Minister of Mines

PROVINCE OF BRITISH COLUMBIA

ANNUAL REPORT

For the Year Ended 31st December

1953

VICTORIA, B.C.
Printed by DON MCDIARMID, Printer to the Queen's Most Excellent Majesty
1954

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 1953 is herewith respectfully submitted.

R. E. SOMMERS,

Minister of Mines.

Minister of Mines' Office.

May, 1954.

CONTENTS

LIST OF ILLUSTRATIONS

PHOTOGRAPHS

DRAWINGS

ANNUAL REPORT OF THE MINISTER OF MINES, 1953

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 Lode Metals; Placer; Structural Materials and Industrial Minerals; Petroleum and Natural Gas; Inspection of Lode Mines, Placer Mines, and Quarries; Coal; 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 on 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 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, 1953

By Hartley Sargent

The value of the mineral output of British Columbia in the calendar year 1953 was $152,731,181, compared with $171,298,142 in 1952. Metals contributed 82.7 per cent of the 1953 production value, industrial minerals contributed 2.1 per cent, structural materials contributed 8.9 per cent, and coal 6.3 per cent.

The value of the metals was $126,333,618, compared with $147,799,867 in 1952. Greater quantities of copper, lead, zinc, iron, and tungsten were produced in 1953 than in 1952. Copper was valued at $14,869,544, iron at $6,763,105, and tungsten at $5,950,323. The combined value of the three metals was $4,300,000 greater in 1953 than in 1952; however, because of lower prices the combined value of lead and zinc was almost $25,400,000 less than in 1952. The quantities of gold and silver produced in 1953 were close to 1952 quantities. The prices* for gold and silver were fractionally higher, but the prices for copper, lead, and zinc were lower than in 1952, copper being 97.8, lead 82.2, and zinc 67.9 per cent of the 1952 average prices.

The value of industrial minerals increased, mainly because of the production of asbestos by the Cassiar Asbestos Corporation Limited. The value of structural materials also increased, mainly because of the increased production of cement, made possible by the expansion in the plant of the British Columbia Cement Company, effective late in 1952.

Sulphur, included under industrial minerals, is a by-product of the lode-mining industry and includes sulphur recovered from smelter gases and the sulphur content of iron sulphide concentrates sold or used as a source of sulphur. Sulphur recovered mainly from roaster fumes at the Trail smelter is used in the manufacture of chemical fertilizer. The value credited for sulphur is less than a tenth of the value of fertilizer produced. A substantial increase in the fertilizer-manufacturing capacity has been provided in the sulphuric acid and ammonium phosphate plants constructed adjacent to the Sullivan mill near Kimberley. Manufacture of fertilizer began in the new plant in October, 1953.

A substantial part of the gold and three-quarters of the silver produced were contained in concentrates and ores shipped to smelters. As has been the case in recent years, gold recovered as bullion was sold to the Canadian mint.

Most of the copper produced was in the form of concentrates exported to the Tacoma smelter. The remainder was in dross from the Trail lead smelter and in precipitates from Britannia mine water; both were shipped to Tacoma.

Some lead and zinc concentrates were exported to United States smelters, but most of the output went to Trail. In addition to treating concentrates from company mines and customs ores and concentrates from other British Columbia mines, the Trail smelter treated lead ores and concentrates from widely separated non-British Columbia shippers and some zinc concentrates from Yukon Territory and the State of Washington.

British Columbia lead and zinc, including the contents of concentrates exported and the refined metal produced, were sold mainly in Canada, in the United States and Great Britain. Well over half the silver produced was sold in the United States.

Import duties on lead and zinc going to the United States were: On lead in ores and concentrates, 0.75 cents per pound; on lead in bullion, 1.06 cents per pound; on zinc in

* Averages for the year, in Canadian funds.

concentrates, 0.6 cents per pound; on refined zinc in slabs, 0.7 cents per pound. Copper concentrates entered the United States duty-free.

For the first year in British Columbia's production history, asbestos was produced in substantial volume. The fibre is of high quality and is shipped from the mine on McDame Creek by truck, rail, and water some 1,500 miles to Vancouver, and from Vancouver to points in the eastern United States.

In 1953 the last company-operated coal mine at Nanaimo was closed, and production of coal on Vancouver Island is now mainly from the Tsable River colliery of Canadian Collieries (Dunsmuir) Limited. Coke production by The Crow's Nest Pass Coal Company has been entirely in by-product ovens since October, 1952, when a new battery of Curran-Knowles ovens was brought into production and the last beehive ovens at Michel were closed. At the end of 1953 a plant to produce briquetted coal for use in steam locomotives was nearing completion at Michel.

Exploration and development of lode-mineral deposits has been reduced because of the reduced prices for lead and zinc and the fact that under the conditions obtaining in the past decade only gold mines having high-grade ore can be operated profitably. The operations of the Cassiar Asbestos Corporation on McDame Creek and some activities in Yukon Territory attracted interest to northern British Columbia. Exploration of the copper prospect at the Leduc glacier by Granduc Mines, Limited (controlled by the Granby Company) points to the possibility of the development of another large copper mine in British Columbia.

The reduced prices for lead and zinc affected exploration and development more widely than they affected production, and reduced employment in lode-mining in 1953 reflects reduced exploration and development as well as the shutting-down of producing mines.

Exploration for petroleum and natural gas was carried on actively and was mainly concentrated in northeastern British Columbia. Drilling was done on forty-seven wells during 1953; of these, eighteen were abandoned, two were standing at the end of the year, seven were drilling, and twenty had been completed as potential gas wells, making a total of thirty-nine potential gas wells.

