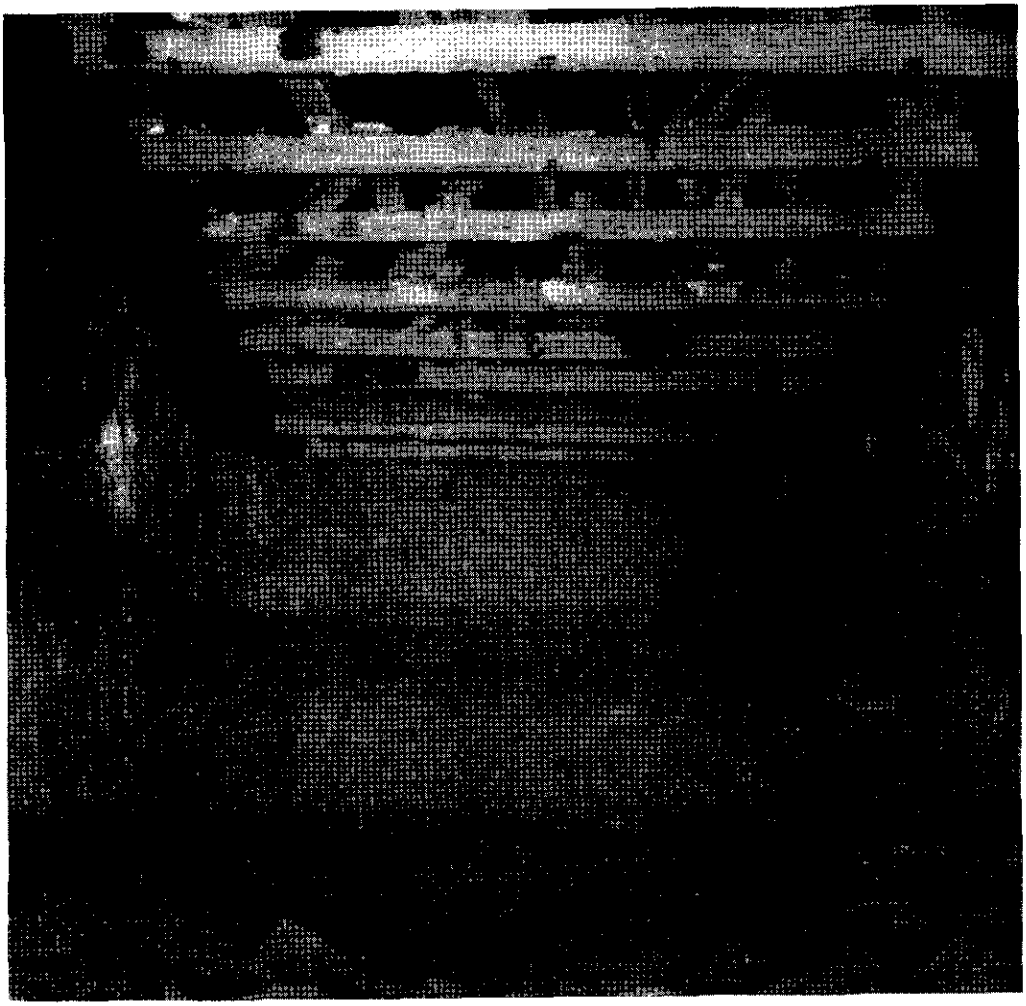
* By H. N. Curry, except as noted.



Estella mill, Wasa.

Windermere from the air (courtesy of J. M. Cummings).

Loading iron ore, Texada Island.



A room in a 14-foot seam of fireclay, Clayburn mine. Roof bolting and 6-by-8 timbers are used in place of cap and post timbering.

Mineral King (Sheep Creek Gold Mines Limited)*

(50° 116° S.E.) This old property is on the Toby Creek slope of the ridge between Toby and Jumbo Creeks, at an elevation of about 5,400 feet. It is reached by 26 miles of road from Athalmer. A camp has been built on the Toby Creek flat, and a newly constructed road leads to the workings, 1,200 feet in elevation above the camp. The deposit is a lead-zinc replacement, with barite, in limestone of the Mount Nelson formation. Toby conglomerate outcrops in a prominent knob uphill from the showing, and slate lies below. The structure is not clear, and although a dragfold is indicated, there has probably been some faulting. The surface showing is a zone stripped for about 100 feet in length and about 30 feet wide, but limits and control of mineralization are obscure. Some mineralization is straight limestone replacement and some is related to quartz-filled fractures. An adit 30 feet below the showing is 150 feet long with a 35- and a 40-foot branch. The adit was dammed as a water reservoir in July, 1952. A second old adit about 80 feet lower was driven northward 250 feet in slates toward the showing.

In 1928, 1 ton of ore was shipped, containing 5 ounces of silver, 180 pounds of lead, and 173 pounds of zinc.

Sheep Creek Gold Mines Limited did some diamond drilling from surface in 1950 and obtained sufficiently encouraging results to warrant further investigation, although little was added to knowledge of the geometry of the deposit. In 1951 ten holes were drilled from the upper adit and two from the lower. The road up Toby Creek was repaired, and bridges were repaired and built. From the end of the existing road at Jumbo Creek a new road was built a short distance to the camp-site and extended up the steep hillside to the property. In 1952 the lower adit was driven an additional 200 feet and a drift was driven 180 feet to the west. Diamond drilling from this drift is reported to indicate an orebody of favourable size and grade, and development is continuing. Ten men were employed, with F. R. Thompson in charge.

Development: Drifting, crosscutting, and slashing, 512 feet; diamond drilling from upper adit (5700 level), 1,260 feet; diamond drilling from lower adit (5600 level), 2,724 feet.

SPILLIMACHEEN†

Silver-Lead-Zinc

Silver Giant (Giant Mascot Mines Limited)

(50° 116° N.E.) Company office, 908 Royal Bank Building, Vancouver; mine office, Spillimacheen. B. H. Gunning, managing director. A management contract is held by Hill, Legg and Hemsworth; L. P. Starck is resident manager. This company is a merger, effected May, 1951, of Hedley Mascot Gold Mines Limited and Silver Giant Mines Limited. Authorized capital: 3,000,000 shares, $1 par value. The Silver Giant is an old property in the Spillimacheen valley 8 miles by road from Spillimacheen.

The mine has been developed by adits on Nos. 2, 3, 5, and 6 levels. All ore is drawn through the lowest, or No. 6, adit level. The ore occurs in steeply dipping, diverging ore zones striking eastward from a "nose" orebody. Shrinkage stoping on Nos. 5 and 6 levels and longhole drilling with extension steel and tungsten-carbide bits on the upper levels have nearly exhausted the known ore reserves in the footwall zone. In April, mining was started on the outcrop of the ore zone above No. 2 level and has since accounted for 50 per cent of the mill-feed. The ore is broken by benching and slashing and is hauled by truck to the mill. Late in the year, mill-holes were driven from No. 2 level, and all ore from the open-cut is to be handled underground. The narrower and lower-grade hangingwall zone was developed on all levels, and preparations for mining it are under way.

* By M. S. Hedley and H. N. Curry.

† By H. N. Curry.

A new No. 6 haulage level was driven to provide a more direct route to the workings. It is 15 feet higher at the portal than the old adit level and is 750 feet long. Diamond drilling was done to delimit oreshoots and explore for new ones. At the end of 1952 a start had been made to sink a three-compartment shaft from No. 6 level. Two levels at 150-foot vertical intervals are to be established for development of the downward continuation of the ore zone.

Development: Drifting and crosscutting, 1,800 feet; raising, 1,800 feet; shaft sinking, 34 feet; diamond drilling, 646 feet. In addition, 4,479 feet of longhole drilling with extension steel was done.

The mill operated steadily and was enlarged to a capacity of 500 tons late in the year. A zinc circuit was added to recover approximately 1 per cent zinc content. The mill flow-sheet is as follows: From a 200-ton coarse-ore bin the ore is conveyed by a 24- by 10-inch Jeffrey pan feeder to a 20- by 24-inch Traylor type A jaw crusher and thence by a 24-inch by 112-foot belt conveyor to a 4- by 8-foot Dillon screen and a 3-foot Traylor TZ gyratory crusher. The ore from the 175-ton fine-ore bin is fed to a 7- by 5-foot Traylor ball mill in open circuit with a 60-inch Akins classifier which in turn is in closed circuit with a 6- by 8-foot Dominion ball mill. The classifier overflow goes to eleven Denver flotation cells, and the resulting lead concentrate goes to a five-leaf Denver disk filter. Tailings from the lead circuit go to six Denver flotation cells, where a zinc concentrate is made and pumped to the same disk filter. The ore is fine grained in a barite and silica gangue.

Surface construction, in addition to the mill enlargement, included a third bunkhouse, a new trestle to the coarse-ore bin at the elevation of the new haulage, a changehouse and office, and a powder magazine. Available power was increased by the installation of a D-17000 Caterpillar diesel and a 350-cubic-foot-per-minute Gardner-Denver compressor. A small townsite has been built by the employees. The average number of men employed was 105.

FIELD*

Silver-Lead-Zinc

Monarch and Kicking Horse (Base Metals Mining Corporation Limited)

(51° 116° S.E.) Head office, Room 413, 62 Richmond Street West, Toronto. E. J. Gleason, mine manager. Capital: 3,000,000 shares, no par value. This company operates the Monarch mine on Mount Stephen and the Kicking Horse mine on Mount Field, both 2½ miles east of Field. The diesel plant, the mill, and the camp are on the Monarch or railway side of the valley, and the Kicking Horse is on the opposite side. Ore from the Monarch is delivered to the mill by aerial tram and that from the Kicking Horse is hauled by truck. Mining of high-grade lead pockets from the old stopes in the East Monarch section was carried on during the early part of the year. Exploratory diamond drilling was also done, but all work ceased in this mine in August. Additional exploration is planned for the spring of 1953.

At the Kicking Horse mine all production came from the 4600 stope in the east orebody. A new haulage level was driven under this orebody; an 18-b.h.p. Ruston & Hornsby diesel tramming locomotive was put in operation; and a surface incline, 1,139 feet in length and having two 2-ton skips in counterbalance, replaced the older aerial tram. A 300-foot crosscut was driven west from the new haulage, and twin 250-foot raises were started from the end of this crosscut. No. 4 orebody, in the west section, is to be opened up and mined by this development. Surface diamond drilling was done on the cliff face.

Milling ceased in August, and the Kicking Horse development programme was stopped in November. A watchman was left in charge, and it is planned to resume work

* By H. N. Curry.

in the spring if metal prices permit. The average number of men employed in the two operations was fifty.

Known ore reserves at the Monarch mine are exhausted, and the reserves at the Kicking Horse are given as 30,000 tons, averaging 8 per cent zinc.

Development at Monarch: Diamond drilling, 4,486 feet.

Development at Kicking Horse: Drifting and crosscutting, 660 feet; raising, 636 feet; slashing, 5,569 cubic feet; underground diamond drilling, 5,495 feet; surface diamond drilling, 2,817 feet.

Production: Monarch mine, 4,845 tons; Kicking Horse mine, 10,090 tons.

REVELSTOKE*

Silver-Lead-Zinc-Tungsten

Regal Silver, Snowflake (Columbia Lead & Zinc Mines Ltd.)

(51° 117° S.W.) British Columbia office, 800 Hall Building, 789 West Pender Street, Vancouver; mine office, Albert Canyon. T. R. Harrison, Toronto, president; T. C. Fawcett, mine manager. Capital: 5,000,000 shares, 50 cents par value. In 1952 control of this company passed to Columinda Metals Corporation. The Regal Silver and Snowflake mines are on Clabon Creek, 7½ miles by road from Silver Creek Siding on the Canadian Pacific Railway 19 miles east of Revelstoke. Activity in recent years has been restricted to the Regal Silver. Two quartz sulphide veins, known as Five and Six, have been developed by six adits, Nos. 5 to 10, with nearly all former work on Five vein. The only underground work during 1952 was the driving of No. 10 level on Six vein 153 feet to surface, to provide a second exit about 1,000 feet south of the old No. 10 portal and camp-site.

On the surface a mill of 50-tons-per-day capacity was built on a site 1,250 feet south of the new No. 10 portal, out of the snowslide area. By December the mill building had been erected and the main machinery installed. Power will be supplied by a Fairbanks-Morse 120-horsepower diesel. The flow-sheet had not yet been decided on—whether to concentrate tungsten or lead-zinc, or both. A snowshed was built from the mill to the mine, and a Ruston 20-horsepower diesel locomotive was obtained for the main haulage. The new camp at Bell Point was ready for occupancy but was not used. Forty men were employed at the end of 1952.

Zinc

Mastodon (Mastodon Zinc Mines Limited)

(51° 118° S.E.) Head office, 844 West Hastings Street, Vancouver; mine office, Revelstoke. H. W. Knight, president and managing director; J. A. Pike, mine manager. Capital: 3,000,000 shares, $1 par value. Golden Manitou Mines Limited owns 50 per cent interest. The main camp and mill-site are on the north side of La Forme Creek, 4½ miles by road from a point on the Big Bend Highway 17 miles north of Revelstoke. The mine is on the divide between La Forme Creek and Carnes Creek and is serviced from the main camp by a 37-degree incline 2,400 feet long, in conjunction with a narrow-gauge railway 9,000 feet long.

A zinc replacement orebody is developed by two adits, Nos. 2 and 3, now known respectively as the 5300 and 5100 levels. A raise was driven in the ore zone from 5100 level to 5300 level. It was found that the ore was not continuous, and a sublevel, 5200 level, was established about halfway up the raise. Ore was encountered in the sublevel, and 320 feet of drifting was done. Stopes extending about 100 feet on both sides of the main raise were carried up almost to the 5300 level. A small amount of stoping was also done on 5100 level. A new adit, 5000 level, was collared in December, 100 feet lower and 800 feet northwesterly from the 5100 portal. The site of this new

* By J. W. Peck.

adit is at the level of the surface railway and is at about the lowest elevation obtainable on the divide.

The railway and incline were ready for operation in July. The incline is powered at the top end by an electric hoist; two skips run in counterbalance with a passing track at the halfway point. A Ruston 20-horsepower diesel locomotive is used on the 2-foot-gauge railway. Both incline and railway were snowshedded during the year.

The 150-ton mill commenced operating in August and continued until December, when all ore production ceased. About 16,400 tons was milled; only a zinc concentrate was produced.

Twelve dwellings and a stand-by diesel power-house were built at the mill-site. At the mine a new change-house and a new compressor-house were built. Electric power was supplied from the hydro plant on La Forme Creek. The crew was reduced from a maximum of 115 in July to 20 in December.

SKAGIT RIVER*

Copper

A.M. (Canam Copper Company Ltd.) — (49° 121° S.E.) Company office, 571 Howe Street, Vancouver. J. W. Heffernan, president; G. Allan MacPherson, manager. This group of eight Crown-granted claims is about 7 miles by truck-road south of Mile 30 on the Hope–Princeton Highway. On No. 6 level, 1,155 feet of diamond drilling was done to trace the horizontal and vertical extent of the mineralized breccia zone. Drifting and crosscutting totalling 285 feet were also done on this level to corroborate drill-hole intersections. A new low-level
± 150 adit about ~~1,100~~ feet below No. 6 level was started. Camp buildings to accommodate twenty men were built near this site. The average number of men employed during the year was twelve.

CHEAM RANGE†

Copper

Lucky Four (Rico Copper Mines Limited) — (49° 121° S.W.) Rico Copper Mines Limited is a public company. Company office, 1155 West Pender Street, Vancouver. Capital: 3,000,000 shares, no par value. A description of the Lucky Four group is contained in the Annual Report for 1949, pages 214 to 216. The history of the property to that time is reviewed, and the nature and setting of the copper showings are discussed therein. The present note, resulting from a brief examination made in September, 1952, records work accomplished subsequent to the 1949 Report.

In 1950 and 1951 an adit was driven to explore the main skarn zone (*see* Fig. 13). The adit is entirely in skarn, most of which is barren of sulphide mineralization. A little chalcopyrite was noted in two vugs and in the compressor station near the portal.

Some thirty holes, including three from the adit, are reported to have been diamond drilled. It is understood that fourteen of the holes were drilled southward and westward to test the main showing from the base of the bluff on which it occurs. One of these holes is reported to have been drilled to 166 feet, the remaining thirteen to depths ranging from 12 to 61 feet.

Other holes were drilled from several localities and reportedly range in length from 30 to 280 feet. Although the collars of some of these holes are exposed on the surface, virtually nothing is known of the drill results because very little core was found at the property.

---

* By R. B. King.
† By W. R. Bacon.

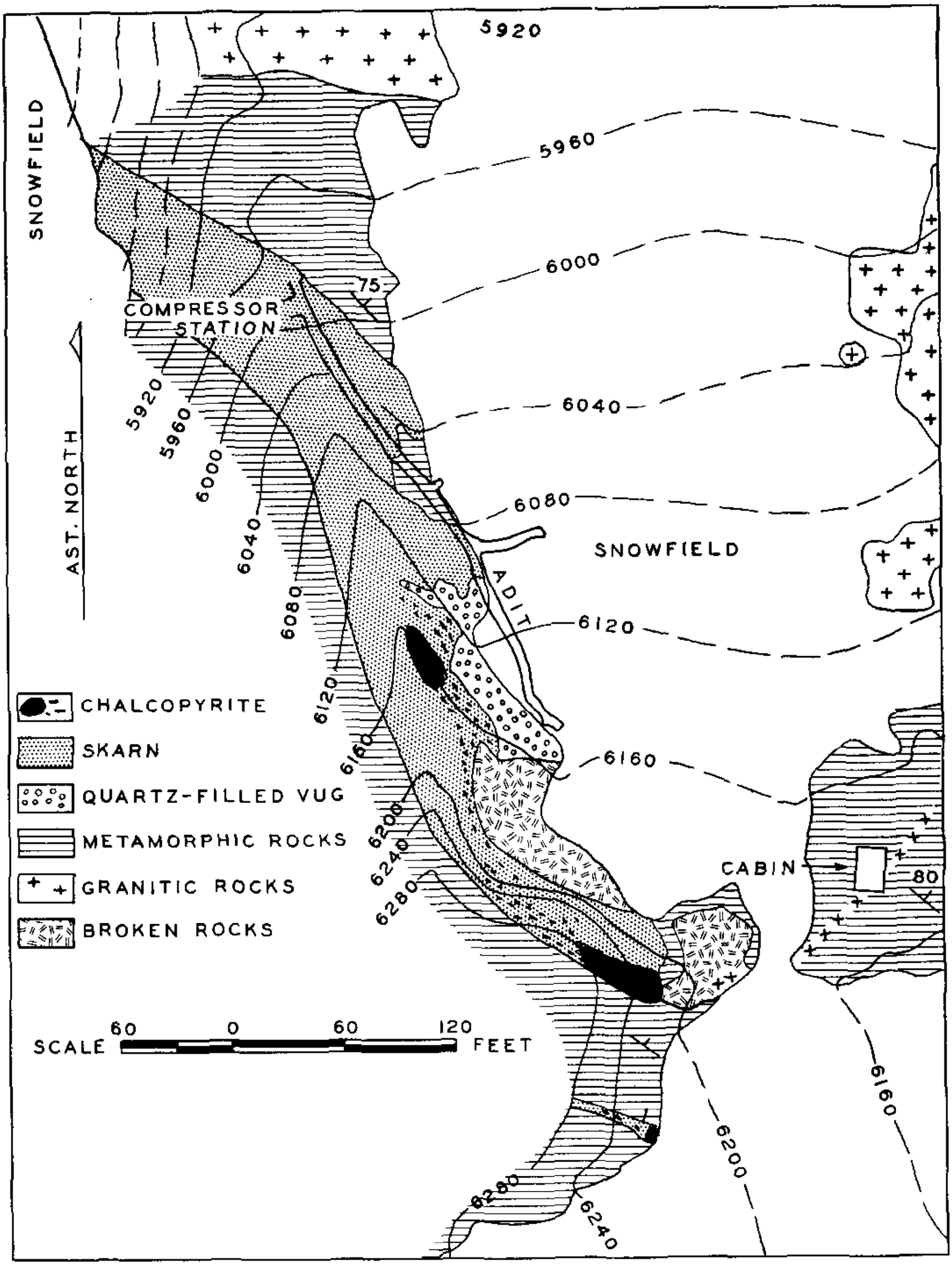


Figure 13. Main showings, Lucky Four group.

HOPE*

Nickel

B.C. Nickel (Western Nickel Limited)

(49° 121° S.W.) Company office, 744 West Hastings Street, Vancouver 1; mine office, Hope. Pacific Nickel Mines Limited and Newmont Mining Corporation of New York formed Western Nickel Limited in 1952 to develop the B.C. Nickel property on Stulkawhits Creek about 4 miles from Choate. The property was owned originally by B.C. Nickel Mines Ltd., succeeded by Pacific Nickel Mines Limited in 1938. During 1952 a geophysical survey was made on the property. As a result of this survey, the company planned to drive a low-level adit at an elevation of 2,600 feet, starting on the Red Rose claim and proceeding in a westerly direction. This adit is to test the general area below the No. 1 adit, which is at an elevation of 3,550 feet.

Mine and camp buildings were being constructed during the latter part of the year.

[Reference: *Geol. Surv., Canada,* Memoir 190, 1936.]

LYNN CREEK*

Zinc

Lynn Creek Zinc Mines Limited

(49° 123° S.E.) Graham-Bousquet Gold Mines Limited, 85 Richmond Street West, Toronto, continued surface exploration on this property during the summer. Eight miles of trail was cut out from the lower intake of the North Vancouver Waterworks to the property. Seventeen diamond-drill holes were drilled, with a total footage of 3,630 feet.

HOWE SOUND*

Copper-Zinc

Britannia Mining and Smelting Co. Limited

(49° 123° N.E.) Head office, 730 Fifth Avenue, New York, N.Y.; mine office, Britannia Beach. H. H. Sharp, president; E. C. Roper, manager; T. M. Waterland, mine superintendent. This company owns and operates the Britannia mine and mill at Britannia Beach. The following data, supplied by the management, provide details of the operation in 1952. The development work totalled 14,605 feet for all sections of the mine and was made up as follows:—

	Jane Mine	No. 8 Mine	Bluff Mine	Fairview Mine	No. 5 Mine	Victoria Mine	Total
	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.
Drifts	739	1,680	884	888	288	1,370	5,849
Crosscuts	461	592	140	109	......	109	1,411
Raises	811	1,171	2,504	1,586	689	158	6,919
Winzes	7	......	......	26	......	......	33
Powder-blast workings	......	......	97	296	......	......	393
Totals	2,018	3,443	3,625	2,905	977	1,637	14,605

Diamond drilling for core and blast-hole mining totalled 82,820 feet and was made up as follows:—

	Jane Mine	No. 8 Mine	Bluff Mine	Fairview Mine	No. 5 Mine	Victoria Mine	Daisy Mine	Empress Mine	Miscellaneous	Total
	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.
Core-drilling	3,231	9,506	2,886	4,255	......	6,918	954	1,086	1,307	28,836
Blast-hole drilling	......	2,519	......	28,285	17,806	4,067	......	......	......	53,984
Totals	3,231	12,025	2,886	32,540	17,806	10,985	954	1,086	1,307	82,820

* By R. B. King.

Ore was broken in the various sections of the mine by different mining methods, as follows:—

	Shrinkage	Cut and Fill	Powder-blast and Cave	Blast-hole by Diamond Drill and Tungsten-carbide Bits	Open Square Set	Square Set and Fill	Total
	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Jane mine	....	....	....	....	....	....	....
No. 8 mine	32,926	33,541	....	....	15,061	81,625	163,153
Bluff mine	24,764	....	324,496	....	....	....	349,260
Fairview mine	36,183	....	72,256	113,054	3,977	....	225,470
No. 5 mine	20,355	....	....	23,616	....	....	43,971
Victoria mine	11,997	18,138	....	18,655	7,946	....	56,736
Totals	126,225	51,679	396,752	155,325	26,984	81,625	838,590
Development	....	....	....	....	....	....	25,762
Total	....	....	....	....	....	....	864,352

Explosives and blasting accessories used were as follows: Powder, 17,297 cases; No. 8 electric blasting-caps, 7,302; No. 6 blasting-caps, 300,325; safety fuse, 2,490,000 feet; primacord, 51,900 feet.

An active underground ventilation programme has been under way all year. The new ventilation set-up for No. 8 mine has been in operation.

A safety educational programme has been built up around weekly underground safety meetings, monthly management-labour accident-prevention meetings, and regular supervisors' meetings. An increased use of sound films, National Safety Council material, locally made posters, and current accident data has proven valuable.

The Britannia 1952 safety record shows an improvement in both severity and frequency rates. Compensable injuries occurred at the rate of 0.524 per 1,000 shifts worked in 1952, compared to 0.587 per 1,000 shifts in 1951. The severity rate was 28.0 per 1,000 shifts worked in 1952, as compared to 34.4 per 1,000 shifts in 1951. No fatalities occurred in the mine in 1952.

The total number of men on the mine payroll at the year-end was 558. The total number of shifts worked in the mining department in 1952 was 158,367, as compared with 149,930 in 1951.

The total production from all mines during 1952 was 829,652 dry tons, as compared with 796,566 dry tons in 1951.

PENDER HARBOUR*

Copper

Cambrian Chieftain

(50° 123° N.W.) The Cambrian Chieftain group was optioned by Chieftain Exploration Limited in June, 1952. The work done by this company consisted of open-pit mining and stripping to recover shipping ore. At the end of the season 150 tons of ore was shipped to the Tacoma smelter. This shipment assayed: Gold, 0.01 oz. per ton; silver, 4.32 oz. per ton; copper, 9.26 per cent.

TEXADA ISLAND*†

Gold-Copper

Little Billie (Vananda Mines (1948) Limited)

(49° 124° N.W.) Company office, 640 West Pender Street, Vancouver; mine office, Vananda. In June, 1952, all mining operations ceased at this property. A crosscut 555 feet long and 163 feet of raises were completed to connect the No. 6 level of the Little Billie with old workings of the adjacent Copper Queen

* By R. B. King.

† Iron-ore deposits of Vancouver Island and Texada Island are discussed on pp. 217–234.

mine. A total of 2,505 feet of diamond drilling was done from the No. 6 level. A total of 1,061 tons of ore was mined from the Queen vein above No. 6 level and shipped to the Tacoma smelter.

VANCOUVER ISLAND*

ZEBALLOS (50° 126° S.W.)†

Gold

Privateer Mine Limited

William Bowen, Lars Omenas, and Charles Hill, leasing the Privateer property, cleaned out ore-passes and mined small pillars in the underground workings. A small mill with a capacity of about 5 tons a day produces jig concentrates, table concentrates, blanket concentrates, and amalgam. The concentrates are amalgamated and then shipped to the smelter at Tacoma. The amalgam is retorted, and the gold recovered is shipped to the Royal Mint.

White Star

Andrew and John Donaldson are working this property, which is located on Spud Creek. About 4 tons of hand-cobbed ore was sacked for shipment. This material was for the most part recovered from No. 2 level on No. 2 vein.

[Reference: *B.C. Dept. of Mines*, Bull. 27, 1950, pp. 77–79.]

MUCHALAT ARM (49° 126° N.E.)†

Zinc

Danzig (Spud Valley Gold Mines Ltd.).—Company office, 525 Seymour Street, Vancouver. This property is on the south side of King Passage in Muchalat Arm, about 15 miles by boat from Nootka. Seventy-seven feet of drifting was done before operations were suspended in February, 1952.

BUTTLE LAKE (49° 125° N.W.)‡

Zinc, copper, and lead mineralization has long been known west of the south end of Buttle Lake, in the valleys of Myra and Thelwood Creeks and on the ridge between them. Twenty-one Crown-granted claims and forty-six recorded claims lie in a north-westerly trending belt, including many claims recorded in 1952. The Lynx and Paw properties in Myra Creek valley have been held for many years, and the latter was explored by diamond drilling in 1952 by The Granby Consolidated Mining Smelting and Power Company Limited. The Boulder group of recorded claims, which has also been held for many years, is southeast of the other two properties and is on the Thelwood Creek slope of the ridge. The writer examined the three properties in three days in September, 1952, and sampled the main showing on each.

Buttle Lake is readily accessible by aeroplane. The north end is reached by trail from Upper Campbell Lake, which is connected by road with the community of Campbell River. An old log cabin on the west shore of the lake, south of the mouth of Myra Creek, is at the beginning of the trail up Myra Creek valley. A shake cabin erected in 1952 is about 2 miles up this trail from the lake and about 300 feet higher at an elevation of about 1,000 feet. From this cabin, trails lead to the main workings on the Paw and Lynx properties, about one-half and 1 mile away respectively. Another trail starts about one-quarter of a mile south of the lake cabin and can be followed to the Boulder showings about 2 miles away.

The claims are in Strathcona Park. A reserve prohibiting recording of claims in the park was removed in 1917, and many claims were recorded shortly thereafter. In the next few years, open-cuts were made on the three properties; on the Paw an adit was driven 60 feet, and in 1920 the Paw was diamond drilled. In the next few years

* Iron-ore deposits of Vancouver Island and Texada Island are discussed on pp. 217–234.
† By R. B. King.
‡ By J. M. Black.

about twenty claims were Crown-granted, and since then little exploratory work was done until 1952.

The properties have been described by Gunning* and in Annual Reports of the Minister of Mines for the years in which they were being developed.

Myra Creek, near its mouth, falls a considerable distance and is a potential source of water power. On the claims there is a good stand of timber suitable for construction and other purposes. The showings are on moderately steep valley slopes, but outcrops are scarce because bedrock is largely covered with a shallow mantle of talus, soil, and moss.

The area is underlain by greenstone, including tuff, breccias, andesite flows, and andesite and diorite or diabase dykes. Near the workings the greenstone ranges in colour from light to dark green and is slightly schistose. In the workings it is pale grey or rusty and has been much altered, and carbonate, sericite, and pyrite are abundant; in places, quartz, barite, and sulphides are present in substantial proportions. The ore sulphides are mostly in veinlets and lenses conformable to the schistosity. They include sphalerite, chalcopyrite, galena, and tetrahedrite; the tetrahedrite is present in minute grains. Pyrite accompanies the other sulphides in the vein matter and is also abundant in the intervening schistose laminæ. Malachite is present in minor amounts.

The greenstone appears to be altered in shear zones that are probably continuous, but workings on each of the three properties are so limited that it is not certain that this is so. The widths of the zones are uncertain because within the workings examined no well-defined contact between greenstone and much altered greenstone was seen.

Lynx

The Lynx and two other Crown-granted claims (Lots 1660, 1661, and 1666) are owned by W. T. Miller and M. V. Cross, of Victoria. They are north of Myra Creek and about 2¼ miles by trail from the south end of Buttle Lake. Work was done on showings north of the Lynx claim for several years, starting in 1917, but in recent years little has been done and the walls of open-cuts are partly sloughed.

The main showing is where a creek flows over a rusty outcrop at an elevation of about 1,500 feet. An open-cut here (numbered 7 in Gunning's report) partly exposes a light-coloured schistose zone. The schistosity in general strikes northwestward and dips steeply northeastward but locally is contorted, especially near faults that are about parallel to the general trend of the schistosity.

At several points east of the open-cut, moss has been stripped from outcrops of greenstone that is only slightly altered and contains scant sulphide mineralization.

The limits or the relationship of the light-coloured mineralized zone to the less altered greenstone are not exposed, but it is probable that the mineralization is confined to a shear zone trending northwestward and possibly 40 to 50 feet wide.

At the showing, pyrite is abundantly disseminated through the schist and occurs also in numerous quartz-barite veinlets and lenses. The veinlets are mostly less than 1 inch wide, but some are a few inches wide. Sphalerite is moderately abundant, and chalcopyrite and galena are present in minor amounts in and near the quartz.

A series of samples were taken from west to east across the accessible part of the zone exposed in the open-cut, a total distance of 23.8 feet. Two sections between samples 1 and 2 and between 2 and 3 where the wall was sloughed and where water was cascading down it, totalling about 10 feet, were not sampled. The samples assayed:—

Sample No.	Approximate Width	Gold	Silver	Copper	Lead	Zinc
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent	Per Cent
1	2.5	0.01	0.1	(1)	(1)	0.5
2	6.8	Trace	*Nil*	(1)	(1)	0.3
3	5.0	0.01	*Nil*	(1)	(1)	1.1
4	5.0	Trace	0.2	0.1	0.2	1.0
5	4.5	*Nil*	1.6	0.7	0.7	2.5

* *Geol. Surv., Canada*, Sum. Rept., 1930, Pt. A, pp. 56–78.

1 Less than 0.3 per cent.

In a small open-cut northwest of the creek cut and about 20 feet higher, similar mineralization is partly exposed. A section 4 feet wide, abundantly mineralized, assayed: Gold, 0.06 oz. per ton; silver, 7.0 oz. per ton; copper, 1.0 per cent; lead, 3.3 per cent; zinc, 5.1 per cent.

Paw (The Paramount Mining Company Limited)

Company office, c/o National Trust Company Limited, 811 West Pender Street, Vancouver. Capital: 5,000 shares, $100 par value. The company owns the East Paw and seven other Crown-granted claims south of Myra Creek and about 2 miles west of the south end of Buttle Lake. The main showings are between 1,400 and 1,500 feet in elevation and are on the East Paw claim. They are reached by about 2½ miles of trail from the lake. The workings are on the lower part of a steep slope which is well timbered except for minor snowslide areas.

This property was diamond drilled in 1920, and was drilled in 1952 by The Granby Consolidated Mining Smelting and Power Company Limited. Before or during 1920 some stripping and trenching were done and a crosscut adit was driven about 60 feet south-southwestward.

The area near the workings is underlain by massive, slightly schistose greenstone. The rock is grey-green to dark green and is cut by numerous stringers of quartz and carbonate that strike west-northwestward and dip steeply southwestward about parallel to the schistosity.

Above the adit are exposures of altered and contorted schist with lenses a few feet wide in which sulphide mineralization is abundant. The adit is in light-coloured schist containing stringers and lenses which strike west-northwestward, and consist of quartz, carbonate, and pyrite, and contain sphalerite and minor amounts of chalcopyrite and galena. Pyrite and minor amounts of the other sulphides are also disseminated in the intervening schist.

Four samples were taken from the most abundantly mineralized section of the adit. Each was taken along a length of 10 feet of the adit wall, equivalent to a width of almost 10 feet across the trend of the schistosity. A section 8 feet long at the portal and another 14 feet long at the face that appeared to be of lower grade were not sampled. The samples were taken in order from near the face toward the portal and assayed:—

Sample No.	Gold	Silver	Copper	Lead	Zinc
	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent	Per Cent
1	0.01	0.5	0.5	1.1	5.5
2	0.02	0.1	0.1	(1)	2.4
3	*Nil*	0.1	0.1	0.1	2.0
4	0.02	0.1	(1)	(1)	1.4

1 Less than 0.3 per cent.

Fourteen holes have been diamond drilled across the schistosity in a strike length of 900 feet, from 350 feet southeast of the adit to 550 feet northwest. Ten of these holes, with an aggregate length of 2,169 feet, were drilled in 1920, and the core is not now available. Paramount Company records indicate that mineralization possibly of about the same grade as in the adit was cored in three holes in the vicinity of the adit, and lower-grade mineralization was cored in one hole 280 feet northwest of the adit. Four holes with an aggregate length of 1,925 feet were drilled by Granby in 1952, southeast of the adit. Core from three of these holes contains mineralization similar to that exposed in the adit, but most of the mineralized core is apparently of lower grade. The hole drilled farthest to the southeast did not encounter sulphide mineralization of importance.

In the core from two of the 1952 holes the grade is apparently higher in the north-eastern side of the zone. If the zone dips southwestward, the material of higher grade is in the footwall section.

The diamond drilling indicates the presence of a shoot of mineralization, which, based on information from a few widely spaced points, may be 200 to 300 feet long and extend for at least 200 feet below the surface. The adit is located in the northwestern part of the shoot. Low-grade mineralization cored in a hole at the southeast limit, beneath better mineralization cored in a hole above it, may be outside the shoot, suggesting that its southeast limit rakes northwestward.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1920, pp. 207–208.]

Boulder

This property consists of a block of six recorded claims, of which five are held jointly by W. T. Miller and M. V. Cross, of Victoria, and one is held by M. V. Cross. The claims are about 1 mile southwest of the south end of Buttle Lake and are on the southeast slope of the ridge between Myra and Thelwood Creek valleys. A poor trail leads from near the south end of the lake to workings on the claims.

The workings examined are at about 2,000 feet elevation on a steep slope. Outcrops are not abundant, except in gullies cut into the slope. Greenstone underlies the area near the workings. An open-cut at the edge of a prominent gully exposes light-coloured altered schistose greenstone. The schistosity for the most part strikes north-northwestward and dips steeply northeastward, although there is contortion near faults that are about parallel to the schistosity. Veinlets and lenses of quartz accompanied by sphalerite and minor amounts of galena and chalcopyrite are conformable with the schistosity. Pyrite is abundant in the schist and vein matter. Toward the east and west, mineralization becomes much less abundant, but the limits of the altered greenstone are not exposed.

Five samples were taken across the most abundantly mineralized section of the cut, across an approximate true width of 21 feet normal to the schistosity. The samples were taken from east to west and assayed:—

Sample No.	Approximate Width	Gold	Silver	Copper	Lead	Zinc
	Ft.	Oz. per Ton	Oz. per Ton	Per Cent	Per Cent	Per Cent
1	4.0	0.02	0.5	0.8	1.7	11.0
2	6.0	0.02	0.1	0.4	0.1	2.5
3	3.0	0.02	0.4	0.8	0.8	10.7
4	4.0	0.02	Trace	(1)	0.1	(1)
5	4.0	0.02	Trace	(1)	(1)	0.2

1 Less than 0.3 per cent.

An open-cut about 20 feet higher exposes part of a similar zone, probably the continuation of that exposed in the lower open-cut. A sample across 4 feet of this zone assayed: Gold, 0.02 oz. per ton; silver, 0.4 oz. per ton; copper, 0.9 per cent; lead, 0.2 per cent; zinc, 7.6 per cent.

Cowichan Lake (48° 124° N.E.)*

Copper

Blue Grouse (Cowichan Copper Company Limited)

This group consists of the Blue Grouse, Blue Grouse No. 2, and Blue Grouse No. 3 Crown-granted claims, and sixteen claims held by record. The group is on the south side of Cowichan Lake and nearly 8 miles west of Lake Cowichan Post-office. The workings are at an elevation of 1,200 feet. In December, preparations were made to continue a crosscut to follow a drill-hole which was reported to have intersected a mineral zone. Four men were employed.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1917, pp. 267–268; 1928, p. 364.]

* By R. B. King.

DUNCAN (48° 123° N.W.)*

Twin J (Vancouver Island Base Metals Limited).—Company office, Credit Foncier Building, Vancouver. C. Rutherford, mine manager; C. H. Hewat, mine superintendent. This property ceased operating on January 21st, 1952.

Zinc-Copper

Fallside† Five claims recorded in 1946 are held by P. R. Horton, of Victoria. They lie across the Koksilah River, 5 to 6 miles by gravel road south of Cowichan Station on the Esquimalt and Nanaimo Railway. There is an old adit caved at the portal, but the period when the adit was driven and the name of the property at that time are not known. More recently several open-cuts have been made by bulldozer, but trees that have fallen over since the work was done almost completely cover some of the cuts, including those reported by Mr. Horton to expose the best showings.

At the property the Koksilah River flows northeastward at about 400 feet elevation and is incised partly in rock and partly in till to form a canyon as much as 70 feet deep. Above the canyon walls the ground rises gently away from the river in a series of terraces, and outcrops are scarce.

On the Duncan sheet‡ the area is shown as largely underlain by Vancouver volcanics, but only the western part of the area examined is underlain by recognizably volcanic rock. This is a massive hard brittle greenstone, probably a chloritized flow or tuff.

Near the showings, marble is the most abundant rock. It is massive, mottled white and grey, and coarsely crystalline. Its attitude was not determined, but the trend of the outcrops is northeasterly.

Intrusive into the marble and greenstone is a granitic mass and several minor bodies that possibly are related to the larger one. The larger mass is part of a body of Saanich granodiorite that extends downriver for several miles. It is a light-coloured granitic rock which near its contact is darker and contains numerous dark-grey inclusions. The lesser bodies are feldspar hornblende porphyry; one, a dyke or possibly a sill, is about 90 feet wide and trends northeastward.

The greenstone has been metamorphosed, and irregular masses consisting of garnet, epidote, diopside, and other minerals are common in it. In places, reconstitution is complete, but elsewhere the metamorphic minerals have developed in rock which retains some indication of its original nature.

The marble is veined by replacement minerals but otherwise is not much changed. However, within the central marble area, masses almost completely replaced by metamorphic minerals appear to be bodies of greenstone that were interbedded with or infolded with the marble. The granodiorite is replaced to a minor extent.

Associated with the metamorphism are comparatively small amounts of sulphides and magnetite. Pyrite is common and is by far the most abundant metallic mineral present. Pyrrhotite is abundant southwest of the open-cuts, and magnetite is common within the granodiorite body. Sphalerite and chalcopyrite are present in minor amounts, generally restricted to rude zones that trend northeastward. Quartz has been introduced along the zones and manganese stain is common near them. One zone is 6.5 feet wide, but the others are less.

The magnetite within the intrusive is associated with pink garnet; in the exposures seen, it is a minor constituent, except in streaks a few inches thick.

Six samples were taken. Three were from the most abundantly mineralized zones across widths of several feet. Two were taken from only partly exposed zones, and one

* By R. B. King, except as noted.
† By J. M. Black.
‡ *Geol. Surv., Canada,* Map 42A, 1918.

was taken from blocks on a dump near a zone not well exposed. Spectrochemical analysis indicated that five of the samples contained small amounts of zinc and copper; the other sample was assayed and found to contain 1.9 per cent zinc. All the samples assayed: Gold, *nil;* silver, *nil.* The showings were examined with an ultraviolet lamp, but no scheelite was detected.

San Juan River (48° 123° N.W.)*

Tungsten

Victory (Westbank)

This claim and eleven others are held by record by G. F. Williams, E. C. Hammond, A. J. Sinclair, and P. G. Williams, all of Vancouver, and T. R. Brewer, of Victoria. The claims form a block, two claims wide and six claims long, that extends across the San Juan River near the section known as Todd Crevice and just above the point where it changes course from southward to westward.

The property is reached by the motor-road that extends from Shawnigan Lake westward to connect with the logging railway that extends up the San Juan valley from Port Renfrew. From a point on the road about 22 miles from Shawnigan Lake a trail leads northward about 1 mile to a cabin beside the San Juan River at about 800 feet elevation. The river flows between slopes that rise steeply for 500 to 600 feet in elevation above the river, and less steeply above this.

This report is based on a three-day examination in September, 1952. No work was being done at that time, and only workings on which work had been done in the last few years were found and examined. Near the showings, outcrops are not abundant, but bedrock is for the most part covered by only a thin layer of soil. There are good stands of timber.

Showings of interest were discovered at some time prior to World War I, and a shaft was sunk 30 feet. A second phase of exploration started about 1939 and has continued to date, with some work done in most years. As far as is known, work done prior to 1945 was on showings on the western claims of the property. At these showings, gold is the chief metal of value, but scheelite and stibnite also occur. The western showings were not examined, but according to an unpublished report by J. S. Stevenson they consist of quartz veins and lenses in a carbonate zone that strikes northeastward in greenstone.

The showings explored in recent years are about half a mile east of the early workings and are on the steep west slope of the valley. They have been explored by a series of trenches and open-cuts and by two drift adits aligned in an easterly direction for a length of 650 feet.

The showings are in massive dark-grey impure limestone and marble, some of which is carbonaceous or graphitic. The limestone appears to trend eastward and dip steeply, but the attitude was not accurately determined. Limestone is exposed in the drifts and in most of the surface workings, but continuity between them has not been demonstrated and there may be numerous limestone bodies. The greatest exposure is near the portal of the lower adit, where a width of 95 feet of limestone is indicated. About 700 feet east of the workings more complete exposures at the river show numerous massive limestone bands, of which some are as much as 15 feet wide, but most are only a few feet wide. They probably are interbeds or lenses within the greenstone. The contacts between limestone and greenstone strike about west-northwest and dip steeply southward.

The greenstone is massive and is grey-green in colour. A thin section examined under the microscope showed it to be an intrusive or possibly a comparatively coarse flow rock which had been considerably altered. Some of it is rudely schistose, with the schistosity striking west-northwest and dipping steeply southward. It weathers rusty.

At the workings there are many white quartz and carbonate veinlets, most of which are less than one-eighth of an inch wide, but some are as much as 3 inches wide. The

* By J. M. Black.

veinlets are irregular in attitude, but many of them strike eastward. Grains of scheelite are irregularly distributed in them. Scheelite masses as much as an inch across were noted in some of the larger veinlets, but many of the grains are minute. The scheelite is white and cream coloured, and many grains are rimmed by buff-coloured carbonate. The quartz is also white but is more watery in appearance. The veinlets contain minor amounts of pyrite and, locally abundant stibnite.

The veinlets appear to be in a belt of undetermined width consisting largely of limestone and marble but including some greenstone. The veinlets are spaced more closely in some parts of the belt than in others, and it is upon the zones of more abundant veinlets that most work has been done.

An upper adit has been driven west along such a zone for 105 feet, and near the face crosscuts have been driven to north and south for 21 feet and 17 feet respectively. In the drift at the crosscuts a zone about 2 feet wide consists of one veinlet 3 inches wide and some narrower parallel veinlets. A similar zone occurs 40 feet from the portal. In both zones, scheelite is abundant in the widest veinlet but is comparatively rare in the rest of the zone. Neither of the main veinlets can be followed more than 20 feet. In the crosscuts, parallel veinlets containing very little scheelite are seen.

The lower adit has been driven 37 feet along a veinlet zone along which there has been movement. No scheelite was seen.

Nine samples were taken, of which six were from points where some scheelite was visible. One was where a veinlet contained a moderate amount of stibnite, and two were taken across the veinlet zone at the face of the lower adit where scheelite was not seen. Only two samples, taken from the veinlet zones exposed in the upper adit, contained appreciable tungstic oxide. One, at the crosscut, taken across 2 feet, assayed 0.22 per cent tungstic oxide; the other, taken across 3 feet, 40 feet from the portal, assayed 0.30 per cent tungstic oxide. The other seven samples, according to spectrochemical analysis, contained less than 0.02 per cent tungstic oxide. One sample taken across 18 inches, including a stibnite-bearing veinlet, assayed 1.3 per cent antimony. Most of the samples assayed trace or *nil* in gold and silver.

IRON-ORE DEPOSITS OF VANCOUVER ISLAND AND TEXADA ISLAND

Interest in the iron ores of British Columbia dates back to the 1870's, when land was acquired on the southwest coast of Texada Island by the Puget Sound Iron Company. This ground included three of the larger known deposits of magnetite on the island—the Prescott, Paxton, and Lake. During the years 1885 to 1903, and 1908, 28,898 tons of magnetite ore was shipped to the company's blast-furnace plant at Irondale, Wash. With the exception of approximately 1,000 tons from the Lake, this production was entirely from the Prescott quarries. Until recently no further shipments were made from these deposits.

"The Iron Ores of the Coast of British Columbia" was the title of a twenty-nine-page report in the Annual Report of the Minister of Mines, 1902. A thirty-page "Report on the Occurrences of Iron-ore Deposits on Vancouver and Texada Islands" was included in the Annual Report of the Minister of Mines, 1916. These reports also appeared as separate publications.

In 1922 the British Columbia and Federal Governments entered into an agreement whereby the Geological Survey of Canada was to undertake a thorough survey of all known iron deposits of British Columbia. The results of this investigation were published in 1926 in Economic Geology Series, No. 3, "Iron Ores of Canada, Volume 1, British Columbia and Yukon."

A preliminary report by J. S. Stevenson on the F.L. iron property near Zeballos, Vancouver Island, was published by the British Columbia Department of Mines in 1940. During the same year the Department approached the Federal Government with regard to the establishment of an iron and steel industry in the Province. A firm of steel consultants, Arthur G. McKee and Company, of Cleveland, Ohio, was employed to investigate the possibilities. In February, 1942, 200 copies of the first part of the McKee report were printed and distributed; the entire report has always been available to any company seriously interested in establishing an iron and steel industry in the Province.

Order in Council No. 138/51 is now in effect, restricting the mining of iron ores to mineral claims held prior to January 19th, 1951, and to lands alienated from the Crown prior to 1896.

During the past four years there has been renewed interest in the magnetite deposits of the southwestern coastal area. Recent exploration has disclosed substantial tonnages of magnetite on the F.L. property and on the property of Quatsino Copper-Gold Mines Limited, northern Vancouver Island. Three deposits are being mined. Production from the Iron Hill near Upper Quinsam Lake, northern Vancouver Island, is approximately 65,000 tons of concentrates monthly, while that from the Prescott and Lake deposits is approximately 40,000 tons monthly. It is understood that a small proportion of the Iron Hill concentrates is being sent to Baltimore, U.S.A.; the remainder and all the Texada concentrates are being shipped to Japan.

Examinations of the properties currently being developed have shown that the deposits thereon have three features in common:—

(1) Skarn,* in which brown garnet is commonly the dominant mineral, is invariably associated with the magnetite.

(2) The deposits occur along or close to contacts between folded metamorphosed rocks and Coast intrusives.

(3) The deposits occur in limestone or close to limestone.

On Texada Island, limestone forms the footwall of the Prescott body and overlies the Lake body. The Paxton deposit is bounded on three sides by quartz diorite, but a small

* Skarn is a name usually applied to an aggregate of one or more silicate minerals such as garnet, epidote, amphibole, and pyroxene formed by replacement of limestone. However, it is used here simply for a rock rich in such minerals without any implication regarding the original nature of the rock.

outcrop of limestone occurs within a few feet of its northern border. On the Quatsino Copper-Gold property, magnetite deposits occur on both sides of a limestone-volcanic contact. At the F.L. and Iron Hill the ore is in greenstone adjacent to limestone. Thus the association of magnetite with limestone, indirect as it may appear in some places, is established. Furthermore, this association can hardly be fortuitous in view of the miles of unmineralized contact between Coast intrusives and rocks other than limestone.

Where limestone is merely adjacent to the magnetite and not the host rock, its role in the deposition of the magnetite is conjectural. In view of the evidence, however, it seems probable that the composition of this rock has in some manner influenced the deposition of the magnetite. Thus, limestone assumes the utmost significance in any search for new magnetite deposits, and belts of this rock, such as the one that apparently extends for more than 50 miles from Quatsino to Zeballos, should be investigated thoroughly.

Examinations of the aforementioned properties have shown that tonnage estimates which are not based on closely spaced diamond-drill holes are of little value. The area of a surface outcrop may be entirely misleading as the known deposits occur in a variety of irregular shapes and usually terminate abruptly.

TEXADA ISLAND*

Iron

Prescott, Paxton, Lake (Texada Mines Limited)

(49° 124° N.E.) Registered office, 626 West Pender Street, Vancouver. A. D. Christensen, San Francisco, president; B. L. Alexander, general manager; J. Yuill, mine superintendent; E. Fox, mill superintendent; J. K. Halley, chief engineer. Texada Mines Limited is a private company incorporated on May 29th, 1951. This company acquired by outright purchase the ground on the southwestern coast of Texada Island formerly owned by the Puget Sound Iron Company Limited. These extensive holdings are shown on Figure 14.

In December, 1951, Texada Mines Limited commenced work preparatory to mining the magnetite deposits on their holdings. Within six months a camp was constructed at Gillies Bay, gravel roads to the three main deposits were built, a mill consisting of crushing plant and magnetic separation unit was installed, and a dock to accommodate freighters was erected.

Milling was begun on May 21st, 1952. By the end of June 1,600 to 2,000 tons of ore was being concentrated daily, and the beneficiated product was shipped as high-grade iron ore.

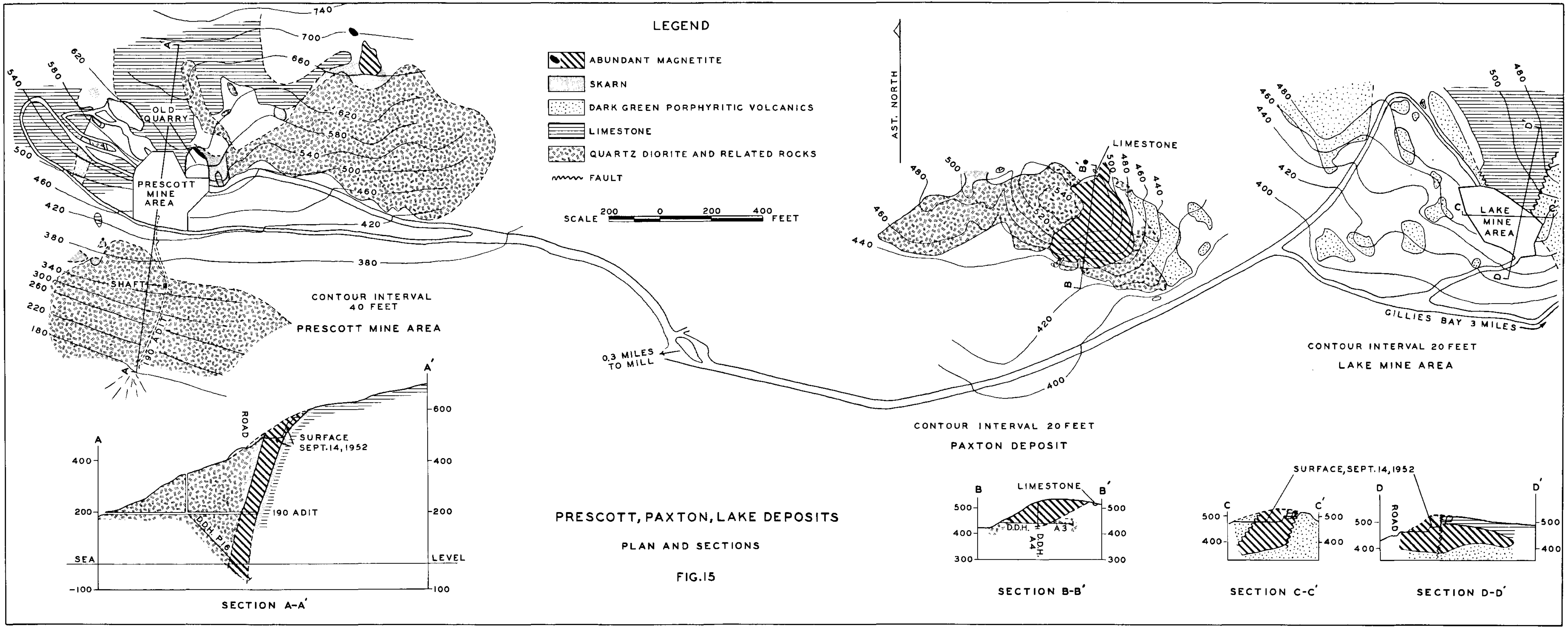
The company is presently quarrying the Prescott and Lake deposits. These and the Paxton deposit have been known for more than seventy-five years and have been the subject of numerous reports. An outline of the geology is included in the Iron Ores of Canada.† For a detailed treatment of the mineralogy and genesis of the deposits, the reader is referred to the excellent report by Swanson.‡

The following account is a summary that includes information supplied by the present company. The property was visited briefly in June, 1952. In September a week was spent in examination of the Prescott, Paxton, and Lake deposits, and a geological map (*see* Fig. 15) was prepared.

The geological setting of the deposits is the contact zone of the Gillies stock. This stock outcrops over an area of 1 square mile and is presumed to be a phase of the Coast intrusives. It intrudes the Texada formation and the overlying Marble Bay formation.

The rocks in the vicinity of the deposits consist of quartz diorite (Gillies stock), limestone (Marble Bay formation), volcanics (Texada formation), and skarn.

* By W. R. Bacon.
† *Geol. Surv., Canada,* Ec. Geol. Series No. 3, 1926: The Iron Ores of Canada, Vol. 1, British Columbia and Yukon, pp. 86–100.
‡ *Geol. Surv., Canada,* Sum. Rept., 1924, Pt. A, pp. 106–144.



PRESCOTT, PAXTON, LAKE DEPOSITS

PLAN AND SECTIONS

FIG. 15

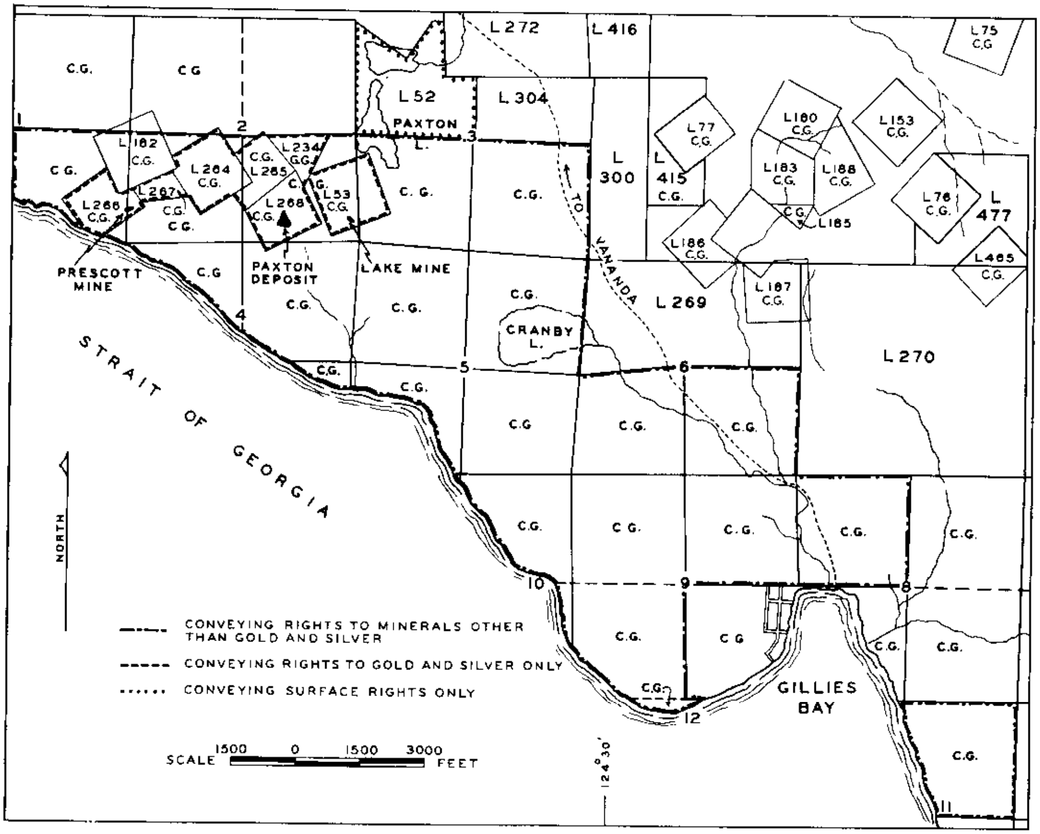


Figure 14. Holdings of Texada Mines Limited.

Much of the Gillies stock consists of medium-grained quartz diorite. In places near the Prescott and Paxton deposits the intrusive is less uniform and contains an abnormal amount of such secondary minerals as epidote, amphibole, garnet, and magnetite. These minerals, however, are not sufficiently abundant to obscure the identity of the rock.

The limestone is a pure greyish-white crystalline rock in which there are few indications of bedding.

Massive dark-green altered volcanics containing scattered phenocrysts of andesine outcrop between the Paxton and Lake deposits and east of the Lake.

The skarn consists essentially of brown andradite garnet with minor amounts of epidote and amphibole. Skarn is best developed along portions of the quartz diorite-limestone contact. It forms an irregular envelope around the Prescott deposit and occurs in patches within all three deposits.

The magnetite at the Prescott and Paxton is coarse grained; that at the Lake is medium grained. Waste within the deposits consists of poorly mineralized wallrock, the skarn minerals, and pyrite, chalcopyrite, pyrrhotite, marcasite, calcite, and quartz. Drill-holes at the Paxton suggest that this body contains a higher proportion of sulphides than either the Prescott or the Lake. In hole A3 (*see* Section B-B′, Fig. 15) 74 feet of core within the orebody averaged 4.58 per cent sulphur and 0.75 per cent copper. Should anything approaching these percentages prove characteristic of the Paxton as a whole, the ore from this body would have to be blended carefully with relatively pure ore from the other two deposits.

From his extensive research on the rocks and ores, Swanson* considered a large part of the massive orebodies and the skarn to be replacements that were formed during a single period of deposition. He concluded that the volcanics were unfavourable both physically and chemically to the deposition of magnetite, that the quartz diorite was favourable physically but not chemically, and that the limestone was favourable chemically but not physically. Swanson held that carbon dioxide derived from the limestone was probably effective as an oxidizing agent in the formation of the magnetite. This offers an explanation regarding the probable role of limestone in places where this rock is merely adjacent to and not the host rock for magnetite.

Brief descriptions of the three deposits follow:—

Prescott.—The Prescott body is an irregular lens that strikes westward, dips steeply southward, and pitches steeply westward. It is enclosed in an equally irregular envelope of skarn which ranges in width from a few feet to 75 feet and averages 20 feet. The contact between skarn and magnetite ore is sharp in places, gradational in others. The unaltered rock on the hangingwall is part of the Gillies stock; that on the footwall is limestone. The skarn-limestone contact is remarkably sharp. It is crossed by northerly trending, steeply dipping fractures in which magnetite occurs as vein-like projections from the main orebody.

Development has proceeded to a stage where a reasonably accurate estimate of tonnage can be made to a depth of 50 feet below the 190 adit (*see* Fig. 15).

Elevation (Ft.)	Difference in Elevation (Ft.)	Ore (Horizontal Section) (Sq. Ft.)
514		7,500
	214	
300		13,650
	110	
190		18,900

Volume of ore to 50 feet below 190 adit

$$=(107\times 7{,}500)+(162\times 13{,}650)+(105\times 18{,}900)$$
$$=802{,}500+2{,}211{,}300+1{,}984{,}500$$
$$=4{,}998{,}300 \text{ cubic feet}$$
$$\text{Tonnage}=\frac{4{,}998{,}300}{7+}=700{,}000 \text{ tons (approx.)}$$

Paxton.—The Paxton orebody outcrops on a knoll 3,600 feet due east of the Prescott. Magnetite is generally abundant over an area of 75,600 square feet. This figure is almost twice the area ascribed to the Paxton in the Iron Ores of Canada (p. 93). The explanation for the discrepancy lies in the admittedly arbitrary position of the northern boundary of the body as shown in the aforementioned volume. It is true that the northern portion of the body as outlined in Figure 15 does include areas of poorly mineralized quartz diorite, and skarn, but similar patches of waste occur within the southern portion as well, and it appears reasonable to consider the orebody as a unit rather than to delimit it along some line that has no geological and little apparent economic significance.

The Paxton is bounded on the south and west by quartz diorite. The contact is sharply defined. The eastern boundary is partially obscured by a light cover of overburden; it is probable that here the magnetite is in contact with the volcanics as well as quartz diorite. The northern boundary of the Paxton is also obscured by overburden, and although one limestone outcrop, 15 square feet in area, occurs immediately north of the deposit, there is further evidence of mineralization in the thick bush north of this outcrop.

The present company supplied the writer with the logs from four horizontal and one vertical diamond-drill holes that penetrated the Paxton deposit. These exploratory holes demonstrate the irregularity of the deposit, and hence the necessity for more holes before making an accurate tonnage estimate.

* *Geol. Surv., Canada,* Sum. Rept., 1924, Pt. A, pp. 106–144.

In two open-cuts the southern contact of the Paxton orebody dips vertically and 80 degrees northward, whereas 15 feet east of the eastern open-cut, diamond-drill hole A3 indicates a flat northerly dip. A vertical section through this hole and hole A4 (*see* Section B-B′, Fig. 15) suggests that the deposit is essentially flat lying and bottoms at a depth of approximately 100 feet below the outcrop. Hole A4, however, is not deep enough to indicate conclusively whether it ended in a narrow tongue of quartz diorite or the main mass of the Gillies stock.

Three flat holes (D3, D4, D5), collared just within the southern boundary of the deposit, fan out northeastward beneath its outcrop. These holes show that, at an approximate elevation of 450 feet, the deposit is much smaller than at the surface and contains a greater proportion of waste. From these three holes, the composition of the deposit at this elevation is 40.6 per cent magnetite ore, 23.7 per cent skarn with minor magnetite, 30.5 per cent quartz diorite, and 5.2 per cent volcanics. Thus, although a tonnage estimate must await further development, all the known facts indicate that the Paxton deposit diminishes sharply with depth.

Lake.—The Lake deposit is 1,600 feet due east of the Paxton. It occurs at the southernmost tip of a down-faulted block of limestone. The block is approximately one-half mile long by one-quarter mile wide and forms a southeasterly trending projection from the main mass of limestone that traverses the northern part of Texada Island; it is bounded on the southwest, southeast, and northeast by volcanics of the Texada formation.

The Lake is a typical magnetite body of the British Columbia coastal area and well illustrates the futility of attempting to estimate accurately the size of these characteristically irregular deposits from the area of mineralized outcrop and a few diamond-drill holes. Closely spaced vertical holes have shown that the Lake deposit extends northward for 280 feet beyond the surface outcrop beneath a 30-foot cover of pure, unmineralized limestone (*see* Section D-D′, Fig. 15). Thus, an intelligently planned drilling programme indicated that, before mining, the Lake deposit contained 450,000 tons of magnetite ore, about five times the amount that could reasonably be estimated from the surface exposures.

Early mining at the Lake was for copper. Chalcopyrite occurs with pyrrhotite and pyrite along the steeply dipping fault contacts between limestone and volcanics and between magnetite and volcanics. Some sulphides are also present within the orebody, and pyrrhotite is especially abundant along the footwall of a post-mineral dyke of mica-pyroxene diorite 3 feet in width and dipping southward at 85 degrees. This dyke bisects the deposit in a north 70 degrees west direction, and it is believed to have been intruded along a pre-mineral fault which was impervious to the pyrrhotite. Near the eastern end of the quarry the dyke is cut by a northerly striking fault that dips westward at 85 degrees; this fault has offset the dyke 10 feet to the right.

VANCOUVER ISLAND

Upper Quinsam Lake (49° 125° N.W.)*

Iron

Iron Hill (The Argonaut Co. Ltd.)

Company office, Campbell River. M. E. Broan,† general manager; E. H. Willes, chief engineer; S. Hellerud, superintendent; John Martin, mill superintendent. The company is a subsidiary of Utah Construction Company Ltd. of San Francisco. The property is in the Esquimalt and Nanaimo Railway belt and is leased from the railway on a royalty basis. The property is on Iron Hill, a ridge trending southwestward between Sihun and Mine Creeks, south of Upper Quinsam Lake. It is southwest of the community of Campbell River and is reached by 23 miles of good gravel road from that point.

* By J. M. Black.
† A. F. Geiger became general manager in January, 1953.

Magnetite outcropping over a considerable area at the east end of the top of Iron Hill probably was discovered early in the century, and by 1914 considerable exploratory work had been done, including stripping and the driving of several adits. Thereafter little was done until 1948, when Coast Iron Company Limited acquired the property, did some diamond drilling, and shipped some ore. The Argonaut Company optioned the property in 1949 and also did some drilling. Early in 1951 more drilling was done, completing a total of more than 12,000 feet, and sections of road necessary to connect with public and logging roads to Campbell River were built. A magnetic concentrator and a power plant were built at Iron Hill, and a dock was built about half a mile north of Campbell River. Stripping and mining were started, and concentrates were made in August when the first separator belts were installed. The installation of belts was completed in February, 1952, and production has been increased to about 65,000 long tons of concentrates per month.

Present Operations.—Ore is mined by quarrying. Limestone waste is stripped where necessary and is dumped on the slopes of the hill.

Levels have been established at 30-foot intervals through a vertical range of 330 feet below the top of Iron Hill. The levels have been driven from the east and are being extended round the hillside to the north. Blast-holes are drilled with wagon drills, and the charges are fired electrically. Some holes are drilled to depths as great as 50 feet to provide samples in advance of mining. Ore is loaded with diesel shovels on to diesel trucks and is hauled to the coarse-ore bin.

Ore from the coarse-ore bin is passed over a grizzly. The oversize from the grizzly is crushed and passes with the undersize to the concentrator, where the ore is again sized and is fed on to twelve belts. Electromagnets separate the fragments on the belts into concentrate, middlings, and tailings. The middlings comprise fragments with weak magnetite attraction, consisting of a mixture of magnetite and gangue. Middlings from belts handling the coarser ore are crushed in a secondary crusher and then returned to belts separating finer products. The magnetic concentrates are conveyed by belts to piles which are pushed by bulldozer into ore-bins, from which they are dropped into ore-carrying trucks and hauled to the dock at Campbell River.

Production in the last half of 1952 was at a monthly rate of about 65,000 long tons of concentrate averaging about 57 per cent iron from about 115,000 long tons of ore. At the present stage of operation more limestone than ore is being mined.

Iron Hill is in the Buttle Lake map-area (*Geol. Surv., Canada,* Sum. Rept., 1930, Pt. A, pp. 56–78). The property has been described briefly in Annual Reports of the Minister of Mines and by G. A. Young (*Geol. Surv., Canada,* Ec. Geol. Series, No. 3, Vol. 1, 1926, pp. 73–78).

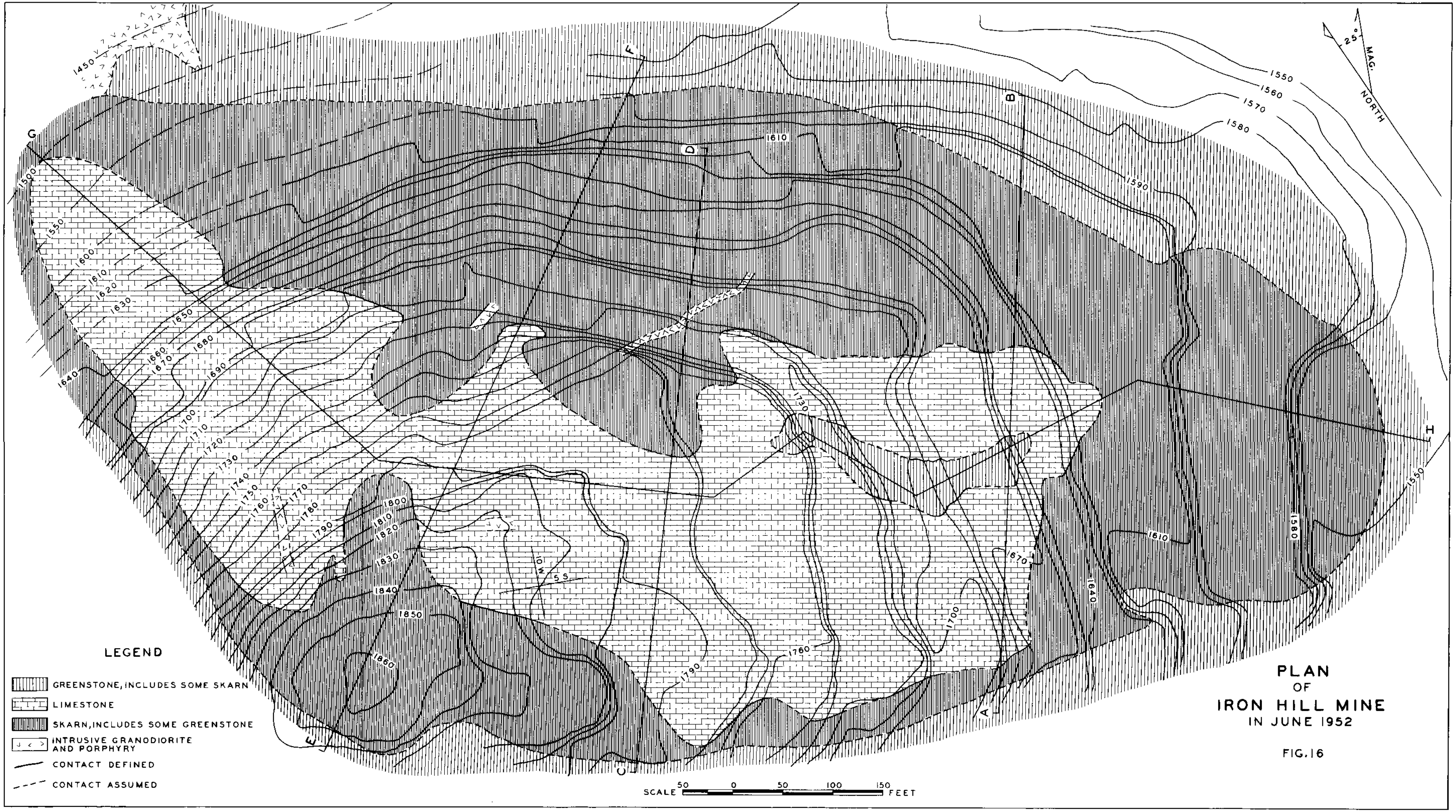
The writer mapped the property during three weeks of June, 1952, and returned for a brief examination in September. A map on a scale of 1 inch to 50 feet, prepared by the company, was used as a base for geological mapping. The datum used by the company, 1,850+ feet for the top of Iron Hill on the property, was determined by barometric readings and is about 50 feet lower than geodetic datum.

Rock in the quarry is not completely exposed. Roadways take up much of the area, and some of the bench faces may be covered with muck. Also, the slopes outside the quarry are partly covered with overburden.

A geological map (*see* Fig. 16*) shows the main geological contacts as they appeared in June. Three cross-sections and one longitudinal section, based on mapping in June, but modified to show the quarry profile at the end of September, show relationships at depth (*see* Fig. 17). Because of the incompleteness of data, provided mostly by diamond drilling, the sections are diagrammatic below an elevation indicated on each. The longitudinal section GH shows approximately the greatest depth to which limestone and ore extend, and not their known depth at the line of section.

---

* One intersection (5s, 10w) of mine co-ordinates is shown on the plan to facilitate comparison with company plans. The 5s and 10w are key co-ordinate lines marked out east and north of the quarry.



PLAN
OF
IRON HILL MINE
IN JUNE 1952

FIG. 16

Geology.—Greenstone, comprising fine-grained greenish igneous rocks which have not been subdivided, outcrops extensively near the quarry and west of it. At the mine it is distributed in a roughly oval ring. Within this ring is an inner ring of skarn* consisting largely of garnet and magnetite. Parts of this inner ring containing a sufficiently high proportion of magnetite constitute ore. Within the skarn ring, most of the rock is grey crystalline limestone. An elongated mass of greenstone occurs within the limestone area, and several tabular bodies of greenstone are exposed in the northwestern part of the limestone. These rocks are part of the Vancouver group of Triassic age, although the skarn, having been formed by replacement, is, of course, younger.

Granodiorite outcrops on the lower slopes of the east end of Iron Hill and presumably extends under all the mine area. It is part of the Quinsam granodiorite, of Jurassic or Cretaceous age. Dykes and sills of feldspar porphyry, probably offshoots from the same magma as the intrusive mass, cut the older rocks. Garnet occurs locally in the granodiorite and in at least one sill.

Greenstone outcrops extensively on the slopes of Iron Hill and appears to form all the western part of the top of the hill. It includes a considerable variety of rocks, ranging in colour from grey-green through many shades of green to greenish-black. It is for the most part porphyritic, consisting of feldspar and hornblende phenocrysts, in a fine-grained groundmass. It has been extensively altered, and the original mineralogy and texture have been largely obliterated; it now consists mostly of chlorite, sericite, and epidote. It is massive and brittle, and near the skarn has been fractured and, especially near the quarry, is traversed by a network of veinlets of white quartz and carbonate.

There are many variations in appearance but few well-defined contacts. What appeared to be pillow-like structures were noted west of the mine, and near them some flow breccia. It is probable that flow rock constitutes a considerable part of the greenstone series. Chilled margins of intrusive bodies were noted, but individual bodies generally cannot be followed and were not mapped. A few vein-like bodies, about an inch wide, consist of hornblende blades oriented normal to the vein walls.

Near the limestone the greenstone has been to a great extent replaced by garnet, magnetite, and minor amounts of other minerals to form the rock referred to here as skarn. The contact of skarn with unreplaced greenstone is sharply defined but irregular. Masses of skarn occur within greenstone which is apparently unreplaced, and masses of greenstone occur apparently surrounded by skarn. The skarn is comprised largely of magnetite, which is black to blue-black, and garnet, most of which is brown, though a small proportion is green.

The greenstone at several points at the west end of Iron Hill and on the slope south of the hill—that is, at some distance from the limestone—has also been replaced by skarn. However, each of these occurrences is only a few feet in extent at the surface, and none has been explored.

Limestone outcrops in a rudely oval area that extends northwestward across the east end of Iron Hill and is well exposed by stripping. There are two outcrop areas, of which the one in the northeast is comparatively small. On the plan they are shown as parts of a continuous body, partly separated at the surface by greenstone. The limestone is completely recrystallized, but bedding is well preserved, massive beds alternating with thin beds, many of which are less than 1 inch thick. Most of the beds are white to light grey, but some, especially the thin ones, are dark grey.

The outline of the limestone is generally smooth but in places is irregular. Drilling indicates that small masses of limestone occur in the greenstone-skarn complex below and on the flanks of the main mass. It is not known whether these are parts of the main mass that have been detached or squeezed away from it during deformation, or whether they are lenses or beds deposited before the main mass of limestone. The thickness of

* Skarn is a name usually applied to a rock rich in garnet and other silicates which has formed by replacement of limestone. However, it is used here simply for a rock rich in garnet without implying that the replaced rock is limestone, and, in fact, it is believed that here most of the skarn formed by replacement of greenstone.

the limestone ranges from a few feet to possibly as much as 200 feet and is greater toward the northwest; the limestone, as deposited, probably thickened toward the northwest.

The limestone is fairly pure, and the only mineral impurity generally present is pyrite in small grains. A grab sample taken by the writer, consisting of chips from blocks on a limestone dump, assayed: Calcium carbonate, 98.88 per cent; acid insoluble matter, 1.29 per cent; total iron, 0.09 per cent; total sulphur, 0.07 per cent. This is a high-calcium limestone, and although the sample cannot be considered to be representative of the whole mass, it does indicate that high-calcium limestone, with a relatively low iron and sulphur content, is present.

The limestone apparently overlies the main mass of greenstone but is separated from it by skarn. The contact with skarn is smooth and well defined and is parallel to the limestone bedding wherever it could be determined.

An elongate mass of greenstone 300 feet long and as much as 50 feet wide is within the area of limestone and appears to overlie it. This greenstone, like the main greenstone body, is altered and shattered, and is cut by many narrow veinlets of quartz and carbonate and is partly replaced by skarn.

Tabular bodies of greenstone a few feet thick within the limestone are exposed on the north slope of Iron Hill. These bodies are conformable to the bedding wherever the attitude of the limestone could be determined. Possibly they are flows or sills, but they are now so altered that their origin is uncertain. These bodies are partly replaced by skarn.

Quinsam granodiorite outcrops on the lower slopes of Iron Hill on the north, east, and south. The granodiorite is a fresh-looking rock, light grey in colour, composed of dark-green hornblende crystals in a nearly white groundmass of medium grain. Near its contact with greenstone the granodiorite contains many rounded and angular inclusions, most of which are dark grey. Diamond drilling indicates that granodiorite extends under the older formations of the mine area. It has intruded the greenstone, but at only one point is it known to have intruded to within a few feet of the limestone.

Numerous dykes cut the greenstone in the mine area, and one sill and one dyke intrude the limestone. These bodies, which range from a few feet to as much as 20 feet wide, consist of feldspar and hornblende porphyries. They are grey and green in colour and weather to light green. Most of the dykes strike westward and dip steeply; the sill strikes northward and is nearly vertical. These intrusives possibly are related to the Quinsam granodiorite.

Granodiorite east of Iron Hill, in the bed of Mine Creek, is garnetized. The sill in the limestone is also garnetized for as much as 1 foot away from the limestone, although the limestone is not garnetized. In both places the replacement is complete but differs from the prevalent replacement inasmuch as magnetite is lacking.

Some skarn at the north end of the lower benches weathers to a crumbly brown mass, in part clayey. The freshest specimens of this material that were obtained consist of garnet traversed by a network of fractures. The clayey, crumbly material probably was formed from weathering along fractures.

Structure.—Bedding in the limestone is well preserved, and the structure has been worked out largely from a study of the limestone. The eastern part of the southern limestone dips gently northward and northeastward, and individual beds dip in the same direction. The northern limestone dips steeply northward and northeastward, although numerous deviations from conformability and some reversals of attitude were noted in individual beds, and at the western end the beds are folded abruptly and strike southward toward the southern limestone. At the eastern end of the northern limestone the beds curve around and dip westward, suggesting continuity between the two masses. The results of diamond drilling suggest that the two masses come together at depth also.

The limestone, therefore, appears to be a single group of beds folded into an overturned syncline. The evidence is not conclusive inasmuch as at the time of examination

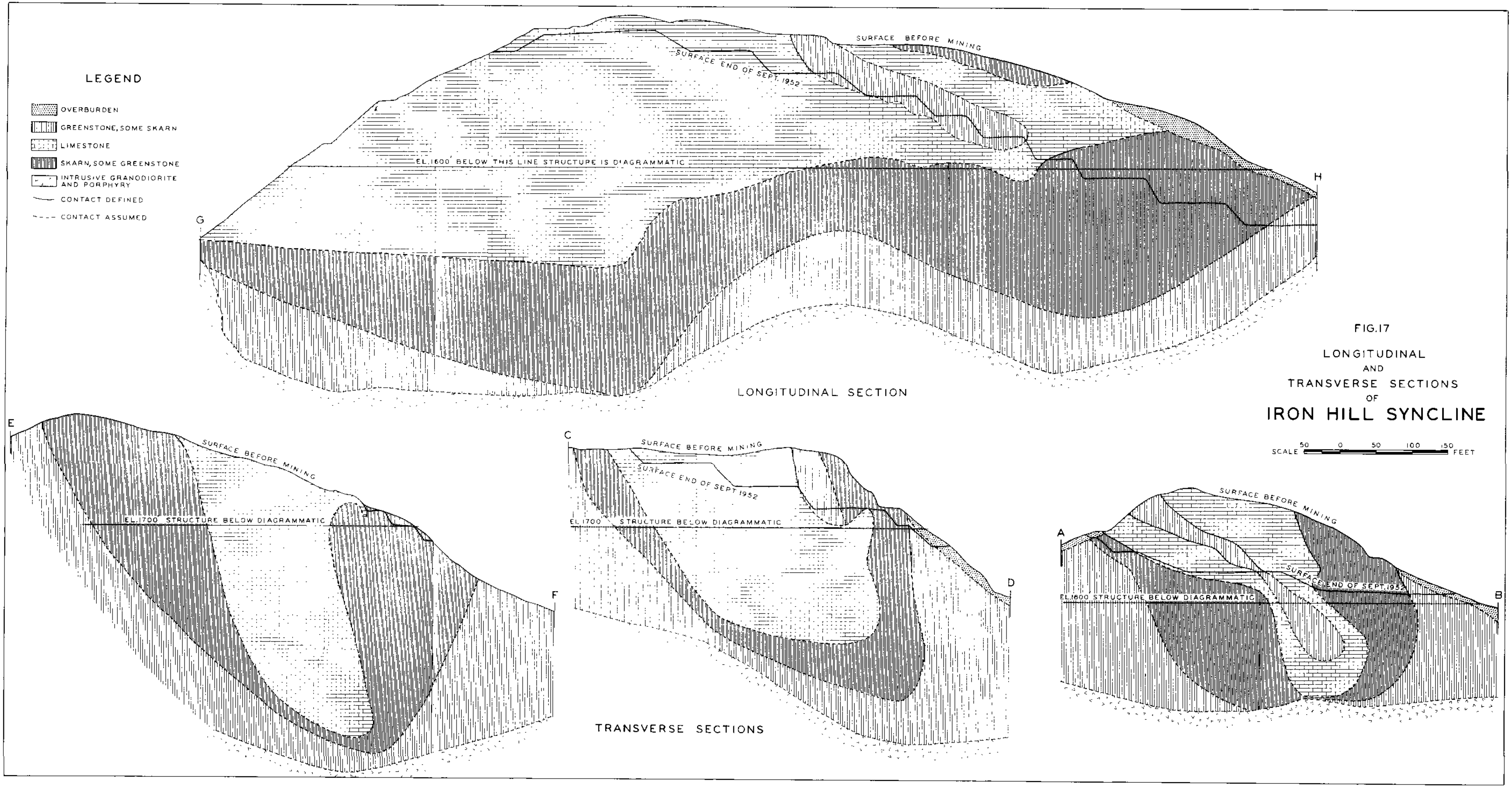


FIG. 17

LONGITUDINAL AND TRANSVERSE SECTIONS OF IRON HILL SYNCLINE the relationship between the limestone of the southern and northern outcrop areas was obscured by roadways. However, the conformability of beds within the two masses, the apparent tendency for the two masses to join, and the lack of any other explanation adequate to explain their abrupt termination to the east, all support this interpretation.

The northern limb of the syncline in the east, where it is separated from the southern limb, is overturned. In the northwest the two limbs are not separated, the position of the axial plane is not certainly known and fewer observations are available, but here also some of the northern beds appear to be overturned.

The greenstone is massive but apparently is conformable in a general way with the limestone. The overlying greenstone presumably is younger, and its position marks the location of the axial plane of the syncline.

The axial plane strikes between northwest and north and dips northeastward to eastward between 45 and 80 degrees (*see* Fig. 16 and Fig. 17, Sections AB, CD, and EF). The trace of the plane is curved and may be sinuous, but some of the apparent sinuosity is an expression of the irregular topography.

The beds near the eastern nose dip westward, and the syncline at that point plunges westward (*see* Fig. 17, Section GH). Toward the northwest, only steeply dipping beds were observed and the direction of plunge is not certainly known, but the fact that the width of the limestone decreases toward the northwest suggests that here the syncline is probably plunging toward the southeast. Thus the general form of the limestone may be likened to that of a canoe, with the base of the limestone, along the synclinal axis, forming the keel. The plunge at the east end of the base of the upper greenstone body is gentle, but the west end plunges steeply in the opposite direction. This has the effect of producing one low in the " keel." Data obtained by drilling suggest that a second low is caused possibly by a second reversal of plunge. The two lows are shown on longitudinal Section GH.

The pronounced swing in the axis of the fold at the west end where the southern contact of the limestone turns abruptly northward probably is the result of cross-folding or crumpling. The limestone is sharply constricted at this point, and although the constriction may be exaggerated by the effect of replacement, the fact that the contact is parallel to the bedding, or nearly so, indicates that the constriction is a structural feature. Possibly a cross-fold, anticlinal in form, arched up the limestone syncline and caused a lower, narrower part of it to be exposed.

Irregularities and changes in thickness of the limestone indicate that it flowed during the general period of deformation. The conformability between bedding and contacts shows that the contacts were not faulted to any great extent. The comparative lack of dykes and veins in the limestone suggests that few fractures existed at the time of intrusion and vein formation.

The greenstone, however, was a relatively massive brittle rock that yielded by slipping or fracturing. It is not noticeably schistose.

No major faults were noted, but slips that probably resulted from displacements of not more than a few feet are common. Many of these occur along contacts between different rock types. The walls of some of the slips are slickensided, and mullions on them are, as a rule, more nearly horizontal than vertical. Little gouge is present.

The upper surface of the granodiorite is trough-like where it underlies the syncline. This suggests that the upper limit of the intrusive was controlled, or at least influenced, by the synclinal structure.

Skarn.—The main body of skarn is between limestone and greenstone. Skarn also occurs in the upper greenstone and the tabular greenstone bodies within limestone. Locally the granodiorite and some of the minor intrusives are garnetized, and some of the greenstone outside the skarn zone is garnetized.

The skarn consists chiefly of garnet and magnetite; other minerals present in small amounts are epidote, calcite, quartz, pyrite, hematite, and chalcopyrite. The contacts of the skarn are irregular but in detail are smooth and well defined. The demarcation between greenstone and skarn and between limestone and skarn is sharp. Lenses and pods of skarn occur within greenstone, and masses of greenstone are apparently surrounded by skarn, but the contacts as a rule are sharp and not gradational. Crystals of garnet and magnetite are not commonly seen in greenstone or limestone, and replacement, where it has occurred, is complete. The general proportions of the two major minerals in the skarn change near contacts with the older rocks; magnetite decreases in proportion and garnet increases, and skarn within a few inches of most contacts is composed almost exclusively of garnet. The grains of magnetite and garnet are commonly from one-eighth to one-quarter inch across, but in places, especially near some contacts, the grains, particularly of magnetite, are much smaller. Garnet-rich skarn is in many places veined by magnetite.

The minor minerals present are mostly in veinlets. Numerous calcite veinlets, about 2 inches wide and flanked by as much as half an inch of pyrite and hematite, presumably formed at a late stage of replacement.

Skarn occurs within the limestone in a few places, but in masses too small to be shown on the map and not of economic importance. In most of these occurrences a rim of garnet separates magnetite from limestone, though in a few magnetite is in contact with limestone. These occurrences, as a rule, appear to replace particular beds and finger out into the limestone.

At no place on the present surface is the limestone embayed in such a way that it obviously appears to be replaced, but at the ground surface prior to quarrying, on the east at the synclinal axis, a section of the limestone was missing. Inasmuch as the limestone generally is not thinned near the axial plane by flowage, it appears probable that this gap in the limestone was the result of replacement. This exception to the general lack of replacement of the limestone may indicate that the susceptibility of the limestone to replacement was greatest near the axial plane of the syncline.

Replacement of the upper greenstone is incomplete and consists of tabular and vein-like masses and pods of skarn separated by unreplaced greenstone. Some of the tabular bodies are sheet-like in form and are parallel to the contact with the underlying limestone, suggesting that bed-like layers may have been more susceptible to replacement than other parts of the greenstone. However, not all the skarn bodies have a bedded aspect, and fractures must have played a part in localizing replacement. The fact that skarn occurs in the upper greenstone but not in the limestone below is significant, and indicates that the limestone was less susceptible to replacement than the greenstone.

A minor part of the skarn has a streaked appearance. In places this is due to the occurrence of rudely defined lenses containing proportionately more magnetite and less garnet than the surrounding skarn; in a few places an opposite effect is noticeable. In other streaks, grains of garnet are larger or smaller than those in the enclosing skarn. These segregations give the rock an appearance similar to one that might be produced by differential replacement of a layered series.

The shape of the main replacement body, between the limestone and underlying greenstone, is trough-like, conforming to the base of the limestone. Its thickness, normal to the margin of the limestone, ranges from about 1 foot to as much as 200 feet and as a rule is greatest near the axial plane of the syncline (*see* Section CD) and on the north limb of the fold. The contact with limestone is smooth and follows the bedding of the limestone. This could mean that replacement was restricted to the greenstone or that some basal limy beds were affected also, but the lack of remnants of limy beds suggests that replacement was to a large extent confined to greenstone. The common presence of skarn in greenstone and of remnants of greenstone in skarn substantiates this observation.

Replacement of the granodiorite and associated dykes and sills is largely replacement by garnet only and is not of economic importance. It is interesting to note, however, that the replacement in the granodiorite occurs near the projected extension of the synclinal axial plane.

The feldspar porphyry sill in the limestone has been garnetized, although the adjacent limestone has not, and this indicates that the limestone was less readily replaced than the intrusive rocks.

Ore.—The ore is skarn that contains a sufficiently high proportion of magnetite. Most of the skarn indicated on Figures 16 and 17 is of ore grade, but parts of it, particularly near its contact with the surrounding greenstone, are below ore grade. The proportions of magnetite and garnet vary widely, and mining limits are determined by sampling. In a general way the proportion of magnetite is highest near the limestone contact and decreases away from it, but skarn for a few inches from the contact consists generally only of garnet. Bodies of unreplaced greenstone in the ore are mined with it, unless they are large enough to be blasted and handled separately. The thickness of the ore zone varies from a few inches to possibly as much as 200 feet and is generally greatest near the synclinal axial plane and on the north limb, as shown on Sections AB and CD. In the southwest the proportion of ore in skarn is comparatively low, and much of the outcropping skarn contains a minor amount of magnetite. Skarn occurs down to about 1,250 feet elevation, and ore may extend down almost as far. The lowest known ore is almost directly below the top of the hill and indicates a possible vertical extent for the deposit of nearly 600 feet.

Ore Controls.—The proximity of the ore to limestone suggests that ore formation and replacement were aided by the presence of limestone. The fact that at some distance from the limestone only small occurrences of skarn are found suggests that in the absence of limestone, ore formation was not on a large scale. Possibly the limestone contributed lime or carbon dioxide to replacing solutions and thus aided the formation of magnetite-bearing skarn.

Limestone is generally considered to be readily replaceable, and the reason for the preferential replacement of greenstone at Iron Hill may logically be attributed to a local condition of the greenstone. An indication of what this condition may be is found outside the skarn zone, where the unreplaced greenstone is shattered and is veined by innumerable veinlets. It is probable that the greenstone in contact with the limestone was shattered even more intensively, and this would seem to be a condition conducive to ready replacement. During deformation the limestone yielded by flowing and folding, but the greenstone near the limestone probably yielded by shattering. In the region near the axial plane of the syncline, flexing was greatest, and the greenstone was probably more intensely shattered than elsewhere. This is a possible explanation for the thickening of the ore zone near the axial plane.

Magnetite-rich skarn, as a rule, formed only where greenstone was available for replacement. Because of the irregular intrusion of the grandiorite, which in places approached the limestone (*see* Section AB) and in others may possibly have intruded it, the thickness of the greenstone zone was irregular and in part was only a few feet thick. Consequently, where the greenstone zone was thin, even where the greenstone was close to the axial plane (*see* Section AB), only a thin skarn zone formed.

Where the limestone is constricted, the thickness of the skarn zone is greater than at other places along the contact, but the zone at this point includes a greater proportion of unreplaced greenstone than elsewhere. If complete replacement were possible only after intense shattering, the incomplete replacement at this part of the contact could be taken to imply that here, near the axis of the postulated anticlinal cross-fold, flexing and shattering may have been less intense than elsewhere. Possibly in these pockets the greenstone was protected from forces that acted at the margin of the general mass of the limestone.

It appears that at Iron Hill the control of ore formation was complex. Greenstone was the favourable host rock, possibly because it was intensely shattered, but it was replaced on a large scale by magnetite and garnet only in the vicinity of limestone. The replacing solutions may have been associated in origin with the magma from which the near-by Quinsam intrusives formed, but the ore deposit is not localized on the grandiorite contact. The deposit is a high-temperature mineral assemblage, and it is presumed that nearness to the intrusion, which was an obvious source of heat, was a necessity for the formation of magnetite-bearing skarn. The origin of the replacing solutions is in doubt, and it is not known whether they may or may not have come from some source within the grandiorite, but the passage of solutions without leaving trace is proved by replacement of the upper greenstone with no visible effect on the underlying and surrounding limestone.

[References: *Geol. Surv., Canada,* Sum Rept., 1930, pp. 56–78; Ec. Geol. Series, No. 3, Vol. 1, 1936, pp. 73–78.]

Iron River (The Argonaut Co. Ltd.)

This property is in the Esquimalt and Nanaimo Railway belt. It is leased by the Argonaut Company from Canadian Collieries (Dunsmuir) Limited on a royalty basis. It is on the west bank of Iron River, about 11 miles in a straight line southwest of Campbell River. It can be reached by about 4 miles of road that has been built southeastward from a point on the road to Iron Hill about 17 miles from Campbell River.

Magnetite-rich skarn outcrops on a knoll just west of the river. It is somewhat similar to the skarn at Iron Hill, but differs inasmuch as it is finer grained and contains a greater variety of minerals. Chalcopyrite is more abundant, and the sulphur content of the ore is appreciably higher than that of the ore at Iron Hill.

No other rocks are exposed on the knoll, and little is known about the relationship of the deposit to rocks near by. On the east bank of the river there is some garnetized rock containing little or no magnetite, and farther east is an intrusive that is possibly a phase of the Quinsam granodiorite. A belt of greenstone and limestone strikes toward the knoll from the northwest. For about half a mile from the knoll the beds in this belt dip consistently toward the southwest, but at the outcrop closest to the knoll the beds dip northeastward. The structural setting is not known, but it may be inferred from this reversal of attitude that some local structure has partly controlled ore formation.

The top of the knoll has been stripped, and all the top consists of magnetite-rich rock. A sample of a few hundred pounds was treated in the Iron Hill plant, but the grade of the concentrate produced was lower than that from Iron Hill ore. Possibly the smaller grain size will necessitate crushing to finer sizes.

Eight holes have been drilled, but neither the shape nor the extent of the body has been determined. Available information indicates that it plunges steeply and extends downward for at least 250 feet below the surface.

[Reference: *Geol. Surv., Canada,* Ec. Geol. Series, No. 3, Vol. 1, 1926, pp. 71–73.]

Kathleen Lake (50° 127° S.E.)*

Iron

Quatsino Copper-Gold Mines Limited

Company office, 572 Howe Street, Vancouver. J. C. Adam, president; H. L. Hill, consulting engineer; S. M. Manning, resident engineer. This company was incorporated in 1928 and is the assessed owner of forty-three Crown-granted mineral claims. According to a directors' report dated October 2nd, 1952, an additional sixteen Crown-granted mineral claims and seven located mineral claims have been acquired by outright purchase and option-to-purchase agreements.

The claims are south of Kathleen Lake in the Quatsino-Nimpkish area of northern Vancouver Island. Deposits of magnetite occur on the Merry Widow No. 5 claim and the Kingfisher Fractional claim; they are reached by 6½ miles of trail from the east end of Kathleen Lake.

* By W. R. Bacon.

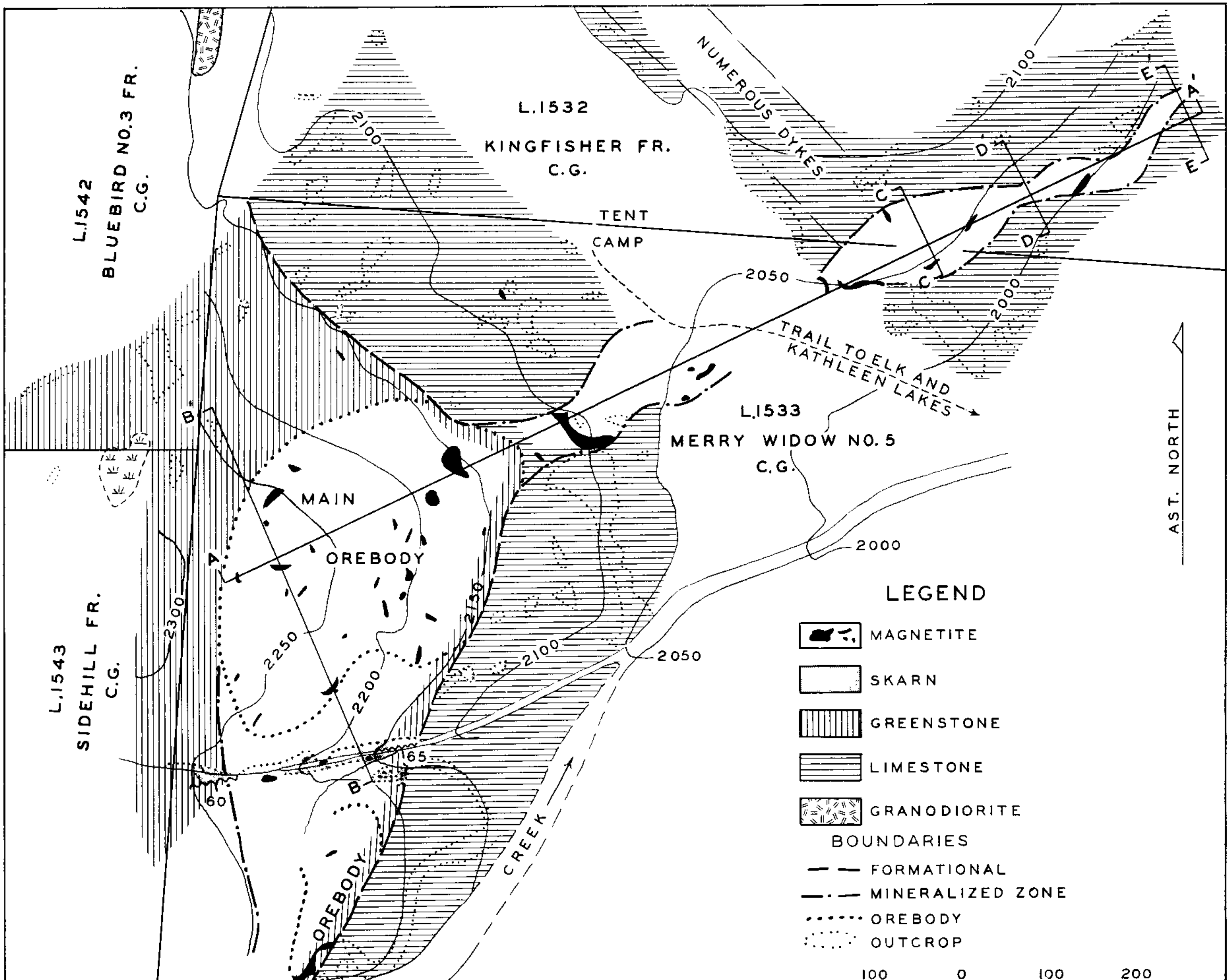


FIG. 18

QUATSINO SURFACE GEOLOGY

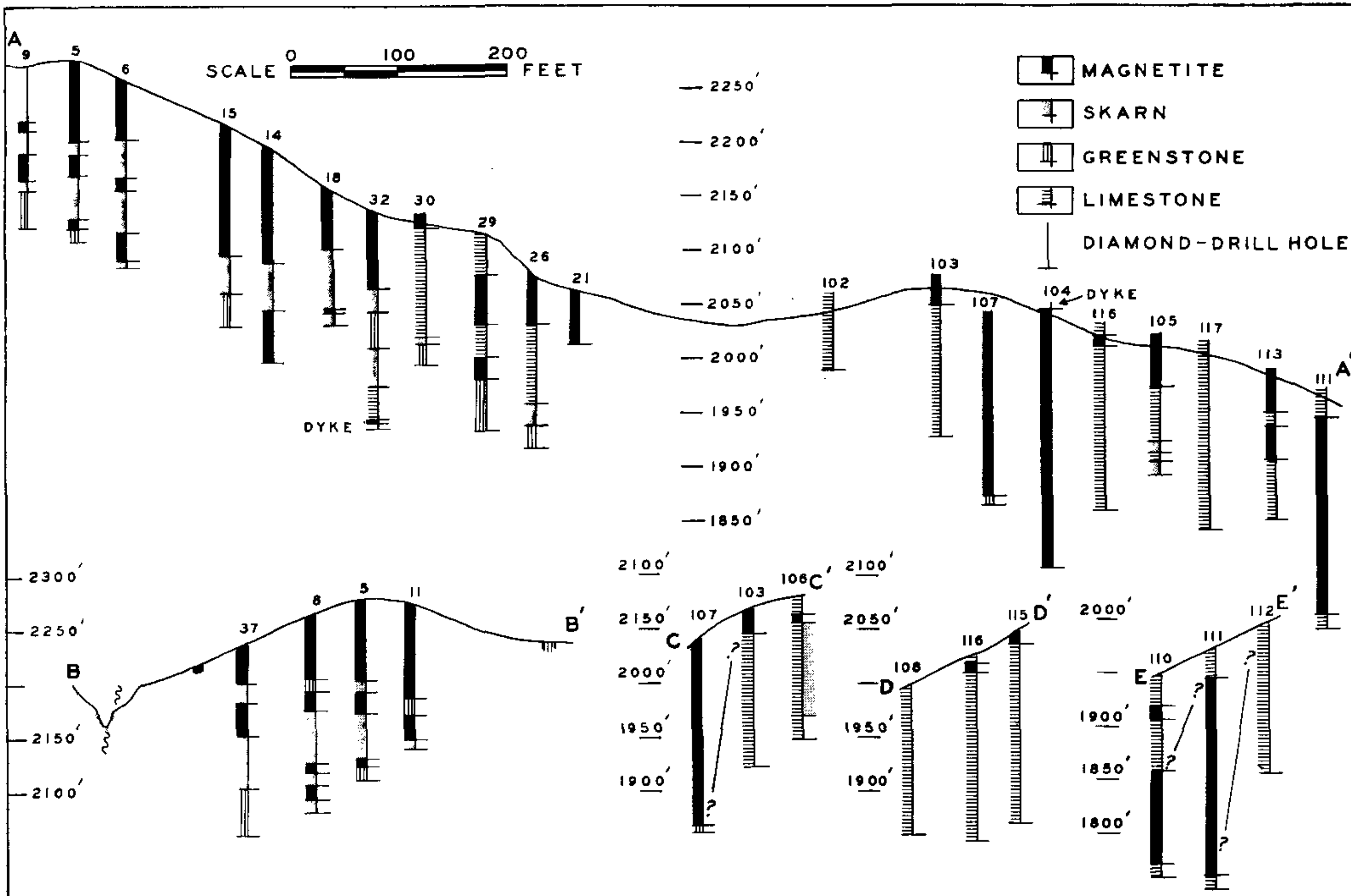


Figure 19. Quatsino longitudinal and transverse sections.

In the Quatsino-Nimpkish area, occurrences of magnetite were known as early as 1897. Until recently, however, this area has been regarded as a possible source of copper rather than of iron. Quatsino Copper-Gold Mines Limited was formed to search for copper orebodies similar to those developed by The Consolidated Mining and Smelting Company of Canada, Limited, on the adjoining Coast Copper property. After some exploration had been carried out, operations on the Quatsino property were suspended in 1931.

Upon resumption of exploration in the latter part of 1950, the company diamond drilled a few short holes on the Merry Widow No. 5 claim. Magnetite was encountered in encouraging amounts, and an extensive drilling programme was initiated in the spring of 1951. With the aid of magnetic surveys this programme was continued in 1952 and a substantial tonnage of magnetite ore was blocked out. All but four of the sixty-three holes were drilled vertically; all were relatively short, the longest reaching a depth of 246.5 feet. The total footage drilled was approximately 9,000 feet.

The property was visited in October, 1952. A week was spent in preparation of a geological map (*see* Fig. 18) and examination of the diamond-drill core.

The magnetite deposits are in rough wooded country at a general elevation of 2,100 feet. Much of the mineralized area is covered by a mantle of soil and roots that varies in thickness from a few inches to several feet. Where the bedrock is limestone, the surface is characterized by sink holes, some of which are more than 10 feet deep.

The deposits are about one-quarter of a mile east of the eastern boundary of the Coast Copper stock. This stock varies in composition from gabbro to granodiorite and is presumed to be a phase of the Coast intrusives. It intrudes the volcanics and limestone that enclose the deposits. In addition to these rocks, skarn and various acidic and basic dykes occur in the immediate vicinity of the deposits.

The volcanics form a narrow, northerly trending, northerly apexing wedge between the stock on the west and limestone on the east. They vary from light greyish-green to dark green, are extensively recrystallized, and commonly massive. They are locally termed hornfels, a name which is applicable when used in its broadest sense. The writer, however, prefers the more widely used name, greenstone, for greenish metamorphosed rocks that appear to be mainly extrusive in origin.

The limestone is a greyish-white to greenish-white crystalline rock in which there are few indications of bedding. In places the limestone is moderately silicified.

The skarn consists of brown garnet with lesser amounts of epidote, actinolite, diopside, and chlorite. Skarn is abundant in the greenstone along parts of the greenstone-limestone contact. It occurs locally in the limestone and was observed in some acidic porphyry dykes.

Magnetite, closely associated with skarn, occurs as disseminated grains and in veinlets, patches, and massive bodies in a northerly trending zone that is bordered on the west by unmineralized greenstone and on the east by limestone. This zone can be traced on the surface for 1,100 feet. Throughout much of its length the zone is at least 100 feet wide and, at the northern end, is 300 feet wide. The main orebody occurs at the north end of the zone. It is exposed in numerous small outcrops of massive magnetite that protrude through a thin layer of overburden. Shallow vertical drill-holes have demonstrated that the magnetite mineralization is virtually continuous between these small outcrops of ore. The deposit, though irregular, is essentially flat-lying and is approximately 55 feet thick.

South of the main orebody, drill-holes have partly outlined a much smaller body of magnetite. It occurs between the two branches of the creek in the southwest corner of Figure 18. The 400 feet of skarn zone to the south of this orebody has not been tested by drilling.

The zone of skarn with associated magnetite terminates in a northeasterly projecting nose in which occurs the largest known orebody, but the zone of magnetite mineralization continues much farther. Beyond the main orebody it narrows sharply and veers abruptly northeastward across the limestone that flanks the greenstone to the east. Along this northeast zone, magnetite outcrops at intervals over a linear distance of 750 feet, and drilling has indicated a minimum length of 900 feet for this portion of the zone. Although impressive intersections of magnetite were obtained in a number of these holes, a tonnage calculation would be difficult at the present stage of development. The writer believes (*see* Sections C-C′, D-D′, E-E′, Fig. 19) that, in the limestone, the magnetite may occur in a series of discontinuous, irregular lenses that dip steeply. This would explain the marked discrepancies that exist between ore intersections in adjacent holes.

Apart from unmineralized dykes, waste within the magnetite deposits is composed largely of the enclosing rock or its alteration products. In the main orebody the waste is skarn and greenstone. In the northeast zone, waste consists of unmineralized limestone or coarse calcite and perhaps some skarn. Very minor amounts of quartz, chalcopyrite, pyrite, pyrrhotite, and marcasite accompany the magnetite; sulphides are negligible in the northeast zone.

A detailed analysis of the structure is impossible. This is partly because most of the outcrops are massive, and partly because most of the diamond-drill holes penetrate only the mineralized zone. There is no conclusive evidence concerning the dip of the greenstone-limestone contact. A study of the critical portion (Holes 32, 30, 29, 26) of Section A-A′, Figure 19, shows that either a steep westerly or easterly dip may exist. Although the evidence appears to favour an easterly dip, doubt remains because regional mapping has shown that volcanic interbeds occur in the limestone and vice versa; such interbedding is likely to occur at the contact between the two formations. This relationship between the two formations may be further complicated if, as may reasonably be supposed, faulting and brecciation have occurred along the contact; evidence of faulting might not easily be recognized in the drill core.

Skarn and magnetite occur in the greenstone at its contact with limestone and are particularly abundant where there is an abrupt change in the direction of this contact. Magnetite occurs in the limestone along a line which is tentatively interpreted as the trace of the axial plane of a fold. If this is correct, it appears that the control of the mineralization was at least partly physical. In the relatively competent greenstone, folding was accompanied by fracturing which was best developed along the greenstone-limestone contact, and especially so at sharp flexures in this contact. In the limestone the stresses were largely dissipated by recrystallization, except in zones of tension where fracturing occurred.

Head Bay (49° 126° N.W.)

Iron

Glengarry and Stormont.*—Wood and McLay Limited supervised the diamond drilling and surface work done on these claims during the summer. Thirty-six diamond-drill holes were completed during the year, bringing the total number of holes drilled to 104.

Zeballos (50° 126° S.W.)

Iron

F.L. (Anyox Metals Limited)† Company office, 626 West Pender Street, Vancouver. The F.L. property is controlled by Anyox Metals Limited, a subsidiary of Ventures Limited. It consists of five Crown-granted and two recorded mineral claims leased from the Ford Iron Syndicate; five Crown-granted claims on which Anyox Metals Limited holds all rights in iron ore by agreement with A. Morod, R. V. Murphy, and others; and one claim held by record by Anyox Metals Limited.

* By R. B. King.
† By W. R. Bacon.

The claims are on the northwest side of the Zeballos River and extend across Blacksand Creek between elevations of 1,400 and 3,300 feet. The principal showings are reached by 2 miles of pack-horse trail from a road along the west bank of the Zeballos River.

This property was the subject of a report by J. S. Stevenson,* which should be consulted. The present report includes data resulting from more recent work.

A detailed geological examination and dip-needle survey were carried out for the company by Alex. Smith in 1951. Twelve holes (Nos. 101 to 111 and 120) were diamond drilled to aid in outlining the impressive surface showings of magnetite south of Blacksand Creek. In 1952 nine holes (Nos. 3 to 11) were drilled. With the exception of hole No. 4, which investigated a dip-needle anomaly, these holes were drilled to block out ore. The magnetite north of Blacksand Creek has not been tested by diamond drilling.

The country is steep to precipitous, with the majority of the outcrops occurring as bluffs. Timber suitable for mining purposes is plentiful on the lesser slopes.

Stevenson† has shown that the regional setting of the deposits is a narrow southwesterly trending remnant of folded rocks that is intruded by hornblende diorite of the Coast intrusives.

The rocks in the vicinity of the deposits consist of limestone, greenstone, skarn, feldspar porphyry dykes, and andesite dykes.

The limestone is a pure greyish-white crystalline rock in which there are few indications of bedding. It occurs in a large body bordering the magnetite on the east and as narrow bands within an outcrop of greenstone in the southeast corner of Figure 20.

Greenstone is used here for the complex of dark-green to greyish-green metamorphosed igneous rocks outcropping west of the magnetite. It includes rocks that range in composition from intermediate to ultrabasic and in texture from fine to coarse grained. At least part of the complex is volcanic in origin and consists of tuffs and flows. An appreciable part is medium to coarse grained and of dioritic aspect. Although some of this diorite may represent the coarse central layers of thick flows, much of it is merely the product of recrystallization of the volcanics. The petrology of the greenstone complex is more complicated in outcrops near the southeastern corner of Figure 20, where stringers and irregular masses of light-coloured intrusive diorite occur in the greenstone. It is believed that this latter diorite is related genetically to the main intrusion of hornblende diorite that outcrops to the northwest and southeast of the remnant of folded rocks and presumably underlies it at no great depth.

A zone of skarn consisting largely of brown resinous andradite garnet borders the main magnetite body on the west. Similar skarn occurs in rather well-defined patches within the same body north of Blacksand Creek. Both garnet and epidote are abundant in stringers and irregular patches in the greenstone. Except for the observation that these minerals are generally absent in the coarser-grained rock, their development in the greenstone may be described as random. Neither garnet nor epidote is present in the limestone.

Magnetite crosses Blacksand Creek in an almost continuous outcrop 1,100 feet long. Throughout this distance it is bounded by limestone on the east and by skarn on the west. Within this main body there is a small proportion of waste consisting of skarn, greenstone, dykes, and very minor calcite in stringers and patches. To the south, smaller outcrops of magnetite are enclosed entirely in skarn and greenstone. The association of the magnetite with the skarn and greenstone is thus apparent. Veinlets of magnetite in the skarn are evidence that some of the magnetite is of later origin than the skarn. It is by no means certain, however, that all or even most of the magnetite was deposited

* *B.C. Department of Mines*, Bull. No. 27, 1950, Geology and Mineral Deposits of the Zeballos Mining Camp, British Columbia, pp. 125–128.

† Op. cit., Fig. 2.

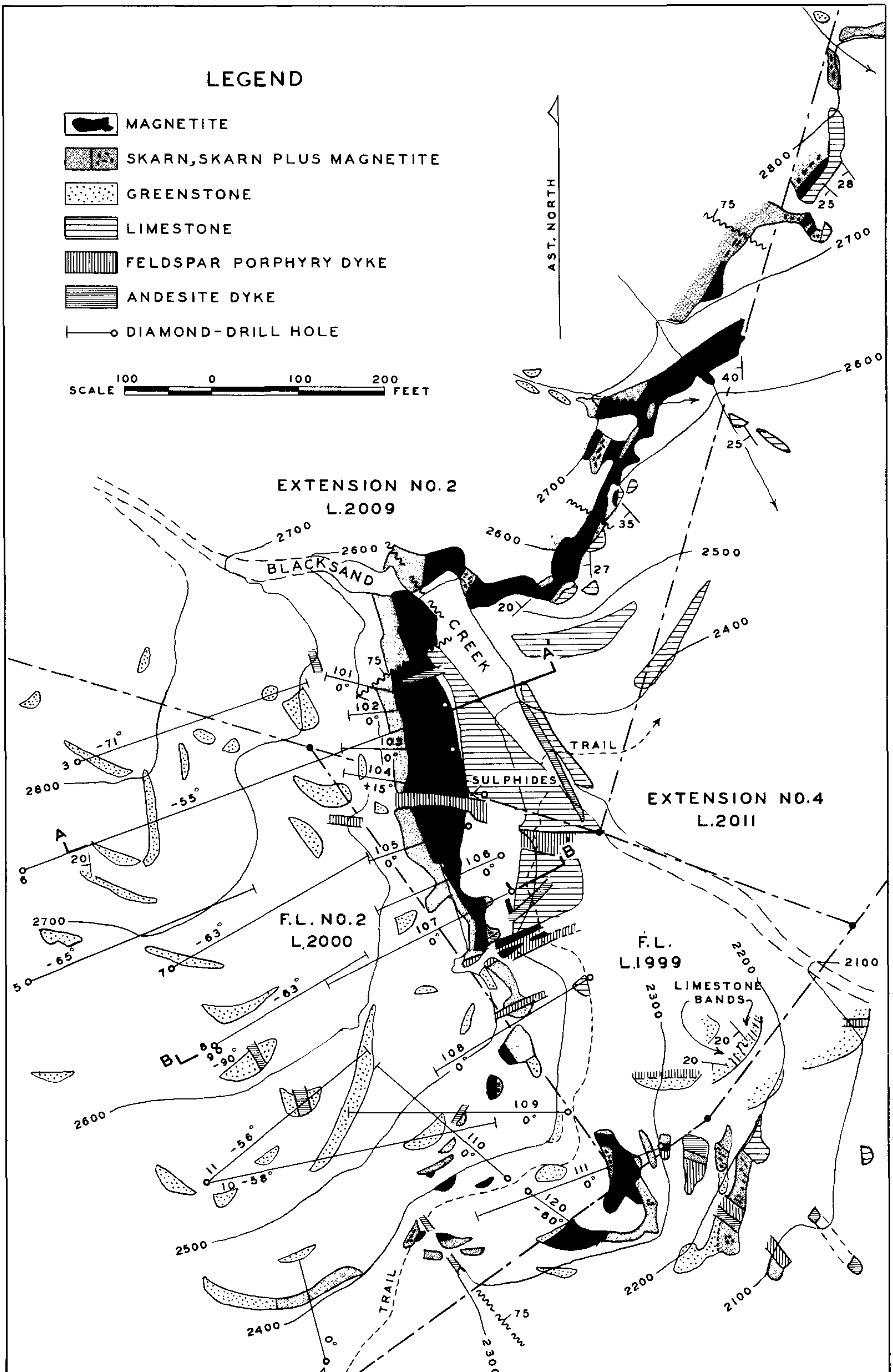


FIG. 20. GEOLOGY OF F.L. PROPERTY

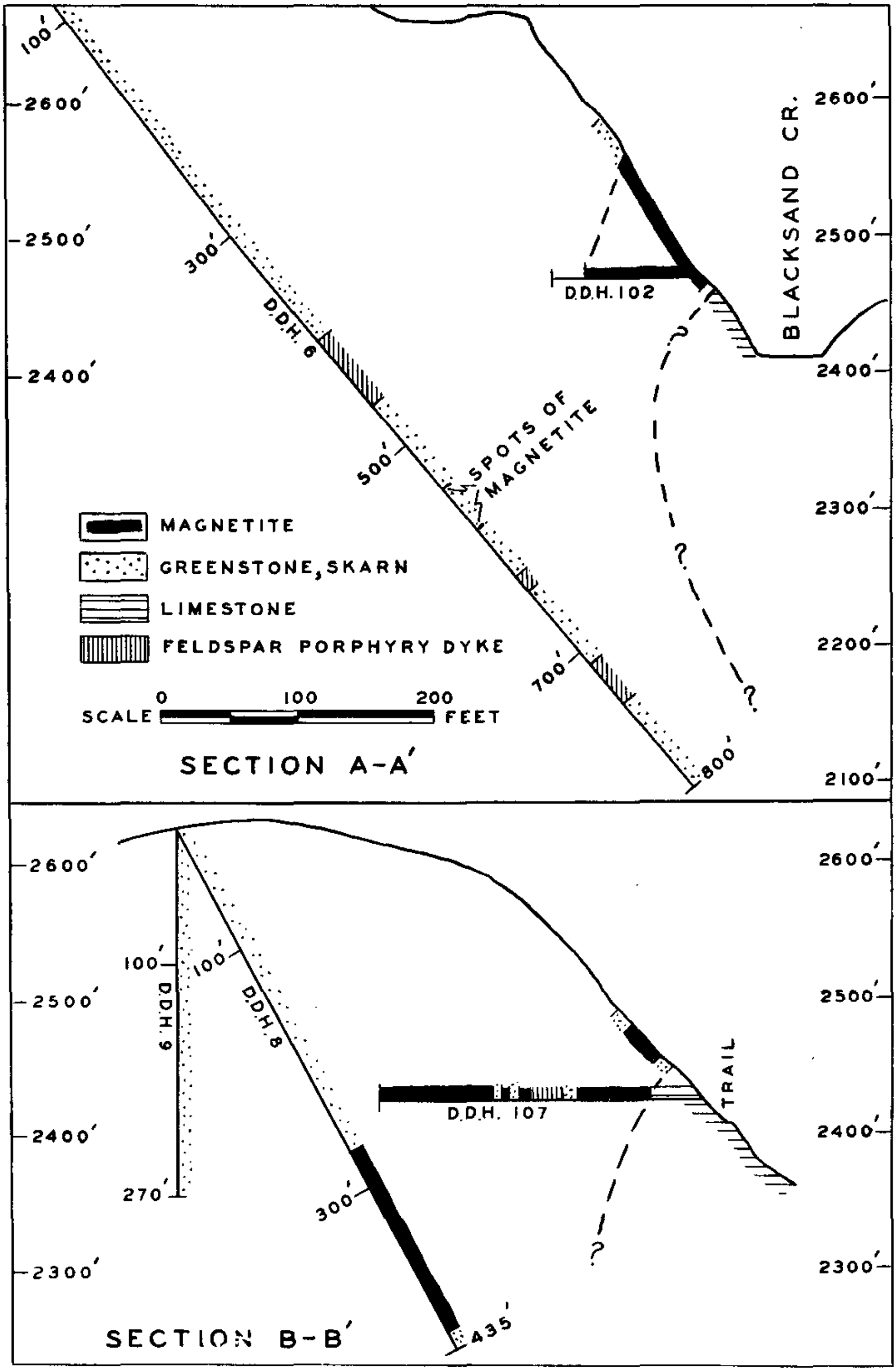


Figure 21. Transverse sections of F.L. property.

subsequent to the garnet and epidote; the deposition of all these minerals may have been essentially contemporaneous.

Metallic minerals other than magnetite are scarce. Pyrrhotite, pyrite, and marcasite were noted in some of the drill cores but very rarely in direct association with the magnetite.

Steeply dipping to vertical dykes of feldspar porphyry and andesite cut all the aforementioned rocks and the magnetite. The feldspar porphyry is characterized by euhedral to subhedral phenocrysts of basic oligoclase. Otherwise it exhibits a considerable range of mineralogical composition. Quartz may be lacking or present to the extent of 40 per cent of the rock. The potash feldspar content is variable, although in none of the specimens examined does it constitute more than 10 per cent of the rock. The ferromagnesian content is also variable and, in the dyke in the southeast corner of Figure 20, is sufficiently high that the rock resembles the intrusive diorite. The andesite dykes are dark-green fine-grained rocks that may contain a few small phenocrysts of plagioclase.

The dykes contain neither skarn nor magnetite. On the precipitous bluff immediately north of hole No. 101, however, a westerly trending andesite dyke appears to lose its identity westward in the magnetite. This is the sole evidence suggesting that the andesite dykes may be premineral in age and are generally unmineralized because they were unfavourable rocks.

In spite of the very considerable information afforded by diamond drilling, the structure can only be discussed in general terms. In the greenstone complex the heterogeneous nature of the rocks, the scarcity of reliable attitudes, and the irregular development of the skarn prevent correlation with any degree of certainty between surface exposures and diamond-drill holes. In the limestone, knowledge of the internal structure is also lacking because of the massive crystalline habit of much of this rock.

Wherever exposed on the surface, the footwall of the main magnetite body is limestone. Although the contact dips westward at angles of 20 to 50 degrees, diamond-drill holes No. 7 and No. 8 (*see* Fig. 21, Section B-B′) intersected the main body and a greenstone footwall. Therefore, at least a part of the main body of magnetite transects the greenstone.

None of the easterly directed diamond-drill holes intersected limestone, a fact for which there are two possible explanations. In depth the limestone south of Blacksand Creek may dip much more steeply westward than at the surface, or even eastward as Section A-A′ seems to indicate; in other words, a fold may exist that is concave to the east in vertical section. Faulting, of which there is considerable evidence at the surface, provides an alternative explanation, equally valid at the present stage of development.

The localization of the skarn is believed to depend upon differences in the physical natures of the greenstone and limestone. Folding caused recrystallization in the limestone and recrystallization and local fracturing in the relatively competent greenstone. The fracturing was best developed along portions of the greenstone-limestone contact, and especially at flexures in this contact. Away from the contact, fracturing depended upon local diversities within the greenstone complex.

Similarly, the deposition of the magnetite has been at least partly controlled by fracturing. Where this has been intense along the contact, there is a large, fairly regular body of magnetite. To the south of this body and wholly within the skarn and greenstone, fracturing was less intense and less regular, and apparently disconnected bodies of irregular outline occur.

Placer-mining

CONTENTS

ATLIN*

Spruce Creek (59° 133° N.W.)

Noland Mines Limited.—J. D. McNeil, manager. The Noland mine is at the junction of Dominion Creek with Spruce Creek and is 12 miles by road from Atlin. The mine operated until September 17th, 1952. A summary of the mine production during this period is as follows:—

	Cubic Yards Excavated	Per Cent
Safety drives, ventilation, and haulage	2,465.6	21.9
Pillar development	2,993.7	26.6
Pillar extraction	5,790.4	51.4
Mine clean-up	7.0	0.1
Totals	11,256.7	100.0

From this total of 11,256.7 cubic yards of gravel, 3,940.737 fine ounces of gold and 671.17 fine ounces of silver were obtained, which together with 78.625 fine ounces of gold and 13.04 fine ounces of silver recovered from the resluicing of the washing-plant tailings have a value of $138,707.16.

* By J. W. Patterson.

Drives and crosscuts totalling 3,441 feet were driven to develop 600 feet of new pay channel having an average width of 125 feet. Present reserves are about 17,000 cubic yards.

One twenty-three-man prefabricated bunk-house was erected in the mine camp, and extensive repairs were made to the Surprise Lake dam.

Enterprise Placers The three partners, John M. Acheson, Clyde B. Day, and Floyd M. Wilson, and two men whom they employed worked ground on Spruce Creek which is leased from Spruce Creek Placers Limited. A diesel shovel, a bulldozer, and a dragline were used to move the gravel and tailings.

McKee Creek (59° 133° S.W.)

Bruce Morton worked alone on his ground from the middle of May until the end of October. Approximately 12,000 cubic yards of gravel was hydraulicked.

Three partners, Joe and Luigi Piccolo and George Watt, worked from the end of May to the end of October. Their work was impeded by the lack of an adequate supply of water.

OMINECA*

Germansen River (55° 124° N.W.)

Loper and Son.—G. H. Loper worked alone on his hydraulic placer property, which is on the north side of Plug Hat Creek about 1 mile south of Germansen Landing.

CARIBOO†

Hixon Creek (53° 122° S.W.)

Hixon Placers Inc.—Company office, 1905 Second Avenue, Seattle 1, Wash. H. W. Hargood, president; C. J. Norris, superintendent. This property, 3 miles east by road from the Cariboo Highway at Hixon, is held under option from B. Briscoe, of Vancouver. In addition to doing further work on the water-supply ditch, the crew of four men hydraulicked 100,000 cubic yards of gravel and overburden from the old Hixon Creek channel.

Willow River (53° 121° S.W.)

Emory Gulch.—F. G. Dumont and partner hydraulicked 3,000 cubic yards of gravel on Emory Gulch, a tributary of Stouts Gulch.

Conklin Gulch.—J. J. Gunn hydraulicked 3,500 cubic yards of gravel on Conklin Gulch at Barkerville.

Kumhila Exploration Co. Ltd. D. P. Kumle, A. T. Lazzareschi, and L. J. Hickman, all of California, formed this private company and optioned part of the Lowhee Mining Company's leases at Devlin Bench on the east side of Williams Creek at the Bowron Lake road crossing. After considerable churn-drill testing, the dredge equipment formerly operated by Summit Mines Limited was assembled on the property. This equipment consists of a Hickenbottom steel-pontoon all-riffle washing plant of 3,500-cubic-yards-per-day rated capacity and a Marion 40A walking dragline shovel with an 80-foot boom and a 3-cubic-yard bucket.

Washing operations commenced in July and continued to early November, when winter conditions halted the work. As drill testing showed the pay gravel to be at an approximate depth of 50 feet, a Caterpillar D-8 bulldozer was used to strip as much of the barren surface gravel as possible. A crew of eighteen men was employed, and

* By J. W. Patterson.
† By J. E. Merrett.

200,000 cubic yards of gravel was moved, of which 84,680 cubic yards was treated by the washing plant.

Lowhee Creek.—O. K. Nason and four partners hydraulicked 30,000 cubic yards of gravel from the sides of the Lowhee pit at a point approximately half a mile downstream from the head of the pit.

Devil's Lake Creek.—Leo Bedford and partner hydraulicked 1,000 cubic yards of gravel on the Barton bench lease on the west side of Devil's Canyon. A small prospect drift was started but was stopped when inadequate gold values were obtained.

Ketch Placers.—R. E. McDougall and another man hydraulicked 50,000 cubic yards of gravel from Devil's Canyon channel above the point where it intersects the Burns Creek pit.

Coulter Creek.—I. Andracki and two partners removed 88 cubic yards of gravel from a prospect drift on Coulter Creek.

Dragon Creek

W. Hong, of Barkerville, and two partners constructed a new road from Nelson Creek to a short distance west of New Creek to join the Slough Creek road. This new road improves access to Dragon Creek by eliminating two bridges over Slough Creek. In addition, a tractor was used to clean out a sluiceway where sluices were installed preparatory to mining next season.

Kwong Foo Creek

W. E. North, employing two men, hydraulicked 7,000 cubic yards of gravel from a bench pit, south of Kwong Foo Creek. A bulldozer was used to construct 3,000 feet of 10-foot-wide ditch between Kee Khan and Slade Creeks. The water from this ditch flows into the head of the 1,500-foot ditch constructed last year from Slade Creek to the pipe-line intake above the present workings.

Hyde Creek.—C. L. MacColm continued hydraulicking on the Hyde Creek bench lease owned by Dr. O. R. Hougen, of Vancouver.

Beaver Channels Limited.—Two men under the supervision of K. E. Langford hydraulicked 3,500 cubic yards of gravel on the east bank of Aura Fina Creek above the canyon.

Rouchon Creek.—J. H. Feyer hydraulicked 8,000 cubic yards of gravel on Rouchon Creek.

Sugar Creek.—The road from Wells to Sugar Creek was repaired, and R. M. Van Bibber, employing a crew of three men, drill-tested Sugar Creek flat immediately below Cooper Creek.

Eight Mile Lake.—M. A. Anderson hydraulicked 1,000 cubic yards of gravel near Eight Mile Lake.

Antler Creek (53° 121° S.E.)

Upper Antler Creek.—A. Holm and T. M. Petersen sluiced 1,800 cubic yards on on Upper Antler Creek.

Guyet Creek.—D. H. Wells and R. M. Van Bibber, employing a crew of seven men, installed 1,800 feet of 2.5-feet-diameter pipe and commenced hydraulic operations at a point approximately half a mile downstream from the Guyet pit on Antler Creek. Operations were suspended when the gold-bearing channel was not found.

Antler Mountain Gold Ltd.—A. W. Ludditt and a crew of four men hydraulicked 6,000 cubic yards of gravel on Grouse Creek. In addition to this work, 360 feet of 30-inch-wide sluice-boxes was installed and the water-storage dam on upper Grouse Creek was raised 8 feet.

Canadian Creek.—A. McGuire sank two short exploratory shafts on upper Canadian Creek. John Holland hydraulicked 5,000 cubic yards of gravel and completed 30 feet of timbered drift on lower Canadian Creek.

Antler Creek.—G. Milbourne hydraulicked 750 cubic yards of gravel at the junction of Empire and Antler Creeks.

Cunningham Creek (52° 121° N.E.)

Peter Creek.—Knute Martinson and two partners hydraulicked and sluiced 6,000 cubic yards of gravel at the junction of Peter and Crazy Creeks.

Lightning Creek (53° 121° S.W.)

Amador Creek.—H. D. Hadlund hydraulicked 35,000 cubic yards of gravel from two leases on Lightning Creek near its junction with Amador Creek.

Perkins Creek.—W. L. Sebolt and C. A. Ritchie hydraulicked 7,500 cubic yards of gravel on Perkins Creek.

Grub Gulch.—Ennerdale Placers, operated by F. W. Freeman and J. Hind, hydraulicked 5,000 cubic yards of gravel.

Dryup Gulch.—D. H. Wells, employing a crew of five men, hydraulicked 45,000 cubic yards of gravel on Dryup Gulch near Stanley.

Last Chance Creek.—A. F. Brown, of Stanley, completed drill-testing on his lease between Last Chance and Lightning Creeks.

Campbell Creek.—E. M. Johnson, of Barkerville, sluiced 2,000 cubic yards of gravel on Campbell Creek.

Cottonwood River (52° 122° N.E. and 53° 122° S.E.)

Cottonwood.—Ellis McMillan sluiced 950 cubic yards of gravel on the Cottonwood River near Cottonwood.

Cottonwood Canyon.—Stanley O. Norwood, of Quesnel, commenced drifting on his lease near Cottonwood Canyon.

Stoney Creek Placers Limited.—The newly constructed suction dredge broke its moorings during the spring flood and floated downstream for a quarter of a mile. The rest of the season was spent in refloating the dredge and in dragging it back upstream.

Quesnel River Area

Lawless Creek Mining Company

(52° 121° N.W.) Company office, 6930 Beverley Boulevard, Everett M26, Wash.; mine office, Likely. Clifford V. Landon, manager. Hydraulicking was resumed above the road crossing on Lawless Creek. This work was suspended when old Chinese workings were encountered. A new pit was commenced downstream and on the east bank of Lawless Creek and over an old buried channel of the Quesnel River. A crew of three men hydraulicked a total of 30,000 cubic yards of gravel from the two pits.

Quesnel Forks Placers Incorporated.—(52° 121° N.W.) Two men hydraulicked 7,500 cubic yards of gravel on Kangaroo Creek near its junction with the Cariboo River.

Cariboo Metals Limited

(52° 121° N.E.) Company office, 379 Coleman Building, Seattle, Wash.; mine office, Likely. A. V. Alvensleben, manager. Early in the spring a series of drill test-holes was completed on the bench leases above Cedar Creek. No pay channel was located, so the machinery and equipment were advertised for sale.

Likely.—E. A. Bradley, employing a crew of two men, commenced driving a 600-foot drainage tunnel to tap flooded workings on the hill on the west side of Quesnel River, opposite Likely.

Morehead Creek.—(52° 121° N.W.) R. C. C. Smith, of Victoria, using hydraulic equipment, tested leases held by F. Jacobie and H. C. Weber on Morehead Creek.

Keithley Creek (52° 121° N.E.)

Duck Creek.—A. E. Sandberg hydraulicked 3,500 cubic yards of gravel on Duck Creek.

Weave Creek.—V. E. Johnson continued underground placer mining on his lease near the junction of Weave and Keithley Creeks.

Upper Keithley Creek

J. R. Foster and associates, of Seattle, optioned placer leases held by C. G. Dunham, G. A. Goldsmith, and A. E. McGregor and built a tractor-road to the falls on upper Keithley Creek near its junction with Honest John Creek. A boom dam was constructed and a small amount of testing was completed.

LILLOOET*

Bridge River

Yalakom Placers Limited.—(50° 122° N.E.) G. Haycock, employing four men, sluiced 1,800 cubic yards of gravel on the Bridge River near Moha.

Besner Leases.—(50° 122° N.E.) G. Haycock, employing four men, sluiced 1,800 cubic yards of gravel on the Bridge River on leases owned by Olier Besner, of Vancouver.

Hurley River

(50° 122° N.W.) E. Nilson and three partners worked W. Haylmore's lease on the Hurley River near Gold Bridge and completed 458 feet of open-cut and three timbered placer drifts having a total length of 184 feet. The gold recovered included two nuggets weighing 6 ounces and 8¼ ounces.

LYTTON*

Kanaka Bar

(50° 121° S.W.) J. Mawsden, of Vancouver, completed considerable repairs and in part redesigned the dredge of the International Gold Master Mining Limited at Kanaka Bar on the Fraser River, 2 miles south of Siska. On completion of this work the dredge was moved downstream, and in December Mr. Mawsden and a crew of two men were test sampling the bed of the Fraser River.

TULAMEEN RIVER†

Tulameen Gold & Platinum Mining Co. Limited

(49° 120° N.W.) Company office, Hope. Fred R. Vertner, manager. In the spring this company moved the dredge formerly operated by the Atkinson Dredging Company Limited at Princeton to a site on the Tulameen River about 2 miles upstream from Tulameen. The dredge was reassembled and operated for two months, but recoveries were reported to be too low for economic operation and the work was stopped.

COLUMBIA RIVER‡

Camp Creek (Samson Mines, Limited)

(51° 117° N.W.) This company holds an option from G. S. M. Larder, of Salmon Arm, on Placer-mining Leases Nos. 368 and 369 on the lower end of Camp Creek. A camp was established 2 miles by rough road from a point on the Big Bend Highway 58 miles north of Revelstoke. Mining was done on the upper end of the leases below the entrance to the canyon. The creek was diverted to one side, and gravel exposed in the bed of the stream scraped into sluice-boxes by a dragline winch.

* By J. E. Merrett.
† By E. R. Hughes.
‡ By J. W. Peck.

The steeply dipping limestone bedrock requires careful cleaning to ensure that no gold remains. Old diggings were noticeable on the east side of the creek. During the summer months a crew of three was employed under S. Moorehouse. The amount of gold obtained in clean-up was small.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1933, p. 212.]

Structural Materials and Industrial Minerals

CONTENTS

INTRODUCTION

This section contains progress notes and reports on structural materials and industrial mineral deposits.

Production statistics for industrial minerals and structural materials will be found under those sub-headings in Table I, page 17; Table III, page 18; Table VIIA, page 24; Table VIID, page 27; and Table VIIE, page 28.

In 1952 the British Columbia Cement Company Limited completed installation of a new 345-foot-long rotary kiln and put it into operation. A large steel and concrete clinker storage bin was built in conjunction with the kiln. Cassiar Asbestos Corporation Limited completed part of their townsite and began operation of the first unit of their asbestos mill. Some shipments of milled fibre were made. A new limestone quarry was opened up on Aristazabal Island to supply limestone for the Columbia Cellulose plant at Port Edward. Small shipments of slag from the smelter dumps at Greenwood and Grand Forks were made to rock-wool manufacturers in Vancouver, Calgary, and Moose Jaw.

Considerable interest was shown in kyanite in 1952, and several claims were recorded on deposits of this mineral in the Big Bend area of the Columbia River. To date no development has taken place on any of the claims.

ASBESTOS

Cassiar Asbestos Corporation Limited*

McDame (59° 129° S.W.). Head office, 85 Richmond Street West, Toronto; British Columbia mine office, Royal Bank Building, Vancouver. T. T. Tigert, manager. Construction of the surface plant began in earnest in 1952, and during the latter half of the year sixteen buildings were completed, the more important of which were the mill (present capacity, 30 tons per hour of wet feed), the power-house, an eight-vehicle truck garage and office, three prefabricated dwelling-houses containing thirteen apartments, two bunk-houses, and a mess-hall.

In 1952, 229 tons of ore was milled and 5,800 wet tons of loose talus ore plus 190 wet tons of crude asbestos were stockpiled near the mill to be treated during the winter.

Considerable work was done on the road between the mine and the Alaska Highway, and the company constructed 8,000 feet of road on Mount McDame near the mine-site. Underground work consisted of 439 feet of crosscutting.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1951, pp. 211–214.]

BARITE

Hilltop, Snowdrop (Mountain Minerals Limited)†

Parson (51° 116° S.W.). Company office, Morris Building, P.O. Box 273, Lethbridge, Alta. R. A. Thrall, managing director; W. MacPherson, quarry superintendent. The Parson barite deposit, located on two mineral claims, the Hilltop and Snowdrop, is in the extreme southwest corner of Section 7, Township 24, Range 19, west of the 5th meridian. The quarries are on a small knoll 5.7 miles by road southwest of the Canadian Pacific Railway siding at Parson, about 22 miles south of Golden. The knoll is surrounded by rolling jack pine and fir-covered terrain 1,000 feet above the Columbia River valley. Underbrush is not thick. Outcrops, except on the knoll where the barite is found, are scarce.

The barite is in two parallel, irregular fissure veins about 300 feet apart. The veins trend north 10 degrees west and dip steeply to the west. They cut diagonally across a series of metamorphosed sedimentary rocks that strike northwestward and dip steeply to the southwest. Apparently the block between the two fissures that contain the barite has moved up and northeastward relative to the two outer blocks.

The country rock consists of a thick series of quartzites underlain by dolomite and shales. As near as can be determined, the rocks belong to the Lower Cambrian St. Piran and Lake Louise formations as named by Evans.‡

The quartzites vary considerably. The beds range in thickness from a few inches to 5 feet or more. In texture they vary from massive to coarse granular and in some places they consist of pebble layers, the pebbles being as much as one-quarter inch in diameter. Colour grades from white, through pink, to dark blue-grey. Some beds contain conspicuous feldspar and sericite, others are dolomitic or limy, and still others are flecked with limonite. Toward the base of the quartzite member, beds of shale 2 to 4 inches thick alternate between 4- to 6-foot-thick quartzite beds.

Directly below the quartzite is a 10- to 20-foot-thick bed of slaty dark-grey shale. This bed, in turn, is underlain by a bed of blue-grey, crystalline, brown-weathering dolomite about 100 feet thick. The dolomite is underlain by an interbedded series of thin shale, dolomite, and quartzite beds. The next exposures, about 1,000 feet to the north, are of paper-thin, laminated, brown, platy shales.

The whole rock series has an average strike of north 50 degrees west and an average dip of about 70 degrees to the southwest. Local variations show strikes ranging from north 25 to 70 degrees west and dips of from 48 to 75 degrees to the southwest. The

* By J. W. Patterson.
† By J. W. McCammon.
‡ *Geol. Surv., Canada,* Sum. Rept., 1932, Part A II, pp. 119–121.

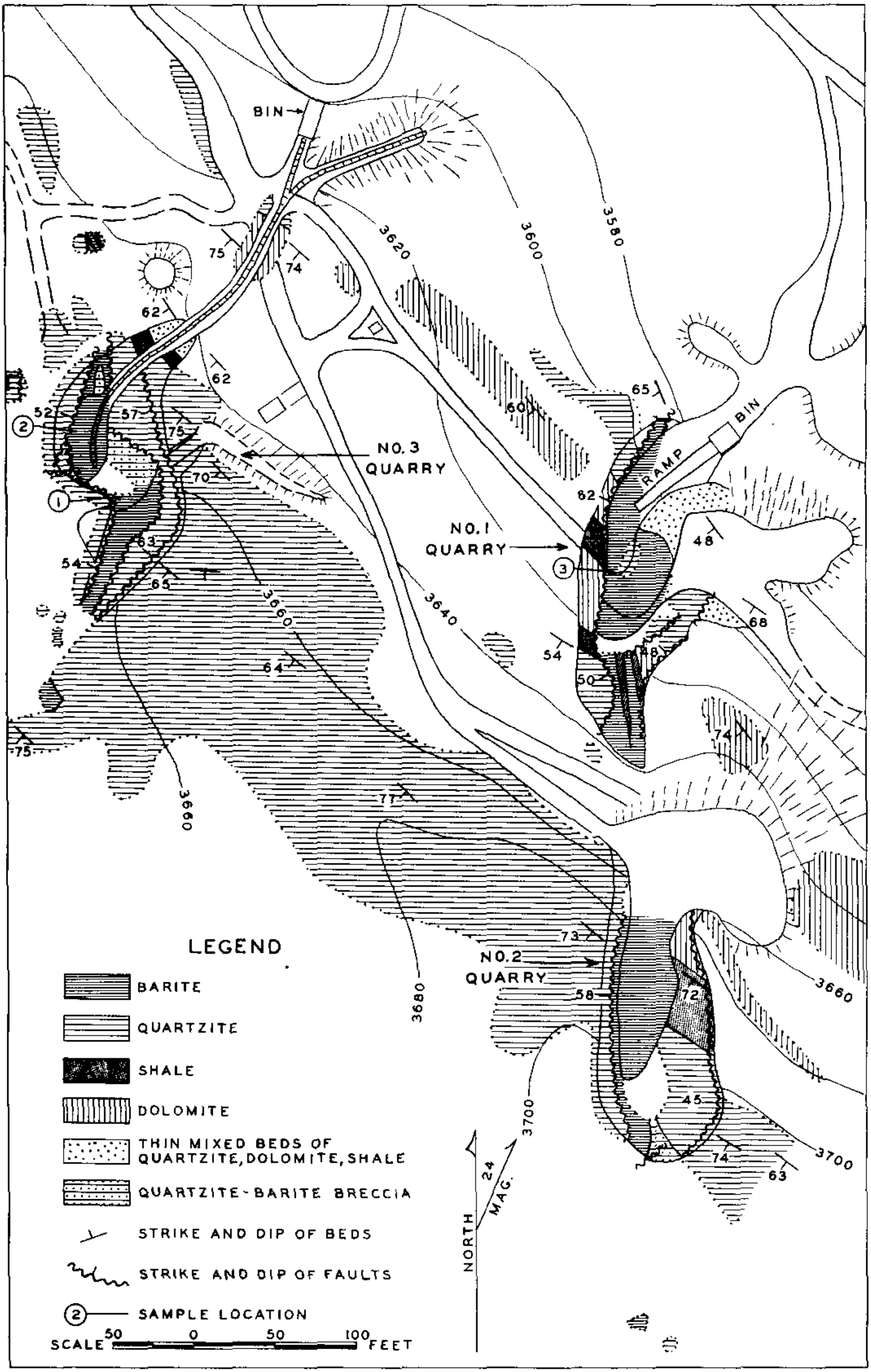


Figure 22. Barite quarries near Parson.

beds appear to be in the east limb of a major syncline, the axis of which lies to the southwest.

The fissures in which the barite is found undulate both along the strike and down the dip. The general strike is north 10 degrees west and the dip ranges between 45 and 63 degrees west. The curving nature of the fault planes combined with movement of the walls has caused pinchings and swellings of the veins. Net horizontal displacement along the faults appears to be small. There has been movement along the faults after the barite deposition and the barite veins have smooth fault-plane walls.

The colour of the barite grades from white to bluish. Much of the barite is iron stained. In general, the ore is crystalline and whitest on the hangingwall side of the vein, with a tendency to be more iron stained and, in some places, to form breccia with quartzite on the footwall. The post-mineral fault movement has given the veins free walls, although some veinlets and gobs of barite can be seen in the wallrock, most noticeably in the hangingwall. The walls contain numerous tiny veinlets of white quartz running more or less parallel to the barite veins. These quartz veins contain scattered specks of pyrite and chalcopyrite, pods of siderite and calcite, and surface coatings of malachite and azurite. Except for a small amount of pyrite, iron stain, and some copper stain, no minerals other than barite were recognized in the main veins.

The east vein is exposed for a length of 200 feet in No. 1 quarry and 150 feet in No. 2 quarry. In No. 1 quarry the vein width varies from 5 feet at the north end to 35 feet in the centre and down to 10 feet at the south end. In No. 2 quarry the vein pinches from a 30-foot width at the quarry entrance to a 10-foot width at the south end. A few scattered outcrops indicate continuation of the vein for at least 210 feet to the south of No. 2 quarry. To the north of No. 1 quarry the vein passes under a swampy flat.

The west vein is exposed in No. 3 quarry for a length of 150 feet, with scattered outcrops indicating a continuation for at least 60 feet beyond the south limit of the quarry. This vein appears to pinch out at the north end of the quarry, swells to 30 feet wide in the centre of the quarry, and pinches down to 11 feet wide at the south end.

The floors of all quarries are in barite, and no drilling has been done to determine the depth of the deposit. However, it seems probable that barite persists for some reasonable depth below the lowest parts now mined.

Three separate quarries as shown in Figure 22 have been operated. No. 2 and No. 3 quarries, because of high overhanging walls, have now reached the practical limits of present quarrying methods. Current production is from No. 1 quarry, but this, too, is nearing workable limits. Unless underground mining is used, future development will be limited to the area between No. 1 and No. 2 quarries and to exploration southerly from No. 2 and No. 3 quarries.

Barite has been shipped in variable quantities from this deposit since 1941. Total recorded production from 1941 to 1952, inclusive, has amounted to 59,545 tons, valued at $241,872. Of this amount, 45,000 tons was produced during 1944 and 1945 to serve as ballast for Liberty ships. The remainder has been used by the glass and pigment trade.

No attempt at systematic sampling was made during the present examination, but three samples were taken to give a representation of the type of material present. Sample No. 1 was cut across 25 feet of clean barite between the hangingwall and breccia zone in No. 3 quarry face; Sample No. 2 was selected clean barite from near the hangingwall in No. 3 quarry; Sample No. 3 was taken across 25 feet at the working face in No. 1 quarry. The analyses of the samples were as follows:—

Sample No.	Width	BaO	SO_3	CaO	SrO	Fe (Total)	CO_2	Specific Gravity
	Ft.	*Per Cent*	*Per Cent*	*Per Cent*	*Per Cent*	*Per Cent*	*Per Cent*	
1	25	61.78	33.73	0.14	1.63	0.01	0.05	4.341
2		63.46	34.56	0.12	1.54	0.02	0.04	4.333
3	25.5	62.49	33.83	0.10	1.34	0.01	0.07	4.321

NOTE.—Impurities not reported mainly silica.

Canyon, Salmon, etc. (Mountain Minerals Limited)*

Brisco (50° 116° N.E.) This property is owned by the same company that owns the Parson barite deposit. The property consists of five Crown-granted mineral claims—the Northisle, Carmine, Salmon, Canyon, and Wamineca. These are on a barite showing 2½ miles due west of Brisco, a Canadian Pacific Railway siding about 48 miles south of Golden. The truck-road from Brisco siding to the quarry is 4.3 miles long. The claims extend in the order named in a single straight line from Dunbar Creek north to Templeton River and beyond.

Development work on the barite showings consists of a small quarry and nine open-cuts, all on the Salmon claim, two small cuts on the Canyon claim, and four small pits on the Wamineca claim.

The quarry is at an elevation of 3,200 feet, 600 feet above Brisco siding in the Columbia Valley. Except for the canyon of Templeton River in the southeastern corner of the Canyon claim, the area is relatively gently rolling, open jackpine- and poplar-covered country. Outcrops are infrequent, except in the canyon.

Barite is found in a northerly striking brecciated zone in dolomite. The dolomite is associated with quartzite and limestone. The rocks have a north-south strike and a steep dip, ranging from 77 degrees west to vertical. They appear to form part of the east limb of the syncline that underlies the northern end of Steamboat Mountain.

The dolomite band is exposed through the entire claim group. It consists of light-brown weathering, dark brownish-grey crystalline dolomite that appears to have been originally massive but now is brecciated. The fragments in the breccia range in size from dust to pieces several inches in diameter. Normally the space between fragments is small, often being simply a fracture line, but at other times there is much matrix. The matrix is usually dolomite but sometimes is barite and rarely is siliceous. This dolomite is thought to be part of the Ordovician Beaverfoot formation.†

A 130- to 200-foot-thick bed of sugary, white, fine-grained quartzite underlies the dolomite. A few outcrops of the quartzite are visible on the Carmine claim; some can be seen about 100 feet northeast of the quarry, and good outcrops are exposed in the Templeton River canyon. It is thought to be the Ordovician Wonah quartzite.†

Below the quartzite is a thick series consisting mainly of ½- to 2-inch-thick beds of limestone and limy shales with some cherty and dolomitic layers. The beds contain abundant fossil shells of various kinds, and the upper beds have conspicuous large ripple-marks. The rocks are dark to light grey and weather similarly. These rocks are considered to represent the upper part of the Upper Cambrian to Ordovician McKay group.† The chief exposures of this series are in the eastern halves of the Canyon and Wamenica claims, especially in the canyon of Templeton River.

The brecciation of the dolomite probably represents a border phase of the major thrust fault indicated on Evans's map† as running northwesterly from the north end of Steamboat Mountain. This fault passes just west of the claim area. In the area examined, the strike of the breccia zone is nearly north, parallel to the bedding exhibited by the quartzite and limestone. Offsetting of beds indicates the presence of a later minor fault across the northeast corner of the Salmon and southwest corner of the Canyon claims. This fault meets Templeton River at the sharp bend at the head of the canyon.

Barite was seen on the Northisle, Salmon, Canyon, and Wamineca claims. A small hill in the centre of the Northisle claim consists of brecciated dolomite. At several places in the bluffs on the western face of the hill the matrix of the breccia is barite. No veins or large quantities of barite were noted, but careful search in this area might prove of value.

* By J. W. McCammon.
† *Geol. Surv., Canada,* Map 295A, 1933, Brisco-Dogtooth Area.

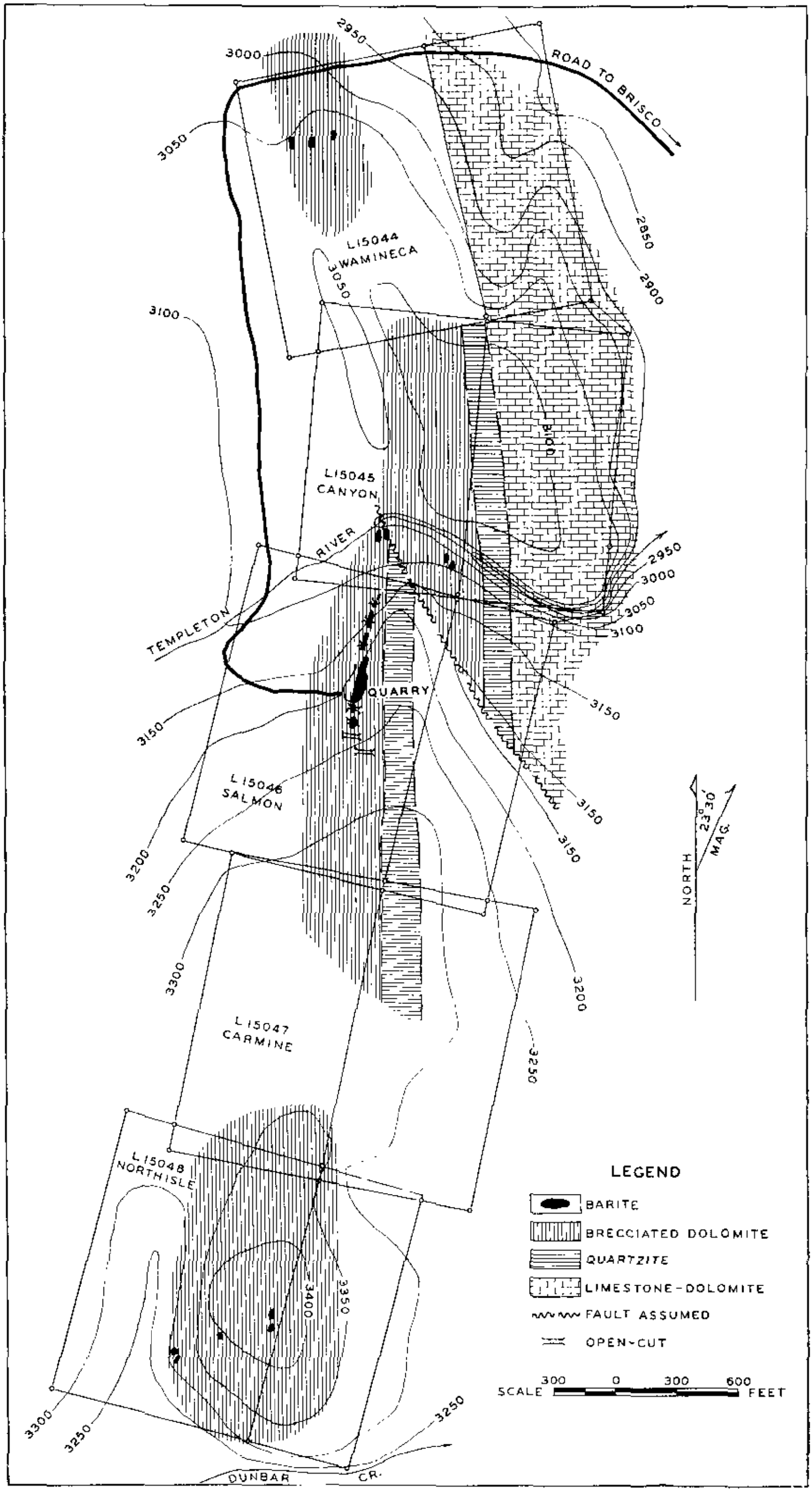


Figure 23. Barite deposit near Brisco.

The exposures of barite on the Salmon and Canyon claims are indicated in Figure 23. At the quarry a vertical vein-like mass of solid barite is indicated that is at least 600 feet long with a maximum thickness of 40 feet. Further stripping would undoubtedly prove the body much longer. The third trench south of the quarry was not dug deep enough to reach bedrock, and the cuts south of that were located too far east to intersect the barite zone. No digging has been done north of the last trench shown to the north of the quarry. On the east side of the quarry, barite is in contact with brecciated dolomite. The contact is a north-striking, steep westerly dipping fault. On the west side the barite is covered by drift. Along the eastern or footwall contact the barite is brecciated. The fragments are relatively white barite, and the matrix consists of powdered barite impregnated with some black carbonaceous material. This breccia consists of 96.3 per cent barite and has a specific gravity of 4.366, but is spoiled for most uses by the black coloration. Near the contact the fragments in the breccia are small, but the fragment size increases westward, and the most westerly exposed part of the barite body consists of fairly white mineral, fractured but without any black matrix. Some pyrite is present in the deposit, and this has resulted in iron staining of most of the "white" barite described above. The dolomite breccia around the barite vein has a matrix that is partly barite, partly siliceous, and the rest dolomitic.

On the Canyon claim there is a little barite in the dolomite outcrop at the sharp bend in Templeton River. Two shallow cuts at the top edge of the canyon wall just west of the location line of the claim expose iron-stained whitish barite. These last two exposures are probably an offset continuation of the quarry body of barite.

Near the northwest corner of the Wamineca claim, about 300 feet east of the road, some pits and trenches expose small irregular masses of fairly white barite in brecciated dolomite. Overburden is deep, outcrops are few, and not much exploration work has been done, so little idea can be gained of the over-all size of the barite body here.

Two samples of barite from the quarry were taken for analysis. Sample No. 1 was a chip sample taken across 34 feet of barite exposed in the south end of the quarry; it contained much of the black breccia. Sample No. 2 was a chip sample across 36 feet of barite exposed in the north end of the quarry; it did not contain much black breccia, but was noticeably iron stained. Analyses of the samples follow:—

Sample No.	Width	BaO	SO_3	CaO	Fe (Total)	CO_2	Specific Gravity
	Ft.	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	
1	34	63.25	34.09	0.08	0.05	0.04	4.366
2	36	63.90	34.35	0.08	0.02	0.03	4.389

NOTE.—Impurities not reported mainly silica.

BENTONITE

Princeton Properties*

Princeton (49° 120° S.W.). Mine office, Princeton. Harold Englund, manager. The head office of the Princeton Properties Limited has for many years been in London, England. In 1952 a partnership consisting of A. Vanderspek and F. W. Wonn, Seattle, obtained control of this old established company, and business is now conducted under the name of Princeton Properties. The holdings include about 1,400 acres in the vicinity of Princeton. Preliminary exploration work was done on the bentonite deposits on Lots 2049 and 388, immediately south of Princeton. Seven holes, totalling 1,529 feet of diamond drilling, were put down by Boyles Bros. Drilling Company Ltd. The drilling proved the existence of seams of bentonite, with the main seam averaging 10 to 11 feet thick. In addition to estimating the amount and grade, tests were made at the Massa-

* By E. R. Hughes.

chusetts Institute of Technology to determine the colloidal and chemical characteristics of the clay.

Future planning cannot be determined until testing has been completed and the processing and marketing requirements become known.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1923, p. 190; 1924, p. 175; 1931, p. 132.]

BUILDING-STONE

Andesite

Haddington Island.*—(50° 127° N.E.) J. A. and C. H. McDonald, of Vancouver, operated this quarry throughout the summer to obtain andesite building-stone. The stone is drilled to size and broken by blasting with black powder. Seven men were employed during the year.

Granite

Vancouver Granite Co. Limited* Nelson Island (49° 124° N.E.). Company office, 744 West Hastings Street, Vancouver 1; quarry, Nelson Island. Dimension stone for building purposes and monuments, jetty-rock, and rubble are mined at this quarry. The rock is drilled to size then wedged or blasted for removal. Three 20-ton-capacity wooden derricks are used to move stone from the quarry face to scows. The blocks are shipped to Vancouver for cutting and finishing. Approximately 1,000 tons of stone was produced from April 16th to August 7th, 1952. The average number of men employed was eight.

Coast Quarries Limited* Granite Falls (49° 122° S.W.). Company office, 1840 West Georgia Street, Vancouver; quarry office, Granite Falls. W. A. Bickell, manager; D. R. Ross, superintendent. Jetty-rock, rip-rap, and rubble are produced. Rock, blasted from a high quarry face, is loaded by a 1-cubic-yard diesel-driven shovel into semi-cylindrical skips of 10-ton capacity. These skips are transported by a steam-driven derrick and loaded directly on to scows. Approximately 50,000 tons of rock was produced at Granite Falls. Approximately twenty men were employed throughout the year.

Gilpin-Nash Limited* Indian Arm (49° 122° S.W.). Company office, Park Royal P.O., West Vancouver. C. W. Nash, general manager; Jack Rose, superintendent. Jetty-rock and rubble are produced from this quarry. Granite, after being blasted, is loaded by a ¾-cubic-yard diesel-driven shovel into trucks and transported directly to scows. Approximately 117,000 tons of granite was produced during the year.

Gilley Bros. Limited* Pitt River (49° 122° S.W.). Company office, 902 Columbia Street, New Westminster; quarry office, Pitt River. J. H. Gilley, general manager; Francis J. MacDonald, superintendent. Granite for jetties, dykes, and concrete aggregate is produced by this company. Rock is broken mainly by " coyote hole " method of mining. Broken rock is loaded by a 2-cubic-yard-capacity diesel-driven shovel into 12-cubic-yard-capacity trucks. The rock is dumped either directly on to scows or into the crushing plant. The crushing plant consists of a 42- by 60-inch jaw crusher and a 6-inch grizzly with a conveyor belt for loading scows. Undersize material, −6 inches, is stockpiled. The average number of men employed during 1952 was thirty-five.

Valley Granite Products Limited* Cheam View (49° 121° S.W.). Company office, 410 Mayfair Avenue, Chilliwack; plant, Bridal Falls. The quarry and crushing plant are several miles east of Rosedale (49° 121° S.W.). The granite is drilled, blasted, and hand-loaded into a 1-ton-capacity

* By R. B. King.

car and transported to a crushing plant. The crushing plant produces turkey, chicken, and bird grit, stucco dash, sand-blasting material, and sanding material for automotive vehicles. The average number of men employed was ten.

CLAY AND SHALE

Bear Creek Brick Company*

Surrey (49° 122° S.W.). Head office, Victoria Tile & Brick Supply Co. Ltd., Vancouver; plant, Archibald Road, Surrey District. James McBeth, plant manager. Surface clay is mined in a pit adjacent to the plant. Cars are hand-loaded and hauled to the plant. The bricks are formed by a wet-press process and placed in hacks to be weather-dried. Wood-fired scove kilns are built for burning brick. About 1,200 tons of clay was mined in 1952, and approximately 430,000 bricks were made. The average number of men employed in the pit was three.

Port Haney Brick Company Limited*

Haney (49° 122° S.W.). Company office, 846 Howe Street, Vancouver; plant, Haney. E. G. Baynes, president; J. Hadgkiss, plant manager. This company operates a large plant primarily producing structural tile and drain-tile. Facebrick and common brick have also been produced. Plastic clay is mined from open-pits adjacent to the plant. A ½-cubic-yard gasoline-driven shovel digs clay from faces 10 feet high and loads it on trucks for transportation to the plant. The clay is dried in a rotary wood-fired kiln and then conveyed to a dry pan for grinding. Brick and tile are formed by the stiff-mud extrusion process and dried in a controlled-temperature drying-room. The formed products are burned in down-draught beehive kilns. In 1952, 9,027 tons of clay was produced from the pit. The average number of men employed during the year was fifty.

Mainland Clay Products Limited†

Barnet (49° 122° S.W.). Head office, 8699 Angus Drive, Vancouver; plant, Barnet. D. Pitkethly, general manager. Surface clay is mined from a pit near the plant, and fireclay is trucked from Kilgard. Dry-pressed common brick and firebrick are burned in rectangular coal-fired kilns.

Clayburn Company Limited*

Kilgard (49° 122° S.E.). Head office, Credit Foncier Building, Vancouver; plant, Kilgard. R. M. Hungerford, managing director; R. Ball, superintendent. The company operates two plants—one, in which sewer-pipe and flue-lining are manufactured, is at Kilgard; the other, in which facebrick, firebrick, and special refractory shapes are made, is at Abbotsford.

In the Kilgard plant, sewer-pipe and flue-linings are extruded through dies, pre-dried, and burned in oil-fired down-draught beehive kilns. In the Abbotsford plant, bricks are dry-pressed, hand-piled on flat cars, and passed through a drier. From the drier, the bricks pass into an oil-fired continuous-tunnel kiln that is 300 feet long.

Clay for these plants is mined from shale members of the Huntingdon formation of Sumas Mountain. The shale seams are mined underground by room-and-pillar methods.

Clay mined during 1952 totalled 39,337 tons. Clay mined for firebrick and facebrick production was 28,038 tons and for sewer-pipe and flue-lining was 11,299 tons.

Richmix Clays Limited*

Kilgard (49° 122° S.E.). Office and plant, 2890 East Twelfth Avenue, Vancouver; mine, Kilgard. G. W. Richmond, manager. Strip-mining of clay pillars left by underground mining is being carried on by this company. The clay is drilled and blasted and

---

* By R. B. King.
† By J. W. McCammon.

then loaded by a diesel-driven shovel on to trucks and transported to markets. Four men are employed.

Fraser Valley Brick Company Limited.*—Abbotsford (49° 122° S.E.). This plant did not operate in 1952.

Fairey and Company Limited.*—Vancouver (49° 123° S.E.). L. T. Fairey, manager. This company produced a variety of fireclay blocks and shapes and high-temperature cements. Local and imported raw materials were used.

Evans, Coleman & Evans Limited.*—Gabriola Island (49° 123° S.W.). This plant did not operate in 1952.

Baker Brick and Tile Company Limited.†—Victoria (48° 123° S.E.). Office and plant, Victoria. J. W. Johnson and D. E. Smith, joint managers. Surface clay is mined by gas shovel and transported by truck to storage bins. The clay pit is operated from March until November, and the plant all year. Clay mined in 1952 was nearly 5,000 tons.

Bazan Bay Brick and Tile Company Limited.*—Saanichton (48° 123° N.E.). F. J. Eves, manager. This plant was remodelled during 1952. Dry-press machinery was installed to replace the former stiff-mud process. Production was small.

GYPSUM

Gypsum Lime and Alabastine, Canada, Limited*

Falkland (50° 119° N.W.). Head office, Paris, Ont.; British Columbia office, 509 Richards Street, Vancouver. Norman Jessiman, British Columbia manager; Alex. Jessiman, quarry manager. This company quarries gypsum at Falkland, 40 miles east of Kamloops on the Kamloops–Vernon Highway and on the Vernon branch of the Canadian National Railway. The company controls a large acreage covered by six Crown-granted mineral claims, one full and three fractional mineral claims held by record and one quarter-section plus three legal subdivisions Crown-granted under the "Land Act."

The Falkland gypsum deposit, originally known as the Salmon River deposit, was discovered sometime before 1889, when it was first mentioned by G. M. Dawson in the Geological Survey of Canada Annual Report of that year. The gypsum was first located in 1894 and was reported on briefly by J. McEvoy in the 1895 Geological Survey Annual Report. H. Cole described the occurrence in Mines Branch Publications No. 245, 1913, and No. 714, 1930; C. E. Cairnes mentioned the area briefly in the Geological Survey Summary Report for 1931. The Annual Reports of the British Columbia Minister of Mines contain production notes on the property from 1913 to date.

The first company associated with this property was the British Columbia Gypsum Company. Later the Manitoba Gypsum Company took over the deposit. Lack of transportation delayed initial development, but on the completion of the Kamloops–Kelowna branch of the Canadian National Railway in 1925 the latter company immediately began production and made the first shipment, 600 tons of gypsum, in December of that year. In 1926 British Columbia Gypsum regained control of the deposit and built a manufacturing plant at Port Mann, near New Westminster. By 1927 quarry production was 24,000 tons of rock. In 1927 Gypsum Lime and Alabastine, Canada, Limited, bought the deposit and plant and have operated both to date. The original plant at Port Mann burnt down in 1944 but was replaced by a new one in 1945.

The gypsum occurs as a series of lenses extending for 1½ miles along the hillside on the northeast side of Bolean Creek valley just north of Falkland. The hillside slopes steeply, averaging 30 degrees or more at the workings. Tree growth is patchy and underbrush is negligible. Natural outcrops are few, but overburden is generally shallow, and stripping and road-building have provided many good rock exposures.

* By J. W. McCammon.
† By R. B. King.

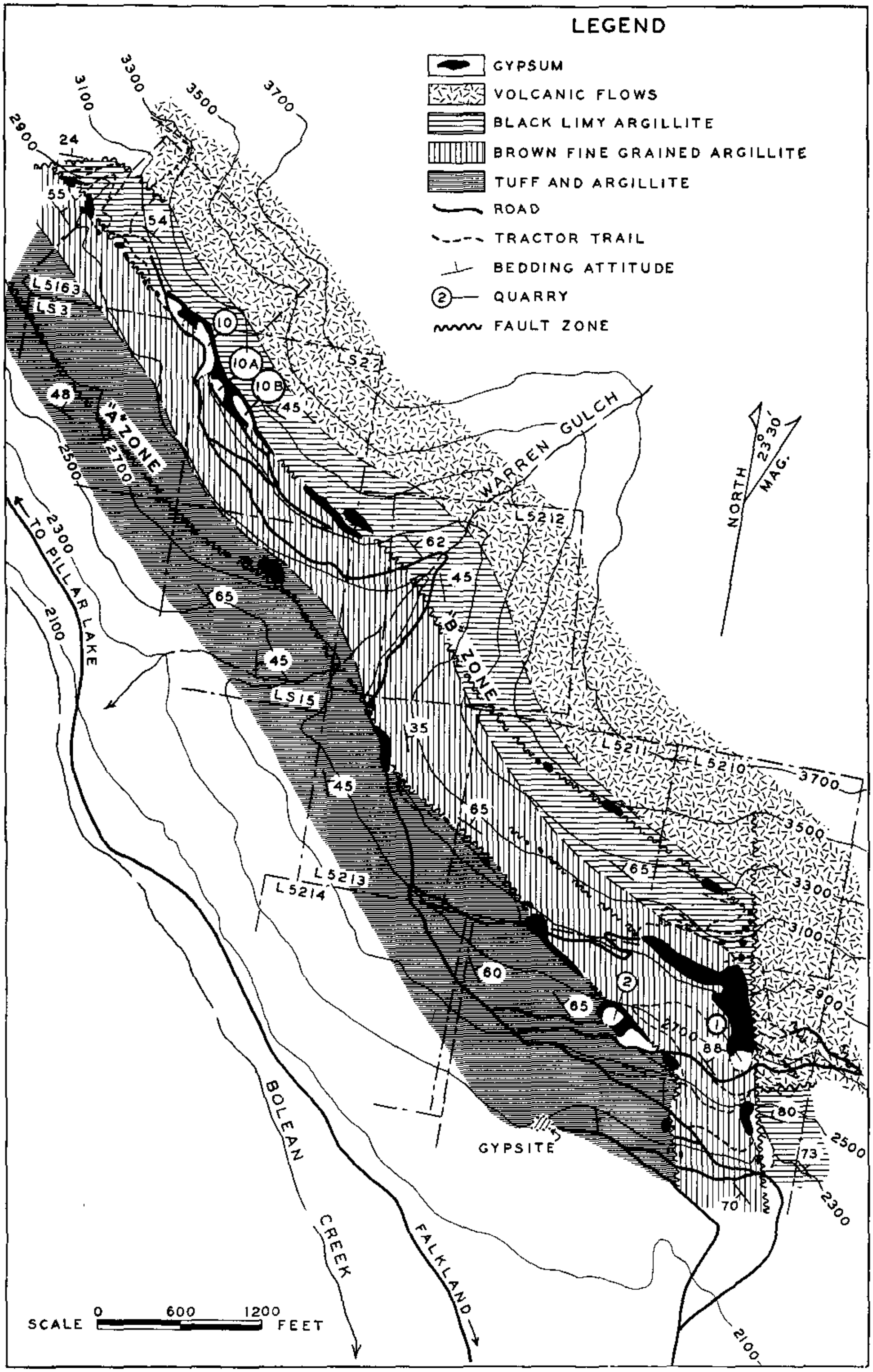


Figure 24. Geology of Falkland gypsum deposit.

The gypsum lenses are found along two large parallel shear zones that crosscut at a slight angle a northwesterly striking and northeasterly dipping series of interbedded volcanic and argillaceous rocks. These shear zones, marked A and B zones in Figure 24, strike about north 52 degrees west and are vertical or have steep northeasterly dips. Other smaller parallel shear zones are present in the area. One large, vertical, northerly striking fault passes along the east wall of No. 1 quarry and appears to offset B zone. Near the southeast corner of the mapped area, A zone is shown as swinging southward parallel to this fault, although it may be that the zone is offset by an undetected cross-fault at this point.

East of Warren Gulch, A zone is marked by numerous gypsum outcrops, most of which have been stripped and show sheared walls. In the gulch and to the west the zone is indicated by pillars and by outcrops of highly altered rock and some gysum. The normal country rock in this vicinity is dark green to black, but along a projection of A zone from east of the gulch there is a series of outcrops of brecciated light-tan fine-grained rock composed mainly of quartz and albite with some carbonate and flecks of pyrite and specularite. Several pillars of this rock from 10 to 40 feet high and from 10 to 20 feet in diameter are in the gulch and beside the outcrop of gypsum. The material illustrated as " pinnacle of limestone " in Mines Branch Publication No. 245 is actually one of the pillars of altered rock. Besides these there are two or three pillars of a loosely lime-cemented conglomerate. The uphill side of the largest rock pillars have a veneer of this conglomerate. The conglomerate material is believed to be of Recent origin because the pebbles are similar to those in the surrounding drift, there is a rude stratification parallel to the present hill-slope, and similar calcareous deposits are now forming in the creek bed.

Where visible, for most of its length B zone is marked by gypsum deposits. Where the zone is exposed in road-cuts near the horseshoe bend in Warren Gulch, the rocks are severely contorted and sheared for more than 100 feet along the road.

The amount and complete nature of the movement on zones A and B are not known, but at least some of the movement was horizontal and took place at two or more periods.

The country rock near the gypsum has an average northwest strike and an average dip of 45 to 65 degrees to the northeast. Locally the strike swings more to the north or west and the dip changes to near vertical or even steep to the southwest. The abnormal dips are most numerous in the southeast corner of the area, particularly in the block between A and B shear zones. The beds appear to be right side up, and the series seems to be conformable. For mapping purposes the rocks have been divided into the four following divisions, named from the top down: (1) Volcanic flow rocks, (2) black limy argillite, (3) brown fine-grained argillite, and (4) tuff and argillite. Preliminary Map 48-4A, second edition, of the Geological Survey of Canada shows these rocks as part of the Cache Creek group(?) of Carboniferous(?) or Permian age.

The volcanic flows are speckled dark-green and grey to black medium-grained rocks. In hand specimens, abundant dark amphibole crystals are conspicuous in an indeterminate groundmass. Microscopically the rock is seen to have a slightly schistose to granulose structure and is composed essentially of crystals of green amphibole in various stages of alteration with abundant epidote in tiny grains, lesser amounts of chlorite, carbonate, quartz, and plagioclase, scattered grains of pyrite and magnetite, and a fine interstitial material of uncertain nature. Some outcrops show scattered lens- and spindle-shaped clots of material lighter in colour than, but of a composition similar to, the general mass of the rock. In most outcrops these rocks are sheared in minor zones roughly parallel to A and B zones. The amphibole crystals and the clots are oriented in planes approximately parallel to these minor shear zones. One or two thin interbeds of argillite were noted east of No. 1 quarry. The flows are exposed along the east side of No. 1 quarry and intermittently across the entire top of the area mapped. They overlie dark limy argillite.

The contact was observed in only two places—on the abandoned road 100 feet southeast of the bottom of No. 1 quarry and at the sharp double bend in the most northerly tractor-trail on Lot 5163. In both exposures the contact is marked by a shear zone. The upper limit of the flow rock was not determined.

Beneath the volcanic flows are thin-bedded fine-grained commonly limy argillites. These are composed of angular grains of quartz, feldspar, and carbonate with minor shreds of sericite, cubes of pyrite, some chlorite, and black, probably carbonaceous, colouring matter. Near gypsum bodies the argillites are altered; this is particularly noticeable along the top of No. 10B quarry, where a zone as much as 30 feet wide has lost the black coloration, is reddish-brown, contains much pyrite, and has scattered quartz veinlets as much as 2 inches wide crosscutting and running parallel to the bedding. Normally the beds are 1 to 4 inches thick, but in some outcrops the beds are thinner than half an inch and the rock is almost slaty. From Warren Gulch northwestward the contact between the black argillite and the underlying brown fine-grained member is along B shear zone. No contact exposures were seen between Warren Gulch and the top of No. 1 quarry.

The rocks below the black argillite are light green to greyish-brown, dense, brown weathering, and thin bedded. Pyrite in tiny cubes is usually visible, and films of gypsum and calcite are common in hand specimens. In most exposures the beds are badly sheared and contorted, and, as a result, most of the rock looks schistose. Fresh surfaces are normally soft enough to be scratched easily by a knife blade. Unreplaced remnants in gypsum bodies of what is thought to be this same rock tend to be light to dark chocolate-brown with a cherty appearance, hard, and peppered with tiny pyrite cubes. Microscopically the constituents of this member are seen to be chiefly extremely fine angular quartz and feldspar grains with sericite, some chlorite, scattered pyrite, carbonate, tourmaline, and other fine-grained indeterminate material. Tourmaline is rare in most specimens, but sections cut from pieces of the large inclusions found in the gypsum contain swarms of tiny green crystals that average 0.04 millimetre long by 0.007 millimetre wide. These tourmalinized sections tend to be more siliceous and contain much more pyrite than the ordinary rock. The outstanding feature of this member is the extreme fineness of the grain size. The rock has been classified as argillite, although it probably contains much volcanic dust. The contact with No. 4 member is along A shear zone from the southeast limit of the mapped area to Warren Gulch. Northwestward from the gulch to the limit of the area, no part of the contact was seen.

The No. 4 or bottom member of the sequence consists of dark-green to black rocks. The upper 300 feet are bedded tuffs made up of angular fragments with a diameter generally less than a quarter of an inch but occasionally as much as 3 inches. Most of the fragments are green volcanic rock similar to the flows of member No. 1, but a few are limestone and black argillite. In many of the outcrops the rock looks massive, and the fragmental nature is only evident where the surface is weathered. Below this tuffaceous zone, thin beds of black argillite are interbedded with layers of tuff. The percentage of argillaceous beds increases to the southwest, and near the limit of the area argillite predominates. It is possible that some thin flows occur in this sequence, particularly in the upper tuffaceous part.

The Falkland gypsum is soft fine-grained material that varies in colour from pure white through various shades of grey, grey and white banded, brown and white banded, to reddish-brown. Thin sections show it consists partly of subhedral crystals, partly of fibrous masses, but mainly of flamboyant aggregates of gypsum with various and variable impurities. The purity varies from place to place and even within a given outcrop. At a depth of from 60 to 100 feet below the outcrop surface the gypsum grades rather abruptly into pale-blue anhydrite. In No. 10 quarry the transitional region is marked by a moist zone in an otherwise dry quarry face. Thin sections from this zone show gypsum replacing anhydrite, the replacement starting along cleavage lines and spreading throughout the mass.

The gypsum is in masses, chiefly along A and B shear zones. The masses are discontinuous bodies that are irregularly lens-shaped both in plan and vertical section. Movement on the shears after the calcium sulphate was emplaced has been at least partly responsible for the shaping of the bodies. A few small outcrops of gypsum were noted in scattered spots away from the main zones. These appear to be related to minor shears.

Inclusions of dark red-brown to orange-brown severely fractured argillaceous rock ranging from masses 60 feet long by 30 feet wide down to dust are rather commonly though unevenly scattered through the gypsum. Microscopically the inclusions are seen to consist of a fine-grained aggregate of quartz and albite, swarms of pyrite cubes and tiny dark-green tourmaline prisms, calcite in masses and small rhombs, and other tiny crystals, some of which appear to be rutile and garnet. In one large inclusion near the top of No. 1 quarry, planes thought to be bedding have the same attitude as the brown argillite to the southwest. In places where inclusions are small and numerous, they tend to be strung out in lines essentially parallel to the bedded wallrocks. This may be a result of shearing action on former large inclusions or it may represent relic bedding of almost completely replaced argillite. In thin section, gypsum seems to be replacing the small inclusions.

In most outcrops the gypsum is banded by alternate brown and white or grey and white thin parallel lines one-eighth to one-half inch apart. Commonly the lines mark the traces of planes parallel to the general attitude of the nearest country rock. In places the bands are severely contorted, and where large inclusions occur, the banding bends around and envelops the foreign material. At least part of this banding has been formed as described in the last paragraph, but whether it has all originated this way is not known.

Gypsum normally is considered to be of sedimentary origin; on occasions it is thought to have formed by the action of sulphuric acid on limestone; and, rarely, it has been reported as a gangue with metallic minerals. The distribution of the Falkland gypsum with respect to the enclosing rocks rules out the first method of origin. Cole and Cairnes considered these deposits to have resulted from alteration of lenses of limestone, the distribution of the gypsum, and the facts that no relic masses of limestone were noticed in the gypsum bodies and no lenses of true limestone have been located on the property or near by, seems to rule out this explanation. It is considered that the deposits were formed by hydrothermal replacement of argillites and tuffs along shear zones because the gypsum is definitely related to shear zones that cut across the bedding of the country rock, thin sections indicate that gypsum was the last mineral to form and replaces all other minerals, and the mineral assemblage in the inclusions in the gypsum is at least partially a hydrothermal suite. The original form of the calcium sulphate is not known. Definitely the last phase of formation was the hydration of anhydrite to gypsum by surface water. Nothing definite could be found to show whether the anhydrite is primary or is a metamorphosed product of original gypsum. One thin section contained a few grains of gypsum that appeared to be older than the anhydrite and other gypsum present. In some sections the anhydrite crystals have a definite linear orientation.

With the exception of the outcrop on A zone northwest of Warren Gulch and the two outcrops on B zone above No. 1 quarry, all of the larger known gypsum bodies have been explored by surface work, and gypsum has been quarried wherever commercial-grade material was found. In 1952 production came from Nos. 2, 10, 10A, and 10B quarries.

No. 1 quarry has not been worked for several years. It is 650 feet long, 150 feet wide, averages 50 to 65 feet deep, and has a difference of 350 feet in elevation between the south floor and the north crest. In the central part of the quarry the gypsum is light grey; toward the west wall, inclusions and streaks of brown argillite appear and become progressively more abundant until an indistinct and irregular contact is reached, beyond which only brown argillite can be found; toward the east wall, dark-grey limy streaks become prominent and the rock is contorted and badly broken up, particularly in the lower southeast corner. In an attempt to check for lime gradation in the gypsum, five spot samples were taken, spaced at equal intervals across the middle of the quarry from east to west. The samples gave the following CO_2 to SO_3 ratios: (1) 2.4 to 42.2, (2) 2.1 to 43.8, (3) 1.0 to 45.8, (4) 2.9 to 43.5, (5) 2.1 to 44.0. Anhydrite can be detected in many places in the floors and faces of the different benches. Rock relationships and the disturbed nature of the east wall indicate a fault along the east wall as shown in Figure 24. At the top of the quarry the gypsum appears to split and follow two directions—one northwesterly along a minor shear and the other north and then northwesterly along B zone. Apparently quarrying ceased because of the drop in grade of the gypsum laterally due to increasing amounts of impurities and because of reaching the anhydrite zone in depth.

Some gypsum was mined from the quarry south of No. 1 quarry, but the quantity was not great; the quality of what remains is poor.

Extensive stripping northwest from the top of No. 1 quarry has uncovered considerable gypsum, but it contains much brown argillite and is badly discoloured.

Not much work has been done on any of the gypsum outcrops on B zone between the top of No. 1 quarry and Warren Gulch. From the gulch to the northwest, gypsum lenses and masses have been exposed in almost continuous succession along the zone for more than 3,000 feet. Nos. 10, 10A, and 10B quarries have opened up a large body in this section.

No. 10 quarry is 1,000 feet above and 2½ miles by road from the railway. The face of No. 10B quarry is about 40 feet high, the floor of No. 10A quarry is 41 feet below that of No. 10B, and the floor of No. 10 quarry is 80 feet below that of No. 10A. The gypsum body in which Nos. 10, 10A, and 10B quarries are located is 30 feet wide where first cut by the road at the southeast end of No. 10B quarry, swells to nearly 100 feet wide at No. 10 quarry, and then narrows to 50 feet wide at the road beyond the northwest end of No. 10 quarry. Like the other gypsum bodies, this one is purest at the centre, where it is light grey, and becomes progressively discoloured toward the walls, where there are fault contacts with the wallrock. Anhydrite is beginning to show in the bottom of the faces of No. 10 quarry. Equally spaced samples from east to west across the southeast face of No. 10 quarry gave the following CO_2 to SO_3 ratios: (1) 2.4 to 42.7, (2) 1.8 to 44.7, (3) 2.2 to 44.0, (4) 0.9 to 45.4.

Two narrow lenses of grey-streaked gypsum separated by 15 to 30 feet of limy black argillite have been stripped 400 feet southeast of No. 10B quarry. These showings have not been opened up enough to expose fresh rock, so the nature of the material is not yet established. The surface material is a poor colour.

Much stripping has been done on B zone northwest of No. 10 quarry, but no large gypsum bodies have been found. In the most northwesterly showing the zone appears to terminate against a shear that curves across it almost at right angles.

White gypsum has been mined from No. 2 quarry, which is 600 feet above and 1⅓ miles by road from the railway. The quarry has been worked in two benches. When examined, the upper bench had a face 167 feet wide by 90 feet high, and the lower had a face 74 feet wide by 38 feet high. Production was coming from the upper bench. The gypsum is pure white in the central part of the quarry. The whiteness is maintained fairly well toward the west wall, where the gypsum is in fault contact with dark coarse tuff. Toward the east wall the gypsum becomes increasingly brown stained and full of brown argillite inclusions until a fault contact with brown argillite is reached. The gypsum body appears to be rapidly lensing out to the northwest, and where uncovered by stripping 200 feet beyond the quarry crest, it is very narrow and badly discoloured. Samples equally spaced across the floor of the upper bench from east to west gave CO_2 to SO_3 ratios as follows: (1) 0.3 to 46.5, (2) 0.1 to 46.3, (3) *nil* to 46.5, (4) 0.2 to 46.6. Thin sections of specimens from these samples showed that the gypsum grains graded from crystals in No. 1 sample to flamboyant aggregates in No. 4 sample. Anhydrite is reported to have been encountered in the floor of the lower bench.

Some gypsum was mined from three small quarries on A zone southeast of No. 2 quarry. The grade of material is not known, and the quantity must have been small. They are now full of rubble.

Zone A has been stripped for 1,000 feet northwest from No. 2 quarry, and some local stripping has been done for 1,600 feet beyond that. Gypsum was uncovered in irregular and generally small patches along the zone. Attempts were made to open quarries at the two largest showings, but the rock was found to be too low grade to be commercial.

No exploration has been done on the gypsum outcrop on A zone north of Warren Gulch. The main outcrop exposes gypsum over an area 200 feet long by 80 feet wide.

A few samples were taken to give an indication of the grade of gypsum. No complete analysis of the white rock was made, but the partial results giving the CO_2 to SO_3 ratios previously quoted indicate how close this rock is to theoretical purity (i.e., 46.6 per cent SO_3). The following samples were all taken in 1951: No. 1 represents a chip sample across 15 feet on the surface at the top of the most northwesterly exposure on B zone, No. 2 is a chip sample across 75 feet at the base of the southeast face of No. 10 quarry, No. 3 is a chip sample across 50 feet on the surface of the large gypsum knob 600 feet north of No. 1 quarry crest, No. 4 is a chip sample across 50 feet at the centre of the quarry 300 feet south of No. 1 quarry, No. 5 is a grab sample of rock being shipped from No. 10B quarry. Analyses follow:—

Sample No.	CaO	SO_3	CO_2	Fe (Total)	Al_2O_3	SiO_2	H_2O-	H_2O+
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
1	32.6	42.8	2.1	0.20	0.5	2.3	0.04	18.9
2	32.9	43.5	2.0	0.16	......	1.9	0.04	19.0
3	33.0	42.5	2.5	0.14	......	2.5	0.02	18.8
4	32.9	42.8	2.7	0.32	......	4.3	0.04	15.8
5	33.0	44.9	1.3	0.14	......	0.9	0.05	19.7

NOTE.—No trace of sodium chloride was detected in any sample.

Originally, when all the workings were at the south end of the deposit near Falkland, the gypsum was carried from a central loading terminal between the quarries to a loading-bin at the railway siding by means of an aerial tram 3,500 feet long. The tram was replaced by trucks in 1941. To-day the rock is drilled by jackhammers and air-legs, blasted with 50 per cent Dynamex explosive, loaded by diesel shovels on to trucks, and hauled to a primary crusher at the loading-bin on the railway siding. A ¾-yard and a ½-yard shovel are used in the quarries to load the truck fleet that consists of one 10-ton, three 9-ton, and three 5½-ton trucks. From the crushing plant the gypsum is loaded on to railway gondola cars and shipped to company plants in Port Mann and Calgary.

Total production from the deposit exceeds 1,000,000 tons of rock gypsum. During 1952, production was at the rate of 300 to 400 tons per day. Twenty-six men were employed at Falkland.

[References: *Geol. Surv., Canada,* Ann. Rept., 1888–89, Vol. IV, p. 11A; Ann. Rept., 1895, p. 37A; Ann. Rept., 1931, Pt. A, pp. 96, 97; Paper 48-4, Salmon Arm Map-area, p. 7. *Dept. of Mines, Canada,* Mines Branch Pub. No. 245, 1913, pp. 91–95; Mines Branch Pub. No. 714, 1930, pp. 58–63. *Minister of Mines, B.C.,* Ann. Repts., 1913 to 1951.]

Canada Cement Company*

Mayook (49° 115° S.W.) This company owns a gypsum quarry on the Cranbrook–Fernie Highway, 16 miles east of Cranbrook and a quarter of a mile northeast of Mayook. A. Howard, of Wasa, continued to work the quarry under lease. Work commenced in

* By *H. N. Curry.*

April, 1952, and steady production of over 1,700 tons per month was maintained until the shut-down in December. After being blasted, the gypsum is broken to 8-inch size and taken to Mayook for transhipping to the company's cement-works at Exshaw, Alta. Equipment consists of a 105-cubic-foot-per-minute Ingersoll-Rand compressor, a TD-9 Caterpillar tractor equipped with a front-end shovel, and air-pluggers with tungsten-carbide bits. The number of men employed averaged four. The 1952 production was 14,363 tons.

Columbia Gypsum Products, Inc.* Windermere (50° 115° S.W.) Head office, 425 Symon's Building, Spokane, Wash.; quarry office, Athalmer. J. M. Cummings, resident manager. This company owns a gypsum deposit on Windermere Creek. In April the quarrying and hauling contract was taken over by General Construction Company of Calgary and Vancouver.

Equipment at the quarry consists of a 210-cubic-feet-per-minute Schramm compressor, a ¾-cubic-yard Link-Belt shovel, a D-7 Caterpillar tractor, and an 8-cubic-yard LeTourneau carryall. A semi-permanent crushing and screening plant, having a capacity of 100 tons per hour, was installed in July. At this plant a 20- by 36-inch Pioneer jaw crusher, belt-driven by a D-13000 Caterpillar diesel, feeds on to a 4- by 10-foot double-decked Pioneer Mesabi screen, and the resulting products are carried on a 24-inch belt conveyor to a second 4- by 10-foot National Machinery Company double-decked screen, where 4-inch, 2-inch, and —½-inch products are separated. The crushed rock is hauled 10 miles by truck to Lake Windermere station.

The year's production came from a small bench in the quarry bottom and the benching back of the hangingwall on the north side. A 100,000-ton block has been made available at the west end of the quarry by removing the overburden, and quarrying of the 100-foot face in 12-foot benches has commenced. Ten men are employed.

Production was 29,400 tons of rock gypsum. Shipments during the year were made to Canada Cement Company at Exshaw, Alta.; British Columbia Cement Company Limited at Bamberton; and the Columbia Gypsum plant at Spokane, Wash.

Assessment work was carried out on the company's gypsum claims near the Kootenay River, 7 miles above Canal Flats.

KYANITE

Big Bend Area† Columbia River (51°–52° 118°). Kyanite has been reported from this area for many years. In the Annual Report of the Minister of Mines for 1931, page 148, B. T. O'Grady described an occurrence between Death and Priest Rapids on the west side of the Columbia River. Here, big clean kyanite crystals were found in large loose slabs and boulders of pegmatite. None of the material was seen in place. No other deposits in the area claimed attention until the summer of 1952. At this time, kyanite was found in several localities, and claims were recorded on some of them. Deposits are now known at the following places: (1) Half a mile up Frisby Creek which flows into the Columbia River from the west, about 22 miles north of Revelstoke; (2) in road-cuts along the Big Bend Highway between Miles 89.5 and 91.8 north of Revelstoke; (3) half a mile up Brown Creek, which flows into the Columbia from the west about 4 miles southeast of Boat Encampment; (4) on the claims of the Yellow Creek Mica mines at the head of Yellow Creek, about 8 miles southeast of Boat Encampment.

The kyanite is found mainly in schists and gneisses with mica, quartz, feldspar, and garnet. Most of that examined consisted of dirty greyish-blue flat crystals from one-quarter of an inch to 3 inches long. The raw rock contains between 10 and 20 per cent kyanite, the content varying from place to place. In a few spots thin pegmatite dykes contain kyanite.

* By H. N. Curry.
† By J. W. McCammon.

LIMESTONE AND CEMENT

Wood & McClay Limited*

Aristazabal Island (52° 129° N.E.). Company office, 1768 East Hastings Street, Vancouver. This company operated a quarry from July 16th to December 3rd, 1952. During this period 12,000 tons of limestone was mined and hauled by barge to the Columbia Cellulose Company Limited plant at Port Edward. An average of fourteen men was employed.

Beale Quarries Limited†

Vananda (49° 124° N.W.). Head office, 744 West Hastings Street, Vancouver; quarry office, Vananda. W. D. Webster, superintendent. Limestone is quarried to produce pulp rock for paper-mills, crushed and pulverized rock for agricultural and industrial uses, and for rock-dusting in coal mines. The quarry is worked on two levels with faces nearly 45 feet high. Wagon drills are used to drill holes for blasting. Broken rock is loaded with two ¾-cubic-yard diesel-driven shovels and transported by 4-cubic-yard trucks to the plant. Pulp rock is separated from spalls by means of a grizzly. The spalls are conveyed to a stockpile, and from there to the crushing and pulverizing plant. Approximately 80,000 tons of limestone and 4,000 tons of waste material were mined during 1952. The average number of men employed during the year was twenty-four.

W. S. Beale Limited†

Vananda (49° 124° N.W.). Office and quarry, Vananda. Stanley Beale, manager. Limestone is quarried to produce pulp rock for paper-mills and flux for smelters. Limestone, blasted from a quarry face nearly 70 feet high, is loaded by a ½-cubic-yard diesel-driven shovel on to trucks of 5- and 10-ton capacity. These trucks transport the rock to a ramp, where it is dumped on to a heavy-duty vibrating screen which separates pulp rock from finer material. The pulp rock is loaded on to scows; spalls are stockpiled.

During 1952, 60,000 tons of limestone was shipped. Of this amount, 35,000 tons went to pulp-mills and 25,000 tons was shipped to smelters for flux. Eight men were employed.

McKay Quarry†

Vananda (49° 124° N.W.). Don McKay, owner. This quarry is on the main road about 2 miles south of Vananda. White limestone is mined and sold for stucco dash. Nearly 10 tons of rock is produced per week. One man is employed.

Pacific Lime Company Limited†

Blubber Bay (49° 124° N.W.). Head office, 744 West Hastings Street, Vancouver; quarry, Blubber Bay; plants, Blubber Bay and Vancouver. F. W. Harvie, general manager; A. M. Stewart, assistant general manager; E. O. Magnusson, plant superintendent. Limestone is quarried nearly 2 miles from the Blubber Bay plant, along the Blubber Bay–Vananda road. Limestone is broken from quarry faces by drilling and blasting horizontal and vertical holes. Broken rock is loaded by a diesel-driven shovel on to 18-cubic-yard-capacity trucks and hauled to the plant. During the year the haulage road was improved to become an all-weather road. The quarried limestone is used in pulp-mills, cement manufacture, and smelter flux, or is burned for lime products. The number of men employed at the end of the year was twenty-six.

British Columbia Cement Company Limited†

Head office, corner of Fort and Wharf Streets, Victoria. N. A. Tomlin, managing director; R. E. Haskins, works superintendent. Quarries are operated at Bamberton (48° 123° N.W.) on Vancouver Island and at Blubber Bay (49° 124° N.W.) on Texada Island to produce limestone and greenstone, used in manufacturing cement. At Blubber Bay quarry the quarry face ranges from 70 to 85 feet in height. A Bucyrus-Erie 27T churn drill is used to drill vertical blast-holes. These holes are spaced at 20-foot centres, have 25 feet of burden, and are drilled 9 feet below the grade

* By J. W. Patterson.
† By R. B. King.

line of the quarry floor. About 35,000 tons is broken in each blasting operation. Broken rock is loaded by 1¾-cubic-yard diesel-powered shovels into Koehring dumptors that transport it a short distance and then transfer it to 6-cubic-yard-capacity railroad dump cars. These cars are hauled over a 36-inch-gauge railroad by gas locomotives to the crushing plant. A 36- by 48-inch Dominion jaw crusher discharges a 5-inch product which is conveyed by an overhead conveyor to a stockpile. An underground conveyor beneath this stockpile conveys crushed rock to scows for shipment to Bamberton. Twenty-eight men are employed.

At the Bamberton quarry, blast-hole drilling, using a Bucyrus-Erie 27T churn drill, is being carried on. Vertical holes spaced at 20-foot centres and having a burden of 25 feet are drilled 150 feet deep. Rock broken by blasting these holes is loaded by an electric shovel and transported by dumptors to the crushing plant. The crushing plant consists of a 60-inch Stephens-Adamson feeder, a 42- by 48-inch Buchanan jaw crusher, and a 5½-foot Symons cone crusher.

During the year a rotary kiln 345 feet long was built to increase the cement production. A large steel and concrete clinker storage bin was also built. Nineteen men were employed in the quarry.

During the fiscal year of the company, December 1st, 1951, to November 30th, 1952, 184,000 tons of limestone was quarried at Blubber Bay and 185,000 tons was quarried at Bamberton. In addition, 26,000 tons of waste was broken at Blubber Bay and 66,150 tons of waste was broken at Bamberton.

Agassiz Lime Quarry*

Agassiz (49° 121° S.W.). Hiram Cutler, owner. Agricultural limestone is produced from this quarry. Broken rock is transported by a ¼-cubic-yard loader from the quarry to the crushing plant. The daily capacity of the crushing plant is 40 tons. The average number of men employed was seven.

Fraser Valley Lime Supplies*

Popkum (49° 121° S.W.). Arthur Isaacs, superintendent. This quarry and plant produce crushed and pulverized limestone for industrial and agricultural purposes. Limestone is blasted from the quarry face, hand-loaded into trucks, and transported to a crushing plant. Five men were employed.

The Consolidated Mining and Smelting Company of Canada, Limited†

Fife (49° 118° S.E.). Head office, Trail; quarry, Fife. G. E. Clayton, engineer; Oscar Tedesco, quarry foreman. Quarrying of limestone continued throughout the year. Compressed-air jackhammers are used for drilling, and the limestone is blasted from benches; 40 per cent Forcite and 55 per cent Stopeite explosives are used for blasting. The quarry is alongside the Kettle Valley branch of the Canadian Pacific Railway, half a mile north of Fife. A ⅝-cubic-yard Northwest diesel shovel is used to load the broken rock, which is hauled by truck to a loading-bin on the railway. It is then shipped to Trail for use as flux in the smelter. During 1952 the output varied between 3,800 and 2,400 tons per month. A crew of from six to eight men was employed.

MARL

Cheam Marl Products Limited*

Popkum (49° 121° S.W.). A. M. Davidson, manager. Marl is mined from a deposit near the east shore of Cheam Lake. A drainage ditch has been dug to lower the level of the lake so that the marl may be more easily recovered. A drying plant was built and operated during the later part of 1952. Fifteen thousand tons of wet, semi-dry, and dry marl was produced. Five men were employed at the plant.

* By R. B. King.
† By E. R. Hughes.

Popkum Marl Products Limited* Popkum (49° 121° S.W.). W. A. Munro, manager. This company mines marl from a deposit on the east shore of Cheam Lake. A ½-cubic-yard dragline digs marl and loads it on trucks for transportation to the drying plant. In the plant a sawdust-fired rotary kiln dries the marl. The plant has a capacity of 10 tons per day. Wet, semi-dry, and dry marl and dried humus are produced. Seven men were employed during the operating year.

PERLITE

Francois and Francois No. 2 (Western Gypsum Products Limited)† Francois Lake (54° 125° S.W.). Head office, Childs Building, Winnipeg, Man. The property of this company, two full claims and one fractional claim, is served by about 4¼ miles of truck-road along Francois Lake east of Francois Lake Post-office. Between September 24th and October 10th in 1952, four men quarried 550 tons of perlite, which was shipped to the company plant in Calgary to be used in the manufacture of plasterboard. The company reports that in the future they expect to quarry between 1,000 and 1,500 tons of perlite per year.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 258–261.]

SAND AND GRAVEL

D. F. Gosling Gravel Pit.*—Abbotsford (49° 122° S.E.). D. F. Gosling, owner and operator. This gravel pit is 7 miles west and 6 miles south of Abbotsford. Gravel is mined by crescent-type scraper and elevated by a bucket conveyor to a washing, sizing, and screening plant. Four men were employed.

Border Sand and Gravel Company* White Rock (49° 122° S.W.). Office and plant, Boundary Road, R.R. 4, White Rock. H. LaPierre, manager. The gravel pit and washing plant operated intermittently during the year. When in production, five men are employed in mining, crushing, and washing gravel. The plant has a capacity of 60 cubic yards a day.

Colebrook Sand & Gravel Company Limited.*—Cloverdale (49° 122° S.W.). Office and plant, R.R. 1, Cloverdale. F. Bray and J. Bray, owners and operators. Sand and gravel for making fill, concrete, and plaster are produced by this company. A ½-cubic-yard-capacity diesel-driven shovel loads gravel on to trucks. In 1952, 14,012 cubic yards of gravel was produced from the pit.

Corporation of the Township of Langley.*—Murrayville (49° 122° S.W.). W. Merrell, superintendent of works. Seven gravel pits are operated within the township for the purpose of road maintenance and construction. All gravel is mined by diesel-driven shovels and is transported by trucks to portable crushers. In 1952, 33,065 cubic yards of pit-run gravel and 61,262 cubic yards of crushed gravel were produced.

Deeks-McBride Ltd.* Company office, 1051 Main Street, Vancouver. J. W. Sharpe, general manager. Two gravel pits with crushing, screening, and washing plants are operated by this company. One pit is at Coquitlam (49° 122° S.W.) and one is at Seymour Creek (49° 123° S.E.). At the Coquitlam plant 500 cubic yards of gravel is crushed and screened per day. Gravel is dug with a 1-cubic-yard-capacity dragline and transported by a conveyor belt to a jaw crusher and then by conveyor belt to the washing plant. Ten men are employed.

At the Seymour Creek pit, gravel is mined with a ¾-cubic-yard dragline, adjacent to and under Burrard Inlet. Gravel is transported to the plant by conveyor belt. This plant produces nearly 1,200 cubic yards of sized and washed gravel products in a sixteen-hour day. Twenty-five men are employed.

* By R. B. King.
† By J. W. Patterson.

E. R. Taylor Construction Company Limited* — Burnaby (49° 122° S.W.). Office, Maplewood Post-office; plant, Stride Avenue, Burnaby. A. G. Teed, superintendent. This company operated the Stride Avenue pit for Burnaby Municipality. Gravel is mined from high faces with one ¾- and one ½-cubic-yard diesel-driven shovel and transported to a portable crusher. In 1952, 250,555 tons of gravel and 27,696 cubic yards of fill material were mined. Of the gravel mined, 70,728 tons was sold as run-of-the-bank gravel, 117,667 tons was crushed to 1⅛-inch size, and 62,160 tons was crushed to 2½-inch size.

Fresh Water Sand & Gravel Company Limited* — Coquitlam (49° 122° S.W.). Company office, 902 Columbia Street, New Westminster. J. H. Gilley, general manager; E. Johnston, superintendent. Sand and gravel and crushed products are produced from the plant on the Fraser River near Coquitlam. Gravel is mined by hydraulicking and digging of high gravel faces. In hydraulicking, the washed gravel is retained in enclosures and loaded from these enclosures by an electric shovel of 1-cubic-yard capacity on to conveyor belts that transfer it to the washing plants. In other parts of the pit, gravel is mined from high faces by shovel and loaded on to trucks that transport it to conveyor belts and then to the washing plants. The two plants for washing, crushing, and screening the gravel have a capacity of 200 cubic yards per hour. More than half a million tons of gravel was produced in 1952. The average number of men employed during the year was thirty-five.

Torgerson Construction Co. Ltd.*—Port Mann (49° 122° S.W.). I. O. Torgerson, manager. Gravel is mined by shovel from a 50-foot face and transported to a portable washing plant. The plant has a capacity of 40 cubic yards per hour.

Highland Sand and Gravel Company* — Lynnmour (49° 123° S.E.). Company office and plant, Lynnmour. W. J. Barrett-Leonard, manager; W. Hills, superintendent. Sand, gravel, and crushed products are produced by this company. Material is blasted from a low gravel bank and loaded on to trucks by ¾-cubic-yard diesel-driven shovels. A crushing, screening, and washing plant is operated, producing sized products. A concrete brick and tile plant is operated. In 1952, 122,747 cubic yards of material was produced. Of this material mined, 19,371 cubic yards was sold as crushed rock, 55,923 cubic yards as sand and gravel, 28,213 cubic yards as crushed fill, and 19,220 cubic yards as bank-run fill.

The Corporation of Delta* — Ladner (49° 123° S.E.). J. C. Johnstone, municipal engineer. Two gravel pits are operated in this municipality. Gravel is loaded by diesel-driven shovels into trucks and is either crushed or used directly on roads. During 1952, 10,955 cubic yards of crushed gravel and 5,726 cubic yards of pit-run gravel were used on roads, and 2,839 cubic yards was stockpiled.

McIntyre and Harding Gravel Company Limited* — Saanich (48° 123° N.E.). Company office and plant, Royal Oak Post-office, Saanich. J. H. Harding, manager. Sand, gravel, and sized gravel products are produced by this company. Gravel is either washed down from gravel faces and dug, or dug directly from these faces by ½-cubic-yard diesel-driven shovels and transported to the washing plant by trucks and a conveyor belt. The washing and screening plant has a capacity of 30 tons an hour. Approximately 48,000 cubic yards of gravel was mined during the year, and of this amount 23,000 cubic yards was washed and screened.

Producers Sand & Gravel Company (1929) Limited* — Albert Head (48° 123° S.E.). Company office, 900 Wharf Street, Victoria; plant, Royal Bay. A. Parker, manager. Crushed and sized gravel and products are produced by this company at its plant, which is nearly a mile north of Albert Head. A scraper operated on a slack-line cableway is used to loosen packed gravel

* By R. B. King.

from a steep, high face. The gravel is loaded by a 1-cubic-yard shovel into a hopper, from which it is moved by a series of conveyor belts to the plant. The plant has a capacity of 200 cubic yards per hour.

Cassidy Sand and Gravel*

Cassidy (49° 123° S.W.). Mine office, Cassidy. N. Manca and associates, operators. This pit is immediately east of the Island Highway, about a quarter of a mile south of the Nanaimo River bridge. The gravel is mined by means of a ½-cubic-yard-capacity slusher bucket driven by a gasoline hoist. The slusher bucket draws the gravel up to a grizzly, which separates out the large rock. The undersize material is then conveyed by a bucket elevator to a washing and screening plant with a capacity of about 10 cubic yards per hour. The following products are sold: Sand (under one-quarter inch), pea gravel (one-quarter to one-half inch), aggregate (one-half to 1½ inches), drain rock (1½ to 2 inches), and road fill and concrete gravel (over 2 inches). Total sales of gravel products in 1952 amounted to 14,441 cubic yards. Three men—two of the operators and one employee—normally work the pit.

McGarrigle Sand and Gravel*

Northfield (49° 123° S.W.). Office, Northfield. This pit is immediately east of the Island Highway about 3 miles north of Nanaimo. The gravel is mined from a bank by a ⅜-cubic-yard-capacity mobile loader. Much of the production from the pit is loaded directly into trucks and sold as pit-run gravel. The remainder is sized in a small rotary screening plant into sand (under one-half inch), gravel (one-half to 1½ inches), and rock (over 1½ inches).

A small plant is operated for the production of concrete blocks of the "mortarless tile" type.

A total of 6,044 cubic yards of gravel was sold in 1952. One man was employed.

Courtenay Sand and Gravel Company*

Courtenay (49° 124° N.W.). Office, Courtenay. J. S. McPhee and H. C. McQuillan, operators; J. S. McPhee, manager. This company operates a pit beside the Courtenay–Cumberland road, 3 miles from Courtenay. The gravel is mined by digging into a high bank with a ½-cubic-yard gasoline-driven shovel. The gravel is loaded into a hopper, from which it is conveyed by a troughed-belt conveyor to a bucket elevator that delivers it to a washing and screening plant of 25-cubic-yards-per-hour capacity. Here the gravel is sized into three products: Sand (under three-eighths inch), gravel (three-eighths to 1½ inches), and rock (over 1½ inches). In 1952, gravel products sold amounted to 29,584 cubic yards. Much of the production was used in construction work at the Comox R.C.A.F. base. Six men were employed at the quarry.

S. H. Marriott Sand and Gravel*

Courtenay (49° 124° N.W.) Office, Courtenay. S. H. Marriott, manager and operator. This pit is beside the Courtenay–Cumberland road, 2½ miles from Courtenay, and is operated on a lease from Canadian Collieries (Dunsmuir) Limited. Gravel is mined from a high face with a ¾-cubic-yard gasoline-driven mobile loader. The gravel is fed to a small rotary screening plant, where it is sized into two products—under 2 inches and over 2 inches. Three men are normally employed at the quarry.

During the latter part of 1952, Dawson & Hall mined gravel at this pit, by arrangement with the operator, for use in the extensive construction programme at the Comox R.C.A.F. base. The gravel was pushed by a bulldozer into a bin, from which it was conveyed to a Pioneer portable crushing and screening plant, where it was crushed and screened to 1½-inch and ⅜-inch sizes. Five men were employed at the pit when the plant was operating.

Total production in 1952 from this pit amounted to 44,273 cubic yards of mixed gravel products. Approximately 20,000 cubic yards of this was mined by Dawson & Hall.

* By A. R. C. James.

SLAG

Granby Slag Dump, Grand Forks*

Grand Forks (49° 118° S.E.). The old Granby Company smelter-slag dump at Grand Forks is owned by the City of Grand Forks. The Glacial Rock Insulation Company, Moose Jaw, Sask., has an agreement with the city to purchase slag, which is shipped to Moose Jaw and used in the manufacture of insulating material. Mining, sorting, loading, and hauling are done by the Grand Forks Cartage Company Limited. Slag is blasted from a face which, in October, was 70 feet high at the south end of the dump. Later, for reasons of safety, an intermediate bench was cut, which allowed work to be done from a face not exceeding 35 feet high. After blasting, the slag is hand-loaded and passed over a vibrating screen, and is then hauled by truck to the railway. A crew of three men worked intermittently. Production averaged about 70 tons per week during the summer months and slightly less during the winter. Total amount shipped in 1952 was approximately 2,500 tons.

Greenwood Slag Dump*

Greenwood (49° 118° S.W.). J. Falkoski and F. Mahoney obtained a lease to mine and ship slag from the dump at the old British Columbia Copper Company's smelter at Greenwood. The slag is blasted from the face of the dump, mechanically loaded into trucks, and hauled to the railway. Production was not continuous. Several carloads of slag were shipped to the Gypsum Lime and Alabastine, Canada, Limited, plant at Calgary for use in the manufacture of rock wool.

* By E. R. Hughes.

Inspection of Lode Mines, Placer Mines, and Quarries

By H. C. Hughes, Chief Inspector of Mines

CONTENTS

PRODUCTION

The output of metal mines for 1952 was 9,147,469 tons. This tonnage was produced from one hundred mines, of which sixty-three produced 100 tons or more.

FATAL ACCIDENTS

During 1952 there were eleven fatal accidents connected with actual mining operations in metal mines and quarries. This was the same number as in 1951. In addition, there were two fatal accidents on the surface, not directly connected with mining operations. A description of these is included.

There were 8,094 persons employed below and above ground in metal mines and 1,516 persons employed in concentrators in 1952.

The ratio of fatal accidents per 1,000 persons employed in mines and concentrators was 1.14, as compared with 1.47 in 1951 for those employed in mines only.

The tonnage mined per fatal accident during 1952 was 796,038 tons, as compared with 634,342 tons in 1951.

The tonnage mined per fatal accident during the last ten-year period was 570,666 tons.

The following table shows the mines at which fatal accidents occurred during 1952, with comparative figures for 1951:—

Mining Division	Mine	No. of Fatal Accidents	
		1951	1952
Fort Steele	Sullivan	1	....
Golden	Paradise	1	....
Slocan	Van Roi	1	....
Nelson	Jersey	1	....
Nelson	Emerald	....	2
Nelson	H.B.	....	1
Osoyoos	Nickel Plate	1	....
Kamloops	Falkland Quarry	....	1
Lillooet	Bralorne	2	1
Lillooet	Golden Contact	....	1
Nanaimo	Iron Hill	1	....
Vancouver	Britannia	2	....
Victoria	Twin J	1	....
Alberni	Privateer	....	1
Skeena	Torbrit	....	1
Omineca	Rocher Deboule	....	1
Omineca	Red Rose	....	1
Atlin	Big Bull	....	1
Totals		11	11

A drowning from a concentrator barge and a fatality at a railroad loading ramp have been omitted from this table.

The following table classifies all fatal accidents as to cause and location:—

Cause	Number	Location
Falls of ground	5	Underground.
Falls of rock	1	Surface quarry.
Falling down shaft or raise	2	Underground.
Loading from chute	1	Underground.
Aerial-tram accident	1	Surface.
Railroad-ramp accident	1	Surface.
Gassed	1	Underground.
Drowned	1	Surface.
Total	13	

A brief description of all fatal accidents follows.

Leonard Oliver Gostling, Canadian, aged 56, widower, and employed as a switchman by Canadian Exploration Limited at the Emerald mine, near Salmo, was instantly killed when he was crushed between a car and chute at the 3968 stope on 3900 level on January 11th, 1952, at 1.05 p.m.

The 3968 stope is drawn by a slusher, set up on the first lift (or 6 feet) above the 3900 tramming level. The ore is scraped through a chute directly into the cars.

One car of a five-car train was loaded and, while loading the second, the body of the car, a gondola side dump, became knocked off its rocker. The car was righted by W. Frame, motorman, and M. Maxsemenko, car-spotter, after the three empty cars had been disconnected from the train and moved a car length north up the track.

While this was being done, Gostling arrived on the scene, possibly to ascertain when the motor would arrive at his working place, which was near by. He did not assist in righting the car, except to pass over a pinch-bar, but remained standing beside the south side of the chute between the car and the wall timber and facing the motor.

After the car was righted Frame returned to the motor to move it to connect up with the three disconnected cars. He was facing Gostling, who was standing in the same position beside the track not more than 3½ feet away. Frame said "Let's go," but then he inadvertently moved the motor the wrong way to the south about 2 feet. He immediately reversed the motor, and when he looked up from the controls as the train moved north, he saw Gostling pinned between the car and the chute lip. He stopped immediately, but by then the train had moved 4 feet. Maxsemenko had just placed the pinch-bar against the side of the drift, and, as he turned, saw Gostling's right shoulder hit the south lip of the chute and his body make a half turn as it rolled between the car and the chute lip.

Gostling was pinned by the chest, face up, and the car had to be dumped to release him. There was no sign of life, but help and first aid was on the scene almost immediately. The doctor arrived about 2 p.m. and pronounced the man dead.

The inquest was held in Salmo on January 16th, and the following verdict returned:—

" L. O. Gostling met his death at approximately 1.05 p.m., January 11th, 1952, on the 3950 level at the slusher chute in 3968 stope of the Tungsten Mine, Canadian Exploration Limited, situated approximately 10 miles from Salmo, B.C. Death occurred in an accidental manner by Gostling being rolled, crushed and pinned between the lip of a muck car and the lip of the chute as the train was being moved north. We find no evidence of negligence on the part of the company or the workmen involved in the accident."

It is difficult to find an explanation for this accident. He was an experienced man and was well aware of what the train crew were doing. He might have been surprised when the train first moved south instead of north and could have leaned over the cars to see why and so was caught when the motor was reversed.

Claude Linner, Swedish, aged 70 years, single, employed as a timberman in the Bralorne mine, was instantly killed by a fall of ground in 12-51 East Drift No. 6 sill on February 4th, 1952, at about 12 noon. He was an experienced timberman and was assisted by T. Schwartz, also experienced, and two helpers.

Linner and his crew were engaged in retimbering a caved section of 12-51 East Drift just east of a cribbed manway in 15-51-6 stope.

About 7 feet of the drift had been cleared of caved muck when Linner and Schwartz put up a bridge stull and drove a complete row of 6-foot lagging without difficulty. Linner went under the lagging to measure for the hangingwall collar brace while one of the helpers proceeded to clean out the footwall side of the drift to make room for a post under the stull. Just then a small flow of muck spilled out under the forward end of the lagging. The men tried to stop this with their hands but found it impossible to do so. The helper moved back as the bridge stull and lagging were suddenly driven down into the muck below them. The stull fell across Linner's shoulders, forcing him face down into the muck, and the helper's right arm was caught by the lagging. Schwartz and the other helper removed him immediately but were unable to free Linner. Help was immediately summoned, and Linner was removed in fifteen or twenty minutes. He was pronounced dead by the doctor, who believed that he died instantly from asphyxia and shock.

It is believed that the initial cave had left a " hang-up " which was released suddenly and dropped on top of the lagging with sufficient force to knock out the bridge stull.

Evidence was given to the effect that the stull was well hitched into both walls and was evidently driven out sideways, the same way it was put in.

The Coroner's jury returned the following verdict:—

" We, the jury, find that Claude Linner came to his death on February 4, 1952, while at work in the Bralorne Mine, by reason of suffocation caused by crushed chest, from falling timber and muck. We are agreed that death was purely accidental, with no blame attached to any person or persons. We recommend that all timber should be checked and braced as installed. Work of this type should only be undertaken by fully experienced crew."

Alexander Rollick, Canadian, aged 35, single, employed as a miner by The Consolidated Mining and Smelting Company of Canada, Limited, in the H.B. mine, was instantly killed when he fell 71 feet down the 2800 service shaft on May 17th, 1952. The 2800 service shaft is a two-compartment shaft that was being driven as a raise for a vertical distance of 750 feet. One compartment is used for muck, and the other is divided into a manway and skipway which is equipped to handle men. The shaft had been raised 90 feet. The shaft crew, of which Rollick was a member, had just completed timbering the twelfth set and were about to descend. Rollick was on a short ladder on the tenth set when he gave the three-bell signal to the hoistman, indicating that men were descending. Immediately on giving the signal he fell into the skipway, landing on his head 70 feet below. It appeared that he either slipped or fainted immediately after giving the signal.

The shaft specifications called for guards between the manway and skipway as soon as the current shaft timbering was completed. However, the guards would never be carried to the top sets, as these have to be kept open for handling timber.

The inquest was held on May 22nd, and it was brought out in the evidence that the deceased had " blacked out " on previous occasions. The following verdict was returned:—

" We, the jury, find that Alexander Rollick met his death at approximately 3.45 p.m. on May 17th, 1952, in the Service Shaft on the 2800 level at the H.B. Mine, Salmo, B.C., death being caused by an accidental fall down the shaft for a distance of 71 feet. No blame attached to anyone. We also suggest that a suitable guard rail be installed to as near the working face as practical."

Olav Torjusson, Canadian, aged 47, married, a lessee at the Privateer mine, was almost instantly killed by a fall of ground in 1114 stope 1100 level on June 23rd, 1952. The 1114 stope is an old shrinkage stope which had been emptied. A small pillar separates it from 1113 ore-pass, but in some places the pillar has been broken through and some of the ore, mined years ago, has accumulated on the timbered sill of the stope just above the 1100 level. The lessee and two partners, Charles Hill and William Bowen, were removing this ore. The stope was 36 to 40 inches wide, and about 20 feet above the muck a stull and plank bulkhead had been built by the lessees for protection. Other stulls had been placed irregularly throughout the stope. The deceased was picking down the muck pile to fill a car when a large piece of rock, bounded by two joint planes, fell from the wall, striking him and causing death. The largest piece weighed about 1½ tons.

The inquest was held on June 25th, and the following verdict returned by the Coroner's jury:—

" O. Torjusson came to an accidental death with no blame attached to person or persons involved."

Alexander MacLean, Canadian, aged 51 years, single, employed as a miner at the Torbrit Silver mine, Alice Arm, was instantly killed by a fall of ground in 908 stope on July 30th, 1952. No. 908 stope is a long shrinkage stope with a width of 40 to 45 feet east and west. It extends across the orebody for a length from north to south of 195 feet. It is served by two manways—one from the east pillar near the hangingwall, and one from the west pillar near the footwall. Mining is done by benching from the hangingwall toward the footwall. Ordinarily, 10-foot benches are taken with standard steel, but near the centre of the stope a 30-foot bench had been taken with sectional steel to avoid working under a faulted area.

On the morning of July 30th, MacLean and his helper prepared to enter the stope, but at the entrance he sent his helper back to the level above for drill-bits and went into the stope alone. When the helper returned about fifteen minutes later, MacLean was pinned beneath a 5-ton slab of rock, with no sign of life. A long steel was beside him, and he may have been testing the back when the slab fell. The area was reported to have been solid the night before by the miner and shiftboss on the previous shift but may have been loosened by a slash taken at that time.

The Coroner's inquest was held at the Torbrit mine on July 31st, 1952. The jury returned a verdict of accidental death with blame attached to no one.

Malcolm Pringle MacDonald, Canadian, aged 63 years, married and employed as tram-line superintendent by the Western Uranium Cobalt Mines Limited at the Red Rose mine, died in the Hazelton hospital on August 8th, 1952, as a result of injuries received in an accident on the Red Rose aerial tram-line on July 31st, 1952.

The Red Rose aerial tram, connecting the 600 level of the mine with the mill, is just under a mile in length and has thirteen buckets. It is gravity operated, having a difference in elevation between the terminals of about 2,000 feet.

There were no actual witnesses to the accident. MacDonald was inspecting and servicing the tram. He had completed work on the tower nearest the upper terminal and was riding the timber-hooks to the next tower when the grips on the running cable, in some manner, came loose and the timber-hooks ran down the cable and struck the next bucket on the line. MacDonald was thrown against the bucket and fell to the ground, a distance of about 25 feet. He suffered severe multiple injuries.

The inquest was held in Hazelton on August 9th and 11th, and the Coroner's jury returned a verdict of accidental death with fault attached to no one.

William D. Dodd, Canadian, aged 40 years, single, employed as a miner by Golden Contact Mines Limited, McGillivray Falls, died as a result of being overcome by monoxide gas and suffocation in a raise on August 2nd, 1952. The raise was being driven to connect the Pep and 49'er levels. It was on a slope of 50 degrees and had been advanced 130 feet.

A round had been blasted at 11 a.m., and an atomizer turned on at that time. At 12 noon the compressor supplying the air was shut down and was started up at 1.05 p.m. At about 1 p.m. Donald Holmes, trammer, saw Dodd climb into the raise. He drew a car of muck from the chute and was returning after dumping it when he saw Jim Bird, Dodd's partner, climb into the raise about 1.30 p.m. As the muck was very wet, Holmes decided to wait until the water was shut off and the chute drained before drawing more. He waited about an hour and returned. The muck was just as wet, but he decided to draw some more. On filling the third car, he heard a scream from the chute. He investigated and found Bird buried to the armpits in wet muck. Holmes was unable to extricate Bird, even with the assistance of the mine foreman, and it was necessary to draw more muck to get Bird out. Holmes held Bird while the foreman drew the chute. In endeavouring to do this the foreman found the chute would not run. On investigation, he felt Dodd's slicker over the sandboard. He called to Holmes, and together they drew Dodd out of the chute. Bird followed almost immediately. Bird was conscious, but Dodd showed no sign of life. His mouth and nose were completely filled with fine, wet muck.

On recovering, Bird said that when he climbed into the raise he saw that Dodd was not there, but noted that Dodd had disconnected the water-hose from the atomizer and had washed down the face of the raise. Bird put up one lot of staging planks and took measurements for the sprags for the next lot. He then decided to find out where Dodd was and started down the ladder. Part way down he felt his legs give out, and he had no recollection from then until he came to outside the portal. He said the air seemed fresh and cool, and he had no suspicion of dangerous gas.

From evidence given, it was apparent that the compressed air blown during the first hour cleared the smoke but failed to clear the raise of monoxide gas. Dodd evidently had collapsed from the effects of the monoxide, fallen down the raise, become buried in the muck in the chute, and suffocated.

An inquest was held the same day and the jury returned the following verdict:—

"We, the jury, find that Dan Dodd came to his death accidentally from suffocation by carbon monoxide poisoning and a fall down a raise about 2 p.m. on August 2, 1952."

Otta Gaal, immigrant, aged about 20 years, single, employed as a truck-driver by Fred Lipsack, was drowned in the Taku River when he fell from a barge being unloaded at Polaris Landing on August 15th, 1952. Fred Lipsack had a trucking contract with

The Consolidated Mining and Smelting Company of Canada, Limited, to haul freight between Polaris Landing and the mining operations near Tulsequah.

Evidence taken at the inquest held at Tulsequah on August 18th brought out the following points: (1) Gaal had no actual business on the barge in connection with his duties as truck-driver; (2) he was wearing hob-nailed boots, which would be slippery on the steel deck of the barge, which was about 6 inches above the water-level; (3) no one actually saw him fall in, and one witness, about 10 feet away with his back turned, heard a slight splash and saw the top of his head disappear under water; (4) medical evidence showed that he died from sudden mental and physical paralysis due to shock from the very cold water (just above freezing) and drowning.

The Coroner's jury returned the following verdict:—

" We find that Otto Gaal, at a place known as Polaris Landing on the junction of the Taku and Tulsequah Rivers, in the county of Prince Rupert, province of British Columbia, came to his death by drowning, having accidentally fallen into the Tulsequah River from a barge tied to the dock, at about 3.45 in the afternoon of August 15th, 1952. We strongly recommend that unauthorized persons be prohibited from entering upon the barges, and that life-saving equipment as pike poles, ropes and floatable life-savers be kept at all times on the dock and barges at that point."

David Nigel Bruce, Canadian, employed as a shiftboss at the Big Bull mine of The Consolidated Mining and Smelting Company of Canada, Limited, at Tulsequah, was instantly killed by a fall of ground in 4801 cut-and-fill stope at the Big Bull mine on September 15th, 1952. The 4801 stope was being prepared for mining by cut-and-fill methods. It was being widened in several places to the full width of the ore, from a subdrift. The width of the stope ranges from 15 to 40 feet, and was about 20 feet wide at the scene of the accident. The back is approximately 7 feet above the floor. The ore is schistose and contains numerous planes and slips, and the back requires regular daily inspection and scaling. Bruce had just given two miners, Steve Noone and Victor Warren, at another point in the stope, instructions regarding their work for the shift and was walking toward the manway when the fall of rock occurred. The miners, about 50 feet away, heard the fall and ran across to investigate. They found Bruce pinned beneath a piece of rock weighing about 5 tons. Immediate steps were taken to remove the rock.

The inquest was held at Polaris on September 18th, 1952, and the jury returned a verdict of " accidental death with blame attached to no one." The District Inspector of Mines, after a careful examination of conditions, prohibited mining by cut-and-fill methods when ground conditions were found to be as they were at the time and when the average width of the stope was over 20 feet.

Harry Ruby, Canadian, aged 38 years, married, employed as a miner by Gypsum Lime and Alabastine, Canada, Limited, at the Falkland quarry, died as a result of injuries received when struck by falling rock and knocked to the floor of the No. 10 north quarry face on September 23rd, 1952. No. 10 quarry is one of a series of gypsum quarries operated at Falkland by Gypsum Lime and Alabastine, Canada, Limited. The face in the vicinity of the accident is about 100 feet high and slopes back at 60 to 65 degrees. Ruby was working 74 feet above the quarry floor, on a bench about 50 feet long and 7 to 13 feet wide.

Ruby, having completed his work in another part of the quarry, had been sent to the north end to bar down the face and make it ready for drilling. He had just arrived and apparently was sizing up the work to be done when some loose rock fell at the back of the bench where he was standing. David Stebner, a miner working about 20 feet away, saw the rock start to fall and shouted a warning. Ruby tried to get clear but was either struck by the rock or lost his footing and fell to the quarry floor about 74 feet below. Ruby was not wearing a safety belt and safety rope at the time.

An inquest was held in Vernon on October 2nd, 1952; the jury returned the following verdict: " We, the jury, agree that the death of Mr. Ruby was accidental."

Ruby was known to be a careful and conscientious workman, and the working face from which he fell was found to be equipped with a safety rope, but whether or not he had intended to use a safety belt must remain a matter of conjecture.

There is much controversy among quarrymen concerning the advantages and disadvantages of using safety belts attached to safety ropes. Many good experienced men and officials maintain that tying a man to a belt tends to restrict his movements and may hinder or retard a quick getaway in case of sudden emergency. However, the value of a safety belt near steep drop-offs or dangerous places cannot be denied, and consequently an order from the District Inspector of Mines was given, calling attention to the necessity of complying with General Rule 220 of the " Metalliferous Mines Regulation Act."

Daniel Anthony Musgrave Dodgson, aged 20, Canadian, single, employed as a mucker at the Rocher Deboule mine, died on October 15th about 9.45 a.m. as a result of injuries received when he was struck by a fall of ground in 650 stope at about 10.45 p.m. on October 14th, 1952. The 650 stope is a timbered open stope, sloping about 40 degrees; stulls are placed about every 10 feet and are kept within 7½ feet of the face, as they are used to support the drillers' staging. There are chutes below to direct the ore into the cars. The hangingwall rock is a diorite and has, in the past, stood up very well. At the time of the accident a timberman, S. Stuns, and muckers J. F. Lum and Dodgson were mucking in the stope. On the shift previous to the accident a breast had been blasted directly over the chute at which Dodgson was working. There was a large slab of loose rock at the face, and Stuns was preparing a stull to place under it when it fell. It broke into several pieces, and one or more of them struck Dodgson, who was mucking into the chute about 30 feet, slope distance, below.

An inquest was held in Hazelton on October 16th, 1952, and the Coroner's jury returned the following verdict:—

" We, the undersigned Coroner's jury, have concluded that Mr. Daniel Dodgson came to his death accidentally through injuries received from falling rock, which occurred October 14th, 1952, at Western Uranium Cobalt Mines Ltd. No negligence is attributed to either employer or employee. We also recommend that compulsory safety inspection be made by one official of the company, accompanied by one employee."

As a result of this accident the District Inspector of Mines issued the following rule:—

" No employee, other than the one actually engaged in timbering or scaling and then only when absolutely necessary, is to be allowed beneath ground that is known to be loose until either the loose ground is scaled down or supported by adequate timber. I have read Rule 216 of the ' Metalliferous Mines Regulation Act ' of British Columbia, and understand it fully."

William Douglas Bauman, aged 23, Canadian, married, employed as a miner at the Emerald Tungsten mine of Canadian Exploration Limited near Salmo, died as a result of injuries received when he fell down 3868 ore-pass raise at about 12.40 p.m. on December 3rd, 1952. The 3868 raise connects the 3868 sublevel with the 3950 main haulage drift. It is driven on a slope of about 55 degrees, is about 5 by 5 feet in cross-section, and has two knuckle-backs in its length. It was to be used as an ore-pass.

The deceased, together with another miner, Ralph McKeown, and a timberman, Frank Dryzmala, were working at the top of the 3868 raise on the 3950 level preparing the location for a grizzly. During the first part of the shift they had been drilling hitches from a safety platform about 5 feet below the 3950 level. This platform consisted of 2-inch planks resting on two 4- by 6-inch timbers 5 feet apart hitched into the sides of the raise. At lunch-time the planks were removed and the holes blasted. When the men returned, they cleaned around the opening, Dryzmala working on one side and Bauman and McKeown on the other. Bauman then decided to descend the ore-pass to see if the two sprags were still secure enough to be used as supports for the planking which had to be replaced as a safety measure. He descended the raise, facing the footwall while holding on to a rope held by McKeown. Apparently, as he placed his weight on one of the sprags, the support gave away suddenly and he lost his grip on the rope and fell down the raise a distance of about 70 feet.

Help was obtained immediately, and Bauman was removed to the first-aid room in a basket stretcher. He was still breathing faintly at 1.10 p.m., but was pronounced dead by the doctor when he arrived at 2 p.m. An investigation revealed both sprags were sound, the rope was in good condition although slippery, and a safety belt which the shiftboss had provided was near by. The use of this belt very possibly would have prevented the fatality.

An inquest was held in Salmo on December 10th, and the jury returned the following verdict:—

" William Douglas Bauman met his death on December 3rd, 1952, at approximately 1.45 p.m. in the tungsten property of the Canadian Exploration Co., with no blame attached to anyone. Bauman fell down 3868 ore pass from the 3950 level while working in a grizzly opening. The jury recommends that better safety precautions be taken when work of this kind is being done."

A safety belt similar to the one provided was tested and found to have adequate strength. All men engaged in the work around the grizzly were experienced.

Andrew Cook, aged 30, Canadian, married, employed as general surface help by The Consolidated Mining and Smelting Company of Canada, Limited, at the Fairview mine near Oliver, was killed when his head was jammed between a concrete counterweight and the ramp timbers at the Oliver railroad siding on December 24th, 1952. This ramp has a triangular apron hinged to the side of it that can be lowered over an open gondola to allow a truck to back on it and discharge its load into the car. The apron is operated by a cable and hand-winch, and has a concrete counter-weight to make its movement easier.

Cook and Andrew Fraser, blacksmith and first-aid man, had driven from the mine to do some repair on a railway car on the siding about 100 feet from the ramp. They stopped opposite the ramp and Fraser got out. Harvey Murfitt and Harvey Skelton, truckers, were having trouble lowering the apron. Cook got out also and went to the ramp. The cable from the winch was fouled in a block, and the truckers were trying to release it when Cook arrived. The cable was replaced and the apron readied for lowering. The all-clear signal appears to have been given, and Cook was presumed to be in the clear. Murfitt operated the hand-winch and was only a few feet from Cook. The ramp was lowered in position when Cook was found on the ground with his head crushed. Evidently he was standing on the ramp cross-braces behind the concrete counter-balance in a position which he may have thought to be in the clear. Cook was not told to go to the ramp, as it was not part of his duties. He was also warned to get away from the position he was in on the cross-braces. It was recommended by the District Inspector of Mines that the framework of the ramp behind the concrete block be completely boarded up, and that signs warning unauthorized persons not to trespass be posted.

FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

Eleven fatal accidents and 405 accidents involving a loss of time of seven days or more, a total of 416, were reported to the Department. These accidents were investigated and reported on by the Inspectors of Mines.

The following three tables classify the accidents as to cause, as to the occupation of those injured, and as to the parts of the body injured.

Accidents Causing Death or Injury Classified as to Cause

Cause	Number of Accidents	Percentage of Total
Blasting	5	1.2
Breaking of staging, ladders, etc.	2	0.5
Falls of ground	80	19.2
Falling or flying material	36	8.7
Falls from ladders, staging, etc.	22	5.3
Lifting and handling material	116	27.9
Machinery and tools	59	14.2
Slipping	75	18.0
Run of ore or waste	3	0.7
Gassed	1	0.2
Burns and shock	3	0.7
Miscellaneous	14	3.4
Totals	416	100.0

Accidents Causing Death or Injury Classified as to Occupation of Those Injured

Occupation	Number of Accidents	Percentage of Total
Underground—		
Barmen	2	0.5
Chutemen	18	4.3
Haulagemen	25	6.0
Miners	180	43.3
Muckers	44	10.6
Timbermen	20	4.8
Trackmen and pipe-fitters	5	1.2
Miscellaneous	43	10.3
Surface—		
Shops	25	6.0
Mill	21	5.1
Surface, general	33	7.9
Totals	416	100.0

Accidents Causing Injuries Classified as to Parts of the Body Injured

Location	Number of Accidents	Percentage of Total
Head and neck	41	9.9
Eyes	18	4.3
Trunk	48	11.5
Back	56	13.5
Arms	30	7.2
Hands and fingers	80	19.2
Legs	65	15.6
Feet	58	13.9
Toes	6	1.4
Shock	2	0.5
Gas poisoning	1	0.2
Fatal (usually multiple injuries)	11	2.7
Totals	416	100.0

DANGEROUS OCCURRENCES

The following dangerous occurrences were reported as required by section 9 of the " Metalliferous Mines Regulation Act " and investigated by the Inspectors of Mines:—

On January 3rd, 1952, in the No. 2 shaft at Copper Mountain, the main right-hand guide on the muck skip failed immediately after the skip had been loaded with ore. The guide became detached and caused the bail to grip the shaft guides. The skip was only moved about 12 feet before the skip-tender noticed trouble and signalled the hoistman to stop. The damaged skip was removed from service. No men are hoisted in this compartment, and no one was injured. Failure was attributed to neglect in changing the wearing plates soon enough, due to some confusion in supervision. The misunderstanding was clarified.

On January 4th, 1952, at the Spider mine of Sunshine Lardeau Mines Limited, in the final break-through of a raise to the surface, six holes were cut off. They were reprimed and blasted, but when the two miners returned to the top of the raise a seventh charge exploded. Injuries, although numerous, were not serious. Apparently the original priming charge in one hole was not detonated by the repriming charge, but could have been detonated a few minutes later by its original fuse, which must have been ignited by the reblast. This is a case of returning too soon to the scene of a reblast.

On January 16th, 1952, in the 3900 main haulage of the Sullivan mine, a shiftboss, while in the course of his inspection duties, discovered two sample sacks containing powder on the main track. One sack containing seven sticks was intact, but the other sack had been run over by a train and the powder crushed, but not detonated. Small amounts of powder are issued to trackmen and timbermen, and the two sacks were either mislaid or fell while being transported.

On January 17th, 1952, two miners were scraping from No. 4 drawhole in N-13-7 stope in the Sullivan mine. Contrary to company rules, they set off a three-stick bulldoze on the grizzly and a flying rock detonated a box of 60 per cent Forcite in their powder storage box, which was 35 feet up a manway in a direct line with the grizzly. The storage box was removed to a more remote place. Bulldozing on the grizzly is to be more strictly supervised.

On January 18th, 1952, at the sheave-wheel at the top of No. 2 shaft in the Sullivan mine, a timberman had applied Varsol to the sheave-wheel to free it from grease preparatory to painting. As the wheel was wet, he was unable to paint and used a blowtorch to dry the surface. While using the torch, he ignited some combustible material which dropped into the head sheave base, setting fire to grease and Varsol vapours. He put out the fire with a Pyrene extinguisher.

On February 4th, 1952, on the 1900 level of the Reeves MacDonald mine, two electricians reached the scene of a blast, but on seeing the burning fuse were able to retreat to a place of safety in time. The miner responsible for not properly guarding the blast had his blaster's certificate suspended for six months.

On February 14th, 1952, in 1211 stope of the Whitewater mine, Retallack, a miner and his helper were engaged in spitting a round of forty-seven holes plus one bootleg hole. Seven-foot fuse was used in the bootleg and 9-foot in the rest of the round. When spitting the forty-fourth hole, one hole detonated. Fortunately, both men were able to retreat relatively uninjured. The miner had used two hot wire lighters and thus lost track of the time. His provisional blasting certificate was rescinded. The company was advised to use electric blasting or Ignitercord for similar large blasts.

The No. 3 shaft at the Copper Mountain mine is inclined at 45 degrees, and is a new connection being driven as a raise from No. 6 level to the surface, a distance of about 1,000 feet. On March 7th, 1952, this shaft raise had been advanced 760 feet when parts of a 30-foot section of the timber wall between the manway and the muck compartment was pushed in by the weight of broken muck, and the manway was blocked for about six hours. The three men working at the face were not in actual danger at any time, but were unable to leave the raise until a passage had been cleared. No one was injured. A control chute has been installed to prevent too much weight developing on the timber. The shaft raise was completed without further difficulty of this nature.

On March 28th, 1952, a chuteman was loading a train at 39-Q-4 chute in the Sullivan mine. The muck hung up in the chute, and while bumping the chute gate to loosen it, an explosion occurred which blew fine muck over the chute gate. No one was injured and the source of the explosion was not determined.

On April 4th, 1952, in the 3700 sublevel of the H.B. mine near Salmo, a raise below the sublevel broke through unexpectedly during blasting. Two miners in a near-by raise above the sublevel had the good sense to establish a fresh-air base, with the aid of compressed-air and water lines, until it was safe to retreat.

On May 1st, 1952, two miners were driving 41-H-1 Sub "A" level at the Sullivan mine. The sublevel was being driven with jack-legs, and the practice had been for the two men to collar all the holes with one machine and then each drill off his side of the face with his own machine. While drilling a knee hole, one of the men drilled into some powder which exploded. It is believed that he mistook an improperly cleaned out bootleg for one of the newly collared holes. Both men received many painful injuries. In future all bootlegs are to be rimmed with yellow chalk before drilling is started.

On May 16th, 1952, the No. 2 shaft hoistman at the Pioneer mine received a release signal for the west cage at the 25 level. He hoisted the empty cage, and on passing the 23 level noted an undue pull on the motor. He stopped the cage, lowered it half a turn on the drum and contacted the shiftboss, who climbed down the manway to locate the trouble. It was found that the 23 pocket loading-hopper gate had fallen open and the top of the cage had struck the gate. The cage hood was bent and some of the members distorted. After repairs to the cage and hopper gate, and a satisfactory rope test, men were again permitted to ride.

On June 2nd, 1952, at the 2200 level fan station in the Britannia mine, an overheated bearing on the fan motor caused accumulated dust and inflammable matter to ignite. No damage was done. Temperature relays were installed in the motor bearings that will shut down this motor when the temperature of the bearings exceeds 110 degrees Fahrenheit.

On June 13th, 1952, in the 7-05 slusher drift at the Sullivan mine, two miners had fired three bulldoze shots in the course of their work. Eighteen 12-ton cars had been scraped when, on bringing the scraper to the discharge point, an explosion took place. The miner operating the scraper received minor injuries. It is not known how the unexploded powder came to be in the muck pile.

On June 14th, 1952, the cage-tender at the Island Mountain mine dropped the cage gate bar down the shaft while putting muck cars on the cage in the No. 1 compartment. He then loaded an empty car and claimed to have blocked it with wedges. He boarded the cage and signalled to be lowered to the 3250 level. The car came loose from the wedges, projected into the shaft, and caught on the timbers and hung up the cage between the 3875 and 3750 levels. The hoistman did not notice the slack cable until he had stopped the hoist at the indicated depth of the 3250 level. On seeing the slack rope he contacted a labourer on the 3250 level and at the same time brought the No. 2 compartment skip to that level. The labourer boarded the skip and rode up the shaft to locate the cage. On going up the shaft the skip encountered the loose cage cable which had crossed over and now hung in this compartment. This cable caught on the skip and ripped out a divider and guide in the shaft. The skip, however, went through to the shaft collar and the man reported the location of the cage to the hoistman. The hoistman then pulled the cage free and lifted it to the collar. The cable was found to be kinked in two places and was replaced. The shaft was examined and the necessary repairs made. The hoistman, cage-tender, and labourer were reprimanded.

On June 24th, 1952, while preparing to make a routine check on the motor of the ore train in the car-repair shop at the Sullivan concentrator, two repairmen came very close to getting caught between a switching trip and empty cars on the track. The trip had been put on the spare track, and in taking the motor into the shop, a string of eighteen empties on this track was bumped. As the track extended to the repair-shop, the men working there were endangered by the moving cars. Up to this time, empties on this track had not been blocked in any manner and there was a complete lack of liason between repair crews and motor crews.

On June 30th, 1952, in the main haulage level of the Jersey mine of Canadian Exploration Limited, near Salmo, a battery locomotive caught fire due to a short circuit from a damaged cable. Considerable smoke was caused, and all-service masks had to be used to bring the locomotive to the surface. Fortunately, the ventilation was outcast on this level so that no smoke entered the working places.

On July 7th, 1952, in the main haulage level of the Reeves MacDonald mine, poor visibility due to smoke was responsible for a rear-end collision when an ore train overtook the passenger train. One man was thrown off and suffered bruises to shoulder and leg. It was fortunate, however, that no derailment occurred, as otherwise, with thirty-five men on the man trip, the incident could have been much more serious. A blocklight system was later installed.

On July 14th, 1952, on the aerial tram-line between the Silbak Premier and Indian mines, a carriage carrying five men was just inside the Indian, or upper, terminal when the tram-line was stopped by a signal. The oscillation of the running cable caused the carriage to move backwards. The men jumped as they noticed the front cable grips were loose. The carriage ran backwards on the standing cable and was demolished when it struck the following bucket. No one was injured. The upper terminal operator had apparently signalled to stop the tram too soon, and the carriage was not in the terminal far enough. The front set of cable grips were detached automatically and the other set by the operator's helper, a new man, who had not fully understood instructions given him by the operator.

On July 23rd, 1952, in the open-cut operation of the Silver Giant mine near Spillimacheen, a miner suspected, but failed to find, a missed hole from the previous day's slashing. In order to level off a hump on the bench, he proceeded to drill across the line of the old holes. The third hole he drilled ran into the missed hole, and the resulting explosion threw him about 75 feet down the hillside. He suffered only minor cuts and bruises.

On August 3rd, 1952, two miners were injured by flying material from a blast they had just ignited at the bottom of a 45-degree inclined shaft in the Jackson mine near Retallack. Twenty holes had been spit and 10-foot fuse was used. A second hot wire lighter was obtained after the first had been dropped in the water; thus the men remained too long at the face.

On August 5th, 1952, at the upper terminal of the Indian-Silbak Premier tram-line, the carriage carrying four men was on the break-over at the entrance to the terminal when one of the men jumped from the carriage, causing it to swing in such a manner as to catch the end of the guard-rail with the back hanger. This stopped the tram-line. To prevent a recurrence, the guard-rail was replaced by a longer one. Two of the men received slight injuries.

On August 13th, 1952, a 1,000-foot length of hoisting rope installed in the 3927 shaft of the Sullivan mine on July 6th was observed to have twenty imperfections in its length. These consisted of inner wires bulging up between the outer wires, the effect being considered the equivalent of a broken wire. Ropes on the 3932 shaft, from the same reel, showed the same defects, and it would appear that these defects occurred in the manufacturing. All three ropes involved were replaced immediately.

On September 5th, 1952, the raise at the top of the 3902 conveyor incline in the Sullivan mine became filled with float rock, but the flapper switch, located near the drive head pulley and designed to stop the belt when this condition occurred, failed to function. This caused the rock to spill behind the tail pulley and to get in between the drive head pulley and the belt. The belt was stopped, but the motor and drive head pulley continued to run, causing heat and dense smoke. Mine-rescue personnel, equipped with Chemox breathing apparatus, advanced up the incline and stopped the motor by pulling the master switch.

On September 6th, 1952, two miners at the Noland underground placer operation near Atlin were lighting the sixth hole of a six-hole round when the first hole exploded. Although one man received severe injuries and the other had particles of sand and gravel imbedded in his arms, legs, and face, both were able to get clear of the face before the other holes exploded. There is no explanation of this accident, as the workmen claimed they had followed normal blasting procedure.

On September 10th, 1952, the hoisting rope in the old Bluebell shaft of the Bluebell mine at Riondel failed, and the skip fell about 650 feet down the 35-degree incline. The shaft was used for hoisting muck only. The rope broke just as the skip was starting its return trip to the bottom after having dumped a load of muck. It jumped the track and lodged in the timbers supporting the 225-level ore-pocket. Little damage was done and no workmen were in the vicinity. The rope had been in use twenty-seven months and was to have been changed the next day. It showed evidence of improper lubrication, but it is believed that the failure was caused by a kink that had happened previously and had not been reported.

On September 11th, 1952, the grips failed on an empty bucket on the Indian-Silbak Premier tram-line just as it was entering the upper terminal. It ran backward, crashing into and knocking off the following bucket. The night shift, returning to Premier on the heavy side of the line, felt a sudden jarring and shaking, but no one was injured. Apparently this mechanical failure was caused by the bucket being improperly attached to the running cable at the Premier end.

On September 16th, 1952, two workmen in the car-shop at the Sullivan mine, while hooking up their welding outfit, discovered jets of water coming from the nozzle tips. They assumed that there was too much water in the flash-back cylinder, a safety device partly filled with water to prevent any water from getting into the main supply-line of acetylene. One of the men, while attempting to drain the flash-back cylinder, unknowingly opened up the valve on the main acetylene line. A spark from some source ignited the gas, causing a small explosion and fire. An emergency valve was used to shut off the gas, and the fire was extinguished. One of the men received burns on his right wrist.

On September 25th, 1952, the drum on a tugger hoist servicing a winze on the 3500 level of the H.B. mine near Salmo fractured at the flange, allowing it to run free. The bucket fell 65 feet to the bottom of the 70-degree incline and, on striking the bottom, pinned a workman against the wall. Injuries suffered were a lacerated face and fractured pelvis.

On October 7th, 1952, at the Cariboo Gold Quartz mine, a miner in 21-165 stope deliberately drilled into the bootleg hole of a blasted round. Apparently some powder remained at the bottom of the hole and drilling caused it to detonate. The miner suffered face and chest lacerations. His blasting certificate was suspended for a period of six months.

On November 14th, 1952, a shiftboss entered a raise in the No. 6 conveyor tunnel of Canadian Exploration Limited, two hours after blasting, to turn on the compressed air.

He was overcome by gas and was unconscious when found two hours later. He suffered no ill effects. More attention to ventilation rules would have prevented this accident.

On December 5th, 1952, two miners, working in the 30122 raise at the Sullivan mine, were instructed to clear out the raise with compressed air preparatory to resuming work at the face. They blew air on the sublevel below for fifteen minutes but neglected to procure extra hose and sweep the face. One of the men went up the raise to tie a rope to a sprag, was overcome by foul air, and fell and slid 100 feet down the raise to the muck. He suffered concussion, head and face lacerations, carbon-monoxide poisoning, and a bruised left arm.

On December 8th, 1952, on the Indian-Silbak Premier tram-line, the grips on a loaded bucket failed just as it left the Indian terminal. The bucket ran free down the standing cable, striking the next bucket in front and knocking both from the line. No men were riding the tram at the time. The grips apparently had not been attached properly to the running cable.

On December 18th, 1952, the skip in the 601 shaft of the Premier mine, Premier, was hoisted too high, with the result that the top clamp on the cable entered the sheave-wheel and broke out a section of the flange about 10 inches in length. No one was riding the skip at the time.

At the time of the accident an electrician was in the hoist-room looking for an apparent short in the ammeter circuit. The hoistman had been running the hoist for short distances, stopping and starting the motor to assist the electrician in making the examination. At the time of the overwind the hoistman was not watching the indicators. The overwind switch cut off the power, but the skip did not stop until the first clamp had entered the sheave-wheel. A new sheave-wheel was installed.

PROSECUTIONS

There were no prosecutions in metalliferous mines and quarries in 1952.

EXPLOSIVES USED IN MINES

The table below shows the quantities of explosives and blasting accessories used in the metal mines and quarries in British Columbia in 1948, 1949, 1950, 1951, and 1952:—

	1948 Total	1949 Total	1950 Total	1951 Total	1952 Total	1952	
						Mines	Quarries
High explosives (lb.)	6,209,950	7,022,000	7,318,962	9,162,179	9,935,946	9,505,073	430,873
Blasting-caps	1,816,000	2,082,400	2,518,200	2,570,600	3,159,900	2,920,500	238,400
Electric blasting-caps	61,150	146,760	65,725	163,920	166,740	148,015	18,725
Delay electric blasting-caps (short period)	....	....	....	232,375	250,649	244,429	6,220
Delay electric blasting-caps (sure fire)	78,800	36,170	110,269	105,950	205,140	205,140	....
Primacord (ft.)	417,000	421,000	460,000	283,000	522,000	514,000	8,000
Safety fuse (ft.)	16,053,900	16,838,400	19,934,700	19,832,300	22,754,200	21,714,700	1,039,500
Ignitercord (ft.)	....	....	....	151,700	146,600	146,600	....
Ignitercord connectors	....	....	....	100,900	114,100	114,100	....

Several points in this table are worthy of special mention.

An increase of almost 8 per cent in the total quantity of high explosives used is a direct indication of the increased activity in the industry.

The large increases in the use of delay electric blasting-caps and Primacord indicates the definite adoption of these safer and more efficient methods of blasting.

The slight falling off in the use of Ignitercord in view of the increase in explosives and all blasting accessories is very much to be regretted. It is difficult to understand why this very definite aid to safe and efficient fuse and cap blasting has not been more universally adopted.

UNDERGROUND DIESEL EQUIPMENT

The use of diesel-driven equipment suitable for underground was increased in 1952. Installations included haulage locomotives, trucks, caterpillar-type bulldozers and loaders. Although there were instances where lack of adequate ventilation and insufficient servicing of scrubbing apparatus made it necessary for the Inspectors of Mines to require corrective measures to be taken, in general the companies using this equipment took adequate measures to ensure its safe operation. Experience to date has shown that this equipment is safe and efficient when operated under existing regulations.

AIR-SAMPLING

Air samples were taken wherever conditions indicated the possibility that noxious gases might be present or that the oxygen content of the air might be below normal, and also to check determinations made by methane detectors, carbon-monoxide detectors, and flame safety lamps. A total of seventy-nine air samples were taken and analysed for oxygen, nitrogen, carbon dioxide, carbon monoxide, sulphur dioxide, methane, and hydrogen, etc., as circumstances and conditions indicated. This is forty more than in 1951, the increase being due to the necessity of sampling to ensure safe underground diesel operation. Of the seventy-nine samples, eighteen were taken to test diesel exhaust gases and a substantial proportion of the remainder to test the air in which the diesels were operating.

DUST AND VENTILATION

Problems in dust control and ventilation have continued to receive the attention of mine operators and Government departments.

Complete dust counts and ventilation surveys were made in fifty-three of the more important mines by the Silicosis Branch of the Workmen's Compensation Board. In addition, forty-two surveys of dust conditions were made in the crushing plants and assay offices of operating mills.

Over-all dust counts were generally found to be below the range where a hazard is thought to exist. In some cases, as a result of these surveys, recommendations were made as to methods of improving ventilation and suppressing dust. Subsequent dust counts have proved the value of these recommendations. The results of the dust and ventilation surveys are available to the Inspectors of Mines and are of considerable assistance to them. In general the mine managements are making a conscientious effort to eliminate, as far as possible, this hazard.

Aluminium therapy for the prevention of silicosis is available at nearly all mines of any size where a silicosis hazard exists.

MINE-RESCUE, SAFETY, AND FIRST AID

During 1952 the mine-rescue stations at Cumberland, Princeton, and Fernie were fully maintained, with modern equipment and an instructor qualified in mine-rescue and first aid at each station. Each station is equipped with several sets of McCaa 2-hour self-contained oxygen breathing apparatus, one set of Chemox 1-hour self-contained oxygen breathing apparatus, all-service gas masks, self-rescuers, methane and carbon-monoxide detectors of the latest type, an H.H. inhalator, and a complete supply of first-aid equipment. Supplies and facilities for charging and servicing this equipment are also maintained.

Training in the use of mine-rescue equipment is given at the stations to all who apply for it, and fully trained teams are given regular monthly practice-training as a unit, not only to keep them familiar with the use of the machines, but to teach them the value of teamwork in mine-rescue operations. In addition, the instructors hold first-aid classes at the stations and at the mines in their areas, as well as visiting some of the more remote mining areas to give instruction in both mine-rescue and first aid.

The mobile mine-rescue unit and instructor, first stationed at Nelson in 1950, continued to be a very valuable asset to the mining operations in that area. First-aid classes were held at the H.B. and Canadian Exploration Limited mines near Salmo, the Cork Province mine near Kaslo, and at Zincton, Sandon, and Riondel. Examinations were held at these places, and sixty-seven candidates successfully passed for St. John Ambulance certificates and higher awards.

Classes in mine-rescue work were held at Canadian Exploration Limited mines, the Reeves MacDonald mine, and the Bluebell mine. Of the fifty-three who took all or part of the course in mine-rescue, twenty-two were examined and awarded certificates.

The fact that these totals are not as high as those of 1951 indicates an increasing interest in this work by the mining companies, as much of the instructing is being done by qualified men at the mines, many of whom have been trained by Department of Mines instructors.

Equipment from the mobile unit was also used to make an examination of the Euphrates tunnel for the Granby Company.

The Sullivan and Copper Mountain mines each have one or more sets of McCaa 2-hour apparatus, and complete sets of Chemox apparatus are maintained at Wells, Hedley, Bridge River, and Britannia. Minor amounts of mine-rescue equipment are kept at the Torbrit mine at Alice Arm, the Silbak-Premier near Stewart, and the Giant Mascot near Spillimacheen. This equipment is periodically checked by one of the mine-rescue instructors.

Teams trained at mines remote from the stations are visited and examined by one of the regular instructors. In this connection, mine-rescue and first-aid instruction was given at Bralorne, Pioneer mine, Wells, Torbrit mine, and the Giant Mascot mine by the instructor from Cumberland; and at the Estella mine near Wasa, the Paradise near Invermere, the Giant Mascot, the Pioneer and Bralorne mines, and Britannia mine by the instructor from Princeton. The Inspector of Mines and the instructor for the district arrange the course of instruction and conduct the examinations.

A certificate of competency in mine-rescue work is granted to each man who takes the full training course and passes the examination set by the Department of Mines. During 1952, in addition to the regular teams in training, 119 men took the full training course and were granted certificates of competency, as follows:—

Cert. No.	Name	Where Trained	Cert. No.	Name	Where Trained
2575	John Boyd Anderson	Kimberley.	2635	Ivan Frank Randall	Riondel.
2576	Donald Robins DeLaporte	Kimberley.	2636	Norman Ninatti	Cumberland.
2577	John Oakley Trinder	Kimberley.	2637	Peter O'Sullivan	Bralorne.
2578	Erick Walter Ekskog	Kimberley.	2638	Russell B. McLean	Bralorne.
2579	Harvey Dietz	Kimberley.	2639	Lars Larsen	Bralorne.
2580	Melvin Eugene Almas	Kimberley.	2640	D. Ashe	Copper Mountain.
2581	James H. R. Davis	Kimberley.	2641	D. S. Ashe	Copper Mountain.
2582	John McS. McConnachie	Kimberley.	2642	John J. Crowhurst	Copper Mountain.
2583	Eric Stone	Kimberley.	2643	N. J. Kirby	Copper Mountain.
2584	Douglas Hugh Smith	Kimberley.	2644	T. E. Rowbottom	Copper Mountain.
2585	Archie Preston Lilley	Kimberley.	2645	B. Raymor	Copper Mountain.
2586	Jack Blinn Golthorp	Kimberley.	2646	William Shindle	Copper Mountain.
2587	Joseph G. P. Desjardins	Kimberley.	2647	H. J. Schroeter	Copper Mountain.
2588	Herbert N. Curry	Cranbrook.	2648	J. M. Stitt	Copper Mountain.
2589	James Bennie, Jr.	Cumberland.	2649	M. L. Truitt	Copper Mountain.
2590	Clyde Lewis	Cumberland.	2650	John D. Hankinson	Pioneer.
2591	Robert Charles Moore	Cumberland.	2651	Ray W. Mikk	Pioneer.
2592	Gerald Andrew Gordon	Salmo.	2652	Herbert J. Forsythe	Pioneer.
2593	Stanley G. Hill	Salmo.	2653	Thomas John Gray	Pioneer.
2594	Archibald McCutcheon	Salmo.	2654	Michael Mahon	Wells.
2595	Frederic Richards	Salmo.	2655	Rodney Noga	Wells.
2596	Joseph J. Shukin	Salmo.	2656	Cecil C. LeClair	Wells.
2597	Robert Gerald Weber	Salmo.	2657	Frank Campbell	Wells.
2598	Brian Richard Woolfe	Salmo.	2658	Vans Havelock Hulbert	Natal.
2599	John Harcoff	Remac.	2659	Phillip D. Larbalestier	Natal.
2600	John Richard O'Rourke	Remac.	2660	Guido D'Angelo	Natal.
2601	John M. Peregoodoff	Remac.	2661	Michael Mikalynuk	Natal.
2602	James Balfour Shannon	Remac.	2662	Paul Kusnir	Michel.
2603	Owen Edward Weightman	Kimberley.	2663	Stephen Orydzuk	Michel.
2604	Samuel Elias	Kimberley.	2664	Joseph Pogadl	Michel.
2605	John Peter Rokosh	Kimberley.	2665	James Brown Singleton	Fernie.
2606	Arvid Ingvald Osing	Kimberley.	2666	George Joseph LeCollier	Alice Arm.
2607	Joseph M. B. Scarborough	Kimberley.	2667	Allan Douglas Munn	Alice Arm.
2608	Donald Hogarth	Kimberley.	2668	George D. Rea	Alice Arm.
2609	James Scott Riddell	Kimberley.	2669	Cameron G. MacFarlane	Alice Arm.
2610	Garnett Coulter	Kimberley.	2670	Archibald Robertson	Alice Arm.
2611	William Ralph Robertson	Kimberley.	2671	Harry Babty	Alice Arm.
2612	Howard Johnston Rayner	Kimberley.	2672	John C. Fredericks	Alice Arm.
2613	Reginald W. Holditch	Kimberley.	2673	Daniel Baldson	Alice Arm.
2614	Kenneth Bourdon	Riondel.	2674	George Wheeler	Alice Arm.
2615	Earl Arthur Cutler	Riondel.	2675	John Crichton	Alice Arm.
2616	Frank George Downing	Riondel.	2676	Edward Troube	Alice Arm.
2617	Clarence Larry Feidler	Riondel.	2677	Archibald M. Cormie	Alice Arm.
2618	William H. R. Gibney	Riondel.	2678	Frank J. Sintich	Alice Arm.
2619	Patrick F. Griffiths	Riondel.	2679	Jack Tellam	Alice Arm.
2620	John Donald McDonald	Riondel.	2680	C. P. T. Brown	Britannia Beach.
2621	Ralph Griffin Peitzsche	Riondel.	2681	Paul D. Campbell	Britannia Beach.
2622	Leslie Martin Rylan	Riondel.	2682	Charles S. Clark	Britannia Beach.
2623	Jack Bysterbosch	Nickel Plate.	2683	W. J. Deuling	Britannia Beach.
2624	R. H. Currie	Nickel Plate.	2684	N. M. Fillip	Britannia Beach.
2625	Robert E. French	Nickel Plate.	2685	Albert T. Hanson	Britannia Beach.
2626	George Friesen	Nickel Plate.	2686	R. F. Nasstrom	Britannia Beach.
2627	Duncan Hendsbee	Nickel Plate.	2687	William Owen Jones	Salmo.
2628	P. Jenner	Nickel Plate.	2688	Rolland Allaire	Bralorne.
2629	John Lamb	Nickel Plate.	2689	Daniel Colvin	Bralorne.
2630	Henry Nickel	Nickel Plate.	2690	Lachlan McMillan	Bralorne.
2631	Peter Rempel	Nickel Plate.	2691	F. Menhinick	Bralorne.
2632	Joseph S. Smith	Nickel Plate.	2692	Robert Richardson	Bralorne.
2633	Gordon R. Wilson	Nickel Plate.	2693	Harry Skogland	Bralorne.
2634	C. T. Williams	Nickel Plate.			

The Mine Safety Associations in the different centres in the Province, sponsored by the Department of Mines and aided by company engineers and officials, Inspectors of Mines, and mine-rescue instructors continued to promote mine-rescue and first-aid work and safety education in their respective districts.

First-aid and mine-rescue competitions were held in Cumberland, Princeton, Chapman Camp, Kaslo, and Britannia. The problems for these competitions are set by the Department of Mines, and the judges are chosen from the staff of Inspectors and mine-rescue instructors.

Owing to the closing of the mine-rescue station at Nanaimo in August, 1951, the competition held by the Vancouver Island Mine Safety Association was held in Cumberland. Two teams competed—one from the No. 8 mine at Cumberland and one from the Tsable River mine. The winning team was the Tsable River team, captained by John Thomson.

At Britannia Beach a total of six teams took part in the mine-rescue competition held by the Central British Columbia Mine Safety Association. There were two teams from the Britannia mine—one from the No. 8 mine (Britannia) and one from the Townsite—and one team each from the Bralorne, Pioneer, Cariboo Gold Quartz, and Island Mountain mines. The team from Bralorne, captained by A. Mracek, and the team from No. 8 mine Britannia, captained by William Harrison, tied for first place.

At Chapman Camp a total of six teams took part in the competition held by the East Kootenay Mine Safety Association. These included two teams from the Sullivan mine—one from the East Section and one from the South Section—two teams from the Michel mine and one team each from Fernie and Coal Creek. The teams representing the Sullivan were chosen by holding a local elimination competition before the meet. The winning team was the Sullivan team from the East Section of the mine, captained by Harvey McDonald.

At Princeton a total of four teams competed in the mine-rescue competition held by the Similkameen Valley Mine Safety Association. There were two teams from the Copper Mountain mine and two teams from the Nickel Plate mine. The winning team was the No. 1 Nickel Plate team, captained by R. Richards.

At Kaslo the West Kootenay Mine Safety Association held its second annual competition. A total of five teams competed: two from the Bluebell mine at Riondel, one from the Emerald mine at Salmo, one from the Reeves MacDonald mine at Remac, and a visiting team from the Nickel Plate mine at Hedley. This last team had taken part and placed second in the Similkameen Valley Mine-rescue Competition at Princeton. The winning team was the No. 2 Bluebell team, captained by W. Dibney.

At all the meets except the one staged at Britannia Beach, competitions in first-aid work as well as mine-rescue were staged. In all these competitions, events were held for women and juniors; representatives of other industries and organizations not necessarily directly connected with mining also participated.

Local first-aid competitions were held at the Pioneer and Britannia mines. At Pioneer, teams from Bralorne and Pioneer mines competed, and in both competitions events were held for women and juniors.

A local competition in both mine-rescue and first aid was held at Kimberley for those directly connected with " Cominco " operations. Teams in mine-rescue and first aid from the Bluebell mine took part in this competition.

The participation of women, juniors, and those not directly connected with the industry is very commendable, and does much to create and sustain interest in this important work.

JOHN T. RYAN TROPHY

The John T. Ryan Regional Safety Award for the metal mine with the lowest accident record for 1951 was won by The Consolidated Mining and Smelting Company's Sullivan mine at Kimberley and concentrator at Chapman Camp. The award was presented to the men and officials of the company at the annual mine-rescue and first-aid competition of the East Kootenay Mine Safety Association that was held in Chapman Camp on June 14th, 1952.

The 1951 award for coal mines was won by the Elk River Colliery of The Crow's Nest Pass Coal Company Limited and was presented at a meeting of the Rocky Mountain Branch of the Canadian Institute of Mining and Metallurgy held in Fernie on June 17th, 1952.

Coal-mining

By Robert B. Bonar, Senior Inspector of Coal Mines

CONTENTS

PRODUCTION

The output of the collieries is given in short tons. The gross output of the coal mines of the Province for the year 1952 was 1,650,619 tons, a decrease of 173,765 tons or 9.6 per cent from 1951; 261,597 tons of the total output came from strip mines at Michel and Tent Mountain.

Vancouver Island collieries produced 403,723 tons, a decrease of 135,424 tons or 25.1 per cent from 1951.

The Northern District production was 41,158 tons, an increase of 10,262 tons or 33.2 per cent over 1951.

The Nicola-Princeton District production was 7,445 tons, an increase of 2,605 tons or 53.8 per cent over 1951.

The East Kootenay District production was 1,198,293 tons, a decrease of 51,208 tons or 4.1 per cent from 1951.

Output and per Capita Production, 1952

Colliery and Mine	Gross Output Mined during Year (Tons)	Days Worked	Total Number of Employees	Daily Output per Employee (Tons)	Yearly Output per Employee (Tons)	Number of Employees Underground	Daily Output per Underground Employee (Tons)	Yearly Output per Underground Employee (Tons)
Comox Colliery (No. 8 mine)	187,453	210	273	3.27	686	219	4.07	855
Tsable River Colliery	122,022	212	176	3.27	693	159	3.62	767
South Wellington No. 10 mine[1]	5,126	13	......	......	......	......	......	......
Bright mine	81,533	229	78	4.56	1,045	67	5.31	1,217
Chambers mine	840	94	4	2.23	210	3	2.98	280
Chambers mine (strip)	290	49	3	......	......	......	......	......
Loudon mine	1,054	195	5	1.08	211	5	1.08	211
Lewis mine (Timberlands)	843	214	2	1.96	421	2	1.96	421
Wellington mine (Carruthers)	580	191	2	1.51	290	2	1.51	290
Stronach mine	1,586	230	7	0.98	226	5	1.37	317
Cassidy mine No. 7	1,803	202	4	2.23	451	3	2.97	601
Wellington Blue Flame mine	390	120	2	1.62	195	2	1.62	195
Wende mine	203	103	2	0.98	101	2	0.98	101
Taylor Burson mine (Blue Flame)	6,306	273	12	1.92	525	11	2.10	573
Coldwater Coal mine	1,139	230	3	1.65	380	2	2.47	569
Bulkley Valley Colliery	37,304	255	51	2.86	731	41	3.56	909
Reschke mine	2,371	170	6	2.33	395	5	2.79	474
Gething mine No. 3	1,483	139	9	1.18	165	8	1.33	185
Elk River Colliery	303,235	240	344	3.67	881	267	4.73	1,136
Michel Colliery (underground)	633,461	249	659	3.86	961	486	5.23	1,303
Michel Colliery (strip)	255,395	......	52	......	......	......	......	......
Coleman Collieries[2] (strip)	6,202	......	......	......	......	......	......	......

[1] Closed down January 19th, 1952.
[2] Formerly Hillcrest Mohawk Collieries.

Collieries of Vancouver Island District

The output of Vancouver Island collieries was 403,723 tons. Of this amount, 111,096 tons or 27.5 per cent was lost in preparation for market, and 2,986 tons or 0.7 per cent was used by the operating companies as fuel under boilers, etc. The total sales amounted to 267,346 tons, and 22,295 tons was put on stocks. Of the amount sold in competitive market, 225,830 tons was sold in Canada, 1,599 tons sold in the United States, and 39,917 tons sold to other foreign countries.

Collieries of the Nicola-Princeton District

The gross total of 7,445 tons produced in the collieries of the Nicola-Princeton District was sold in Canada.

Collieries of the Northern District

A total of 41,124 tons was sold in Canada from the Northern District; 34 tons was added to stocks, the gross output for 1952 being 41,158 tons.

Collieries of the East Kootenay District

The gross output of the collieries in the East Kootenay District was 1,198,293 tons. Of this amount, 113,027 tons or 9.4 per cent was lost in preparation for the market; 15,813 tons or 1.3 per cent was used as fuel under company boilers, etc.; and 245,528 tons was used in making coke. Of the amount sold in competitive market, 761,470 tons was sold in Canada and 60,601 tons sold in the United States.

Output and per Capita Production in Various Districts, 1952

District	Gross Output Mined during Year (Tons)	Total Number of Employees at Producing Collieries	Yearly Output per Employee (Tons)	Number of Men Employed Underground in Producing Collieries	Yearly Output per Underground Employee (Tons)
Vancouver Island District	403,433	555	727	469	860
Nicola-Princeton District	7,445	15	496	13	573
Northern District	41,158	66	623	54	762
East Kootenay District	936,696	993	943	744	1,259
Whole Province	1,388,732	1,629	852	1,280	1,085

Note.—The above table deals only with coal mined from underground operations. Coal-stripping operations and the men employed at strip mines are not included.

Output per Man-shift, Underground Mines, 1942–52

Year	Man-shifts[1]	Tonnage	Average per Man-shift (Tons)
1942	662,505	1,938,158	2.92
1943	773,088	1,786,152	2.31
1944	703,384	1,767,989	2.51
1945	627,110	1,518,673	2.42
1946	596,631	1,463,640	2.45
1947	496,727	1,485,476	2.99
1948	434,074	1,281,530	2.95
1949	520,188	1,589,131	3.05
1950	460,159	1,481,813	3.22
1951	442,170	1,434,974	3.24
1952	383,422	1,388,732	3.62

[1] Includes both surface and underground workers.

The following tables show the production and distribution of coal by the various collieries and districts, also distribution of men employed, compiled from returns furnished by the owners:—

COLLIERIES OF BRITISH COLUMBIA, 1952—PRODUCTION AND DISTRIBUTION, BY COLLIERIES AND BY DISTRICTS (IN SHORT TONS)

Mine	Gross Output	Washery Loss	Net Output	Used under Companies' Boilers, etc.	Used in Making Coke	Stocks: On Hand First of Year	Stocks: On Hand Last of Year	Stocks: Added To	Stocks: Taken From	Sales: In Canada	Sales: In U.S.A.	Sales: Elsewhere	Sales: Total Sales
Vancouver Island District	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Canadian Collieries (D.) Ltd.—													
Comox Colliery (No. 8 mine)	187,453	59,698	127,755	1,387	......	1,851	13,853	12,002	......	95,193	928	18,245	114,366
Tsable River Colliery	122,022	29,753	92,269	1,002	......	1,677	10,345	8,668	......	68,751	671	13,177	82,599
South Wellington No. 10 mine[1]	5,126	1,391	3,735	41	......	614	......	......	614	3,725	......	583	4,308
Bright mine	81,533	20,254	61,279	556	......	2,025	4,234	2,209	......	50,602	......	7,912	58,514
Chambers mine (underground and strip)	1,130	......	1,130	......	......	......	......	......	......	1,130	......	......	1,130
Loudon mine	1,054	......	1,054	......	......	......	......	......	......	1,054	......	......	1,054
Lewis mine (Timberlands)	843	......	843	......	......	......	......	......	......	843	......	......	843
Wellington mine (Carruthers)	580	......	580	......	......	......	......	......	......	580	......	......	580
Stronach mine	1,586	......	1,586	......	......	......	......	......	......	1,586	......	......	1,586
Cassidy No. 7 mine	1,803	......	1,803	......	......	320	350	30	......	1,773	......	......	1,773
Wellington Blue Flame mine	390	......	390	......	......	......	......	......	......	390	......	......	390
Wende mine	203	......	203	......	......	......	......	......	......	203	......	......	203
Totals, Vancouver Island District	403,723	111,096	292,627	2,986	......	6,487	28,782	22,909	614	225,830	1,599	39,917	267,346
Nicola-Princeton District													
Taylor Burson mine (Blue Flame)	6,306	......	6,306	......	......	......	......	......	......	6,306	......	......	6,306
Coldwater mine	1,139	......	1,139	......	......	......	......	......	......	1,139	......	......	1,139
Totals, Nicola-Princeton District	7,445	......	7,445	......	......	......	......	......	......	7,445	......	......	7,445
Northern District													
Bulkley Valley Collieries	37,304	......	37,304	......	......	100	134	34	......	37,270	......	......	37,270
Reschke mine	2,371	......	2,371	......	......	......	......	......	......	2,371	......	......	2,371
Gething No. 3 mine	1,483	......	1,483	......	......	......	......	......	......	1,483	......	......	1,483
Totals, Northern District	41,158	......	41,158	......	......	100	134	34	......	41,124	......	......	41,124
East Kootenay District													
Crow's Nest Pass Coal Co. Ltd.—													
Elk River Colliery	303,235	26,469	276,766	4,060	......	......	......	......	......	240,957	31,749	......	272,706
Michel Colliery (underground and strip)	888,856	85,814	803,042	11,753	245,528	150	2,004	1,854	......	515,055	28,852	......	543,907
Coleman Collieries (strip)[3]	6,202	744[2]	5,458	......	......	......	......	......	......	5,458	......	......	5,458
Totals, East Kootenay District	1,198,293	113,027	1,085,266	15,813	245,528	150	2,004	1,854	......	761,470	60,601	......	822,071
Grand totals for Province	1,650,619	224,123	1,426,496	18,799	245,528	6,737	30,920	24,797	614	1,035,869	62,200	39,917	1,137,986
Coke													
Crow's Nest Pass Coal Co. Ltd.—													
Michel Colliery	177,266	......	......	......	......	20,383	15,208	......	5,175	104,908	77,533	......	177,266

[1] Closed down January 19th, 1952. [2] Estimated. [3] Formerly Hillcrest Mohawk Collieries.

Collieries of British Columbia, 1952—Men Employed, Distribution by Collieries and by Districts

Mine	Supervision and Clerical			Miners			Helpers			Labourers			Mechanics and Skilled Labour			Boys			Total Men Employed		
	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.—																					
Comox Colliery (No. 8 mine)	14	9	23	138	......	138	......	......	......	53	23	76	14	22	36	......	......	......	219	54	273
Tsable River Colliery	10	......	10	93	......	93	......	......	......	40	12	52	14	5	19	2	......	2	159	17	176
South Wellington No. 10 mine[1]	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Bright mine	5	......	5	36	......	36	......	......	......	21	10	31	5	1	6	......	......	......	67	11	78
Chambers mine	1	......	1	2	......	2	......	......	......	......	......	......	......	1	1	......	......	......	3	1	4
Chambers strip mine	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Loudon mine	1	......	1	4	......	4	......	......	......	......	......	......	......	......	......	......	......	......	5	......	5
Lewis mine (Timberlands)	......	......	......	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Wellington mine (Carruthers)	......	......	......	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Stronach mine	1	......	1	4	......	4	......	......	......	......	2	2	......	......	......	......	......	......	5	2	7
Cassidy No. 7 mine	1	......	1	2	......	2	......	......	......	......	1	1	......	......	......	......	......	......	3	1	4
Wellington Blue Flame mine	......	......	......	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Wende mine	......	......	......	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Totals, Vancouver Island District	33	9	42	287	......	287	......	......	......	114	48	162	33	29	62	2	......	2	469	86	555
Nicola-Princeton District																					
Taylor Burson mine (Blue Flame)	1	......	1	9	......	9	1	......	1	......	......	......	......	1	1	......	......	......	11	1	12
Coldwater mine	......	1	1	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	1	3
Totals, Nicola-Princeton District	1	1	2	11	......	11	1	......	1	......	......	......	......	1	1	......	......	......	13	2	15
Northern District																					
Bulkley Valley Colliery	4	3	7	24	......	24	10	......	10	......	3	3	......	4	4	3	......	3	41	10	51
Reschke mine	1	......	1	4	......	4	......	......	......	......	1	1	......	......	......	......	......	......	5	1	6
Gething No. 3 mine	1	......	1	3	......	3	2	......	2	2	1	3	......	......	......	......	......	......	8	1	9
Totals, Northern District	6	3	9	31	......	31	12	......	12	2	5	7	......	4	4	3	......	3	54	12	66
East Kootenay District																					
Crow's Nest Pass Coal Co. Ltd.—																					
Elk River Colliery	12	16	28	143	......	143	39	......	39	33	32	65	31	25	56	......	3	3	258	76	334
Michel Colliery (underground)	30	25	55	216	......	216	138	......	138	83	65	148	19	81	100	......	2	2	486	173	659
Michel Colliery (strip)	......	9	9	......	......	......	......	......	......	......	30	30	......	13	13	......	......	......	......	52	52
Coleman Collieries[2] (strip)	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Totals, East Kootenay District	42	50	92	359	......	359	177	......	177	116	127	243	50	119	169	......	5	5	744	301	1,045
Grand totals for Province	82	63	145	688	......	688	190	......	190	232	180	412	83	153	236	5	5	10	1,280	401	1,681

[1] Closed down January 19th, 1952. [2] Formerly Hillcrest Mohawk Collieries.

NOTE.—*U.=Underground; A.=Above ground; T.=Total.*

Coal-preparation Plants

The primary object of preparation plants is to remove from the raw coal all rock and other non-combustible material so as to maintain a uniform product—one with the highest calorific value. A second practice followed at many modern plants is blending the different grades or sizes, or the products from the different seams, to form a fuel for a specific purpose, such as stoker coal and coke.

Elk River Colliery.—The equipment of the cleaning plant, housed in a steel and brick structure 120 by 100 feet and 68 feet high, includes two furnaces for heating the air supplied to the cleaned-coal driers, two Ty-Rock 6- by 16-foot sizing screens, three Vissac jigs, two Vissac driers, one M.C. centrifugal drier, three Ty-Rock dewatering screens, two boom-loaders, and three box-car loaders. The capacity of the plant is 2,000 tons in eight hours.

The raw coal is transported from the rotary dump by belt-conveyor to the picking-table, then directly by a 42-inch belt-conveyor to the screens whereby the coal is sized and the −¼-inch slack removed. When necessary the coal from the picking-table may be switched to the 500-ton steel bin for storage and blending. This bin, together with the 300-ton bin, is used in storing, temporarily, a portion of the afternoon-shift coal to allow the preparation plant to remain idle on that shift. The slack is by-passed directly to railway cars, but the coarser sizes are passed through the Vissac jigs for the removal of rock and high-ash material, then over the unwatering screens to the driers, whereby most of the surface moisture is removed. The plant is equipped so that different sizes, after being dried, may be segregated or blended to suit market demands.

Michel Colliery.—The preparation plant, erected in 1938, is capable of treating a maximum of 380 tons of coal per hour of operation. The coal is sized by shaking and vibrating screens prior to being transported to the rock-removing jigs. All sizes above ¼-inch are treated on three Vissac jigs, and those below ¼-inch are diverted to an American Coal Cleaning pneumatic table. The moisture adhering to the washed coal under 1⅝-inch size is removed by a stream of air delivered to four Vissac driers at a temperature of approximately 700 degrees Fahrenheit. To keep the liberation of dust to a minimum in subsequent handlings, the coal, as it is loaded into railway cars, is sprayed with hot oil.

Comox Colliery.—This preparation plant at Union Bay is of the wet type throughout and handles the output from the Comox No. 8 and Tsable River mines.

A reciprocating feeder delivers the coal from the track bin on to a 30-inch belt-conveyor, which in turn transports the coal to a two-deck 6- by 14-foot Ty-Rock screen that has 1¼-inch and 3/16-inch perforations whereby the coal is sized to +6-inch, 1¼- to 3/16-inch, and −3/16-inch. All sizes above 3/16-inch are treated by two Vissac jigs for the removal of rock, and the −3/16-inch is diverted to four Masco wet-type cleaning-tables.

The coarser sizes in the refuse are crushed and recirculated through the cleaning plant for recovery of the coal that formerly adhered to the rock. The washed coal is again screened to size before loading for market. Because of the differences in densities in the raw material coming from the two mines, each coal is, of necessity, treated separately.

Nanaimo Preparation Plant.—This plant, situated near the site of the old No. 1 mine tipple, is of the wet type and handles the coal from the Bright mine.

The coal is brought to the plant by truck from the mine and is dumped on to a feeder conveyor of the plate type that transports the coal to a Hummer screen, wherein the −¼-inch slack is removed and diverted to Deister tables for rock-removal. From these tables the slack coal is loaded into railway cars. All sizes above ¼-inch are treated in two Howe cones, and, after cleaning, the coal is again sized by a shaker screen before it is loaded on to railway cars.

Coke-making

The earliest recorded commercial coke-making in the Province was in 1892 at the Union Colliery's No. 4 slope mine near Comox Lake, Vancouver Island. In 1898 coke was made at The Crow's Nest Pass Coal Company Limited plant at Fernie in bee-hive ovens. This company recorded production of coke in bee-hive ovens at its Michel and Morrissey Collieries in 1902 and 1904 respectively. In December, 1908, Hosmer Mines Limited began making coke at its Hosmer Colliery.

Of the plants mentioned, the one at Michel Colliery is now the only one active in coke-making. The coke produced there is dense, hard, and very low in sulphur content, making it an excellent product for metallurgical use. Production of coke in bee-hive ovens at Michel continued from 1902 until October, 1952, when the last of these ovens was shut down. The entire output of coke is now made in Curran-Knowles by-product ovens. The No. 1 battery of Curran-Knowles ovens went into production in 1939, and was followed by three batteries of the same type numbered in order of building. No. 2 battery went into production in 1943, No. 3 in 1949, and No. 4 in October, 1952.

No. 1 and No. 2 batteries both consist of ten ovens 30 feet long and 8½ feet wide; No. 3 and No. 4 batteries both consist of sixteen ovens 40 feet long and 10½ feet wide. The coal charge in No. 1 and No. 2 batteries is 5½ tons per oven and in No. 3 and No. 4 batteries is 7½ tons. From a total daily charge of approximately 775 tons of coal into the fifty-two ovens, about 580 tons of coke is produced, of which 540 tons is sized coke, plus ¼-inch, and about 40 tons is breeze, —¼-inch. With a charge depth of 10½ to 11 inches of coal, the coking time is ten and a half hours at 2,500 to 2,600 degrees Fahrenheit.

By-product tar amounts to about 6 gallons and by-product gas to 8,000 to 10,000 cubic feet per ton of coal charged. The tar is sold commercially. Part of the gas is burnt in the combustion flues of each oven to bring the charge to the required coking temperatures. The excess gas is burnt under boilers at the company's power-house.

The ovens are charged from the top from hopper cars, and the coke is expelled mechanically by a ram operated by an engine using by-product gas.

The plant is operated continuously on a three-shift basis. Bins with a total capacity of 3,200 tons provide a storage bank of coal that ensures continuous operation of the plant throughout week-ends, statutory holidays, and minor stoppages of coal delivery. The total number of men employed at the plant is sixty.

LABOUR AND EMPLOYMENT

During 1952, 1,681 persons were employed in and about the coal mines of the Province, a decrease of 244 from 1951.

Because of the five-day week in force throughout the Province at the larger mines, and the legal holidays, the maximum number of working-days is rated at 254. In the Vancouver Island District approximately 22.5 per cent of the possible working-days was lost because of lack of demand for coal and other minor causes. In the East Kootenay District the loss of working-days averaged 3.9 per cent, due mainly to the shortage of railway cars during the latter part of the year. In the Northern and Nicola-Princeton Districts the average loss of working-days was 26.0 and 0.9 per cent respectively, due mainly to a lack of coal orders.

COMPETITION FROM COAL PRODUCED OUTSIDE OF BRITISH COLUMBIA

During 1952 the shipment of Alberta coal to British Columbia totalled 1,021,484 tons, coke shipped was 94 tons, briquettes 28,575 tons, and fabricoal 514 tons. The following table shows the amount of Alberta coal brought into British Columbia during the past ten years:—

Year	Short Tons	Year	Short Tons
1943	963,000	1948	945,700
1944	678,960	1949	891,132
1945	868,396	1950	873,558
1946	982,413	1951	898,533
1947	899,403	1952	1,021,484

Of the 1,137,986 tons of British Columbia coal marketed, 258,853 tons was sold for domestic and industrial uses in Alberta, Saskatchewan, Manitoba, Ontario, and Yukon Territory; 471,035 tons was sold for railway use in Canada; 62,200 tons was exported to the United States; 39,917 tons was exported to foreign countries other than the United States; and 10,712 tons was sold for ships' bunkers. The amount sold for domestic and industrial uses in the Province was 295,269 tons.

ACCIDENTS IN AND AROUND COAL MINES

During 1952, 1,681 persons were employed in and around coal mines, including strip-mining operations. Three fatal accidents occurred during the year, as compared with six during 1951. The number of fatal accidents per 1,000 persons employed was 1.78, compared with 3.11 in 1951, 2.21 in 1950, 0.43 in 1949, 2.04 in 1948, 0.82 in 1947, 1.73 in 1946, 2.05 in 1945, 1.06 in 1944, and 2.80 in 1943. The average for the ten-year period was 1.78.

The number of fatal accidents per 1,000,000 tons of coal produced in 1952 was 1.81, compared with 3.21 in 1951.

The following table shows the collieries at which fatal accidents occurred in 1952, with comparative figures for 1951:—

Name of Company	Name of Colliery	1952	1951
Crow's Nest Pass Coal Co. Ltd.	Michel Colliery	1	3
Crow's Nest Pass Coal Co. Ltd.	Elk River Colliery	1	2
Canadian Collieries (D.) Ltd.	Tsable River	....	1
Canadian Collieries (D.) Ltd.	No. 10, South Wellington	1	....
Totals		3	6

The following three tables classify the fatal accidents in coal mines in 1952 as to cause, as to quantity of coal per accident, and as to inspection districts.

Fatal Accidents Classified as to Cause

Cause	1952		1951	
	Number	Per Cent	Number	Per Cent
By falls of roof and coal	1	33.33	3	50.00
By mine cars and haulage (underground)	....	....	1	16.66
Asphyxiated by methane gas	....	....	1	16.66
Asphyxiated by being covered with coal from blowout	....	....	1	16.66
By falling power-line pole	1	33.33	....	....
By runaway stone-boat	1	33.33	....	....
Totals	3	100.00	6	100.00

Fatal Accidents Classified as to Quantity of Coal Mined

Cause	1952 Number of Fatal Accidents	1952 Coal Mined per Fatal Accident[1]	1951 Number of Fatal Accidents	1951 Coal Mined per Fatal Accident[1]
		Tons		Tons
By falls of roof and coal	1	1,388,732	3	478,324
By mine cars and haulage (underground)	....	....	1	1,434,974
Asphyxiated by methane gas	....	....	1	1,434,974
Asphyxiated by being covered with coal from blowout	....	....	1	1,434,974
By falling power-line pole	1	1,388,732	....	....
By runaway stone-boat	1	1,388,732		....
Average	3	462,910	6	239,162

[1] Excludes coal from strip mines.
NOTE.—There were no fatal accidents in strip-mining operations in the years 1952 and 1951.

Fatal Accidents Classified as to Inspection Districts

District	Number of Deaths from Accidents						Totals	
	Falls of Roof and Coal	Mine Cars and Haulage	Asphyxiated by Methane Gas	Asphyxiated by Being Covered with Coal	Falling Power-line Pole	Runaway Stone-boat	1952	1951
Vancouver Island	....	....	....	....	1	....	1	1
Nicola-Princeton	....	....	....	....	....	....	....	....
East Kootenay	1	....	....	....	....	1	2	5
Northern	....	....	....	....	....	....	....	....
Province, 1952	1	....	....	....	1	1	3	....
Province, 1951	3	1	1	1	....	....	....	6

Ratio of Fatal Accidents

District	Accident Death Rate			
	Per 1,000 Persons Employed		Per 1,000,000 Tons of Coal Mined	
	1952	1951	1952	1951
Vancouver Island	1.80	1.34	2.47	1.85
Nicola-Princeton	....	....	....	....
East Kootenay	1.91	4.79	1.66	5.81
Northern	....	....	....	....
Province, 1952	1.78	....	1.81	....
Province, 1951	....	3.11	....	3.21

In 1952 there were three fatal accidents at the coal mines in the Province—two underground and one on the surface.

On January 28th, 1952, Adolph Jack Delmas, an electrician working at No. 10 mine, South Wellington, was fatally injured when the power-line pole on which he was working broke off at ground-level and fell. Delmas was engaged in stripping material from the pole when the accident occurred. The pole was 28 feet high and had been in use about ten years. Delmas had neglected to test the pole at or below ground-level prior to climbing it. He died from his injuries three days after the accident.

On August 27th, 1952, Vindice Petracco, a rope-rider employed at Michel Colliery, was fatally injured when the stone-boat in which he was riding uncoupled from the rope and travelled about 300 feet down a 40-degree raise out of control before it struck a bull-wheel headframe. The stone-boat had been connected to the rope by a "bitch-link." Slack in the rope had allowed the link to become detached from the rope.

On December 30th, 1952, Peter Meketech, a miner employed at the Elk River Colliery, was fatally injured when his head was crushed between a post and a car. The post had been knocked out by a slab of top coal which slid from an old roadway.

Including the above-noted fatal accidents, 500 accidents involving loss of seven days or more were reported to the Department by the management of the various mines. All these accidents were investigated and reported by the District Mine Inspectors.

The following three tables classify the accidents in coal mines in 1952 as to occupation of the men involved, as to cause, and as to injury. The fatal accidents are included in the totals.

Accidents Classified as to Occupation

Occupation	Number of Accidents	Percentage of Accidents
Underground—		
Miners	249	49.8
Drillers and facemen	8	1.6
Conveyormen and muckers	26	5.2
Haulagemen	71	14.2
Trackmen and mechanics	18	3.6
Supervisors	16	3.2
Timbermen	16	3.2
Coal-cutters	12	2.4
Miscellaneous	31	6.2
Surface—		
Shops	11	2.2
Surface	25	5.0
Preparation and coke-ovens	11	2.2
Miscellaneous	6	1.2
Totals	500	100.0

Accidents Classified as to Cause

Cause	Number of Accidents	Percentage of Accidents
Fall of ground	144	28.8
Fall of material and flying material	50	10.0
Lifting and handling equipment and material	148	29.6
Machinery and tools	37	7.4
Slipped and tripped	79	15.8
Falling off staging and platforms	7	1.4
Miscellaneous	35	7.0
Totals	500	100.0

Accidents Classified as to Injury

Injury	Number of Accidents	Percentage of Accidents
Head and neck	28	5.6
Eyes	17	3.4
Trunk	98	19.6
Back	63	12.6
Arms	21	4.2
Hands and fingers	97	19.4
Legs	115	23.0
Feet	38	7.6
Toes	23	4.6
Totals	500	100.0

EXPLOSIVES

The following table shows the quantity of explosives used in coal mines during 1952, together with the number of shots fired, tons of coal produced per pound of explosive used, and the average number of pounds of explosive per shot fired (these quantities include all the explosives used for breaking coal and for rock work in coal mines):—

Vancouver Island District

Colliery	Quantity of Explosives Used (Pounds)	Coal Mined (Tons)	Total Number of Shots Fired	Average Tons of Coal per Pound of Explosive Used	Average Pounds of Explosive per Shot Fired
Comox Colliery (No. 8 mine)	36,100	187,453	58,150	5.19	0.62
Tsable River Colliery	57,950	122,022	72,411	2.10	0.80
South Wellington No. 10	......	5,126	......	......	......
Bright mine	29,725	81,533	34,850	2.74	0.85
Chambers mine (underground and strip)	500	1,130	1,100	2.26	0.45
Loudon mine	1,000	1,054	1,000	1.05	1.00
Lewis mine (Timberlands)	1,350	843	1,250	0.62	1.08
Wellington mine (Carruthers)	600	580	750	0.96	0.80
Stronach mine	1,450	1,586	1,500	1.09	0.96
Cassidy No. 7 mine	1,100	1,803	2,500	1.64	0.44
Wellington Blue Flame mine	1,300	390	2,000	0.30	0.65
Wende mine	180	203	170	1.12	1.06
Totals for district	131,255	403,723	175,681	3.07	0.74

Nicola-Princeton District

Taylor Burson mine (Blue Flame)	3,050	6,306	2,350	2.06	1.29
Coldwater Coal mine	500	1,139	350	2.27	1.43
Totals for district	3,550	7,445	2,700	2.12	1.29

Northern District

Bulkley Valley Colliery	16,150	37,304	20,250	2.31	0.79
Reschke mine	800	2,371	800	2.96	1.00
Gething No. 3 mine	600	1,483	1,400	2.47	0.43
Totals for district	17,550	41,158	22,450	2.34	0.78

East Kootenay District

Elk River Colliery	39,900	303,235	43,038	7.59	0.92
Michel Colliery	87,127	888,856	77,625	10.20	1.12
Coleman Collieries	......	6,202	......	......	......
Totals for district	127,027	1,198,293	120,663	9.43	1.05
Totals for Province	279,382	1,650,619	321,494	5.90	0.86

Quantity of Different Explosives Used

	Lb.
Monobel of different grades	269,450
Permissible rock powder	9,932
Total	279,382

MACHINE-MINED COAL

During the year 1952, mining-machines produced approximately 729,830 tons or 52.5 per cent of the total output from underground mining. All strip-mined coal is removed by mechanical means.

District	Number Driven by		Type of Machine Used	
	Electricity	Compressed Air	Chain Undercutting	Puncher Type
Vancouver Island	—	15	13	2
Nicola-Princeton	—	6	—	6
Northern District	1	3	1	3
East Kootenay	2	42	18	26
Totals	3	66	32	37

In addition to the above, 211 air-picks were used in the mines of The Crow's Nest Pass Coal Company Limited.

SAFETY LAMPS

There were 1,904 safety lamps in use in the mines of the Province. Of this number, 150 were flame safety lamps and 1,754 were approved electric lamps, mostly of the Edison type.

Approved Safety Lamps—Electric and Flame

The following is a list of approved safety lamps, electric and flame:—

- The Wolf lamp, flame type.
- The Koehler lamp, flame type.
- The Edison electric lamp (cap) as Approval No. 18 of the United States Bureau of Mines, and all Edison lamps up to and including Model P, carrying the Approval Certificate No. 26 of the United States Bureau of Mines; Model R-4, Approval No. 29.
- The Wheat electric lamp and having Approval No. 20, as issued by the United States Bureau of Mines.
- The Wolf electric lamp, No. 830c.
- The electric lamp manufactured by the Portable Lamp and Equipment Company, under Approval No. 27 of the United States Bureau of Mines.
- M.S.A. single-cell trip lamp, carrying United States Bureau of Mines Approval No. 1009, approved for use on haulage trips in mines.
- The Davis M.L. model pneumatic electric lamp.

ELECTRICITY

Electricity is used for various purposes on the surface at seven coal mines and underground at seven. A total of 18,296 horsepower was used in and about these mines. Detailed information as to how and where this power is used is given in the report of the Electrical Inspector of Mines.

VENTILATION

Information regarding the quantity of air passing in the main airways and working-places in the various mines is given in the reports of the District Inspectors. Blasting operations are not allowed in working-places where methane can be detected by the use of a flame safety lamp.

Although it has been necessary for the District Inspector to issue orders prohibiting blasting in several instances, the ventilation in general, as found during inspection visits, was adequate to meet requirements.

METHANE DETECTION

The principal instruments used to detect small percentages of methane gas in the mines are the Burrell gas-detector and M.S.A. detector.

Regular tests are made on every shift in the working-places and roadways by the fire-bosses and other certified mine officials, principally by means of the flame safety lamp. Every candidate for a miner's certificate must show, over and above other necessary qualifications, that he has a thorough knowledge of the flame safety lamp, of handling it safely, and of the method of testing for methane gas before he is given a certificate.

MINE-AIR SAMPLES

In addition to regular tests made by use of the flame safety lamp and methane detector, the Inspector of Mines in each district takes mine-air samples regularly in main return airways and return airways of the various splits so that a complete record may be kept of the condition of the air passing through the mine. Air samples are also taken by the Inspectors and mine officials when there is an abnormal issuance of gas in working-places. Two such instances took place during the year—one in the Comox Colliery No. 8 mine and one in the No. 3 mine, Elk River Colliery. The occurrence at the Comox Colliery was of a prolonged and serious nature. Daily sampling was inaugurated in the affected district until the ventilation was restored to normal. A total of seventy-four daily samples was taken therein and sent to the Department of Mines for immediate analysis.

The abnormal issuance of gas at the No. 3 mine, Elk River Colliery, was due to a blowout. Two samples were taken in the return from the affected working-place to ascertain the percentage of gas; the percentage of gas issuing was judged to be too high for normal testing by use of a flame safety lamp.

Periodic samples were also taken by the District Inspector and officials of the No. 9 mine, Elk River Colliery, to ascertain the condition of the exhaust fumes of the diesel locomotive working on the main haulage level. Samples were also taken of the ventilating current on the return side of the operating diesel. The analyses were, in general, satisfactory.

In 1952 eighty-seven samples were taken.

INSPECTION COMMITTEES

The provisions of the " Coal-mines Regulation Act," section 65, General Rule 19, require that an inspection committee of workmen shall inspect the mine regularly on behalf of the workmen and make a true report of the conditions found. In all the larger mines of the Province this rule is fully observed, and copies of the reports are sent to the Inspector for the district. The work of these committees is valuable and assists in furthering the interests of safety at the various mines.

COAL DUST

The danger of accumulations of coal dust on the roadways and in the working-places is fully realized, and, as a rule, the regulations regarding the control of coal dust are adequately carried out. Large quantities of limestone dust are used continually in the larger mines to combat this hazard. It is used in the roadways, working-places, and for the tamping of shots.

Dust samples are taken regularly from roof, sides, and floor of mine roadways and analysed. The reports of the analyses are forwarded to the District Inspector. In 1952, 1,535 dust samples from the various mines were analysed, and in all these samples the incombustible content was well over 50 per cent, as required by the " Coal-mines Regulation Act."

DIESEL LOCOMOTIVES

Early in August, 1950, the first diesel underground locomotive to be used in any mine in British Columbia made its trial runs in No. 9 mine, Elk River Colliery, The Crow's Nest Pass Coal Company Limited.

The locomotive is a 15-ton 100-horsepower North British type, and is fully permissible for use in coal mines. To date its performance has been satisfactory.

MILLI-SECOND DELAY DETONATORS

In February, 1951, an amendment to the " Coal Mines Regulation Act " was passed to allow, with the permission of the Chief Inspector of Mines, more than one shot to be fired at a time in any coal mine or district of a mine. The amendment was endorsed by the industry.

Early in May, 1951, experiments with milli-second detonators were conducted at No. 4 mine, Elk River Colliery, The Crow's Nest Pass Coal Company Limited, by officials of the British Columbia Department of Mines, the coal company, and Canadian Industries Limited.

In the latter part of May, 1951, and also in December, 1951, further experiments with milli-second delay detonators were conducted at the Tsable River mine, the Canadian Collieries (Dunsmuir) Limited, by officials of the company, and the British Columbia Department of Mines.

This method of blasting coal, from both solid and machine-cut places, is now in general use at the mines of both The Crow's Nest Pass Coal Company Limited and the Canadian Collieries (Dunsmuir) Limited.

On February 18th and 19th, 1953, the technique of blasting coal from solid and machine-cut places by the use of milli-second delay detonators was demonstrated at the Bulkley Valley Colliery by officials of the British Columbia Department of Mines.

The conclusions reached from these experiments are as follows: That the method provides for a safer and more economical operation of coal blasting, and that, although more powder was being detonated at one time over the one-shot-at-a-time method, there was a definite lessening of concussion felt and a reduction in the over-all amount of powder used.

DANGEROUS OCCURRENCES

On January 9th, 1952, an " air blast " occurred in the vicinity of No. 5 split, off No. 1 entry in "A" West mine, Michel Colliery. This incident was due to the sudden caving of roof in an extensive gob area following pillar extraction. No one was injured, but the ventilation was temporarily disarranged as three stoppings were damaged by the blast. A dense cloud of dust was raised throughout the district, but no gas was expelled from the gob area.

On February 13th, 1952, four loaded cars uncoupled from a trip ascending the No. 5 slope in No. 9 mine, Elk River Colliery, and ran down the slope about 600 feet. Several posts and sets of timber were dislodged by the runaway cars, causing caves of roof. Fifty cars of rock were loaded to clear the roadway. No one was injured. The runaway occurred in spite of the cars being derailed by a runaway switch and the trip being equipped with a safety drag.

On March 31st, 1952, the bull-wheel frame at the top of No. 4 incline, No. 3 mine, Elk River Colliery, broke and allowed the descending empty trip to run away for a distance of 200 feet. Although some of the cars were damaged, there was little or no damage to the roadway. The rope-rider jumped off the trip and was slightly injured. The safety-post set in the bight of the rope was broken by the impact.

On April 26th, 1952, 40 feet of the 10-inch compressed-air main discharge pipe from the surface air receiver at No. 8 mine, Comox Colliery, broke with explosive violence. A corner of the compressor-house roof and a power-line pole were damaged by the blast. Subsequent investigation showed that a blockage of tubes in the intercooler had occurred due to precipitation of salts from the cooling water. This allowed the compressed air to become overheated, which, in all probability, ignited a film of oil on the inside surface of the pipes.

On May 2nd, 1952, smoke was noticed issuing from a compressed-air receiver on the surface at Michel Colliery. The receiver was one of a battery of five steam-boiler shells used for the purpose. Investigation showed that several of the longitudinal tubes were leaking. The origin of the fire was believed to be due to the use of a cutting-torch which had been used on the receiver several hours prior to the incident. A defective tube had been cut off and allowed to fall to the bottom of the receiver, where either the hot ends of the tube or sparks from the torch had ignited oil in the receiver.

On May 29th, 1952, part of the bench immediately in front of No. 3 mine portals, Bulkley Valley Collieries, suddenly subsided about 10 feet vertically. This caused considerable lateral movement of the tipple structure, with the result that the 300-ton coal-storage bunker collapsed and was considered a total wreck. The subsidence took place about six weeks after the spring break-up, suggesting that the cause was due to the thawing of the ground that had been well soaked with the previous heavy autumn rains.

On July 10th, 1952, at No. 9 mine, Elk River Colliery, a heavy rail 30 feet long came loose from its lashings on a supply trip on the surface incline and slid 1,400 feet. No one was injured.

On September 23rd, 1952, smoke was found issuing from the drive end of the conveyor-belt that had stalled in the new belt development room off No. 4 incline, No. 3 mine, Elk River Colliery. No active fire was noticed, but there was excessive heating of the belt in contact with the drive pulley. Investigation disclosed that a blockage at the tension pulley had caused the belt to stall, with the result that frictional heating took place between the drive pulley and the belt.

On November 11th, 1952, on the tipple at Tsable River mine, a loaded trip of eight cars uncoupled from the rope and ran down the haulage slope about 1,500 feet. Fifty-eight sets of timber were dislodged, but the fall of ground was slight. The occurrence was due to slack rope as the trip was coming to a stop on the tipple, and to a worn pin in the coupling clevis.

On November 18th, 1952, the rope on No. 3 raise, " B " seam, Michel Colliery, broke and allowed the descending trip of empty cars and a timber tram to run away for a distance of about 200 feet before derailment. One of the rope-riders on the trip was seriously injured. Investigation disclosed that the " dead " rope, the rope that travels from the hoist to the bull-wheel, had been grooving several ties on the outside of the tracks. This suggests that protruding wires of the splice in the rope had caught in a groove which caused the rope to bunch and finally break.

BUMPS AND BLOWOUTS

On January 11th, 1952, at the face of No. 8 incline, No. 3 mine, Elk River Colliery, an outburst occurred in which 50 tons of coal was dislodged and a considerable quantity of methane gas was emitted for a short period. As the usual warnings of an impending outburst were given, the workmen retreated to a place of safety uninjured. No material damage was done, and it was disclosed later that the outburst had occurred at the edge of a 5-foot upthrow fault.

On January 31st, 1952, an outburst occurred at the face of No. 1 airway off No. 8 incline, No. 3 mine, Elk River Colliery. Eighty tons of coal was expelled, which filled the roadway to 25 feet from the face. No timbers were dislodged. Methane gas was released in such quantity that it took about two hours for the gas percentage in the return from the face to be reduced to 1½ per cent. No one was injured. The outburst occurred at the intersection of two upthrow faults.

On February 12th, 1952, an outburst occurred at the face of No. 2 airway off No. 8 incline, No. 3 mine, Elk River Colliery. Thirty-five tons of coal was expelled from the face of No. 2 airway and No. 7 incline, into which the No. 2 airway had just broken through. Three per cent of gas was present in the return from the affected area about one hour after the occurrence. No one was injured.

On February 28th, 1952, a minor bump occurred near the face of No. 1 split off No. 5 room, " B " seam slope district, Michel Colliery. The damage was confined to the left side of the roadway, where the floor heaved about 2 feet for a distance of 25 feet back from the face. One post was broken, four pushed out of alignment, and several conveyor-pans tilted. The three men engaged in the working-place were bruised and shaken. No gas was released. The cause of the bump was attributed to heavy roof pressures in a large area of uncaved gobs in the vicinity. Considerable difficulty has been experienced in inducing caving in this area as the roof is particularly strong.

On April 17th, 1952, an outburst occurred at the face of No. 7 incline, No. 3 mine, Elk River Colliery. The customary warnings of an impending outburst were given, and the miners retreated to a place of safety. No one was injured and no material damage was done. Forty-five tons of coal was expelled from the face and 3 per cent of gas was present in the return air from the affected place for an hour following the occurrence.

On April 29th, 1952, a bump occurred at the face of No. 7 cross-cut off No. 7 room, "A" East mine, Michel Colliery. Fifteen tons of coal was dislodged at the face of the crosscut and 40 tons sloughed from the high side rib of No. 6 room toward which the crosscut was heading. Methane gas was released in considerable quantity at the time of the occurrence, but diminished rapidly, and work was resumed two hours later. No one was injured and no material damage was done.

On June 18th, 20th, and 23rd, 1952, a series of minor outbursts occurred at the face of No. 4 split off No. 7 room, "A" East mine, Michel Colliery. In each case, methane gas was released in considerable quantities for a short period and the men were withdrawn from the face. The quantity of coal expelled ranged from 12 to 20 tons. No material damage was done.

PROSECUTIONS

There was no prosecutions during 1952 in and about the coal mines of the Province.

SUPERVISION OF COAL MINES

During 1952 sixteen companies operated thirty-two mines, employing 1,280 men underground. In the supervision of underground employees, there were 6 managers, 15 overmen, 4 shiftbosses, and 81 firebosses, or approximately 1 official for every 12 men.

"COAL SALES ACT"

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 Location	Producing Company
Comox	No. 8 mine and Tsable River mine, Comox Colliery (Cumberland)	Canadian Collieries (D.) Ltd.
Ladysmith-Wellington	No. 10 mine (South Wellington)	Canadian Collieries (D.) Ltd.
Hi-Carbon	Mixture of Canadian Collieries' coal and B.C. Electric coke	Canadian Collieries (D.) Ltd.
Old Wellington	No. 9 mine (Wellington)	Canadian Collieries (D.) Ltd.
Chambers-Extension	Chambers (Extension)	R. H. Chambers.
Cassidy-Wellington	Cassidy mine (Cassidy)	A. H. Carroll.
Taylor Burson	Jackson No. 1 mine (Princeton)	Taylor Burson Coal Co. Ltd.
Hat Creek	Hat Creek (Lillooet)	Canada Coal and Development Co. Ltd.
Bulkley Valley	Bulkley Valley (Telkwa)	Bulkley Valley Collieries.
Crow's Nest, Elk River	Elk River (Coal Creek)	Crow's Nest Pass Coal Co. Ltd.
Crow's Nest, Michel	Michel (Michel)	Crow's Nest Pass Coal Co. Ltd.
Coldwater	Coldwater No. 3 mine (Merritt)	S. Gerrard.
Black Prince	Black mine (Princeton)	R. B. Savage.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS

First-, Second-, and Third-class Certificates and Mine Surveyors' Certificates

The Board of Examiners, formed on July 10th, 1919, consists at present of H. C. Hughes, Chief Inspector of Mines, chairman; Edward R. Hughes, Inspector of Mines, member; and Robert B. Bonar, Senior Inspector of Coal Mines, secretary and member.

The meetings of the Board are held in the office of the Department of Mines in Victoria. The examinations are held in accordance with the amended rules of the Board of Examiners and approved by the Minister. The examinations are held at least once a year, and more often if necessary. One examination was held in 1952 on May 14th, 15th, and 16th at both the Fernie and Cumberland centres.

The total number of candidates at these examinations was as follows: For first-class certificates, 3 (none passed); for second-class certificates, 5 (3 passed); for third-class certificates, 6 (4 passed); for mine surveyors' certificates, no candidates.

The following is a list of the candidates who were successful in the various classes:—

Second class: Vans H. Hulbert, Philip D. Larbalestier, and Glyn R. D. Parry.

Third class: George H. Nicholas, Herbert H. Parsons, Eric Singleton, and Michael Tymchuk.

In addition to the above, an interchange certificate was granted without full examination to the following candidate, who holds coal-mine official certificates from another Province: Second class, Stirling A. Baudoux.

All officials, before engaging in multiple blasting with milli-second delay detonators, are required to obtain a permit to do so from the Board of Examiners (Coal-mine Officials). This permit is issued only after the applicant has successfully passed oral and practical examinations in such work.

Examinations for Certificates of Competency as Coal-miners

In addition to the examinations 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. Examinations are held regularly in coal-mining districts, and no certificate is granted where the candidate has failed to satisfy the Board as to his fitness, experience in a coal mine, and a general working knowledge of the English language.

During 1952 there were 135 candidates for coal-miners' certificates, eight of whom were unsuccessful.

In addition to the certificates granted above, substitute certificates were issued to those who had lost their original certificates.

Permits to act as coal-miners, as provided by the Act, have been granted to younger men by Inspectors in their respective districts. This method allows promising men with less than one year's experience underground to work at the coal face as miners under the guidance of an experienced miner.

The Board of Examiners desires to thank the different coal-mining companies for the use of their premises for holding examinations where necessary.

NOTES ON COAL MINES

VANCOUVER ISLAND INSPECTION DISTRICT

By A. R. C. James

The output of coal from the Vancouver Island Inspection District was 403,723 tons, a decrease of 25.1 per cent from the 1951 output. Production from the Nanaimo coal-field has continued to decline rapidly with the depletion of the remaining workable deposits. In 1952 the output from this area was only 94,248 tons, a decrease of 54 per cent from the 1951 production. Ninety-two per cent of the present production at Nanaimo comes from the Bright mine of Canadian Collieries (Dunsmuir) Limited, and the remainder comes from a number of small mines working outcrops, pillars, and barriers left during earlier working.

Production from the Cumberland mines was 309,475 tons. This was a decrease of 7.5 per cent from the 1951 output, but was well up to the average of production over the past five years. The Tsable River mine produced a slightly higher output than it did in 1951 in spite of several months of short-time working. No. 8 mine of Comox Colliery has continued to maintain its place as the largest producer on the Island.

It is most pleasing to report that 1952 has been a year free from fatal accidents in the Vancouver Island coal mines. There were six serious accidents, four of which occurred at No. 8 mine, one at No. 10 mine, and one at Bright mine. Two of these accidents were due to falls of coal, one to a fall of roof, two were caused by coal-face machinery, and one was a haulage accident. Three of the accidents resulted in spinal or pelvic injuries, two in simple fractures of limbs, and one involved serious injuries to a leg without fracture of any bones.

In addition to the above, 251 minor accidents have been reported and investigated, representing a 24-per-cent decrease from the figure for 1951.

Two dangerous occurrences were reported and investigated. One of these involved an explosion in a compressed-air main pipe-line on the surface at No. 8 mine, and the other involved a runaway trip on the main slope at Tsable River mine. In both cases positive steps have been taken to prevent a recurrence of these incidents.

The annual mine-rescue and first-aid meet organized by the Vancouver Island branch of the British Columbia Mine Safety Association was held at Cumberland on May 31st. Only two teams participated in the mine-rescue competition, but a high standard of performance was maintained. The winning team was the Tsable River mine team, captained by J. Thomson.

Canadian Collieries (Dunsmuir) Limited Company office, Nanaimo. F. Ronald Graham, chairman of the board; R. Whittal, president; E. O. T. Simpson, general manager; W. Frew, district superintendent, Nanaimo; W. Johnstone, district superintendent, Cumberland. During 1952 this company operated No. 10 mine at South Wellington (closed on January 19th), Bright mine at Cassidy, and No. 8 and Tsable River mines in the Cumberland district. Descriptions of these operations and progress notes on them are given in the following pages according to district.

Nanaimo (49° 123° S.W.)

No. 10 Mine, South Wellington.—W. Frew, manager; J. Wilson, overman; A. Hannah, F. Johnston, J. McArthur, and T. McCann, firebosses. This mine, covering a large area of the Douglas seam, was closed down on January 19th, the extraction of the remaining pillars on the main slope having been completed. The mine had been in operation for thirteen years, and total production had amounted to well over 2½ million tons. The percentage of coal recovered during the extraction of the pillars was very high, due to the efficient organization of the work. Production during 1952 was 5,126 tons over a working period of thirteen days. The number of employees was eighty-three underground and twenty-four on the surface.

One serious accident and three minor accidents were reported and investigated.

Bright Mine, Cassidy.—W. Frew, manager; J. Wilson, overman; M. Brodrick, A. Dunn, F. Johnston, and J. Unsworth, firebosses. The mine is in Sections 1 and 2, Range 7, in the Cranberry district, near Cassidy, approximately 9 miles south of Nanaimo. Operations were begun in April, 1950, with the intention of working the Douglas seam immediately to the south of the old Granby No. 2 mine workings. The Granby No. 2 mine slope was unwatered and reopened, and now forms the main slope of the present mine. This slope, originally 400 feet long, was advanced in the Douglas seam an additional 600 feet. The coal to the west of the main slope was, however, found to be too thin and dirty to be economically worked, hence most of the development has been to the east of the main slope. A main diagonal slope was started in September, 1950, from a point on the main slope just inby the old Granby workings and was advanced 830 feet southeast. Three levels were set off during 1950 and 1951 to the east off this diagonal, and the No. 3 left level has become the main haulage and development level. This level has been advanced a total distance of 1,380 feet due east. Headings and counter levels driven from No. 3 left level have subdivided the area into a series of substantial pillars which, before extraction commenced, were estimated to contain about 90,000 tons of coal. The area blocked out is roughly triangular in shape, covering approximately 15 acres. It is bounded on the southeast by a fault of considerable displacement which converges toward the old Granby No. 2 mine workings on the north side. On both the west and the northeast sides the workable area is limited by barren ground. The Douglas seam in this mine is even more variable than usual; in some parts it is entirely absent, and in others, especially near the fault, it is over 50 feet thick. The overlying strata consist of sandy shales, sandstones, and conglomerates. The general structure of the area is synclinal, the old Granby workings being on the upper portion of the northern limb and the Bright mine workings at the base. The dip of the seam in the Bright mine workings is usually less than 12 degrees.

The method of working is the room-and-pillar system, and the coal is hand-loaded into cars. Development driving in 1952 amounted to approximately 7,500 feet. All this was completed by the end of August, and no further development is at present contemplated. The splitting and extraction of pillars was commenced in September in the northeastern section of the mine. Production for 1952 was 81,533 tons over a working period of 229 days. The number of employees in December was sixty-four underground and eleven on the surface.

All coal is blasted off the solid. A total of 28,700 pounds of Monobel explosive, 1,025 pounds of CXL-ite explosive, and 34,850 electric detonators were used in 1952. The coal is hauled to the surface up the main slope by a Ledgerwood geared hoist driven by a 60-horsepower electric motor. On the surface the coal is tipped into a 70-ton storage bunker. The entire output is trucked from the mine to the coal-preparation plant.

Power for underground operations is supplied by a Canadian Ingersoll-Rand 23- by 14½- by 12-inch XVHE-2 air compressor having a capacity of 1,500 cubic feet of air per minute. This compressor is driven by a 300-horsepower synchronous motor.

The mine is ventilated by a small Sirocco fan which circulates 30,000 cubic feet of air per minute at a water-gauge of 0.5 inch. A sample of the main return air current taken in December showed only 0.03 per cent of methane; very little gas is given off in the workings.

The mine is naturally damp throughout, and it has not been considered necessary to take dust samples. Eight tons of rock dust was used in 1952 for tamping shots.

First-aid arrangements have been maintained at a satisfactory standard. Four employees are qualified as industrial first-aid attendants, and twelve others hold first-aid certificates.

Conditions in the mine were usually found satisfactory in the course of inspections. Twenty-two accidents were reported and investigated; one was classed as serious.

Chambers No. 4 Mine, Extension

R. H. Chambers and associates, operators; R. H. Chambers, fireboss. This mine is in the Extension district. Since 1945 the operators have been mining a barrier pillar in the Wellington seam left between the old Extension No. 1 and No. 3 mines. On May 29th the extraction of this barrier coal was completed. Some prospecting was then done in the same seam on the upper side of a fault which crosses the main slope of the mine. A slope was driven for a distance of 125 feet in the seam in this area, but was stopped due to the coal being too thin and dirty to be profitably worked.

In the latter half of 1952 Mr. Chambers discovered a considerable showing of coal at the surface about half a mile from the No. 4 mine. The coal appears to form the crest of a local upward fold in the Wellington seam. He had the area cleared by a bulldozer and, as a result, decided that it would make a promising small-scale stripping operation. During September and October a tipple was erected at this site, together with a gasoline-driven hoist to haul cars out of the stripping pit, and a small shaker screen to sort the coal into under 1-inch, 1- to 2-inch, and over 2-inch sizes. A road was cleared to the tipple, and small storage bunkers were erected. By the end of the year a total of 290 tons of coal had been strip-mined from this site.

Total production in 1952 from all the above operations was 1,130 tons over a working period of 143 days with a crew averaging three men. Working conditions were found fairly satisfactory in the course of inspections and no accidents were reported.

Deer Home No. 2 Mine, Extension

R. H. Hamilton and associates, operators; R. H. Hamilton, fireboss. This mine is near the old Vancouver slope in the Extension district, and has been operating in a small section of outcrop pillars left in the Wellington seam when the old Extension No. 3 mine was abandoned. This mine was closed during 1952.

No. 7 Mine, Cassidy

A. Carroll and associates, operators; H. Kirkpatrick, fireboss. This mine is at Cassidy, in Range 7, Section 2, and the eastern 500 feet of Range 6, Section 2, in the Cranberry district. It commenced production at the end of 1949, and operates in a seam which lies 50 to 60 feet stratigraphically above the Douglas seam. The seam is a purely local deposit and appears to lie in a small basin. From the outcrop it dips 20 degrees in a southerly direction, but the angle of dip gradually decreases until the seam is horizontal at a point 300 feet from the outcrop under a cover of approximately 75 feet. The immediate roof of the seam in the present workings is a strong grey shale which is overlain by conglomerate. The seam is normally about 7 feet thick, and a typical section is as follows: Coal, 1 foot 3 inches; shale, 8½ inches; coal, 10½ inches; carbonaceous shale, 1 foot 5 inches; coal, 6 inches; bone, 4 inches, coal, 2 feet.

A main slope has been driven southwest down the dip of the seam for 325 feet; in 1952 this slope was advanced 65 feet. Two new levels were started—one to the right off the slope and one to the left. Both these levels had been advanced 60 feet by the end of the year. A diagonal slope, started from the left side of the main slope in 1951, has been driven 330 feet, and four short levels have been developed from this diagonal during the year. Total drivage in 1952 amounted to approximately 700 feet. Production was 1,803 tons for a working period of 202 days with a crew of four men.

The coal is mined by blasting it off the solid, and a Huwood compressed-air-operated rotary drill is used to drill the shot-holes. The coal is hand-loaded into cars which are hauled to the surface by a gasoline-driven hoist. A shaker screen, driven by a 3-horsepower gasoline engine, sizes the coal into lump (over 3 inches), egg (2½ to 3 inches), and screenings (under 2½ inches). Compressed air for the underground pumps and drill is now purchased from the neighbouring Bright mine of Canadian Collieries (Dunsmuir) Limited. A pipe-line from the latter mine leads to an air receiver at the portal of the slope.

General working conditions were found to be satisfactory in the course of inspections, and no accidents were reported during the year.

No. 8 Mine, Timberlands

J. R. Wilson and G. Lewis, operators; J. R. Wilson, fireboss. This property comprises two small mines operating in the Wellington seam in a small area of outcrop coal that was left when No. 8 mine was abandoned by Canadian Collieries (Dunsmuir) Limited. The seam outcrops on the side of a ridge parallel with and immediately to the south of the Nanaimo River valley at an elevation of 540 feet above sea-level; the coal measures dip southward at about 8 degrees. The two mines are one-third of a mile apart. The old mine, which has been described in previous Annual Reports, is now only worked for short periods in the winter when the new mine is inaccessible due to flooding.

The new mine, which commenced production in May, 1951, is in Range 1, Section 2, of the Cranberry district. It operates in the Wellington seam in an area of outcrop coal about 1 acre in extent, which is bounded on the west by a thrust fault that also formed the western boundary of the old No. 8 mine workings. The seam in this area is 6 feet thick, including two thin rock bands. Until recently more than half this coal was inaccessible due to the flooding of the old mine. In 1952 the operators decided to try to drain part of the old workings by means of a 4-inch inclined drill-hole. The drilling of this hole was started in June from a point on the hillside 80 feet below the mine portal, and in August it penetrated the old workings at 450 feet. Drainage was not as satisfactory as had been hoped, and it was assumed that a blockage had occurred at the inner end of the hole. However, the water-level was lowered sufficiently, with the aid of a small electrically driven pump, to render accessible all the coal reserves in the new mine except during periods of exceptionally heavy rainfall. In 1953 it is hoped to locate the end of the drill-hole and clear away any obstructions which may be preventing a full flow of water through the hole.

During 1952 the main slope of the new mine was advanced in a direction approximately south 20 degrees west for a distance of 210 feet from the portal. A level to the right was driven 50 feet. The main slope is connected by a 100-foot crosscut with a drainage outlet from the old workings.

The coal is blasted off the solid and hand-loaded into cars which are hauled to the surface by a small gasoline-driven hoist. A shaker screen sorts the coal into lump, nut, pea, and fines sizes. Total production in 1952 was 843 tons over a working period of 214 days with a crew of two men.

Conditions were found generally satisfactory in the course of inspections. No accidents were reported during the year.

Timberlands Mine

F. Vlasich and associates, operators; F. Vlasich, fireboss. This mine was started during the latter part of 1950 by A. Newbury and F. Vlasich, but there was no production until April, 1952. Since Mr. Newbury's death in September, 1952, the mine has been operated by F. Vlasich.

The mine is in Lot 194 in the Bright district, about 600 feet west of the Timberlands road and 16 miles by road from Nanaimo. It is operating in the western outcrop of the Wellington seam about half a mile south of the Nanaimo River. The Wellington seam in this area outcrops between two northwesterly striking thrust faults. The coal measures between these faults are steeply tilted, with the result that the seam dips 45 degrees or more to the northeast. All the outcrop coal immediately to the northwest of the mine was worked out from the old Timberlands No. 8 mine from 1926 to 1928. The seam in this area usually comprises the following section: Coal, 10 inches; mudstone, 10 inches; coal, 3 feet. The roof is a massive conglomerate, but in places an interbed of shale as much as 2 feet thick overlies the top coal.

A slope has been driven due east in the seam at an angle of 45 degrees from the full dip. This slope, which took nearly a year to complete, is now 210 feet long and dips at approximately 25 degrees. This work was completed in June, 1952. Since that date a level 130 feet long has been driven northwest and has connected with an old level, which provides a natural ventilation circuit. A room 30 feet wide has been driven a short distance up the pitch from the level. Total production in 1952 amounted to 390 tons over a working period of 120 days with a crew of two men.

The coal is blasted from the solid and hand-loaded into cars. These are hauled up the slope by a geared hoist driven by a 20-horsepower electric motor. Power for drills is supplied by an air compressor of about 250-cubic-feet-per-minute capacity driven by a 25-horsepower electric motor. Other equipment includes an electrically driven shaker screen and a 100-ton storage bunker.

Conditions were usually found satisfactory in the course of inspections. No accidents were reported.

North Wellington (49° 124° S.E.)

Loudon No. 5 Mine

W. Loudon and associates, operators; W. Loudon, fireboss. This mine is about 1 mile southwest of Wellington and is on the opposite side of the ridge from the old No. 9 mine. It operates in a small area of coal near the outcrop in the No. 2 or Upper Wellington seam. Production in 1952 amounted to 1,054 tons over a working period of 195 days with a crew of four men. Working conditions were usually found satisfactory in the course of inspections. No accidents were reported during the year.

Carruthers and Wakelam No. 3 Mine

R. B. Carruthers and W. Wakelam, operators; R. B. Carruthers, fireboss. This mine is near the Loudon mine and is also in the No. 2 or Upper Wellington seam adjacent to the abandoned workings of No. 9 mine. Production in 1952 amounted to 580 tons over a working period of 191 days with a crew of two men. Working conditions were found satisfactory in the course of inspections. No accidents were reported during the year.

Stronach No. 2 Mine

C. Stronach, operator; H. Gilmour, fireboss. This mine is in a section of the No. 2 or Upper Wellington seam adjacent to the old No. 9 mine. Most of the output comes from the mining of pillars and small areas of coal left in the earlier workings. Production amounted to 1,586 tons over a working period of 230 days with a crew of from four to six men. Working conditions were usually found satisfactory in the course of inspections, and no accidents were reported.

Wende Mine

J. McArthur, operator and fireboss. This mine is in Section 20, Range 4, of the Mountain district, about 1 mile southwest of Wellington, and is operating from the outcrop of the No. 2 or Upper Wellington seam. Work started on July 22nd. A level has been driven due west in the seam for a distance of 166 feet. Two raises have been driven north from the level for 50 feet, and a connection to the surface has been established at the end of the first one. Connections have also been established for ventilation purposes with a disused well near by. Total development drivage has amounted to 360 feet.

The seam section in this mine has not proved very encouraging so far, a typical section being as follows: Shale, 2 feet; carbonaceous shale, 6 inches; coal, 1 foot; shale, 2 inches; coal, 6 inches. The seam is almost level in this area. The roof near the outcrop is a soft shale, but this is replaced by conglomerate 100 feet inby from the portal of the level.

Production in 1952 amounted to 203 tons over a working period of 103 days with a crew of three men. Conditions were usually found satisfactory in the course of inspections. No accidents were reported during the year.

Comox (49° 124° N.W.)

Canadian Collieries (Dunsmuir) Limited

*No. 8 Mine, Comox Colliery, Cumberland.**—J. S. Williams, manager; J. Weir, overman; L. Cooper and J. W. Smith, shift-bosses; T. Robertson, A. Dean, A. Maxwell, D. Waddington, T. Shields, A. Jones, J. Vaughan, F. Coates, C. Williams, D. Morgan, J. Queen, and P. Queen, firebosses. This mine is 600 feet north of the Lake Trail road, 2½ miles southwest of Courtenay. During 1952 it maintained its position as the largest producing coal mine on Vancouver Island, with an average daily production of 889 tons. The entire output has been obtained from the No. 2 seam, which has an average thickness of 3 feet 9 inches, including rock bands, and lies 700 feet below the surface at the shafts. The seam dips 6 degrees in a northeasterly direction. It is reached by two shafts, each 1,000 feet deep, which penetrate to the lower or No. 1 seam, where operations have been suspended for some years due to heavily faulted ground. The mine has been worked entirely by the longwall system. In December five longwall faces were in operation; three were advancing longwalls, each 250 to 300 feet long, and two were retreating longwalls, 300 feet and 150 feet long respectively. Production has lately come mainly from the No. 2 dip sections on the north side and on the south side of the mine. All work in the North incline section ceased in May. In the North main level section the advancing longwalls were abandoned due to dirty seam conditions, and during the latter part of the year work in this section was restricted to a retreating face, 150 feet long, operating in the main level pillars.

Development work was continued until June in the No. 2 dip section on the north side of the mine. The No. 2 slope and counter slope were advanced a total distance of 700 feet, and two longwall faces, each 260 feet long, were headed out to the left of the slope. In January a large hoist, driven by a 250-horsepower electric motor, was installed in a concrete-lined housing at the top of No. 2 slope to handle production from faces off the slope. The two longwall faces in this section went into production on March 27th and May 9th respectively. At the beginning of June a new connection, 510 feet long, was completed between the bottom end of No. 2 counter slope and No. 1 left level off No. 1 dip slope; this provided an additional return airway for the section. This was the last development work done at No. 8 mine, and by a company policy decision the two Joy loaders and two Goodman duckbill units used in this work were then transferred to Tsable River mine.

The methods of working at this mine, involving the use of coal-cutters and conveyors, have been described in detail in previous Annual Reports.

Production in 1952 amounted to 187,453 tons over a working period of 210 days. Due to slack trade the mine worked only three days a week from the beginning of July to the end of November. In December a crew of 229 men was employed underground and 32 on the surface. The underground crew decreased by 93 men during the year, but 42 of these were transferred to Tsable River mine.

Working conditions were found fairly satisfactory in the course of inspections, apart from occasions when small emissions and accumulations of methane were encountered. Until these conditions were remedied, blasting was invariably suspended. During the early months of the year, difficulty was experienced on two longwalls on the south side due to unusually heavy methane emission, mainly from breaks in the roof strata. In

* This mine was closed down permanently on February 6th, 1953.

addition to taking measures to increase the already large quantities of air circulating on these faces, the management was directed to take daily air samples at the return ends of the walls. Special arrangements were made for the rapid analysis of these samples for methane content at the Department of Mines laboratory at Victoria. These accurate daily measurements were of great value both to the management and the District Inspector in keeping in touch with the situation and in judging the efficacy of the remedial measures taken. As the situation improved, the sampling was carried out weekly instead of daily. It was not stopped altogether until conditions became normal. A total of more than fifty air samples was taken by company officials over a period of two and a half months. An additional fifteen air samples were taken by the District Inspector at the mine during the year. A sample taken in December at the bottom of the upcast shaft showed 0.47 per cent of methane in the general body of the return air. Air measurements taken at the same time showed 146,835 cubic feet of air per minute passing in the main returns.

One hundred and thirty-two samples of dust were taken from the various roadways in 1952; four of these samples showed a higher combustible content than the minimum set by the " Coal-mines Regulation Act." Seventeen check samples of mine dust were taken by the District Inspector during routine inspections; seven of these showed a higher combustible content than the minimum set by the " Coal-mines Regulation Act." In all cases where sampling showed a high combustible content, immediate treatment with inert dust was stipulated, followed by resampling. One hundred and forty-four tons of rock dust was used during the year; 110 tons was used for treating roadways, and the remainder was used on the faces and for tamping shots.

First-aid arrangements were maintained at a satisfactory standard, with a well-equipped first-aid room available on the surface.

A mine-rescue team of six men was maintained, which attended periodic practices at the Cumberland mine-rescue station.

One hundred and forty accidents were reported and investigated, a 13.6-per-cent decrease from the total for 1951. Four of these were classed as serious, and the remainder as minor. One dangerous occurrence was reported and investigated; this is described elsewhere in this report.

Tsable River Mine.—S. J. Lawrence, manager; T. Ecclestone, overman; J. Thomson, A. Somerville, M. Brown, A. Cullen, M. Frobisher, L. Hutchinson, W. Bennie, W. High, and C. Lewis, firebosses. This mine is situated on the left bank of Tsable River, approximately 5 miles west of Buckley Bay. It operates in the upper or westerly portion of the Tsable River coalfield, which is separated from the lower or easterly part by a buried ridge of volcanic rocks which project up into the coal-bearing Comox formation. Both these parts of the Tsable River field are separated from the Cumberland field by a large " want," the seams having been eroded and coarser sediments deposited in their place. The seam section being worked, known as the No. 2 seam, ranges in thickness from 6 to 10½ feet and contains several bands of shale of varying thickness. The roof strata consist of sandy shales and sandstones. The measures dip at 9 degrees in a northerly direction, but in the diagonal section the dip decreases to 6 degrees and is in a northeasterly direction.

The mine has been developed by a main slope and three counter slopes driven for 3,000 feet on the full dip of the seam. At the lower end of the main slope the direction of full dip changes toward the northeast, and the east side of the property in this area is crossed by a belt of faults and disturbed ground striking northwest. In April, 1951, to meet these new conditions, a main diagonal and two counter diagonals were set off at an angle of 50 degrees to the main slope and have now been driven in a northeasterly direction for 1,500 feet. These diagonals have penetrated through the belt of faults and have provided access to a large area of virgin coal beyond the faults. During 1952, development has been mainly in this section of the mine, and it is intended to extend the main slope haulage down the main diagonal in the near future.

The mine is worked on a modified room-and-pillar system. Levels are set off in pairs from each side of the main slope and main diagonal at intervals of 300 to 450 feet, and driven to the boundary of the property or to the limits of workable coal. The coal between the pairs of levels is later extracted by driving a series of rooms, commencing at the boundary and working back toward the slopes on a retreating system. All the coal, both in development and pillar-extraction workings, is blasted off the solid. Electrical multiple blasting with milli-second delay detonators is used throughout the mine. This method of blasting, which replaced single-shot blasting during the first half of the year, has proved to have many advantages over the previous practice. A total of 56,750 pounds of Monobel No. 4 explosive was used during the year, together with 73,511 detonators.

In most cases the coal is conveyed from the faces by shaker conveyors to a convenient loading point on one of the levels, where it is loaded into cars. Four Joy loaders and four Goodman duckbill units are used, mainly for development work. Twelve Climax compressed-air-operated rotary drills are used for drilling shot-holes.

Total development in 1952 amounted to 12,990 feet of drivage in the seam, including slopes, diagonals, counter slopes, levels, counter levels, and crosscuts. In addition, 300 feet of rock drivage was carried out; this includes the driving of the main diagonal through a series of faults and the driving of a rock raise upward from the prospect level for a distance of 150 feet on an angle of 40 degrees. This rock raise is being driven through to the surface, a distance of 400 feet, for ventilation purposes.

In addition to development work, the extraction of coal between Nos. 2 and 3 right levels continued throughout the year, and a limited amount of pillar extraction was also carried out between Nos. 3 and 4 right levels. It is estimated that 90 per cent of the coal is being recovered in these operations.

Total production in 1952 amounted to 122,022 tons over a working period of 213 days with a crew of 166 men employed underground and 14 on the surface. The number of men employed at the mine has increased by 18 per cent during the year, and the average daily output has increased by about the same percentage.

An additional pump was installed at the underground pumping station in 1952. This is a 7-stage Mather and Platt turbine pump of 350-gallons-per-minute capacity and driven by a 75-horsepower electric motor. The new installation was made to provide a convenient stand-by in the event of a breakdown and to facilitate regular inspection and maintenance of the pumping plant generally.

On the surface an additional Ingersoll-Rand air compressor was installed during the year to meet the increasing requirements for power in the mine. This is a unit of 3,300 cubic-feet-per-minute capacity and is electrically driven by a 500-horsepower electric motor.

Conditions in the mine have usually been found satisfactory in the course of inspections. The seam normally gives off very little methane; small accumulations have been found on a few occasions at the working-faces, but these were usually diluted without difficulty. The mine is ventilated by a 50-inch-diameter Keith-type centrifugal fan which circulates 60,000 cubic feet of air per minute at a water-gauge of 3 inches. An air sample taken in the main return airway in December revealed only 0.07 per cent of methane in the general body of the air.

Although a considerable proportion of the workings are naturally damp, 93 tons of limestone dust was used during the year for tamping shots and dusting the coal faces, and an additional 33 tons was used for treating the roadways.

First-aid arrangements have been maintained at a satisfactory standard. A suitably equipped first-aid room is provided on the surface, and an ambulance car is kept at the mine in readiness for emergencies. Five qualified industrial first-aid attendants are employed—covering the three working shifts—and thirteen other employees hold first-aid certificates.

A mine-rescue team of six men is maintained, which attends regular practices at the Cumberland mine-rescue station.

Seventy-four accidents were reported and investigated, all of which were classed as minor. One dangerous occurrence was reported and investigated; this is described elsewhere in this report.

Sixteen minor accidents were reported from the various surface departments of the company in the Cumberland area and were investigated.

At the three mines of the company in the Nanaimo and Cumberland areas regular inspections were made each month by the inspection committees appointed by the workmen, and copies of their reports were forwarded to the office of the District Inspector through the courtesy of these committees.

Suquash (50° 127° N.E.)

Suquash Collieries Limited

Company office, 1016 Stock Exchange Building, 475 Howe Street, Vancouver. H. C. Ketcheson, president. The company was incorporated on November 26th, 1951, and has acquired licences to develop and produce coal over an area of 7,201.80 acres of partially developed coal lands at Suquash. The property is on the northeast coast of Vancouver Island, 7½ miles northwest of Port McNeill and 13 miles southeast of Port Hardy. At present there is no road to the property, and the only means of approach is from the sea. The coastline is of low relief and is thickly forested.

Sediments of Upper Cretaceous age, containing a few coal seams, form a continuous outcrop along the coast from Port McNeill to Beaver Harbour, a distance of 14 miles. According to C. H. Clapp, these sediments consist mainly of a grey siliceous sandstone similar to that of the Comox formation. The structure of the measures is very regular and appears, in general, to be a broad syncline dipping slightly to the northeast. The dips are low, usually less than 10 degrees. Three coal seams have been located at Suquash. These are as follows: No. 1 seam is 2½ feet thick and outcrops at the shoreline and near the mouth of Suquash Creek; No. 2 seam is at a depth of 173 feet at the shaft and consists of from 4 to 8 feet of coal interbedded with rock bands of varying thickness; No. 3 seam was cut by a drill-hole at a depth of 445 feet and is estimated to be 4 feet thick.

Dr. W. F. Tolmie recognized the presence of coal on this part of the coast in 1835, the first coal deposit to be found on Vancouver Island. Mining on a limited scale was carried on by the Hudson's Bay Company from 1849 until 1853. Approximately 10,000 tons was mined from outcrops at Suquash for the use of naval and other shipping. The workings were abandoned after the discovery of the richer deposits at Nanaimo.

Pacific Coast Coal Mines Limited became interested in the area in 1908. Drill-holes were put down, cutting the No. 2 seam at a depth of 173 feet, following which a twin-compartment vertical shaft was sunk to the seam. Between 1909 and 1914 about 10,000 feet of development drivage was done; a longwall face 800 feet long was opened up to the south of the shaft on the landward side, and two pairs of slopes were driven northeast toward the sea, the longest of these being advanced 1,140 feet beyond the shoreline. During this period approximately 12,000 tons of coal was mined. In 1914 work was started on the sinking of a new and larger shaft. However, all work was suspended after the outbreak of World War I and was not resumed again until 1920. The original shaft was then unwatered, and a considerable amount of location work was done on the surface with a view to handling a large production. There is no record of any further underground work being done, and operations ceased entirely in 1922.

The present company started operations on March 6th, 1952, at the old shaft, which had been found with some difficulty due to a very thick overgrowth of bush. The ground was cleared for several hundred feet around the shaft, and a tent camp established. A 16-foot headframe and a hoist were installed at the shaft collar. The unwatering of the shaft was then commenced, using a Knowles duplex piston pump of 50-gallons-per-minute capacity. Power was supplied by a portable compressor, but this was replaced in July by a 5- by 10-foot vertical steam boiler. By June 6th the shaft and rise workings were pumped out and a start was made on reopening this portion of the mine. During the next few months 800 feet of old levels were reopened on the south side of the mine to provide access to the old longwall face. Samples of the coal were taken and operations ceased on November 15th, pending a report by the company's consulting engineers. Six men were employed on the property during the summer. Ancillary work done included the erection in July of a 12- by 16-foot frame building for use as an office and the cutting of a trail for three-quarters of a mile south to a telephone-line.

The shaft, situated 200 feet from the shoreline, is 6 by 10 feet in the clear and is lined with 12- by 12-inch timbers. It is divided into a manway compartment, 6 by 4 feet, fitted with ladders, and a pumping and hoisting compartment, 6 feet square. Hoisting of men and materials was done by a small steam-driven geared hoist. A ⅜-inch-diameter rope was used, and a system of pull bell signals was in use at the shaft.

The underground workings were ventilated by a 3-foot-diameter Sirocco exhausting fan. After the workings had been drained of water, a considerable amount of methane was given off; this necessitated careful provision of ventilation as the reopening of the workings progressed. A ventilation circuit along the south level was established by erecting temporary stoppings in the crosscuts off this level. No explosives were used underground.

The old workings have stood very well because of the very hard sandstone roof above the seam. The writer was not able to examine the seam section on the old longwall face, but a section examined on the side of the south level 360 feet from the shaft showed a total thickness of 7 feet 6 inches. This included seven rock bands totalling 3 feet 1 inch. The thickest continuous section of clean coal was only 1 foot 5 inches. The seam section is believed, however, to improve on the longwall face and toward the south.

Conditions were found to be generally satisfactory in the course of inspections. While the work was in progress a stretcher and first-aid equipment were kept at the camp, and communication could be established when necessary with Sointula and Port McNeill by radio-telephone.

NICOLA-PRINCETON INSPECTION DISTRICT

By E. R. Hughes

Coal-mining in this district continued on a small scale during 1952. Although production showed an increase over that recorded in 1951, it was only a fraction of the yearly average of the preceding ten-year period. The present quiescent stage of coal-mining in the district is not caused by the depletion of the coal reserves at recently closed collieries, but chiefly by rising production costs making competitive fuels more attractive. The presence of rock bands of varying thickness, particularly in the absence of adequate cleaning facilities, the presence of bentonite, and the effects of weak strata at the greater depths have been to a considerable extent accountable for the high production costs. The introduction of modern mining methods, together with improved coal preparation, could do much toward restoring the markets formerly held by the coal mined in this district. Whereas Princeton coal was for many years sold in the Vancouver and Interior markets, Alberta coal is now sold in Princeton in competition with the locally mined coal. There were no producing mines in the Coalmont or Hat Creek coal areas during 1952, nor was there any exploratory or development work done toward bringing in new properties. The only mining operation in the Merritt coalfield was the small amount of remnant recovery at the Coldwater No. 5 mine. At Princeton the Taylor Burson Coal Company Limited continued the extraction of pillars left by former operators between the old main level and the surface at the reopened Blue Flame No. 1 mine. This company actively prospected in the area adjacent to the old Blue Flame mine and was successful in uncovering the continuation of the coal zone east of the old workings near the Hope–Princeton Highway.

No accidents to workmen were reported from the coal mines in this district during 1952. There were no prosecutions under the "Coal-mines Regulation Act" during the year, nor were there any dangerous occurrences to report.

The Similkameen Valley Mine Safety Association held its annual field-day competitions at Princeton on Saturday, June 21st. The mine-rescue competition was held in the forenoon at the Princeton Memorial Park, and the first-aid events were held in the auditorium at the Princeton school. Four teams competed in the mine-rescue event, which was won by a Nickel Plate mine team captained by R. E. C. Richards.

Princeton (49° 120° S.W.)

Taylor Burson Coal Company Limited

Blue Flame Mine.—James Fairley, overman; Arthur Hilton and Thomas Bryden, firebosses. This mine is about 10 miles by road south of Princeton and about three-quarters of a mile west of the Hope–Princeton Highway at Lamont Creek. The mine was formerly operated by the Wilson Mining and Investment Company Limited but was closed from April, 1937, until the Taylor Burson Coal Company Limited started work at the property in the spring of 1951. Underground work in 1952 consisted only of the removal of pillars left by the former operators between the old Main East level and the surface. The new lower level started in 1951 immediately above the old Main East level was extended eastward about 500 feet from the haulage slope to the old abandoned raise workings where further advance was discontinued. From this point the pillars were taken out toward the slope, and at the end of 1952 more than half of the available pillar coal had been extracted in this area.

Coal-cutting is done with compressed-air-operated post-type punching-machines. After cutting and blasting, the coal is loaded by hand into mine cars which are then hauled to the surface by a small compressed-air-operated hoist. An innovation worthy of note consisted of the conversion of an old post-type punching-machine into the drive unit of an improvised shaker-type conveyor. This device worked fairly well for the short distances over which the coal had to be conveyed from the split-pillar raises to the level below. A small tipple has been built near the portal, from which trucks haul the coal for sale in Princeton and district. A 20-ton Gurney scale was installed at the mine to weigh loaded coal trucks. The total production of coal for 1952 was 6,310 tons. In December 949 tons was produced, and twelve men were employed.

New Prospect.—The Taylor Burson Coal Company Limited continued prospecting in the area east of the Blue Flame No. 1 mine, and an adit was driven northward into the side of a hill about 800 feet westerly from the Hope–Princeton Highway and about 8 miles south of Princeton. The new adit is in the Blue Flame coal-bearing zone. After driving horizontally for the first 50 feet from the portal, the prospect tunnel was driven on a down grade of 20 degrees to follow the bedding of the burnt-out outcrop material which is typical of the surface showings in this part of the Princeton coalfield, where heat generated from volcanic eruptions has burnt and indurated the underlying sedimentary strata. At the end of 1952 the slope had been advanced about 150 feet and had passed through the burnt zone and had reached black coal. Insufficient work had been done to determine the full minable width and value of the seam. The prospecting work was done by a crew of two or three men, normally employed at the old Blue Flame mine, who worked at intermittent periods at the new showing during the times when the demand for local coal was sufficiently low to permit such procedure.

MERRITT (50° 120° S.W.)

Coldwater Coal Mines

This property, formerly owned by the Middlesboro Collieries Limited, is about 1 mile south of the city of Merritt. During 1952 the property was operated by the owners, S. Gerrard and partners; Francis Kelly, fireboss. Activities were confined to the Coldwater No. 5 mine and consisted of the extraction of remnants of coal left between the abandoned Middlesboro No. 5 mine and the surface in the area near the old water-tank, about 250 feet west of the portal of the old Middlesboro No. 4 mine.

Coal is blasted from the solid and is then hand-loaded into 1-ton cars which are then hauled up the short slope by a gasoline-operated hoist on the surface. Ventilation is natural and has been sufficient to date for such a small operation. No methane has yet been detected in the mine workings. The total production of coal for 1952 was 1,113 tons. In December 177 tons was produced, and five men were employed.

EAST KOOTENAY INSPECTION DISTRICT

By D. R. Morgan

Coal-mining activities in the East Kootenay District during 1952 were confined to the Crowsnest Pass area and comprised underground and open-cast mining. The major operations, carried out by The Crow's Nest Pass Coal Company Limited, produced 1,192,091 tons of coal, which is an increase of 28,773 tons over the 1951 production. The only other production, 6,202 tons, was by Coleman Collieries Limited, of Coleman, Alta., from the British Columbia side of their open-cast mine on the interprovincial boundary at Tent Mountain. This was a reduction of 78,981 tons from the 1951 production, and resulted in a decrease of 51,208 tons for the whole district.

With the exception of a few idle days due to shortage of railway cars, the collieries operated regularly throughout 1952 and showed an increase over 1951 in the number of working-days. A shortage of skilled miners was experienced at various times, and a considerable number of immigrants were directed into the area. Many of these, however, were not acquainted with local mining conditions and had to be trained, while others were not conversant enough with the English language and could not qualify under the requirements of the " Coal-mines Regulation Act."

Regarding accidents, two fatal accidents occurred in the district—one at Michel Colliery and the other at Elk River Colliery. This number was three less than in 1951, but unfortunately the improvement was not maintained with other serious accidents. Seventeen such accidents were reported and investigated under the " Coal-mines Regulation Act," an increase of nine over 1951. A considerable number of these were involved in haulage, and the attention of all concerned was drawn to their severity. Classification of the serious accidents was as follows: Eight involving haulage (including one fatal); six by falls of coal (including one fatal), and five by falls of rock. Accidents of a comparatively minor nature numbered 353, of which 308 resulted in more than six days' lost time. This is a slight increase over the 1951 figure, and resulted in an increase in the number of shifts lost due to accidents. No accidents were reported from the British Columbia side of the strip mine at Tent Mountain.

The regional Ryan Trophy for coal mines was won by Elk River Colliery for the best safety record during 1951. This was the second year in succession and the third time in four years that the colliery has won the award. The presentation of the 1951 award was made by the Chief Inspector of Mines at a branch meeting of the Canadian Institute of Mining and Metallurgy held in Fernie, on June 17th, 1952.

A successful mine-rescue competition was held under the direction of the East Kootenay Mine Safety Association at Kimberley on June 14th. Six teams from Fernie, Michel, and Kimberley competed, and the shield was won by the Sullivan mine East Section team, captained by Harvey McDonald. In the first-aid competitions there were

125 competitors, and the first-aid cup and shield were won by the engineers' team of the Sullivan mine.

The Crow's Nest Pass Coal Company Limited

T. G. Ewart, president, Fernie; Thomas Balmer, vice-president, 305 Great Northern Railway Building, Seattle, Wash.; T. H. Wilson, general manager, Fernie; H. H. Gardner, general superintendent, Fernie; A. L. McPhee, treasurer, Fernie; W. R. Prentice, secretary, Fernie. This company, with head offices at Fernie, operates two collieries, two coal-stripping operations, and a by-product plant in the East Kootenay District. A brief description of the operations follows.

MICHEL COLLIERY.—(49° 114° N.W.) William Chapman, manager; Irving Morgan, senior overman; John Whittaker, afternoon shiftboss; Stephen Lazaruk, night shiftboss.

The colliery is at Michel, 24 miles east of Fernie. It is the largest coal-producer in the district, and comprises five mines operating in three seams. The mines, with the exception of the "A" North mine, are developed off a pair of rock tunnels, along one of which the coal is hauled by compressed-air locomotives and delivered to a modern preparation plant. The seams worked at present are "A" seam, " B " seam, and No. 3 seam, and operations were commenced toward the latter part of the year to advance the rock tunnels to develop the Lower No. 3, No. 4, and No. 5 seams. The motive power used underground in all the mines is compressed air, but preparations are at present being made for electrification of the No. 3 and "A" North mines.

The combined underground operations of the colliery are under the direct supervision of five overmen, two shiftbosses, and twenty-three firebosses.

"A" East Mine.—William Gregory, overman; Harry Saunders, Thomas Taylor, Frank McVeigh, Frederick Nash, and Robert Doratty, firebosses.

This mine, which operates on the left side of the tunnels in the "A" seam, is on the eastern limb of the Michel syncline. The seam averages 10 feet thick and dips 20 degrees in a southwesterly direction. The coal is of good quality and is friable and gassy; the roof is weak and requires careful attention to its support. The mine is operated by the room-and-pillar method of working, and the pillars are extracted on the retreating system.

An average of 700 tons of coal per day was produced; a crew of 125 men was employed at the end of the year. Apart from a small amount of main pillar extraction above the inner end of the main east level, all the production was obtained from slope workings, the seam having already been worked toward the outcrop. The major production was obtained from the No. 1 slope section, where rooms are driven on the strike off the slope, and extraction of pillars up to the present has been confined to the left side rooms. The coal in the rooms is generally cut by compressed-air coal-cutters and loaded by duckbill-equipped conveyors. The pillars are extracted by the shortwall method and, as the coal is friable, pneumatic picks are used to advantage, and only occasional shots are necessary. The coal from the pillars is loaded by hand on to shaker-conveyors and transferred to loading points in the rooms by shaker-, chain-, and belt-conveyors. From these loading points the coal is hauled in trips of cars by compressed-air hoists to the tops of the slopes, and then by compressed-air locomotives to a parting in the main tunnel.

The mine, together with the slope district in the " B " seam, is ventilated by an electrically driven aerodyne fan which delivers 120,000 cubic feet of air per minute at a 3.8-inch water-gauge. Of this quantity, 75,000 cubic feet is circulated in the "A" East mine, and, in general, the ventilation was found fairly good. Small quantities of methane gas were found on a few occasions near the roof at some of the working-places, which were usually present due to defective bratticing. On two occasions the ventilation in the lower section, in No. 7 room, was found to be sluggish and had to be remedied by the installation of an auxiliary fan. As reported in more detail under " Dangerous Occurrences," difficulties were experienced on a number of occasions due to minor blowouts of methane gas at the faces of the " splits " in this section.

"A" West Mine.—Harry Corrigan, overman; James Walsh, Reginald Taylor, Robert Taylor, William Davey, Thomas Krall, and John McInnes, firebosses.

This mine, similar to the "A" East mine, is operated in the "A" seam and on the eastern limb of the Michel syncline. It is entered on the right side of the tunnels, and all workings are toward the outcrop. The seam is as described in the "A" East report, but due to the proximity of the surface above the seam the coal is not so gassy.

The mine is the largest producer in the colliery and has an average daily production of 800 tons. There were 140 men employed at the end of 1952, and most of the production was obtained from the No. 4 belt-road section. This section comprises three pairs of inclines or " entrees " where pillar extraction was carried out on a large scale, and, to the west of the inclines, three pairs of raises which were developed during the year. Other production was obtained from the development of another panel of workings commenced from the top of the main-belt incline.

In general, the roof is weak throughout the mine and requires careful attention to its support. The inclines and crosscuts are mined by shortwall coal-cutters and blasted, usually with milli-second delay detonators. The broken coal is then loaded by duckbill loaders on to chain- and shaker-conveyors, to be transferred to a loading point on the main west level by a series of belt-conveyors. All the production of the mine is loaded at this point, and large trips are hauled to a parting in the rock tunnel by compressed-air locomotives.

The mine is ventilated by an electric Sirocco double-inlet fan which delivers 65,000 cubic feet of air per minute at a 1.4-inch water-gauge. This quantity was found to be generally satisfactory throughout 1952.

"A" North Mine.—Thomas Slee, fireboss. A description of this new operation, which is being driven to develop a new mine in the "A" seam on the north side of Michel valley, is included in the 1951 Annual Report.

Very little progress was made in 1952 owing to the breakdown of a compressor and lack of motive power. For this reason the mine was closed in April and remained idle for the rest of the year. An overhead electric power-line has since been installed, from the power-house to the mine, and operations are expected to be resumed early in 1953.

No. 3 Mine.—Walter McKay, overman; Roger Pasiaud, Mario Pettoello, and Stirling Baudoux, firebosses.

This mine in the No. 3 seam is being developed on the western limb of the Michel syncline. The seam is 5½ feet thick, hard, of good quality, and has a fairly strong shale roof. The average inclination varies from 35 to 40 degrees.

The mine is being developed by four raises, driven on the full pitch, which originally were to be driven to the northern outcrop of the seam. Work on two raises was stopped during the year and was concentrated on the other two until they reached a distance of 2,200 feet from the main level. A rock raise is being driven from the roof at the face of one of the raises to provide an airway to the surface. Preparations for developing the mine on a larger scale have been commenced to the south of the raises, and rooms are being driven on the strike of the seam.

The average daily production from the mine at the end of 1952 was 120 tons, with thirty men employed. All production is loaded on the main south level, at the bottom of No. 4 raise, and the coal is conveyed to this loading point by shaker-conveyors and angle chutes. A Joy mobile loader was purchased for loading at the face of the main south level but had not been put into operation at the end of the year.

The coal is mined by shortwall coal-cutters, radial-punching machines, or is blasted from the solid with milli-second delay detonators. The mine is ventilated as a separate split by the same fan as "A" West mine, and the ventilation was found satisfactory throughout the year.

"B" South Mine (No. 3 Raise and No. 3 Incline Districts).—Vans Hulbert, overman; Sidney Hughes, Henry Eberts, David Thewlis, Sr., David Thewlis, Jr., and Paul Kusnir, firebosses.

This mine is in the " B " seam, on the western limb of the Michel syncline. The seam averages 5½ feet in thickness, is of excellent quality, has a strong shale roof, and is inclined at 30 degrees.

Extraction of pillars in the No. 3 Incline district was completed in 1952, and all production is now obtained from the No. 3 Raise district. This district is a panel of workings, 1,500 feet wide, at the inner end of the " B " South level. Operations include both development and extraction of pillars. The panel is split by three inclines, and rooms are driven in pairs on the strike of the seam. They are driven on both sides from the centre incline to form pillars 250 feet long. The rooms are connected every 100 feet by splits, driven on the pitch, for ventilation purposes, and the splits later form faces for extracting the pillars.

The coal at the faces is cut by shortwall coal-cutters or radial-punching machines, and is blasted. It is conveyed to a loading point on the main south level by angle chutes and shaker-, chain-, and belt-conveyors. From the loading point it is hauled in large trips by compressed-air locomotives. At the end of 1952 the average daily production was 400 tons, with ninety men employed.

General conditions were found fairly good during inspections. The district is now ventilated by a Joy airovane fan which delivers 60,000 cubic feet of air per minute at a 3.9-inch water-gauge. This fan was put into operation in October to replace the smaller Sheldon fan formerly in use. Some difficulties had been experienced in the district because of sluggish ventilation, but these were overcome by the use of the new fan.

"B" South Mine (Slope District).—Walter McKay, overman; Thomas Owen, Henry Batchelor, and John Krall, firebosses.

This district is situated to the dip of the main south level, and operations consist entirely of pillar extraction, which is rapidly nearing completion. The coal is gassy and friable and is mined by pneumatic picks, no shot-firing operations being necessary. The coal is loaded on to shaker-conveyors and transferred to loading points in the rooms by shaker-, chain-, and belt-conveyors. From the loading points it is hauled in trips to the main south level by a compressed-air hoist.

The roof is of strong shale, but considerable difficulty is experienced in maintaining sufficient height on the roadways owing to heaving of the floor. This is caused chiefly by pillar extractions converging on the roadways.

The district is partly ventilated as a separate split by the "A" East mine fan and partly by the same fan as the No. 3 Raise district in " B " seam. In general, the ventilation was fairly good throughout the year but, on a few occasions, difficulties were experienced by gas escaping from the goaves.

In 1952, 83,570 pounds of Monobel No. 4, 3,557 pounds of CXL-ite, and 77,625 electric detonators were used at the colliery in coal and rock blasting. Seven misfired shots were reported.

Six hundred and seven tons of limestone dust was applied to the roadways at the various mines to minimize the coal-dust hazard and for tamping shots.

Monthly examinations were made by the miners' inspection committees at all the mines, and regular meetings were held at the colliery offices each month by the pit safety committee. All report books kept at the various mines in accordance with the " Coal-mines Regulation Act " were examined and found in order.

Baldy Mountain Strip Mines.—C. M. Matson, foreman. The Crow's Nest Pass Coal Company Limited operates two coal-stripping operations—No. 2 and No. 4A—on Baldy Mountain near Michel. The coal deposit is of considerable size and ranges from 60 to 100 feet thick. All coal mined in 1952 was from No. 2 mine, which has been in production over three years. Operations at No. 4A mine commenced in November, 1952, following extensive drilling, and were confined to removal of overburden.

The coal is of fairly good quality, although some sections have inferior coking qualities. It is loaded on to trucks by power-shovels and hauled 4½ miles along a company road to the colliery tipple. The average daily production was 1,200 tons. The number of men employed varied considerably, being dependent on the amount of rock work that was necessary.

Prior to December, stripping and loading operations at the No. 2 mine were carried out by Emil Anderson Construction Company on a contract basis. The contract for No. 4A mine was granted to Mannix Ltd. of Calgary, who afterwards undertook the work at both mines.

By-product Plant.—The by-product plant is situated on the colliery site at Michel and at present consists of four batteries of Curran-Knowles ovens. A new battery, mentioned in the 1951 Annual Report, was completed in 1952 and was put into operation in October. A new storage bin of 1,000 tons capacity was also built at the plant in 1952, which, with the ones already in use, provide a storage for 3,200 tons of slack coal for charging the ovens. This is necessary in order to keep the ovens in operation over the week-ends and during day on which the mines may be idle (*see* p. 289).

ELK RIVER COLLIERY.—(49° 114° S.W.) James Littler, manager. This colliery is operated at Coal Creek, 4 miles from Fernie. It comprises four mines, which are driven from the outcrop of their respective seams and are all on the south side of the valley. A description of the surface arrangements is included in the 1951 Annual Report, and no alterations were made on the surface in 1952.

The combined underground operations are under the direct supervision of three overmen, one assistant overman, and fifteen firebosses. A brief description of the mines follows.

No. 1 East Mine.—Carmichael McNay, overman; Leonard Brett and John Cairns, firebosses.

This mine is the oldest producing mine at the colliery and operates in the No. 1 seam. Extraction of pillars on the retreating system in the old section of the mine has been nearly completed, and the major production is now obtained from an area being developed south of the No. 1 West roadway. The extent of this area is restricted by the presence of abandoned workings on each side. The mine is still an important producer at the colliery, and at the end of 1952 the daily output averaged 285 tons with sixty men employed.

The coal ranges in thickness from 12 to 25 feet, of which the top 12 feet is worked and is of good quality. Owing to the friability of the coal it is worked by pneumatic picks, and no shot-firing is necessary. All the coal is loaded directly into cars by hand and hauled by horses to partings. The entire production of the mine is then brought from these gathering points by a compressed-air hoist to the head of the endless-rope system, now 450 feet from the mine portal, whereby the trips are lowered on a surface incline to the main parting at the level of the old Coal Creek tipple. From there it is taken by a steam locomotive to the Elk River preparation plant. In order to minimize the horse haulage at the mine a new haulage slope has been completed between the No. 1 West section and the surface, and an electric hoist is being installed outside the portal of the slope. When completed, all production from this section will be hauled up the slope and lowered on a 950-foot surface incline to the same parting as the endless-rope system. This new haulage system is expected to be in operation in the near future.

The underground conditions, in general, were found to be fairly good during inspections, although many difficulties were experienced in maintaining the height and width of the roadways in the old section because considerable squeezing followed the extensive pillar extraction. The mine is ventilated by an electrically driven Sirocco double-inlet fan which delivers 130,000 cubic feet of air per minute at a water-gauge of 2.4 inches. This quantity represents an increase of 35,000 cubic feet, which was obtained when the new slope and another roadway were driven to the surface from the No. 1 West section; both of these serve as additional intake airways. Of the present quantity, 90,000 cubic feet is supplied to the active workings and the remainder is circulated through abandoned workings.

No. 4 Mine.—Arnold Webster, assistant overman. This mine is operated in the No. 4 seam and is worked by fifteen men on a single-shift basis. The average daily production of 100 tons was obtained by the extraction of pillars on the retreating system in a panel of workings off an incline inby the old No. 3 incline. This section is rapidly nearing exhaustion, and at the end of 1952 it was decided to commence two slopes from the main level to develop a panel of workings to the dip.

The seam of coal averages 8 feet in thickness and has a pitch of 15 degrees. The coal is of good quality, but the erratic distribution of ash and the frequent occurrence of thin rock bands complicate the preparation for market. The shale roof conditions are variable and necessitate systematic close timbering.

Rooms 12 feet wide are driven on a slight inclination in favour of the load to the right and left of the incline, and are connected by splits 12 feet wide driven on the full pitch. These splits later form longwall faces for extracting the pillars which, except for occasional shots, are extracted efficiently by pneumatic picks. In the rooms and splits the coal is cut by radial-punching machines or blasted off the solid with the use of milli-second delay detonators. The coal is conveyed from the rooms, splits, and longwall faces by shaker-conveyors to the incline, down which it is transported by a series of belt-conveyors to a loading point on the main entry. The coal is loaded into cars and hauled by horses to the mine portal, a short distance from the rotary dump.

Conditions in general were found to be satisfactory throughout 1952. The mine is ventilated by an electrically driven Sirocco double-inlet fan which delivers 34,600 cubic feet of air per minute at a 1-inch water-gauge. Emission of gas from the coal is slight. In the winter months the fan is reversed to act as a blower to prevent the formation of ice on the main entry.

No. 9 Mine.—Daniel Chester, overman; Ralph Larner, Harry Miller, William Waller, Albert Littler, James Corrigan, Archibald Allen, and Ralph Baker, firebosses.

This mine is at a high elevation on the mountainside and is worked in No. 9 seam. The coal is of excellent quality and is normally 9 feet thick; the seam pitches 15 degrees and is overlain by a hard sandstone roof. It is a large mine, worked on the room-and-pillar system, and, in the past few years, difficulties have been experienced in developing the inner section. The coal seam at the faces of the main levels, although of good quality, remained thin and contained a thick rock band. A similar condition was found in a slope driven from the face of the main level, inby the old No. 2 mine abandoned workings. Conditions in the No. 8 incline section, being developed to the rise of the main levels, were also found to be adverse. Because of this situation all workings in the No. 9 seam inby the No. 5 slope were stopped in September, 1952, and it was decided to curtail all large-scale development work in this seam for the time being. In an effort to maintain the production, No. 7 and No. 8 seams were prospected from this mine in 1952, but with unsatisfactory results, and the work was later abandoned. At the end of 1952 a rock raise was being driven from the No. 10 incline to the No. 10 seam which overlies the No. 9 seam.

Despite these difficulties the mine continues to be one of the larger producers at the colliery, and at the end of 1952 averaged 400 tons of coal per day, with 106 men employed. Most of the production was obtained from extraction of pillars, which at present is confined to No. 5 slope and No. 4 incline sections. In order to increase the output the old No. 1 belt-slope, the entrance to which is outside the mine portal, was reopened, and it is intended to extract pillars left in the past in that area.

Throughout the mine the coal is cut by pneumatic picks, radial-punching machines, or is blasted off the solid with the use of milli-second delay detonators. In the No. 8

incline section, coal was mined by electric coal-cutters, and the conveyors were electrically driven, but since the closure of this section, most of the electrical equipment has been withdrawn and the remainder of the mine is operated by compressed air. The coal is conveyed from the faces by shaker-, chain-, and belt-conveyors and loaded on to cars at the various loading points. The trips of cars are brought to the main level by compressed-air hoists and are taken out of the mine by a 100-horsepower diesel locomotive. With reference to the No. 1 slope, mentioned above, the coal is hauled up the slope by a 300-horsepower electric hoist which was installed in 1952 on the surface outside the slope. It was decided to introduce large-capacity mine cars in this section, and at present two 10-ton bottom-dumping cars are in use. They are unloaded on a ramp outside the mine, and the coal is conveyed by a short belt-conveyor to the retarding conveyor which transports the entire production of the mine down the mountainside to the preparation plant.

In general, conditions throughout the mine during 1952 were found to be fairly satisfactory at the time of inspections. The mine is ventilated by a Joy axivane fan delivering 87,000 cubic feet of air per minute at a 5.3-inch water-gauge.

No. 3 Mine.—James Anderson, overman; James Brown, David Brown, Brindley Morris, William Verkerk, Roger Girou, and Kenneth Kniert, firebosses.

This mine, operated in the No. 3 seam, is the major producer at the colliery. The seam is 17 feet thick where normal and is considerably thicker at the inner end of the main levels. The average pitch of the seam is 20 degrees, and only the top 10 feet is worked. The coal is friable and, as a rule, is mined with pneumatic picks, only occasional shots being required. It is gassy, and a strong current of air is required to dilute the gases effectively.

The average production of the mine is 450 tons of coal per day with seventy men employed. Most of the output in 1952 was obtained from pillar extraction in the No. 1 slope and No. 4 incline sections.

The prevailing conditions in the No. 1 slope section are very favourable, and a considerable amount of pillar extraction was carried out on the left side of the slope. In the No. 4 incline section many difficulties were experienced due to faults, and because the roof is weak, very close attention must be given to its support. In both sections the coal is loaded on to conveyors and transferred to loading points. It is brought to the main level by a series of belt-conveyors from the incline and by rope haulage from the slope and is taken out of the mine by a battery locomotive.

Two inclines, Nos. 7 and 8, form the innermost section of the mine and are being driven with considerable difficulty due to heavy roof pressure, which results in costly maintenance of roadways. The coal is very gassy and, as reported in more detail under "Dangerous Occurrences," several outbursts of gas occurred at the faces during the earlier part of 1952.

The mine is ventilated by an electric aerodyne fan which delivers 87,000 cubic feet of air per minute in the mine at a water-gauge of 1.8 inches. In general, the ventilation was fairly good throughout 1952.

No. 8 Mine.—A description of this new prospect being driven in the No. 8 seam is included in the 1951 Annual Report. Very little progress was made in 1952 after the main entry encountered a large fault, and all operations were suspended in the early part of the year.

During 1952, 36,000 pounds of Polar Monobel No. 4, 3,900 pounds of CXL-ite and 43,038 electric detonators were used in all the mines at the colliery in coal and rock blasting. Six misfired shots were reported.

To neutralize the coal dust, 158 tons of limestone dust was applied to the underground roadways of the mines. Monthly mine-dust samples were collected and analysed. All the samples were above the minimum requirements of incombustible content set by the "Coal-mines Regulation Act."

Monthly inspections were made at all the mines by the miners' inspection committees, and a copy of each inspection report was forwarded to the office of the District Inspector through the courtesy of the committee members. Meetings were held at the colliery office each month by the safety committees. All report books kept at the various mines in accordance with the "Coal-mines Regulation Act" were examined regularly and were found in order.

Coleman Collieries Limited

Henry Miller, general superintendent, Bellevue, Alta. The only mine worked by this company in the East Kootenay District is an open-cast mine on the interprovincial boundary at Tent Mountain, near Corbin. Most of the operation is in Alberta, but the seam, which is 60 feet thick and dips 65 degrees, crosses the boundary for a short distance into British Columbia before outcropping on the mountainside. The coal property on the British Columbia side is owned by The Crow's Nest Pass Coal Company Limited, but as the quantity of coal available did not warrant building extensive roads for its recovery, an arrangement was made with the Alberta company to include the area in its operations. Prior to January, 1952, the mine was operated by Hillcrest Mohawk Collieries Limited of Bellevue, Alta., but the company amalgamated with two other Alberta companies and now operates as Coleman Collieries Limited.

All the coal is loaded by power-shovels and transported by trucks to the company's preparation plant at Coleman. The major work on the British Columbia side during 1952 was the removal of rock from the hangingwall to provide the necessary slope for operating the seam of coal on the Alberta side.

NORTHERN INSPECTION DISTRICT

By A. R. C. James

Telkwa (54° 127° N.E.)

Bulkley Valley Collieries Limited

Company office, Telkwa. F. M. Dockrill, managing director; A. H. Dockrill, superintendent. This is a private company mining coal on a royalty basis on property comprising six Crown-granted Lots—388 to 392 and 401. The property is on Goat Creek, about 7 miles southwest of Telkwa. Two mines were in operation in 1952; the No. 2 mine has been worked to meet local demand for domestic coal in the district between Hazelton and Burns Lake, while all the output from the No. 3 mine has been supplied to the Columbia Cellulose plant at Prince Rupert. Both mines are connected by a good road with the Canadian National Railway and the Northern Trans-Provincial Highway at Telkwa.

Total production from both mines in 1952 was 37,235 tons, this being a substantial increase above the 1951 production. Most of the output now comes from the No. 3 mine.

No. 2 Mine.—F. Bond, fireboss. This mine is on the west bank of Goat Creek, about 200 feet above river-level. The workings are in the Betty seam, which dips westward at 7 degrees. The seam is 13 feet thick and contains two bands of rock 2½ and 1½ inches thick. The top 2 feet of coal is left to form a roof.

Operations during the year were confined to pillar extraction. The mine was closed between March and September. During the latter part of the year a crew of twelve men was employed, producing 700 tons monthly. The coal in the broken pillars is blasted off the solid and hand-loaded into mine cars. The cars are hand-trammed to sidings, from which they are hauled to the surface by a small Canadian Ingersoll-Rand compressed-air hoist. On the surface the coal is dumped over fixed bar screens which separate the coal into lump (over 4 inches), nut (1¼ to 4 inches), and slack (under 1¼ inches). The coal is stored in bunkers with a total capacity of 300 tons.

Conditions in the mine have been found generally satisfactory in the course of inspections, and no accidents were reported.

No. 3 Mine.—H. Bankhead, L. Gething, and G. Mack, firebosses. This mine which began production at the end of 1950, is in the Betty seam on the east side of Goat Creek, about 7 miles from Telkwa. The main slope portal at the outcrop of the seam is on a steep hillside on the east side of the creek valley at an elevation of 2,450 feet. The seam section over much of the present working area is 12 feet thick, and the following section is typical: Coal, 2 feet 4 inches; rock, 2½ inches; coal, 5 feet; rock 2 inches; coal, 4 feet 4 inches. The immediate roof consists of 2 feet of inferior coal, and this is overlain by grey shales. The dip of the seam ranges from 10 to 20 degrees in a north-easterly direction.

The main slope has been driven 500 feet from the surface outcrop down the full dip of the seam. In February a fault of considerable displacement was encountered at the face of the slope, and the same fault appeared at the face of a development level driven 160 feet to the right from a point near the lower end of the main slope. Since then the main slope has not been advanced, and all development work has been carried out on the left or northwest side of the main slope and along the strike of the fault in a northerly direction. A diagonal heading was set off from a point near the bottom of the slope in a direction parallel to the strike of the fault. However, after being driven 260 feet, the diagonal crossed the fault. Two pairs of levels were driven a distance of 500 feet to the boundary fault dividing the No. 3 mine workings from those of the old No. 1 mine. The first pair of levels was driven at 50-foot centres from the main slope, and the second was driven at 35-foot centres from the diagonal. Both pairs of levels were connected by raises driven at 75-foot intervals, thus forming a series of substantial pillars. By December the extraction of these pillars had begun, and those adjacent to the old No. 1 mine boundary had already been extracted. Total amount of development work completed during 1952 amounted to 4,000 feet, including slopes, levels, and cross-cuts. A total of 15,000 pounds of Monobel No. 4 explosive was used for blasting.

The fault that crosses the main slope now appears to strike approximately north 20 degrees west. From the drill-hole records and other data the management is of the opinion that this fault has an upward throw of 50 to 100 feet to the east. Additional drilling is intended next spring to determine the position of the seam on the east side of the fault.

The mine is worked by a mechanized room-and-pillar system. Where conditions are suitable, the coal is cut by a Mavor & Coulson modified longwall coal-cutter fitted with a 7-foot jib. Shot-holes are drilled with Siemens Schuckert E47 rotary electric drills, of which two are in use. A Goodman duckbill unit and shaker-conveyor were installed in 1952 to speed up face loading. At the remainder of the faces the coal is hand-loaded on to Mavor & Coulson 15-inch scraper chain-conveyors. These deliver on to two Mavor & Coulson belt-conveyors, one a 24-inch troughed belt and the other a 26-inch flat belt. These in turn deliver on to the main-slope conveyor, which is a Mavor & Coulson 24-inch troughed-belt gate-conveyor, driven by a 10-horsepower electric motor. The main-slope conveyor drops the coal on to a gravity chute at the surface, where it falls into a small hopper. From here a 15-inch scraper chain-conveyor delivers it to the main 300-ton storage bin. The run-of-mine coal is taken by truck and train to the Prince Rupert plant of the Columbia Cellulose Company. Average daily production in 1952 was approximately 130 tons.

All the machinery, both underground and on the surface, is electrically driven, and the underground electrical plant is of modern Buxton-certified flame-proof design. Power is purchased from the British Columbia Power Commission at 440 volts.

Conditions at the mine were usually found satisfactory in the course of inspections, and the workings were normally free of accumulations of methane. The temporary ventilating fan was replaced in May by a 50-inch Sirocco axial-flow fan which is belt-driven by a 5-horsepower electric motor. This is operated as a forcing fan to keep the main slope free from cold intake air in winter, and circulates approximately 10,000 cubic feet of air per minute.

First-aid arrangements consist of a No. 2 first-aid kit and carrying stretcher. Five employees hold first-aid certificates. One serious accident was reported and investigated during the year.

A dangerous occurrence took place on May 29th at 10.30 a.m., when there occurred a sudden subsidence of part of the surface ground in front of the portal that displaced the tipple structure. The movement of the tipple structure resulted in the overturning of the 300-ton storage bin, which was entirely wrecked. Luckily no persons were in the vicinity at the time.

Cariboo

Bowron River (53° 121° N.W.)

Bowron Coal Company Limited

D. Wells, president. This company holds a coal lease on Lot 9596, on the Bowron River about 30 miles due east of Prince George. The company established a camp on the east side of Bowron River in 1947, and between 1947 and 1950 explored coal seams exposed on the west bank of the river on part of Lots 9592 and 9596. A prospect tunnel was driven for a distance of 50 feet with the intention of exploring and sampling a promising seam, but all underground work ceased at the end of the summer of 1950. In 1951 and most of 1952 work has been confined to maintaining the road into the property from Buckhorn Lake. Repairs have been carried out this year on the bridge over Willow River, and a caterpillar tractor has been employed on road maintenance.

On December 10th a start was made to reopen the prospect level and drive it forward to crosscut the major seam. Two men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept. 1948, pp. 233–240.]

Peace River (56° 122° S.E.)

King Gething Mines

Quentin F. (King) Gething, operator and fireboss. This property is on Lot 1039, on the southeastern slope of Portage Mountain at an elevation of 2,300 feet; it is about 12 miles by road from Hudson Hope and 72 miles from Fort St. John. The present mine, known as the King Gething No. 3 mine, was started in 1949. The seam being worked is from 6 to 8 feet thick and occurs in the lower part of the Gething formation. The coal measures dip 16 degrees in an easterly direction and form part of the eastern limb of the Bullhead anticline.

The mine has been developed by means of two parallel levels driven due north along the strike of the seam from the surface outcrop. The lower level is the main haulage level. The upper level was commenced at a point 75 feet to the rise of the main level, but this distance between the levels was later increased to 100 feet. The levels have been connected by a series of raises driven at 50- to 70-foot intervals from the main level.

The main level has been driven 518 feet from the portal and the upper level 440 feet. The levels are now connected by six raises, and two others are partly driven. The first five raises have been extended beyond the upper level for distances ranging from 30 to 60 feet. A total of about 350 feet of development work was done in 1952.

The coal is blasted from the solid and hand-loaded into cars which are hand-trammed out of the mine to the tipple. The only mechanical equipment now in use at the mine is a 6-horsepower gasoline engine which drives a shaker screen. The coal is screened into lump, nut, and stoker sizes, and is stored in three 30-ton bunkers. In 1952 the principal market for the coal from this mine was the Fort St. John airport, local schools, and domestic consumers in the area.

The mine was closed down from the end of March to the middle of September. Production in 1952 was 1,903 tons. In December seven men were employed.

Conditions in the mine were found fairly satisfactory in the course of inspections. No methane was detected. No accidents were reported.

Reschke Coal Ltd. Company office, Fort St. John. P. F. Tompkins, managing director; J. Reschke, fireboss. This property is situated at about 2,600 feet elevation on a steep hillside on the southwest slope of Butler Ridge, about 23 miles by road from Hudson Hope and 83 miles from Fort St. John. The seam worked is from 4 feet 6 inches to 5 feet thick, and contains two rock bands in the top 6 inches. Both roof and floor are a fine-grained grey shale. The seam dips 43 to 47 degrees due west and is on the western limb of the Danish Creek anticline.

The mine has been developed from two parallel levels driven due north along the strike of the seam from the surface outcrop. The lower level forms the main haulage level and intake airway, and the upper level, 330 feet to the rise, provides a return airway and an alternate exit. The lower level has now been driven for a total distance of 980 feet from the portal, and the upper level 460 feet.

The coal is mined from a series of 30-foot-wide rooms set off from the lower level at 50-foot centres and driven on the full pitch of the seam to a point where they connect with the upper level. Sixteen rooms have been worked out, and Nos. 17, 18, and 19 rooms are at present being worked. Pillars of coal 15 feet wide are left between the rooms to support the roof.

The coal is cut with two Ingersoll-Rand R47 punching-machines and is transported by gravity chutes into cars on the main level, from which it is brought out of the mine by horses or trammed by hand. Mechanical equipment includes two Davis compressed-air-operated rotary coal-drills and a jackhammer. Power for this equipment is supplied by an air compressor of 240-cubic-feet-per-minute capacity driven by a 75-horsepower Allis-Chalmers diesel engine. The latter engine was installed in 1952 to replace the one previously used.

At the end of 1951 an attempt was made to increase production by installing an electrically driven longwall coal-cutter. The operation of this heavy machine on a 47-degree pitch proved to be impracticable under the conditions prevailing, and the attempt was abandoned early in 1952.

The run-of-mine coal is screened on the surface into lump, nut, and stoker sizes. During 1952 the principal market for this coal was with domestic consumers in the area, local schools, and Pacific Petroleums Limited. During the latter part of the year, Pacific Petroleums Limited was taking a large proportion of the mine output, the coal being used for heating purposes at the drill rigs in the Fort St. John area.

The mine was closed down from the end of March to the beginning of October, and actually operated for six months in 1952. The average monthly production during the working months was about 400 tons. In December a crew of eight men was employed.

Conditions were found fairly satisfactory in the course of inspections, and no methane was detected. No accidents were reported.

Inspection of Electrical Equipment and Installations at Mines and Quarries

By L. Wardman, Electrical Inspector of Mines

CONTENTS

ELECTRICAL POWER

During 1952 electrical power was used at sixty-five properties for operations including mining, concentrating, coal preparation, and quarrying.

LODE MINES

The generating capacity of private plants in kva. is as follows:—

	Kva.
By steam turbine	23,050
By diesel engine	17,406
By hydro-electric	15,782
Total	56,238

In addition to the above-mentioned generating capacity, 8,838 horsepower which is used for direct mechanical application is produced as follows:—

	Horsepower
By diesel engines	7,622
By water power	810
By gasoline engines	406
Total	8,838

The connected load for the various operations at the metal mines is approximately as follows:—

	Horsepower
Hoists	7,182
Scraper hoists	5,579
Ventilation	3,287
Pumping	3,093
Sink-float	1,096
Rectifiers	6,619
Compressed air	19,035
Crushing	9,602
Milling and concentrating	41,658
Workshops	2,673
Miscellaneous	9,452
Total	109,222

For surface and underground haulage there were in use 136 battery locomotives, 102 trolley locomotives, and 7 diesel locomotives.

Placer Mines

Electrical power was used at one placer mine for power. The generating capacity is as follows:—

	Kva.
Diesel-engine-driven generators	70
Hydro-electric	600
Total	670

The connected load is as follows:—

	Horsepower
Shaft hoists	40
Ventilation	5
Compressed air	75
Workshops and miscellaneous	30
Total	150

One million kwh. was used during nine months' operation in 1952.

One battery locomotive is used for underground haulage.

Quarries

With the exception of the Cassiar Asbestos Corporation's operation, where 260 horsepower is used for milling, only a very small amount of power is used in the quarries for the removal of rock or gravel, and for electrical blasting.

Coal Mines

During 1952 electrical power was used for operations at nine coal mines—one less than in 1951. At two of these mines, power is used for underground pumps only, and at two others it is used on the surface only. At the other five mines, power is used both on the surface and underground.

The distribution of electrical power is as follows:—

	Horsepower	
Surface		
Compressed air	7,425	
Ventilation	1,200	
Hoisting	2,407	
Haulage	315	
Coal washing and screening	3,167	
Pumping	500	
Coke production	1,215	
Miscellaneous	667	
Total		16,896
Underground		
Haulage	408	
Pumping	788	
Coal-cutters	50	
Coal-loaders	15	
Conveyors	74	
Miscellaneous	65	
Total		1,400
Total for surface and underground		18,296

Four battery locomotives and one diesel locomotive were used for underground haulage on the roadways.

MINE ELECTRICAL INSTALLATIONS

Following is a brief general description of new electrical installations and of alterations and improvements to existing installations, together with mention of some of the irregularities found at the time of inspection.

LODE MINES

ATLIN

Fourth of July Creek (59° 133° N.W.)

Atlin Ruffner Mines (B.C.) Limited.—The electric lighting plant, installed in 1951, was used very little in 1952 because only two or three men were employed during the greater part of the year. At the time of inspection it was found that the neutral wire of the lighting circuits required grounding at the power plant and at each service entrance.

TAKU RIVER

Tulsequah Mill (Tulsequah Mines, Limited) (58° 133° N.W.) To increase the concentrating capacity, the following equipment was installed in the mill: A No. 30 flotation machine driven by four 20-horsepower motors; a No. 21 flotation machine driven by three 7½-horsepower motors; two 2-inch Denver vertical pumps driven by two 3-horsepower motors; an 8-foot conditioner driven by a 5-horsepower motor; a 4-inch Wilfley pump driven by a 15-horsepower motor; a 28-foot thickener driven by a 1½-horsepower motor; a 6-foot filter with agitator driven by two 1-horsepower motors; a diaphragm pump driven by a 1½-horsepower motor; a 7½-inch Denver sump pump driven by a 3-horsepower motor; a vacuum pump driven by a 15-horsepower motor; a Jennings filtrate pump driven by a 1-horsepower motor; a Sturtobuilt blower driven by a 7½-horsepower motor; three conveyors, one driven by a 2-horsepower motor and the others driven by two 3-horsepower motors; a ball mill driven by a 175-horsepower motor; a classifier driven by a 7½-horsepower motor; a Wilfley pump driven by a 5-horsepower motor; and several reagent feeders and samplers driven by small motors. These additions increase the connected load to 397 horsepower. To take care of the extra load a second-hand 300-kw. 480-volt 300-r.p.m.. Fairbanks-Morse diesel-engine-driven generating unit, complete with control panel, was installed in the power-house.

Five four-room bunk-houses, three staff-houses, and an addition to the cook-house were built and wired for lighting.

Big Bull (Tulsequah Mines, Limited).—(58° 133° N.W.) No alterations were made to the electrical installations in 1952.

Tulsequah Chief (Tulsequah Mines, Limited).—No alterations were made to the electrical installations in 1952. At the time of inspection some temporary wiring required removing and the non-current-carrying metal parts of the skill-saw and electric welder required grounding.

PORTLAND CANAL (56° 130° S.E.)

Salmon River

Silbak Premier Mines Limited and Indian Mines (1946) Ltd. The installation of a hoist in the Premier Border shaft was commenced. At the time of inspection several recommendations for improvements were made, a few of which are given here. Fuses which had been installed in the grounded neutral of the lighting circuits must be removed. Exposed 2,200-volt and 440-volt wiring in the mill must be enclosed. The concrete basin for the transformers in the mill substation must be repaired.

ALICE ARM

Torbrit Silver Mines Limited

(55° 129° N.W.) No major alterations were made to the electrical installations in 1952. At the time of inspection it was found that the blasting switch was incorrectly connected and that blasting was being done from a circuit having a grounded conductor. Blasting from such a circuit is one of the causes of misfired shots.

HAZELTON

Silver Standard Mines Limited

(55° 127° S.W.) In the power-house a second 300-horsepower Petter diesel engine direct-connected to a 245-kva. 440-volt 60-cycle 3-phase alternator was installed. This increases the generating capacity to 653 kva. A second 500-cubic-feet-per-minute Broom-Wade compressor, V-belt driven by a 125-horsepower General Electric motor, was also installed. Other equipment consisted of two pumps—one driven by a 2-horsepower motor and the other driven by a 3-horsepower motor. The Prim diesel engine and the D13000 diesel engine that were driving compressors were removed.

In the mine the temporary wiring supplying the hoist and other equipment was replaced by an armoured cable. The cable is installed through a raise on No. 4 vein to the hoistroom and is supplied at the surface by an overhead power-line. Two identical pumps driven by 15-horsepower 440-volt General Electric motors were installed for pumping on the 850 level and the 1150 level.

In the mill a unit cell driven by a 2-horsepower motor was installed.

A D13000 diesel engine and generator were removed from the old mill power-house. The remaining D13000 and U.D. 18A diesel engines and generators are being retained as stand-by units.

At the time of inspection, lightning arresters were required on the overhead lines at the point where the underground cable was connected, the frames of the underground electrical equipment required grounding, and some temporary wiring in the sample crushing plant required replacing with permanent wiring.

Rocher Deboule (Western Tungsten Copper Mines Limited).—(55° 127° S.W.) The mill was completed, and operated for a short period in 1952. In November it was closed down, and some of the equipment has been moved to the Red Rose mine.

Red Rose (Western Tungsten Copper Mines Limited)

(55° 127° S.W.) The 6,600-volt transmission-line was extended from the mill camp to the mine camp, and a transformer substation and switch-house were built. At the time of inspection the following recommendations were made: Remove the motor control wiring from the switchboard bus gutters; mark all switchgear to indicate circuits controlled; remove temporary wiring from compressor-house.

SMITHERS

Cronin Babine Mines Limited

(57° 127° N.E.) The mill described in the 1951 Annual Report was completed, put into operation for several months, and then closed down. The power-plant equipment mentioned in the 1951 Annual Report was taken to the mine but was not used. Instead, a 150-horsepower 6-cylinder Murphy diesel engine, V-belt connected to a 440-volt 125-kva. 60-cycle generator, was installed.

Sil Van (Sil Van Consolidated Mining & Milling Company Ltd.).—(57° 127° N.E.) A mill building and power-house were built and much of the machinery, electric motors, switchboards, and conduit had been installed, but the wiring had not been pulled in before it was decided to suspend operations.

CARIBOO

Wells-Barkerville (53° 121° S.W.)

Cariboo Gold Quartz Mining Company Limited.—No major alterations or additions were made to the electrical installations in 1952. At the time of inspection one switch required maintenance because it was overheating.

Island Mountain Mines Company Limited.—No major alterations or additions were made to the electrical installations in 1952. At the time of inspection the following required attention: The retardation cams on the Lily control required forming to allow a uniform retardation; material blocking access to the underground transformer stations and switchgear required removal.

BRIDGE RIVER

Bralorne Mines Limited.—(50° 122° N.W.) No major alterations were made to the electrical installations during 1952.

Pioneer Gold Mines of B.C. Limited

A new substation to supply a shaft hoist on the 25 level has been commenced. A 150-kva. 6,600–440-volt 3-phase transformer, primary oil circuit-breaker, primary cable junction box, and secondary gutter box have been installed. A new dry and shifters' office was built and wired for lighting. At the time of inspection it was found that copper bars had been installed in one switch in place of fuses. These had to be removed and the fuses replaced. Some of the underground secondary cables showed considerable deterioration of the armour.

Wayside (L.A.P. Mining Company Limited)

(50° 122° N.W.) A Riverside Iron Works single-drum hoist driven by a 75-horsepower 440-volt 900-r.p.m. wound-rotor motor was installed at the top of the incline shaft. About 225 feet of 3-conductor No. 4/0 B. & S. gauge armoured cable was installed in No. 5 drift to supply the 440-volt service at the hoist. A new 110-volt line was installed to supply limit switches, lights in the shaft, and hoist signals.

The 350-cubic-feet-per-minute Ingersoll-Rand compressor, driven by a 100-horsepower 2,300-volt motor mentioned in the 1951 Annual Report, was installed.

Porcelain-clad fused disconnects housed in a metal cabinet, which is not approved, were shipped with the second-hand electrical equipment for the above-mentioned compressor motor and were unknowingly installed. Enclosed, externally operated disconnects and an oil circuit-breaker are suitable for this service. A suitable backout switch and overspeed governor were necessary on the hoist.

COPPER MOUNTAIN AND ALLENBY

The Granby Consolidated Mining Smelting and Power Company Limited

(49° 120° S.W.) In the mine eleven slushers were moved to new ore blocks and a Bryan Jackson deep-well pump was installed at No. 8 level. At the time of inspection the overspeed governor on No. 1 hoist required adjustment and two of the underground transformer stations were wet and required attention. At Allenby the 2,200-volt line to Hitchens Flat was changed to 13,800 volts and a 300-kva. 3-phase 13,800–440-volt transformer was installed for power to the tailings-pump motors. The second pump, which is driven by a 75-horsepower motor, was installed in 1952.

HEDLEY

Nickel Plate and French (Kelowna Mines Hedley Limited)

(49° 120° S.E.) Electrical equipment installed in the mine consisted of a 600-volt 3-conductor No. 1 B. & S. gauge wire-armoured lead-covered cable 300 feet long installed in a bore-hole between the Dickson transformer vault and No. 3 adit level to supply power to scraper hoists, and a 48- by 24-inch single-drum Stephens-Adamson hoist driven by a 75-horsepower motor was installed on the 4150 incline. This hoist replaced the smaller one which was used for sinking. Equipment installed in the mill consisted of a 5- by 8-foot Allis-Chalmers ball mill driven by a 100-horsepower 2,200-volt 600-r.p.m. General Electric motor. For use in conjunction with the ball mill, three Allis-Chalmers S.R.L. pumps driven by 5-horsepower 440-volt motors were installed.

Fairview Camp

Fairview (The Consolidated Mining and Smelting Company of Canada, Limited).—(49° 119° S.W.) No additions were made to the electrical installations during 1952.

Beaverdell

Highland-Bell Limited

(49° 119° S.E.) Two portable conveyors, driven by a 1½-horsepower motor and a ¾-horsepower motor respectively, were installed at the mill for loading concentrates. No major installations were made. At the time of inspection it was found that the above-mentioned motors required grounding. Permanent wiring was required to replace the temporary wiring installed for the workshop machinery which had been moved.

Lightning Peak

Waterloo, Dictator (Paycheck Mining and Development Company Limited)

(49° 118° N.E.) A mill was built on this property but was not put into operation. The following equipment was installed: A power plant consisting of a 150-kva. 480-volt alternator driven by a diesel engine; three belt feeders driven by three 2-horsepower motors; a jaw crusher driven by a 15-horsepower motor; a rolls crusher driven by a 20-horsepower motor; a ball mill driven by a 50-horsepower wound-rotor motor; a rake classifier driven by a 2-horsepower motor; a lead flotation machine driven by a 7½-horsepower motor; a zinc conditioner driven by a 3-horsepower motor; a Wilfley table driven by a 2-horsepower motor; two sand-pumps driven respectively by a 3-horsepower motor and a 1-horsepower motor; and a water-pump driven by a 5-horsepower motor.

Rossland

Midnight and I.X.L. (Kootenay Central Mines Limited).—(49° 117° S.W.) There was very little activity at this property during 1952.

Bluebird (Rossland Mines Limited).—(49° 117° S.W.) New electrical installations and equipment consist of a hoist driven by a 35-horsepower motor, a fan driven by a 10-horsepower motor, battery-charging equipment totalling 10 horsepower, and two battery locomotives.

Nelson

Eagle Creek (49° 117° S.E.)

Kenville Base Metal Concentrator (Emerald Glacier Mines Limited).—No alterations were made to the mill electrical installations in 1952.

Salmo

Erie Creek (49° 117° S.E.)

Arlington

Several alterations and additions have been made in the crushing plant and mill as follows: The gasoline engine which drove the jaw crusher was replaced with a 10-horsepower 440-volt electric motor; the ¾-horsepower motor driving the coarse-ore conveyor was replaced by a 1½-

horsepower 440-volt motor; the sorting belt is driven by a 1-horsepower motor; the ¾-horsepower motor on the fine-ore conveyor was replaced by a 2-horsepower 440-volt motor; the vibrating screen is driven by a 1-horsepower 440-volt motor; six cells have been added to the flotation circuit. These are driven by three 3-horsepower motors.

Thermal elements were required in one of the magnetic switches, and bonding conductors were required on several of the motors.

Aspen Creek (49° 117° S.E.)

H.B. (The Consolidated Mining and Smelting Company of Canada, Limited)

Prints of the electrical layout for a crushing plant, concentrator, and other buildings to be used in connection with the mining operation were approved. The following work was in progress during 1952: The construction of a main substation containing three 1,000-kva. 6,900–2,200-volt single-phase transformers; three 250-kva. 2,300–575-volt transformers; 69-kv. gang-operated disconnects, drop-out fuses, and lightning arresters; six 7.5-kv. single-pole disconnects; a 2,300-volt Bepco panel consisting of a metering panel and three oil circuit-breaker panels to control feeders to the upper camp, the three 250-kva. transformers, the mill area, and the underground distribution; a 5-kva. 2,300–115/230-volt transformer to supply lighting; a Canadian General Electric 800-ampere air circuit-breaker to control the 575-volt circuits for the mill area; a triplex voltmeter ground detector to indicate ground faults on the 2,300-volt circuits; a neon ground detector to detect ground faults on the 575-volt circuits.

The construction of a pole-line to carry two 500-m.c.m. B. & S. gauge weather-proof 575-volt mill feeders; one No. 4/0 B. & S. gauge weather-proof 2,300-volt mill feeder; one No. 4/0 B. & S. gauge weather-proof 2,300-volt compressor and underground feeder; and one No. 1/0 B. & S. gauge weather-proof 2,300-volt upper mine feeder.

The installation in the concentrator of a 2,300-volt 3-phase service; a 400-horsepower 2,300-volt ball-mill motor controlled by a Canadian Westinghouse starter and drum controller; a 300-horsepower 2,300-volt rod-mill motor controlled by a General Electric starter and drum controller; a 575-volt 3-phase service and 575-volt switchboard consisting of five panels with 600-volt main switch, branch circuit switches for motors and lighting transformers, and motor starting switches (the power load on this service will be 642½ horsepower), a 575–115/230-volt 25-kva. lighting transformer; and four lighting panels.

The installation in the crushing plant of a 2,300-volt 3-phase service in No. 2 B. & S. gauge rubber-insulated lead-sheathed cable; a 150-horsepower 2,300-volt jaw-crusher motor and a 150-horsepower 2,300-volt cone-crusher motor, both with Canadian Westinghouse starters and drum controllers; a 575-volt 3-phase service consisting of three No. 4/0 B. & S. gauge rubber-insulated cables; a 200-ampere 600-volt fused main switch, junction box, motor circuit switches, and starters (the 2,300-volt load will be 300 horsepower and the 575-volt load 48 horsepower); and lighting service and panel.

The installation underground of a 3-conductor No. 2/0 B. & S. gauge 2,300-volt paper-insulated lead-sheathed steel-wire-armoured cable and a 200-ampere cable isolator.

The installation in the underground substation of six 100-kva. single-phase 2,300–575-volt transformers; a 5-kva. single-phase 575–115/230-volt transformer; a 400-ampere 600-volt switch for mine power; a 200-ampere 600-volt fused switch for the hoistroom; a 300-ampere 600-volt fused switch for the lighting transformer; two 30-ampere 115/230-volt solid neutral fused switches for lighting circuits; a neon 575-volt ground fault detector; and a 3-conductor 500-m.c.m. 575-volt paper-insulated lead-sheathed steel-wire-armoured cable from the substation to the hoistroom.

The installation in the hoistroom of a 200-ampere 600-volt unfused disconnecting switch; a 600-ampere air circuit-breaker; a 100-horsepower 3-phase wound-rotor hoist motor complete with drum controller, grids, and protective devices; one 5-kva. single-phase 575–115/230-volt lighting transformer; and a 30-ampere 115/230-volt solid neutral switch for lighting service.

The installation at the Zincton portal of three 50-kva. and one 7½ kva. single-phase 2,200–575-volt transformers; a 400-ampere 600-volt fused disconnecting switch; a magnetic switch; a 100-horsepower 3-phase exhaust-fan motor; and a 60-ampere 115/230-volt solid neutral fused safety switch for a lighting panel in the fanroom.

At the time of inspection an isolating transformer was required in the supply circuit so that blasting would not be done from a circuit having a grounded neutral. The intermediate switch on the blasting circuit required arranging so that it could not be locked in the neutral position. This is to prevent the blasting circuit from being left without short circuit on the leads when not in use.

Iron Mountain (49° 117° S.E.)

Jersey, Emerald, Feeney, and Dodger (Canadian Exploration Limited)

Electrical work done on the property in 1952 was as follows: The West Kootenay Power Company built 7,000 feet of 69,000-volt overhead power-line. The Canadian Exploration Company's electricians built 9,000 feet of 2,300-volt overhead power-line and renovated 6,000 feet of old line. Eight outdoor transformer stations totalling 990 kva. were built. Eleven pole transformers totalling 350 kva. were installed, and the capacity of the tungsten-mill substation was increased to 1,200 kva. by adding another bank of transformers.

Underground, 4,000 feet of 2,300-volt cable was installed and three transformer stations totalling 240 kva. were built. Also installed were eight ventilating fans totalling 230 horsepower, ten scraper hoists totalling 380 horsepower, and three ramp loaders totalling 150 horsepower.

In the tungsten mill a rod mill driven by a 200-horsepower 440-volt motor was installed, and twenty-eight electric motors.

In the lead-zinc mill two water-pumps driven by two 150-horsepower motors were installed. The installation of forty-seven new motors totalling 220-horsepower was commenced, and twenty had been installed by the end of 1952. The installation of a 350-horsepower 2,300-volt motor to drive a rod mill was commenced and will be completed early in 1953, as will be an indoor-type 420-kva. power and lighting transformer installation.

For the conveyor tunnel work a 500-horsepower 2,300-volt synchronous motor driving an air compressor was installed, and at No. 6 level a 50-horsepower surface hoist was installed.

Twelve motors totalling 150 horsepower were installed for various other equipment.

At the time of inspection it was found that the 2,300-volt overhead power-line had been installed under the conveyor ramp between the crushing plant and mill in such a position that men working on the building might come in contact with it. This span was replaced with a 3-conductor armoured cable. Insufficient space was allowed between the fence and switchgear in the Emerald compressor plant. The blasting circuit and switch at the 4400 level Dodger mine was incorrectly connected and had to be rewired.

A dangerous occurrence took place in the 40D main drift, Jersey mine, on June 30th. A fire caused by a short circuit in the cab-tire cable from the battery to the fuse box started in one of the underground locomotives. It is thought that the cable was damaged by falling rock. The battery sealing compound and the cable insulation which was burning made considerable smoke. M.S.A. all-service gas masks were worn while moving the locomotive to the surface for complete extinguishing of the fire.

NELWAY

Reeves MacDonald Mines Limited (49° 117° S.E.) The installation of 2,300-volt power cable in the shaft was continued and is now completed from 2250 level to No. 2 shaft substation on 1900 level. This is a 3-conductor No. 2/0 B. & S. gauge varnished-cambric-insulated lead-sheathed steel-wire-armoured cable. To date 1,142 feet of cable has been installed. On 2350 level a double-drum slusher hoist driven by a 50-horsepower motor was installed, and on 1900 level a ventilating fan driven by a 15-horsepower motor was installed.

A new crushing plant was built to increase the crushing capacity. The following equipment was installed: A jaw crusher driven by a 100-horsepower 2,300-volt 3-phase motor; two conveyors driven respectively by a 25-horsepower motor and a 3-horsepower motor; a steel pan feeder driven by a 5-horsepower motor; and a dust fan driven by a 5-horsepower motor.

A second Ingersoll-Rand compressor was installed. It is driven by a 2,300-volt 3-phase motor which is started by magnetically operated across-the-line starting equipment.

SOUTH KOOTENAY LAKE

Pilot Bay (49° 116° N.W.)

Pilot Bay Concentrator.—No alterations were made to the electrical installations in 1952.

NORTH KOOTENAY LAKE

Riondel (49° 116° N.W.)

Bluebell (The Consolidated Mining and Smelting Company of Canada, Limited).—The mill described in the Annual Report for 1951 was completed and put into operation on April 15th, 1952. A hoist driven by a 200-horsepower 550-volt 3-phase induction motor was installed at the top of the new No. 1 shaft.

Ainsworth (49° 116° N.W.)

Yale Lead & Zinc Mines Limited With the exception of the addition of a new switchboard to accommodate two generating units, no major alterations were made to the electrical installations. At the time of inspection the switchboards were found to have the disconnecting switches connected on the generator side of the oil circuit-breakers. This was later changed so that both oil circuit-breakers and generators can be isolated.

Kootenay Florence (Western Mines Limited).—The only new electrical installations made during the year were made in the assay office and consisted of one 1-horsepower 440-volt motor, one 2-horsepower 440-volt motor, one 4-kw. 220-volt hot-plate, and one 4-kw. 440-volt heater.

KEEN CREEK

Cork Province (Base Metals Mining Corporation Limited) (49° 117° N.E.) A new hoist driven by a 100-horsepower 3-phase induction motor was installed at the top of the new shaft. To supply this motor with 440-volt power, 900 feet of 3-conductor armoured cable was installed from the portal to the new hoistroom.

Trouble has been experienced with the magnetic switches on the flotation circuit tripping open. This was apparently caused by the heat from the diesel engines on the opposite side of the wall to the switches affecting the thermal elements in the switches, and it was necessary to insulate the wall against heat transfer.

Bonding conductors were required on much of the mill electrical equipment.

Retallack-Three Forks

Whitewater (Kootenay Belle Gold Mines Limited) (50° 117° S.E.) No major alterations were made to the electrical installations in 1952. At the time of inspection it was found that several switches were overheating and required to be replaced with switches of adequate capacity, some temporary wiring required to be replaced with permanent wiring, and incandescent lamps were in use for immersion heaters in reagents instead of suitable immersion heaters.

Lucky Jim (Zincton Unit, Sheep Creek Gold Mines Limited) (50° 117° S.E.) New electrical installations in 1952 consisted of a 500-cubic-foot-per-minute compressor driven by a 100-horsepower 440-volt motor installed in the power-house and a scraper driven by a 10-horsepower motor installed underground. A new service entrance was installed for the assay office. However, the conductors were not of approved code size and had to be replaced with larger ones. A more suitable type of cable connector for connecting trailing cables to terminal boxes was required, as the ones in use did not hold the cable effectively.

Jackson Basin Mining Co. Ltd.—(50° 117° S.E.) Prints of the electrical plans for a mill at this property were received and approved. Building was commenced, but operations at the property were suspended before installation of the mill equipment was completed.

Sandon

Silversmith (Carnegie Mines of British Columbia Ltd.) (49° 117° S.E.) Plans of the electrical installations for a new mill were received and approved in July. The mill equipment is as follows: A 24-inch by 12-foot coarse-ore feeder driven by a 3-horsepower motor; a 10- by 20-inch Bacon jaw crusher driven by a 20-horsepower motor; an 18- by 20-inch magnet energized by a 1-horsepower motor generator set; an exhaust fan driven by a 1-horsepower motor; an 18-inch by 82-foot conveyor and an 18-inch by 56-foot conveyor, each driven by a 3-horsepower motor; a 36-inch by 6-foot model 50 D.D. Dillon screen driven by a 2-horsepower motor; a 2-foot Symons cone crusher driven by a 30-horsepower motor; an 18-inch by 64-foot fine-ore conveyor driven by a 2-horsepower motor; two 18-inch by 12-foot fine-ore feeders, each driven by a 1½-horsepower motor; a 6-foot by 22-inch Hardinge ball mill driven by a 50-horsepower motor; a 5- by 4-foot Nelson Iron works ball mill driven by a 50-horsepower motor; a 48-inch by 17-foot Akins classifier driven by a 3-horsepower motor; a 3-inch classifier overflow pump driven by a 2-horsepower motor; a 6-cell 32- by 32-inch Denver lead flotation machine driven by three 5-horsepower motors; a 5- by 6-foot zinc conditioner driven by a 3-horsepower motor; an 8-cell 32- by 32-inch Denver zinc flotation machine driven by four 5-horsepower motors; a 2-inch lead-concentrate pump driven by a 5-horsepower motor; a 2-inch zinc-concentrate pump driven by a 5-horsepower motor; a mill sump pump driven by a 5-horsepower motor; a 6-foot 4-disk filter driven by a 1½-horsepower motor; a blower driven by a ½-horsepower motor; a 12- by 6-inch vacuum pump driven by a 20-horsepower motor; a 6- by 6-inch Clayton vacuum pump driven by a 5-horsepower motor; and a 1½-inch filtrate pump driven by a 2-horsepower motor.

A new 150-kw. 2,200-volt 3-phase a.c. generator with switch panel was installed at the power plant to replace the old diesel unit.

Richmond Eureka (Kootenay Belle Gold Mines Limited).—(49° 117° S.E.) The sink-float plant that was built in 1951 was not used in 1952. A small gasoline-engine-driven generator was installed to charge locomotive batteries for a time but was taken out and sold before the end of 1952.

Cody Reco Mines Limited.—(49° 117° S.E.) The mill described in the 1951 Annual Report was completed and put into operation in July, 1952.

Wonderful (Silver Ridge Mining Company Limited).—(49° 117° S.E.) No alterations were made to the electrical installations in 1952. The diesel-powered air compressor was moved to the new power-house at No. 4 level portal.

Victor (Violamac Mines (B.C.) Limited)

(49° 117° S.E.) New electrical equipment consisted of the following: A battery locomotive for haulage on No. 7 level with a motor-generator set installed underground on this level to charge the batteries. In the mill the flotation section was increased, which required an addition of 11 horsepower in motors. The mill was closed down in November. A D-318 electric generating set was used for the remainder of the year to provide electrical power.

At the time of inspection it was found that the magnetic switch on the 7½-horsepower flotation-cell motor required to be replaced with a larger size, several switches required marking to indicate circuits controlled, and a 100-watt incandescent lamp used as an immersion heater for reagents required to be replaced with a heater suitable for the purpose.

Slocan Lake

Bosun (New Santiago Mines Limited).—(49° 117° (N.E.) No changes were made to the electrical installations in 1952.

Western Exploration Company Limited.—(49° 117° S.E.) No major alterations were made to the electrical installations in 1952. At the time of inspection several switches required marking to indicate circuits controlled and several grounding conductors were required on motor frames.

Van Roi (Van Roi Consolidated Mines Limited).—Operations at this property were suspended in August.

North Lardeau

Spider (Sunshine Lardeau Mines Limited)

(50° 117° N.W.) The mill described in the 1951 Annual Report was completed and put into operation. A 75-kva. General Electric generator driven by a 75-horsepower 4-cylinder Vivian diesel engine was installed for auxiliary power. This unit can be paralleled with the main 212.5-kva. generator. At the time of inspection some bonding and grounding was yet to be done and a ground detecting device installed.

Kimberley

Sullivan (The Consolidated Mining and Smelting Company of Canada, Limited)

(49° 115° N.W.) Electrical installations at the Sullivan mine in 1952 included the following: Three 75-kva. transformers were installed in the No. 2 shaft hoistroom to supply 575-volt power to electrical equipment installed in the shaft; two 25-horsepower motors driving pumps were installed in the shaft at the 3500 level. Three 100-kva. transformers were moved from 3500 level to a new substation in 3559 drift. This substation serves as a distribution centre and takes the place of the 3901 hoistroom substation, which has been discarded. A 6,900-volt oil switch was installed in the No. 1 shaft surface substation to control the 6,900-volt power transmitted down the shaft by armoured cable.

A new blacksmith-shop is being built and wired for power and lighting.

Magnetic switches and controllers were installed for the 125-horsepower motor on the jaw crusher and the 50-horsepower motor on the skip car in the underground crushing plant.

A new 40-ton trolley locomotive was put into use for yard service.

The wiring to the No. 1 rolls motor was replaced, as was the lighting-circuit wiring on the filter floor.

Two 100-horsepower rated reduced-voltage automatic starters were installed for pump motors in the sink-float plant.

Formerly, when switchgear was moved to a new circuit, it was often some time before the markings indicating the circuit controlled were changed. Identification plates with standard mounting holes are now used, and when a piece of switchgear is changed to a new circuit, the identification plate is changed also.

At the time of inspection the switchgear for two fan motors was blocked by equipment and the brakes on No. 2 hoist were not functioning properly. These conditions have been corrected.

Fort Steele

Kootenay King (Kootenay Base Metals Limited).—(49° 115° N.W.) The mill described in the 1951 Annual Report was completed and put into operation in March, 1952.

Wasa

Estella (Estella Mines Limited) (49° 115° N.W.) No major alterations were made to the electrical installations at the mill. A new power-house was built at the mine, and in it was installed a 75-kw. 440-volt 3-phase a.c. generator direct-connected to a 90-horsepower General Motors diesel engine. This unit replaces the 15-kw. Higgs generator and the 28-horsepower Lister engine. The air compressors were transferred from the old power-house to the new one. At the time of inspection the brakes on one locomotive and the controller on the other required repairs.

Windermere

Paradise (Sheep Creek Gold Mines Limited) (50° 116° S.E.) No alterations have been made to the mill electrical installations. The installation of a 375-horsepower Fairbanks-Morse diesel engine driving a 312-kva. 2,200-volt generator in the mill power-house has been commenced. This unit will replace the present International diesel-driven generating units. At the time of inspection, repairs were required to the controller on the battery locomotive and the brakes required adjusting, also some improvement to the wiring in the buildings at the mine was necessary.

Spillimacheen

Silver Giant (Giant Mascot Mines Limited) (50° 116° N.E.) Two new generating units have been installed in the power-house. One is a 500-horsepower General Motors diesel direct-connected to a 375-kva. 440-volt 3-phase a.c. Electric Machinery Company generator. The other unit is a 165-horsepower Caterpillar diesel direct-connected to a Louis Allis 96-kw. 480-volt self-regulating generator. These units are paralleled with the other units on the main switchboard and bring the total generating capacity to 1,221 kva.

A 750-cubic-foot-per-minute Bellis & Morcom air compressor driven by a 150-horsepower Westinghouse motor was installed in the power-house.

In the mill a ball mill driven by a 160-horsepower motor was installed and six flotation cells driven by three 10-horsepower motors.

At the time of inspection it was found that the frames of much of the electrical equipment required grounding and the steel-wire-armoured cable installed underground required support at more frequent intervals.

Field

Monarch and Kicking Horse (Base Metals Mining Corporation Limited).—(51° 116° S.E.) Operations at this property were suspended in November. No major changes were made to the electrical installations during the period of operation in 1952.

Revelstoke

Mastodon (Mastodon Zinc Mines Limited).—(51° 117° S.W.) The mill described in the 1951 Annual Report was built and put into operation. From a small diversion dam on La Forme Creek the water for the power plant is carried 10,060 feet through 24-inch wood-stave pipe and then dropped 1,200 feet through 24-inch steel pipe of 3/16- and 1/4-inch thickness to the water-wheels. The power plant consists of a 750-kva. 6,900-volt Westinghouse generator driven by a double-runner water-wheel built by Ross & Howard of Vancouver. It is governed by a Woodward governor.

At the mine a compressor driven by a 300-horsepower 440-volt motor was installed but was not put into operation.

Two high-voltage inflammable oil-filled transformers installed in the power-house required to be enclosed in a vault or replaced with a dry-core type.

The hoist on the incline required limit switches, a backout switch, an emergency switch, and an overspeed device.

Isolating transformers were required on the telephone-line which was strung on the high-voltage transmission-line poles.

A ground detecting device was necessary on the 440-volt system.

Howe Sound

Britannia (Britannia Mining and Smelting Co. Limited).—(49° 123° N.E.) Electrical work done in 1952 was as follows: In the mill a new substation has been built to replace the upper mill transformer station and switchroom. Canadian Westinghouse metal-clad switchgear has been installed. A new assay office has been built and wired for lighting and power. A 40-foot addition has been built on to the concentrate storage shed, which necessitated moving the power and lighting feeders.

Twelve scrapers, ranging from 7½ to 75 horsepower and totalling 472½ horsepower, were installed on various levels underground. Two fans of 7½ and 25 horsepower respectively and two motor-generator sets of 7½ and 40 horsepower respectively were also installed underground. Three 100-kva. 6,900–440-volt Packard transformers and a 200-horsepower fan motor were installed on 3500 level, No. 7 shaft. A 95-horsepower hoist motor was installed on 1400 level. It is supplied with power at 440 volts from No. 1 shaft. No. 3 hoist transformer station on 2200 level was disconnected, and 440-volt power was supplied to this area by armoured cable from No. 7 hoist transformer station.

At the time of inspection No. 7 shaft hoist required adjustment of the brakes to give smooth deceleration when stopped under automatic control. Two locomotives had ineffective controller-handle latches and required repairing. Dust-tight fixtures were required for the incandescent lamps in the explosive storage room.

Texada Island

Little Billie (Vananda Mines (1948) Limited).—(49° 124° N.W.) Operations at this mine were terminated early in 1952, and some of the equipment from the power plant has been taken away.

Texada Mines Limited.—(49° 124° N.W.) A power plant, crushing, screening, and separating plant, stockpile tunnel, loading dock, sample crushing plant and assay office were built early in 1952. The power plant consists of one 200-kw. and two 100-kw. 440-volt diesel-driven generators. The primary crushing plant consists of a primary crusher driven by a 150-horsepower wound-rotor motor. The crusher is fed by a plate feeder driven by a 25-horsepower motor. The rock is carried to the secondary crushing plant by a conveyor driven by a 40-horsepower motor. When it is desired to stockpile, the ore may be diverted at this point to a stockpile by way of a conveyor driven by a 50-horsepower motor. For returning this material to the circuit there are two plate feeders in the stockpile tunnel, each driven by 5-horsepower motors. These plate feeders deliver on to a conveyor driven by a 30-horsepower motor.

In the secondary crushing plant the ore passes over a Messabi screen driven by a 20-horsepower motor, after which it is fed by two synctron feeders on to two magnetic separating conveyors, each driven by a 5-horsepower motor. One of the head pulleys is a permanent magnet and the other is an electromagnet. The electromagnetic pulley is energized by a 7.5-kw. motor-generator set. The iron ore removed is dropped on to a cross-conveyor driven by a 5-horsepower motor and is carried to the concentrate stockpile conveyor by a conveyor driven by a 10-horsepower motor. The remainder of the coarse ore is crushed by a Traylor crusher driven by a 60-horsepower motor.

From the secondary crushing plant to the screening plant the ore is moved by a conveyor driven by a 25-horsepower motor. In the screening plant the ore is passed over a screen driven by a 15-horsepower motor. From the screen the ore is passed over separating equipment. One of these is a conveyor which has a magnetic head pulley and is driven by a 5-horsepower motor. The other two are Stearns type M separators. Each of these units is driven by a 5-horsepower motor through a speed reducer. The waste is carried by a cross-conveyor driven by a 10-horsepower motor to the waste conveyor, which is driven by a 7½-horsepower motor, and is transferred to the stockpile conveyor, which is driven by a 30-horsepower motor.

Under the stockpile the ore is fed on to the main conveyor by three pan feeders, each driven by a 5-horsepower motor. The main conveyor is driven by a 75-horsepower motor. From the main conveyor the ore is passed to the boom conveyor, which is driven by a 25-horsepower motor. The boom hoist is driven by a 25-horsepower motor.

At the time of inspection the bonding and grounding of the frames of the electrical equipment had yet to be completed.

Vancouver Island

Quinsam Lake (49° 125° N.W.)

Iron Hill (The Argonaut Co. Ltd.) Details of the power plant and crushing equipment were given in the 1951 Annual Report. The separating plant was completed during 1952 and is described generally as follows: From the crushed-ore stockpile the ore is taken by a conveyor driven by a 25-horsepower motor to the separating plant, where it passes through a coarse screen driven by a 15-horsepower motor. The undersize is conveyed by a conveyor driven by a 15-horsepower motor to a Messabi screen driven by a 20-horsepower motor, where it is further sized and dropped into various bins by three shuttle conveyors driven by three 5-horsepower motors and moved by three 1-horsepower motors. Under the bins nine conveyors with electromagnetic head pulleys, each driven by a 5-horsepower motor and two Stearns type M separators, separate the ore into concentrate, middlings, and waste.

The concentrate is conveyed to the concentrate stockpile by a conveyor driven by a 15-horsepower motor, and from there is moved to the loading bins by a conveyor driven by a 15-horsepower motor.

The middlings are returned to the secondary crushing system by three conveyors driven respectively by a 10-horsepower motor, a 7½-horsepower motor, and a 15-horsepower motor.

The waste is carried away by two conveyors, each driven by 7½-horsepower motors.

At the time of inspection it was found that porcelain-clad fused cutouts in metal cabinets, which are not approved, and improper entrance cables were being installed on two 2,300-volt motors. Also no gravity-opened switch was being used on blasting circuits, and blasting was done from a grounded source of supply. These conditions have been corrected.

Duncan (48° 123° N.W.)

Twin J (Vancouver Island Base Metals Limited).—Operations at this property were terminated early in 1952.

NON-METALLIC MINES AND QUARRIES

Liard

Cassiar Asbestos Corporation Limited.—(59° 129° S.W.) A mill for the concentration of asbestos ore was built at the property. The connected load for the mill is 260 horsepower, for the workshop 10 horsepower, and for miscellaneous work 2 horsepower. The power plant consists of one generating unit capable of developing 300 kva.

Blubber Bay

Pacific Lime Company Limited.—(49° 124° N.W.) No alterations have been made to the quarry lighting and blasting installations.

British Columbia Cement Company Limited.—Bamberton Quarry (48° 123° N.W.). Blubber Bay Quarry (49° 124° N.W.). No alterations have been made to the electrical installations in the Bamberton quarry. Use of the electrically powered shovel in the Blubber Bay quarry has been discontinued, leaving only the electric blasting equipment in use.

Indian Arm

Gilpin-Nash Limited.—(49° 122° S.W.) This quarry was operated only intermittently in 1952. No major alterations were made to the electrical installations.

Kilgard

Clayburn Company Limited.—(49° 122° S.W.) No alterations were made to the mine electrical installations in 1952. The underground lighting system had deteriorated and in places was damaged so that repairs were necessary.

Coquitlam

Deeks-McBride Ltd.—(49° 122° S.W.) The portable railway system in the gravel pit has been replaced with a conveyor system. At the time of inspection several temporary splices on the trailing cable required to be replaced with vulcanized splices.

Fresh Water Sand & Gravel Company Limited.—(49° 122° S.W.) The overhead lines in the gravel pit have been rebuilt. A thermoplastic jacketed and insulated cable, laid in a trench and covered with sand, carries the power from the end of the overhead lines to an outlet box for the shovel trailing cable.

Windermere

Columbia Gypsum Products, Inc.—(50° 115° S.W.) The contract for removing the gypsum has been given to another company. Since all the electrical equipment belonged to the former contracting company, it was removed upon termination of the contract.

PLACER MINES

Atlin

Spruce Creek (59° 133° N.W.)

Noland Mines Limited.—No major alterations were made to the electrical installations in 1952. Operations at the property were suspended in September, 1952, for an indefinite period.

COAL MINES

NANAIMO (49° 123° S.W.)

Bright Mine, Cassidy (Canadian Collieries (Dunsmuir) Limited).—No alterations have been made to the electrical installations in 1952.

Timberlands Blue Flame.—A screen, driven by a 5-horsepower 440-volt motor, was installed to screen the coal.

No. 8 Mine, Timberlands.—A 5-horsepower motor driving a pump was installed underground for unwatering the mine.

NORTH WELLINGTON (49° 124° S.E.)

Carruthers and Wakelam No. 3 Mine.—A 3-horsepower motor driving a pump was installed underground for unwatering the mine.

COMOX (49° 124° N.W.)

Tsable River Mine (Canadian Collieries (Dunsmuir) Limited).—A second 75-horsepower 2,200-volt 25-cycle motor driving a pump was installed in the underground pumproom. On the surface a compressor driven by a 500-horsepower 2,200-volt 25-cycle motor was installed, and also two conventional-type Edison mine-lamp charging-racks.

At the time of inspection it was found that the 2,200-volt circuit to the river pumps could not be de-energized without also de-energizing the mine-ventilation-fan motor circuit. This unsatisfactory arrangement has been corrected.

No. 8 Mine (Canadian Collieries (Dunsmuir) Limited)

A 5-panel distribution centre was installed underground to control the following circuits: North dip hoist, north side charging-station, pumps, south dip hoist, and charging-station. On the north side a hoist driven by a 250-horsepower 440-volt 25-cycle motor was installed, also a battery-charging unit and an additional 6-ton battery locomotive. Installations on the surface consisted of a compressor driven by a 500-horsepower 60-cycle motor; a 225-kva. 2,200–440-volt 60-cycle transformer bank; the replacement of a 25-cycle motor on a compressor with a 150-horsepower 2,200-volt 60-cycle motor; and the installation in the tipple of a 15-horsepower 440-volt 25-cycle totally enclosed crusher motor. One of the 1,000 kw. 13.2-kva. 25-cycle transformers was changed to 60-cycle British Columbia Power Commission current.

During inspection of the electrical equipment it was found that one of the 2,200-volt cubicles was being used as a storage cabinet. This is a dangerous practice. A set of porcelain-clad fused disconnects in a metal cabinet had been installed for protection on a pump motor. The management was asked to remove these, as they are not approved equipment.

EAST KOOTENAY (49° 114° S.W.)

Michel Colliery (The Crow's Nest Pass Coal Company Limited)

To operate the equipment connected with the new No. 4 battery of by-product coke ovens, the following electrical equipment was installed: Three 150-kva. 2,300–230-volt single-phase transformers; one 75-horsepower, 2,300-volt motor; two 40-horsepower, one 30-horsepower, five 20-horsepower, and ten 1½- to 10-horsepower 220-volt motors. A mile of 6,600-volt overhead power-line was run to A north mine. It consists of three No. 2A copperweld line wires and one No. 4A copperweld neutral wire. The line is supplied by a 500-kva. 2,200–6,600-volt 3-phase transformer which is protected by a 600-ampere 7,500-volt circuit-breaker having an interrupting capacity of 100,000 kva. At the mine a 200-kva. 6,600–

550-volt 3-phase transformer, protected by high-rupturing-capacity fuses and an oil circuit-breaker on the primary, supplies through a 200-ampere 550-volt circuit-breaker, a 100-horsepower 550-volt circuit-breaker, a 100-horsepower 550-volt motor driving an air compressor, and a 15-horsepower 550-volt motor driving a ventilation fan.

Elk River Colliery (The Crow's Nest Pass Coal Company Limited)

A hoist driven by a 350-horsepower 550-volt wound-rotor induction motor was installed at No. 9 mine for slope haulage. It is supplied from three 200-kva. 6,600–550-volt transformers, which in turn are supplied from the 6,600-volt power-line through 300 feet of 7,000-volt 3-conductor paper-insulated lead-sheathed steel-wire-armoured cable. At No. 1 East mine a hoist driven by a 100-horsepower 550-volt motor was installed. It is fed from three 37.5-kva. 2,300–550-volt transformers, which are supplied from the main power-line to No. 1 East mine.

TELKWA (54° 127° N.E.)

Bulkley Valley Collieries Limited.—A new Goodman duckbill loader was added to the mine electrical equipment, and 500 feet of armoured cable was installed down the slope. Moisture condensing in the electrical equipment has caused some trouble, such as burned sockets and contacts.

PEACE RIVER (56° 122° S.E.)

Reschke Coal Ltd.—Use of electrical equipment at this mine has been discontinued.

BRITISH COLUMBIA DEPARTMENT OF MINES
LIST OF PUBLICATIONS

The publications listed are available for distribution except as noted. Recent publications for which no charge is made may be obtained from the Department's offices at Victoria, Vancouver, and Nelson.

PRICES

A small reserve stock of each Annual Report or Bulletin is set aside; the greater part of each issue is distributed free of charge. When the free stock has been exhausted, copies may be obtained from the reserve stock on payment of the price set. The price for a cloth-bound copy of an Annual Report is $1. The Provincial sales tax of 3 per cent must be collected on all sales of publications within the Province. If a charge is made, application for the Annual Report or Bulletin should be made to the Department of Mines, Victoria, B.C., and should be accompanied by the proper sum, including the tax.

INDEXES

Index to Annual Reports of the Minister of Mines of British Columbia for the years 1874 to 1936, inclusive. (By H. T. Nation.) Paper bound, $1; cloth bound, $2.

Index to Annual Reports of the Minister of Mines, 1937–43, and Bulletins Nos. 1–17. (By H. T. Nation.) Paper-bound copies, 50 cents each. Cloth-bound copies, out of print.

Corrigenda, Index to Annual Reports of the Minister of Mines, 1874–1936.

ANNUAL REPORTS

For each year the entry "free" or the price charged appears in the following table if the report is available. If neither "free" nor a price is entered, the report for that year *is not available for distribution.*

Year	Paper Bound	Cloth Bound	Year	Paper Bound	Cloth Bound
1874–1896	—	—	1928	Free	—
1897	—	—	1929	Free	—
1898–1900	—	—	1930	—	—
1901	—	—	1931	—	—
1902–1906	—	—	1932	—	—
1907	—	—	1933	Free	$1.00
1908	—	—	1934	Free	1.00
1909	—	—	1935	Free	—
1910	—	—	1936	(1)	1.00
1911	—	—	1937	(1)	1.00
1912	—	—	1938	(1)	1.00
1913	—	—	1939	Free	1.00
1914	—	—	1940	Free	1.00
1915	50c.	—	1941	Free	1.00
1916	50c.	—	1942	Free	1.00
1917	50c.	—	1943	Free	—
1918	Free	—	1944	Free	1.00
1919	50c.	—	1945	Free	1.00
1920	50c.	—	1946	Free	1.00
1921	Free	—	1947	Free	1.00
1922	50c.	—	1948	Free	1.00
1923	Free	—	1949	Free	1.00
1924	—	—	1950	Free	1.00
1925	—	—	1951	Free	1.00
1926		—	1952	Free	2.50
1927	Free	—			

[1] Parts A to F, bound separately in paper, are available (free) for the years 1936, 1937, and 1938. Part G, "Inspection of Mines," is not available for these years.

BULLETINS, OLD SERIES

Bulletin No. 2, 1918: Bumps and outbursts of gas. (By George S. Rice.)
Bulletin No. 2, 1919: The commercial feasibility of electric smelting of iron ores in British Columbia. (By Alfred Stansfield.)
Bulletin No. 2, 1932: Report on McConnell Creek placer area. (By Douglas Lay.)

MISCELLANEOUS

Special Reports on Coal-mine Explosions. (By George Wilkinson, Thomas Graham, and James Ashworth.) 1918.
Report on Snowflake and Waverley-Tangier Mineral Properties. (By J. D. Galloway.) 1928.
Report on Mineral Properties of the Goldside Mining Company. (By B. T. O'Grady.) 1935. Out of print.
Elementary Geology applied to Prospecting. (By John F. Walker.) Revised, 1953. 75 cents.
Possibilities for Manufacture of Mineral Wool in British Columbia. (By J. M. Cummings.) 1937.
Lode-gold Deposits of the Zeballos Area. (By J. S. Stevenson.) 1938. Out of print.
Preliminary Investigations into Possibilities for Producing Silica Sand from British Columbia Sand Deposits. (By J. M. Cummings.) 1941.
Iron Ores of Canada: Vol. I, British Columbia and Yukon. (By G. A. Young and W. L. Uglow, Geological Survey, Canada, Department of Mines.) 1926.
Mining in British Columbia—an outline of the development of the industry, 1952.

BULLETINS, NEW SERIES, STARTING IN 1940

(Free, except as noted.)

Bulletin No. 1: Aiken Lake Area, North-Central B.C. (By Douglas Lay.) 50 cents.
Bulletin No. 2: Placer-gold Deposits, Wheaton (Boulder) Creek, Cassiar District. (By Stuart S. Holland.) Out of print.
Bulletin No. 3: Fraser River Tertiary Drainage-history in relation to Placer-gold Deposits. I. (By Douglas Lay.)
Bulletin No. 4: Saline and Hydromagnesite Deposits of British Columbia. (By J. M. Cummings.) 50 cents.
Bulletin No. 5: Mercury Deposits of British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 6: Geology of Camp McKinney and the Cariboo Amelia Mine. (By M. S. Hedley.) Out of print.
Bulletin No. 7: Lode-gold Deposits of the Upper Lemon Creek Area and Lyle Creek-Whitewater Creek Area, Kootenay District. (By R. J. Maconachie.) Out of print.
Bulletin No. 8: Preliminary Report on the Bedwell River Area. (By H. Sargent.) 50 cents.
Bulletin No. 9: Molybdenite in British Columbia. (By John S. Stevenson.) Out of print.
Bulletin No. 10: Tungsten Deposits of British Columbia. (By John S. Stevenson and staff of the Department of Mines.) Revised. Out of print.
Bulletin No. 11: Fraser River Tertiary Drainage-history in relation to Placer-gold Deposits. II. (By Douglas Lay.)
Bulletin No. 12: Reconnaissance in the Area of Turnagain and Upper Kechika Rivers. (By M. S. Hedley and Stuart S. Holland.)
Bulletin No. 13: Supplementary Report on Bedwell River Area. (By H. Sargent.)
Bulletin No. 14: Coal Analyses of British Columbia. (By James Dickson.)
Bulletin No. 15: Hydraulic Mining Methods. (By Stuart S. Holland.) Out of print.

Bulletin No. 16: Dragline Dredging Methods. (By Stuart S. Holland.) Out of print.

Bulletin No. 17: An introduction to Metal-mining in British Columbia. (By Officers of the Department.) To be reprinted.

Bulletin No. 18: Specimens and Samples—Their Treatment and Use. (By Officers of the Department.)

Bulletin No. 19: The Tuya-Teslin Area, Northern British Columbia. (By K. DeP. Watson and W. H. Mathews.)

Bulletin No. 20: Lode-gold Deposits—

Part II: South-eastern British Columbia. (By W. H. Mathews.) Revised, 1948.

Part III: Central Southern British Columbia. (By M. S. Hedley and K. DeP. Watson.)

Part IV: South-western British Columbia—exclusive of Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part V: Vancouver Island. (By J. S. Stevenson.) Revised, 1946.

Part VI: North-eastern British Columbia and Cariboo and Hobson Creek Areas. (By S. S. Holland.) Revised, 1946.

Bulletin No. 21: Notes on Placer-mining in British Columbia. (By Officers of the Department.)

Bulletin No. 22: Geology of the Whitewater and Lucky Jim Mine Areas. (By M. S. Hedley.)

Bulletin No. 23: Calcareous Deposits of the Georgia Strait Area. (By W. H. Mathews.)

Bulletin No. 24: Geology and Coal Resources of the Carbon Creek-Mount Bickford Map-area. (By W. H. Mathews.)

Bulletin No. 25: The Squaw Creek-Rainy Hollow Area. (By K. DeP. Watson.)

Bulletin No. 26: Report on the Stanley Area, Cariboo Mining Division. (By Stuart S. Holland.)

Bulletin No. 27: Geology and Mineral Deposits of the Zeballos Mining Camp, British Columbia. (By John S. Stevenson.)

Bulletin No. 28: Placer Gold Production of British Columbia. (By S. S. Holland.)

Bulletin No. 29: Geology and Ore Deposits of the Sandon Area, Slocan Camp, British Columbia. (By M. S. Hedley.)

Bulletin No. 30: Clay and Shale Deposits in British Columbia. (By J. W. McCammon and J. M. Cummings.)

Bulletin No. 31: Geology of the Sheep Creek Camp. (By W. H. Mathews.)

Buletin No. 32: Geology and Mineral Deposits of the Shulaps Range Southwestern British Columbia. (By G. B. Leech.)

Bulletin No. 33: Geology of the Crowsnest Coal Basin with special reference to the Fernie Area. (By C. B. Newmarch.)

SPECIAL REPORTS

Special reports on certain properties were advertised in the Annual Reports 1936 to 1941, inclusive, as available on application. A list of those still available will be supplied on request. The text of a report is either in mimeographed or typewritten form, and ozalid prints can be made of maps or other drawings. Copies of reports still available will be supplied at 10 cents per page of typewritten or mimeographed copy, excepting that the charge for any mimeographed report shall not exceed 25 cents. Additional charges will be made for prints of maps. Requests for these Special Reports, accompanied by the proper sum, should be addressed to the Chief of the Mineralogical Branch.

NOTICES *RE* PUBLICATIONS

Applications are invited from those who wish to receive notices when new publications become available.

MAPS SHOWING MINERAL CLAIMS AND PLACER LEASES

Maps showing the approximate locations of placer-mining leases and mineral claims held by record may be seen at the Central Records Offices at Victoria and Vancouver. Prints are obtainable on request made to the Chief Gold Commissioner at Victoria, and accompanied by the proper sum. The charges are: Full sheet, $1; half-sheet, 50 cents; quarter-sheet, 25 cents. The sales tax of 3 per cent is payable on these charges. The maps conform to the reference and mineral-reference maps issued by the Lands Department in size and geographical detail and correspond as to numbers.

PROSPECTORS' SETS

Prospectors working in British Columbia, and schools in British Columbia giving instruction in prospecting or related to prospecting, may obtain sets of specimens for $2.06 each. That price includes the 3-per-cent sales tax. Each set includes sixty identified specimens of rocks and minerals. Most of the specimens are about an inch square. The localities from which the specimens were obtained are not indicated.

When applying for a set of specimens, the prospector should give the number of his free miner's certificate or otherwise indicate that he is seriously interested in prospecting. Sets will be supplied for a class or a school on request from the principal, teacher, or School Board.

Prospectors outside of British Columbia seriously interested in prospecting in British Columbia may be supplied with sets of specimens but will be expected to pay the postage or express charges. The set as packed weighs 3 pounds.

A request for a set of specimens should be addressed to the Chief of the Mineralogical Branch, Department of Mines, Victoria, B.C., and should be accompanied by the proper sum ($2.06).

LIST OF LIBRARIES

Department publications are being sent to the following Government departments and legislative, university, and public libraries:—

CANADA

Government departments—

- Department of Mines and Technical Surveys, Ottawa.
- Department of Resources and Development, Ottawa.
- Department of Mines and Resources, St. John's, Newfoundland.
- Department of Mines, Halifax, Nova Scotia.
- Department of Lands and Mines, Fredericton, New Brunswick.
- Department of Mines, Quebec, Quebec.
- Department of Mines, Toronto, Ontario.
- Department of Mines and Natural Resources, Winnipeg, Manitoba.
- Department of Natural Resources and Industrial Development, Regina, Saskatchewan.
- Department of Mines and Minerals, Edmonton, Alberta.

Legislative libraries—

- Library of Parliament, Ottawa.
- Legislative Library, Halifax, Nova Scotia.
- Legislative Library, Fredericton, New Brunswick.
- Legislative Library, Quebec, Quebec.
- Legislative Library, Toronto, Ontario.
- Legislative Library, Winnipeg, Manitoba.

Legislative Library, Regina, Saskatchewan.
Legislative Library, Edmonton, Alberta.
Provincial Library, Victoria, British Columbia.

University libraries and museums—
Dalhousie University, Halifax, Nova Scotia.
Acadia University, Wolfville, Nova Scotia.
Laval University, Quebec, Quebec.
McGill University, Montreal, Quebec.
Queen's University, Kingston, Ontario.
Royal Ontario Museum of Geology and Mineralogy, Toronto, Ontario.
University of Toronto, Toronto, Ontario.
University of Manitoba, Winnipeg, Manitoba.
University of Montreal, Montreal, Quebec.
University of Saskatchewan, Saskatoon, Saskatchewan.
University of Alberta, Edmonton, Alberta.
University of British Columbia, Vancouver, British Columbia.

Public libraries—
Public Library, Halifax, Nova Scotia.
Public Library, Montreal, Quebec.
Public Library, Toronto, Ontario (Reference Division).
Public Library, Edmonton, Alberta.
Public Library, Calgary, Alberta.
Public Library, New Westminster, British Columbia.
Nelson Municipal Library, Nelson, British Columbia.
Public Library, Prince Rupert, British Columbia.
Public Library, Prince George, British Columbia.
Public Library, Vancouver, British Columbia (Science and Industry Division).
Public Library, Victoria, British Columbia.

ENGLAND

British Columbia House, Regent Street, London, England.
Canada House, London, England.
Joint Library, Institution of Mining Engineers, Finsbury Circus, London, England.

SOUTH AFRICA

Public Library, Johannesburg, South Africa.

AUSTRALIA

Public Library, Sydney, Australia.

UNITED STATES

Government departments and legislative libraries—
Library of Congress, Washington 25, D.C.
The Interior Department Library, Washington 25, D.C.
United States Geological Survey, Washington 25, D.C.
California State Division of Mines, Ferry Building, San Francisco, California.
Oregon State Department of Geology and Mineral Industries, 702 Woodlark Building, Portland, Oregon.
Washington State Division of Mines and Geology, Olympia, Washington.
Idaho State Bureau of Mines, Boise, Idaho.

University and society libraries—
- Columbia University, New York 27, New York (Document Division).
- University of California, Berkeley, California (Document Division).
- Engineering Societies Library, 29 West Thirty-ninth Street, New York, New York.
- State University of Iowa, Iowa City, Iowa.
- Montana School of Mines, Butte, Montana.
- Oregon State College, Corvallis, Oregon.
- University of Washington, Seattle, Washington.
- University of Nevada, Reno, Nevada.

Public libraries—
- New York Public Library, New York, New York.
- Free Library, Philadelphia Zone 3, Pennsylvania.
- Public Library, Boston, Massachusetts.
- Public Library, Los Angeles, California.
- Public Library, San Francisco, California.
- Library Association of Portland, Portland, Oregon.
- Public Library, Seattle, Washington.
- Public Library, Spokane, Washington.

Lode-metal Deposits Referred to in the 1952 Annual Report

The names of the properties are arranged alphabetically within five areas. Each area consists of the mining divisions listed below. The table shows the principal metals produced or indicated in the deposits in 1952:—

Northern British Columbia.—Atlin, Liard.

Central British Columbia.—Cariboo, Clinton, Omineca, Quesnel.

Coast and Islands.—Alberni, Nanaimo, New Westminster, Skeena, Vancouver, Victoria.

South Central British Columbia.—Greenwood, Kamloops, Lillooet, Nicola, Osoyoos, Similkameen, Vernon.

Southeastern British Columbia.—Ainsworth, Fort Steele, Golden, Nelson, Revelstoke, Slocan, Trail Creek.

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Antimony	Uranium	Cobalt	Molybdenum	Nickel	Page
Northern British Columbia																	
Atlin Ruffner	Atlin	59° 133° N.W.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	75
Big Bull	Atlin	58° 133° N.W.	1	1	1	1	1	..	2	..	..	..	..	..	..	..	75
Black Diamond	Atlin	59° 133° N.E.	..		..	..	..	3	..	..	..	..	..	..	..	..	75
Erickson-Ashby	Atlin	58° 133° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	76
Tulsequah Chief	Atlin	58° 133° N.W.	1	1	1	1	1	..	2	..	..	.	..	..	..	..	75
Central British Columbia																	
American Boy	Omineca	55° 127° S.W.	..	3	..	3	3	..	..		.	.	..	..	..	..	86
Amparo	Quesnel	52° 121° N.E.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	111
Beveley	Omineca	56° 125° S.E.	.	3	..	3	3	.	..	..	..	..	..	..	..	..	101
Bob Creek	Omineca	54° 126° N.W.	3	.	..	..	..	..	..	.	..	..	..	..	..	..	95
Brunswick	Omineca	55° 127° S.W.		3	..	3	3	..	..	..	..	..	..	..	..	..	93
Cariboo Gold Quartz	Cariboo	53° 121° S.W.	1	2	.	..	..	..	..	..	..	..	..	..	..	..	109
Cariboo-Hudson	Cariboo	53° 121° S.W.	.	.	..	..	..	3	..	..	..	..	..	..	..	..	110
Cassiar Crown	Omineca	54° 126° N.W.	..		.	..	3	..	..	..	..	..	..	..	..	..	94
Childhood Dream	Omineca	56° 124° S.W.	..		..	3	3	..	..	..	..	..	..	..	..	..	103
Cronin	Omineca	54° 126° N.W.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	94
Davies	Omineca	56° 124° S.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	103
Duchess	Omineca	54° 127° N.W.	..	..	3	..	3	..	..	..	..	..	..	..	..	..	95
Duthie	*Omineca*	*54° 127° N.E.*	*1*	2	..	*1*	*1*	..	..	..	..	..	..	..	..	..	*93*
Emerald	Omineca	53° 127° N.E.	2	1	..	1	1	..	..	..		.	..	..	..	..	97
Empire	Omineca	54° 127° N.E.		3	..	3	3	..	..	..	..	..	.	..	..	..	94
Fiddler	Omineca	54° 128° N.E.	1	2	2	1	1	..	..	..	..	..	..	..	..	..	85
Golden Eagle	Omineca	54° 126° N.E.	3	3	3	3	3	..	..	.	..	..	..	..	..	..	95
Gordon	*Omineca*	*56° 124° S.W.*		3	..	3	3	..	..	*3*	..	..	..	..	..	..	*105*
Grotto	Omineca	54° 128° N.E.	..		..	..	..	3	..	..	..	..	..	..	..	..	85
Harrison	Omineca	53° 127° N.E.	3	3	..		..	3	..	..	..	..	..	..	..	..	98
Island Mountain	Cariboo	53° 121° S.W.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	110
Jim	Quesnel	52° 121° N.E.	3	..	..	..	.	..	..	..	..	..	..	..	..	..	111
Lakeview	Omineca	54° 126° N.W.	..	..	..		3	..	..	..		..			.	..	94
Lead Empire	Omineca	53° 127° N.E.		3	..	3	3	..	..	.	..	..	..	..	..	..	97
Mamie	Omineca	54° 127° N.E.	1	2	..	1	1	..	..	.	.	..	..	..	..	..	93
Nicholson Creek	Omineca	54° 128° N.E.	.	..	3	..	..	..	..	..	..	..	..	..	..	..	85
Red Rose	Omineca	55° 127° S.W.	1	1	1	..	..	1	..	..	..	..	..	..	..	..	92
Rocher Deboule	Omineca	55° 127° S.W.	1	1	1	..	..	2	..	..	..	..	..	3	..	..	86
Ruby	Omineca	56° 125° S.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	100
Sil Van	Omineca	54° 127° N.E.	1	2	.	1	1	..	..	..	..	..	..	..	..	..	93
Silver Cup	Omineca	54° 126° N.E.	3	3	3	3	3	..	..	..	..	..	..	..	..	..	95
Silver Standard	Omineca	55° 127° S.W.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	85
Smith-Nash	Omineca	53° 127° S.W.	3	3	..	..	..	..	..	..	..	..	..	..	..	..	97
Snowshoe	Omineca	54° 127° N.E.	..	3	.	3	3	.	..	..	..	..	..	..	..	..	94
Stella	Omineca	54° 125° S.E.		.	..	..	..	..	..	..	..	..	..	..	3	..	98

Shipping Mines.—(1) Metal contributed at least 10 per cent of gross value of the shipment. (2) Metal contributed less than 10 per cent of gross value of the shipment.

Non-shipping Mines.—(3) Metal present, indicated by assay or mineralogical determination.

Lode-metal Deposits Referred to in the 1952 Annual Report—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Antimony	Uranium	Cobalt	Molybdenum	Nickel	Page
Central British Columbia —Continued																	
Topley Richfield	Omineca	54° 126° N.E.	3	3	3		3										95
Vernon	Omineca	55° 124° N.W.		3		3	3										106
Weber	Omineca	56° 125° S.E.				3	3										105
Coast and Islands																	
A.M.	New Westm't'r	49° 121° S.E.			3												206
Anyox	Skeena	55° 129° S.W.			3												78
B.C. Nickel	New Westm't'r	49° 121° S.W.														3	208
Big Four	Skeena	55° 129° N.W.		3		3	3										77
Blue Grouse	Victoria	48° 124° N.E.			3												213
Boulder	Alberni	49° 125° N.W.	3	3	3	3	3										213
Britannia	Vancouver	49° 123° N.E.	2	2	1	2	1		2								208
Cambrian Chieftain	Vancouver	50° 123° N.W.		2	1												209
Danzig	Alberni	49° 126° N.E.					3										210
East	Skeena	56° 130° S.E.	1	2													77
Ecstall	Skeena	53° 129° N.W.	3		3		3			3							81
F.L.	Alberni	50° 126° S.W.								3							231
Fallside	Victoria	48° 123° N.W.			3		3										214
Gibson Girl	Skeena	53° 130° N.E.			3	3	3										79
Glengarry and Stormont	Alberni	49° 126° N.W.								3							231
Indian	Skeena	56° 130° S.E.	1	1		1	1										77
Iron Hill	Nanaimo	49° 125° N.W.								1							221
Iron River	Nanaimo	49° 125° N.W.								3							228
Lake	Nanaimo	49° 124° N.E.								1							218
Little Billie	Nanaimo	49° 124° N.W.	1	2	1												209
Lucky Four	New Westm't'r	49° 121° S.W.			3												206
Lynn Creek	Vancouver	49° 123° S.E.					3										208
Lynx	Alberni	49° 125° N.W.	3	3	3	3	3										211
Maple Bay	Skeena	55° 130° S.E.			3												76
Paw	Alberni	49° 125° N.W.	3	3	3	3	3										212
Paxton	Nanaimo	49° 124° N.E.								1							218
Premier Border	Skeena	56° 130° S.E.	1	1		1	1										76
Prescott	Nanaimo	49° 124° N.E.								1							218
Privateer	Alberni	50° 126° S.W.	1	2													210
Quatsino Copper-Gold	Nanaimo	50° 127° S.E.								3							228
Silbak Premier	Skeena	56° 130° S.E.	1	1		1	1		2								76
Silver Tip	Skeena	56° 130° S.E.	3	3		3	3										77
Toric	Skeena	55° 129° N.W.	2	1		2	2										77
Twin J	Victoria	48° 123° N.W.	3	3	3	3	3		3								214
Victory	Victoria	48° 123° N.W.						3				3					215
White Star	Alberni	50° 126° S.W.	1	2													210
South Central British Columbia																	
Attwood Copper	Greenwood	49° 118° S.W.			3												141
Bluebell	Similkameen	49° 121° S.E.		3		3	3										131
Bralorne	Lillooet	50° 122° N.W.	1	2													111
Chalco	Lillooet	50° 122° N.W.			3			3									114
Copper Mountain	Similkameen	49° 120° S.W.	2	2	1												134
Copperado	Nicola	50° 120° S.W.			3												119
Crown Point	Greenwood	49° 119° S.E.		1		1	1										139
Dictator	Greenwood	49° 118° N.E.		3		3	3										140
Dynamo	Greenwood	49° 118° S.W.		3		3	3										140
El Alamein	Similkameen	49° 120° N.W.	3														119
Elizabeth	Lillooet	51° 122° S.E.	3														111
Eureka	Similkameen	49° 121° S.E.		3		3	3		3		3						125
Fairview	Osoyoos	49° 119° S.W.	1														138
French	Osoyoos	49° 120° S.E.	1	2	2												137
Golden Contact	Lillooet	50° 122° N.E.	3														114
Golden Ledge	Lillooet	50° 122° N.W.	3														113
Gray Rock	Lillooet	50° 122° N.W.										3					113
Highland-Bell	Greenwood	49° 119° S.E.	2	1		1	1		2								138
Indiana	Similkameen	49° 121° S.E.		3		3	3										132
Iota	Osoyoos	49° 120° S.E.	3	3		3	3										136
Iron Mask	Kamloops	50° 120° N.E.			3												114
Lucky Strike	Similkameen	49° 120° N.E.	3	3	3	3	3										136
Nickel Plate	Osoyoos	49° 120° S.E.	1	2	2												137
Okanagan	Osoyoos	49° 119° S.W.	1	2		1	1										138
Oregon	Osoyoos	49° 120° S.E.	1	2	2												137

Lode-metal Deposits Referred to in the 1952 Annual Report—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Antimony	Uranium	Cobalt	Molybdenum	Nickel	Page
South Central British Columbia —Continued																	
Pioneer	Lillooet	50° 122° N.W.	1	2													112
Pothook	Kamloops	50° 120° N.E.			3												115
Providence	Greenwood	49° 118° S.W.	2	1		2	2										140
Queen Bess	Similkameen	49° 121° S.E.		3		3	3										132
Silver Chief	Greenwood	49° 118° S.W.				3	3										141
Silver Chief	Similkameen	49° 121° S.E.		3		3	3		3		3						125
Southern No. 8 Fraction	Similkameen	49° 121° S.E.		3		3	3					3					130
Stemwinder	Greenwood	49° 118° S.W.	3		3												140
Summit	Similkameen	49° 121° S.E.		3		3	3										133
Tungsten King	Lillooet	50° 122° N.W.						3									114
Tungsten Queen	Lillooet	50° 122° N.W.						3				3					114
W.S.	Greenwood	49° 118° S.E.		3		3	3										141
Waterloo	Greenwood	49° 118° N.E.		3		3	3										140
Wayside	Lillooet	50° 122° N.W.	3														113
Wellington	Greenwood	49° 119° S.E.	2	1		1	1										139
Yalakom	Lillooet	51° 122° S.E.	3														111
Southeastern British Columbia																	
Ajax	Revelstoke	50° 117° N.E.	3	3		3											187
Alice	Nelson	49° 116° S.W.		1		1	2										195
Alps	Nelson	49° 117° S.E.		3		3	3										153
Altoona	Slocan	49° 117° N.E.		2		1	1										175
Amco	Nelson	49° 117° S.E.	3														146
Arlington	Nelson	49° 117° S.E.	1	2		1	1										146
Ayesha	Ainsworth	49° 116° N.W.		2		1	1										164
B.N.A.	Ainsworth	49° 117° N.E.	2	1		1	1										172
Big Ledge	Slocan	50° 118° N.E.					3										181
Black Diamond	Ainsworth	49° 116° N.W.		2		1	1										159
Black Fox	Ainsworth	49° 117° N.E.	2	2		2	1										171
Black Rock	Nelson	49° 117° S.E.		3		3	3										147
Blue Jay	Revelstoke	50° 117° N.E.		3		3	3										189
Bluebell	*Ainsworth*	*49° 116° N.W.*		*1*		*1*	*1*		*2*								*154*
Bluebird	Slocan	49° 117° N.E.		3		3	3										175
Bluebird	Trail Creek	49° 117° S.W.	3	3		3	3										142
Bosun	Slocan	49° 117° N.E.	2	1		1	1										177
Boy Scout	Fort Steele	49° 116° N.E.	3	3	3	3	3										196
Buck	Slocan	49° 117° N.E.		3		3	3										179
Buckeye	Ainsworth	49° 116° N.W.		2		1	1										165
Budwiser No. 2	*Ainsworth*	*49° 116° N.W.*		*3*		*3*	*3*										*169*
Burt	Fort Steele	49° 115° S.E.		3		3	3										198
Caledonia	Ainsworth	50° 117° S.E.		1		1	1										172
Carey Fraction	Ainsworth	49° 116° N.W.		2		1	1										164
Copper Chief	Revelstoke	50° 117° N.W.		3		3		3									183
Cork-Province	Ainsworth	49° 116° N.E.	2	2		1	1		2								171
Creston Hill	Nelson	49° 116° S.E.			3												195
Daisy Bell	*Ainsworth*	*49° 116° N.W.*		*3*		*3*	*3*										*169*
Deadman	Slocan	49° 117° N.E.		3		3	3										174
Delaware	Nelson	49° 116° S.W.		3		3	3										195
Dewey	Nelson	49° 117° S.E.		2		1	1										145
Dodger	Nelson	49° 117° S.E.						1									148
Doherty	Ainsworth	50° 117° S.E.		3		3	3										172
Dundee	Nelson	49° 117° S.E.	3	3		3	3										144
Eden-Crescent	Ainsworth	49° 116° N.W.		2		1	1										163
Emerald	Nelson	49° 117° S.E.						1									147
Enterprise	Slocan	49° 117° N.E.	2	1		1	1		2								178
Estella	*Fort Steele*	*49° 115° N.W.*	*2*	*2*		*1*	*1*		*2*								*199*
Feeney	Nelson	49° 117° S.E.						1									149
G.Y.P.	Revelstoke	50° 117° N.E.	3	3		3	3										187
Galena Farm	Slocan	49° 117° N.E.		1		1	1										180
Goodenough	Nelson	49° 117° S.E.	1	2		1	1										144
H.B.	Nelson	49° 117° S.E.		3		3	3										147
Hercules	Ainsworth	49° 116° N.W.		3		3	3										165
Hewitt	Slocan	49° 117° N.E.	2	1		1	1		2								179
Highland	Ainsworth	49° 116° N.W.		2		1	1										165

Shipping Mines.—(1) Metal contributed at least 10 per cent of gross value of the shipment. (2) Metal contributed less than 10 per cent of gross value of the shipment.

Non-shipping Mines.—(3) Metal present, indicated by assay or mineralogical determination.

Lode-metal Deposits Referred to in the 1952 Annual Report—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Antimony	Uranium	Cobalt	Molybdenum	Nickel	Page
Southeastern British Columbia—Continued																	
Highlander	Ainsworth	49° 116° N.W.	2	2		1	1										162
I.X.L.	Trail Creek	49° 117° S.W.	1	2													142
International	Nelson	49° 117° S.E.		3		3	3										150
Iron Cap	Nelson	49° 117° S.E.		3		3	3										146
J.G.	Ainsworth	50° 116° S.W.		3		3	3										192
Jack Pot	Nelson	49° 117° S.E.					3										145
Jackson	Ainsworth	50° 117° S.E.	3	3		3	3										173
Jersey	Nelson	49° 117° S.E.		2		1	1		2								148
Jessie	Slocan	49° 117° N.E.		1		1	1										174
Kontiki	Nelson	49° 117° S.E.		3		3	3										150
Kootenay Florence	Ainsworth	49° 116° N.W.	2	2		1	1		2								163
Kootenay King	Fort Steele	49° 115° N.W.	2	2		1	1		2								198
Krao	Ainsworth	49° 116° N.W.		2		1	1										163
Lakeshore	Revelstoke	50° 117° N.W.		3		3	3										181
Lakeview	Nelson	49° 116° S.W.	2	2		1	1										154
Lamac	Ainsworth	49° 116° N.E.				3	3										156
Last Chance	Nelson	49° 117° S.E.					3										145
Last Chance	Slocan	49° 117° N.E.		3		3	3										174
Libby	Ainsworth	49° 116° N.W.		2		1	1										165
Little Phil	Ainsworth	49° 116° N.W.		2		1	1										156
Little Tim	Slocan	49° 117° N.E.	2	1		1	1										180
Lone Bachelor	Slocan	49° 117° N.E.				3											177
Lucky Boy	Revelstoke	50° 117° N.W.		3		3		3									183
Lucky Jack	Ainsworth	50° 117° S.E.		3		3	3						3			3	191
Lucky Jim	Slocan	50° 117° S.E.	2	2		2	1		2								173
Maestro	Ainsworth	49° 116° N.W.		2		1	1										156
Mammoth	Slocan	49° 117° N.E.	2	1		1	1		2								178
Mastodon	Revelstoke	51° 118° S.E.		2		2	1		2								205
Midnight	Trail Creek	49° 117° S.W.	1	2													142
Mineral King	Golden	50° 116° S.E.		3		3	3										203
Molly Mac	Revelstoke	50° 117° N.E.		3		3	3										190
Monarch and Kicking Horse	Golden	51° 116° S.E.		2		1	1		2								204
Monitor	Slocan	50° 117° S.E.	2	1		1	1										173
Moonshine	Ainsworth	50° 116° S.W.		1		1	1										194
Nettie L.	Revelstoke	50° 117° N.E.	3	3		3	3										187
New Jerusalem	Ainsworth	49° 116° N.W.	2	2		1	1		2								168
New Springfield	Slocan	49° 117° N.E.		1		1	1										176
Nicolet	Ainsworth	49° 116° N.W.		2		1	1										164
Noah	Ainsworth	49° 116° N.W.		2		1	1										164
Noble Five	Slocan	49° 117° N.E.	2	1		1	1										174
Ottawa	Slocan	49° 117° N.E.	2	1													180
Oxide	Nelson	49° 117° S.E.					3										145
Paradise	Golden	50° 116° S.E.	2	2		1	1		2								200
Paradise	Kamloops	52° 119° S.E.											3				115
Queen	Nelson	49° 117° S.E.	1	2													146
Reeves MacDonald	Nelson	49° 117° S.E.		2		1	1		2								153
Regal Silver	Revelstoke	51° 117° S.W.		3		3	3	3									205
Renata	Slocan	49° 117° S.E.	3	3		3	3	3									181
Republic No. 2	Slocan	49° 117° N.E.		1		1	1										181
Richmond-Eureka	Slocan	49° 117° N.E.		1		1	1										174
Right Bower	Ainsworth	50° 116° S.W.		1		1	1										194
Rosebery Surprise	Slocan	49° 117° N.E.		1			1										177
Ruth Hope	Slocan	49° 117° N.E.		3		3	3										174
St. Patrick	Ainsworth	50° 116° S.W.		3		3	3										193
Sampson	Revelstoke	50° 117° N.W.		3		3	3										181
Scranton	Ainsworth	49° 117° N.E.	2	1		1	1		2								170
Silver Bear	Ainsworth	49° 117° N.E.		1		1	1										172
Silver Cup	Revelstoke	50° 117° N.E.		3		3	3										189
Silver Dollar	Revelstoke	50° 117° N.W.		3		3	3										183
Silver Giant	Golden	50° 116° S.E.		2		1	1		2								203
Silversmith	Slocan	49° 117° N.E.		3		3	3										174
Slocan Sovereign	Slocan	49° 117° N.E.		1		1	1										174
Snowflake	Revelstoke	51° 117° S.W.		3		3	3	3									205
Society Girl	Fort Steele	49° 115° S.W.		2		1	2										195
Spider	Revelstoke	50° 117° N.W.	2	1		1	1										182
Spokane	Ainsworth	49° 116° N.W.		2		1	1										159
Spokane	Nelson	49° 116° S.W.	1	2		1	2										154
Standard	Slocan	49° 117° N.E.	2	1		1	1		2								178

LODE-METAL DEPOSITS REFERRED TO IN THE 1952 ANNUAL REPORT—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Antimony	Uranium	Cobalt	Molybdenum	Nickel	Page
Southeastern British Columbia —Continued																	
Star	Ainsworth	49° 116° N.W.	3	3	—	3	3	—	—	—	—	—	—	—	—	—	166
Stewart	Nelson	49° 117° S.E.	—	—	—	—	—	3	—	—	—	—	—	—	—	—	145
Sullivan	Fort Steele	49° 115° N.W.	2	1	—	1	1	—	2	—	—	—	—	—	—	—	196
Sun Fraction	Nelson	49° 117° S.E.	1	2	—	2	2	—	—	—	—	—	—	—	—	—	144
Sunset	Trail Creek	49° 117° S.E.	—	1	—	1	1	—	—	—	—	—	—	—	—	—	143
Sylverite	Slocan	49° 117° N.E.	—	3	—	3	3	—	—	—	—	—	—	—	—	—	176
Teddy Glacier	Revelstoke	50° 117° N.W.	—	3	—	3	3	—	—	—	—	—	—	—	—	—	183
Townsite	Ainsworth	49° 116° N.W.	—	2	—	1	1	—	—	—	—	—	—	—	—	—	156
True Fissure	Revelstoke	50° 117° N.E.	—	3	—	3	3	—	—	—	—	—	—	—	—	—	189
Truman	Nelson	49° 117° S.E.	—	3	—	3	3	—	—	—	—	—	—	—	—	—	150
Twin	Ainsworth	49° 116° N.W.	—	2	—	1	1	—	—	—	—	—	—	—	—	—	164
Union	Trail Creek	49° 117° S.W.	—	1	—	1	1	—	—	—	—	—	—	—	—	—	143
United	Ainsworth	49° 116° N.W.	—	2	—	1	1	—	—	—	—	—	—	—	—	—	163
Van Roi	Slocan	49° 117° N.E.	2	1	—	1	1	—	2	—	—	—	—	—	—	—	179
Velvet	Trail Creek	49° 117° S.W.	1	2	1	2	2	—	—	—	—	—	—	—	—	—	142
Verity	Kamloops	52° 119° S.E.	—	—	—	—	—	—	—	—	—	—	3	—	—	—	115
Victor	Slocan	49° 117° N.E.	2	1	—	1	1	—	2	—	—	—	—	—	—	—	176
Victory	Nelson	49° 117° S.E.	—	—	—	—	—	3	—	—	—	—	—	—	—	—	146
Vigilant	Ainsworth	49° 116° N.W.	—	2		1	1	—	2	—	—	—	—	—	—	—	170
Vulture	Slocan	49° 117° N.E.	—	3	—	3	3	—	—	—	—	—	—	—	—	—	175
Wagner	Ainsworth	50° 117° N.E.	—	3	—	3	3	—	—	—	—	—	—	—	—	—	191
White Quail	Ainsworth	50° 117° N.E.	—	3	—	3	3	—	—	—	—	—	—	—	—	—	191
Whitewater	Ainsworth	50° 117° S.E.	2	1	—	1	1	—	2	—	—	—	—	—	—	—	172
Winona Boon	Ainsworth	50° 117° S.E.	—	1	—	1	1	—	—	—	—	—	—	—	—	—	173
Wonderful	*Slocan*	*49° 117° N.E.*	—	*3*	—	*3*	*3*	—	—	—	—	—	—	—	—	—	*176*
Woodbury	Ainsworth	49° 116° N.W.	—	2	—	1	1	—	—	—	—	—	—	—	—	—	169
Yankee Girl	Nelson	49° 117° S.E.	3	3	—	3	3	—	—	—	—	—	—	—	—	—	144
Young Canuck	Revelstoke	50° 117° N.W.	—	3	—	3	3	—	—	—	—	—	—	—	—	—	181

Shipping Mines.—(1) Metal contributed at least 10 per cent of gross value of the shipment. (2) Metal contributed less than 10 per cent of gross value of the shipment.

Non-shipping Mines.—(3) Metal present, indicated by assay or mineralogical determination.

INDEX

A

B

C

D

E

F

G

H

I

J

K

L

Mc and Mac

M

N

O

P

T

U

V

W

LIST OF ILLUSTRATIONS

DRAWINGS

PHOTOGRAPHS

VICTORIA, B.C.
Printed by Don McDiarmid, Printer to the Queen's Most Excellent Majesty
1953

2,250-453-3238