Figures for employment and expenditure in exploration for petroleum and natural gas are not available. The average number employed throughout 1953 in placer, lode, coal, industrial-mineral, and structural-materials mining was 15,658. Major expenditures by those branches of the industry included: Salaries and wages, $55,543,490; fuel and electricity, $8,668,099; process supplies, $20,979,411; Federal taxes, $11,811,177; Provincial taxes, $1,172,276; municipal and other taxes, $1,210,966; levies for workmen's compensation (including silicosis) and for unemployment insurance, $1,760,232. Dividends amounted to $22,323,089, and the lode-mining industry spent $27,815,152 in freight and treatment charges on ores and concentrates.

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.

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* p. 14). 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 14.

* 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. Table IX lists the full mine output (gross) produced and its value, and these figures are incorporated in Table I, in the total 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.

The average price for coal, listed year by year (*see* p. 14), is the total value *divided by the quantity. Up to and including 1945, the quantity is the gross mine output;* for 1946 and subsequent years, the quantity is the quantity sold and used. For 1946 and subsequent years, the value (Tables I, III, VIIA, and IXA) is the amount realized from sales of coal, at colliery loading points, plus the colliery valuation of coal used, under *the headings given in Table IXC. For 1946 and subsequent years the quantity sold* and used is shown in Table IXC. " Use " includes coal used under company stationary and locomotive boilers, and used in making coke. Washery loss and changes in stocks, year by year, are shown in the section on Coal, in the Annual Report of the Minister of Mines in a table " Collieries of British Columbia, Production and Distribution by Collieries and by Districts."

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 NY.	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 ,,	5.57
1947	28.78	35.00	72.000 ,,	20.39 ,,	13.670 ,,	11.230 ,,	6.51
1948	28.78	35.00	75.000 Mont.	22.35 U.S.	18.040 ,,	13.930 ,,	7.20
1949	29.60	36.00	74.250 U.S.	19.973 ,,	15.800 U.S.	13.247 U.S.	6.55
1950	31.29	38.05	80.635 ,,	23.428 ,,	14.454 ,,	15.075 ,,	6.46
1951	30.30	36.85	94.55 ,,	27.70 ,,	18.4 ,,	19.9 ,,	6.46
1952	28.18	34.27	83.157 ,,	31.079 ,,	16.121 ,,	15.874 ,,	6.93
1953	**28.31**	**34.42**	**83.774 ,,**	**30.333 ,,**	**13.265 ,,**	**10.675 ,,**	**6.96**

[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 13.

The bases for the prices listed are discussed in detail on pages 11 and 12.

TABLE I.—TOTAL MINE PRODUCTION FOR ALL YEARS UP TO AND INCLUDING 1953

	Total Quantity	Total Value	Quantity, 1953	Value, 1953
Gold—placer crude, oz.	5,177,145	$95,308,138	14,245	$403,230
„ —lode fine, oz.	14,220,286	403,921,587	253,553	8,727,294
Silver oz.	368,564,743	210,257,632	8,376,953	7,017,709
Copper lb.	2,741,006,264	419,371,946	49,021,013	14,869,544
Lead lb.	11,084,181,022	705,113,129	296,559,781	39,338,655
Zinc lb.	8,236,626,564	585,301,802	378,345,159	40,388,346
Miscellaneous metals[1]		78,014,850		15,588,840
Industrial minerals[2]		38,862,952		3,211,748
Structural materials		172,788,342		13,555,038
Coal[3] tons	134,756,885	508,975,481	1,576,105	9,630,777
Totals		3,217,915,859		152,731,181

[1] For individual miscellaneous metals, *see* Tables III and VIIIB, pages 16 and 28.
[2] For individual industrial minerals, including sulphur, *see* Tables III and VIIIc, pages 16 and 30.
[3] Quantity is gross mine output; it includes material discarded in picking and washing. For 1946 and subsequent years the quantity of coal sold and used is shown in Tables III, VIIA, and IXc.

TABLE II.—PRODUCTION FOR EACH YEAR FROM 1836 TO 1953, INCLUSIVE

1836–95 (incl.)	$95,355,012	1926	$67,188,842
1896	7,507,956	1927	60,729,358
1897	10,455,268	1928	65,372,583
1898	10,906,861	1929	68,245,443
1899	12,429,707	1930	55,391,993
1900	16,344,751	1931	34,883,181
1901	19,671,572	1932	28,798,406
1902	17,486,550	1933	32,602,672
1903	17,495,954	1934	42,305,297
1904	18,977,359	1935	48,821,239
1905	22,461,325	1936	54,081,967
1906	24,980,546	1937	74,475,902
1907	25,882,560	1938	64,485,551
1908	23,851,277	1939	65,681,547
1909	24,443,025	1940	75,701,145
1910	26,377,066	1941	78,479,719
1911	23,499,072	1942	75,551,093
1912	32,440,800	1943	65,892,395
1913	30,296,398	1944	54,923,803
1914	26,388,825	1945	63,343,949
1915	29,447,508	1946	72,746,446
1916	42,290,462	1947	114,497,115
1917	37,010,392	1948	153,230,249
1918	41,782,474	1949	131,163,469
1919	33,296,313	1950	148,332,891
1920	35,543,084	1951	175,607,514
1921	28,066,641	1952	171,298,142
1922	35,162,843	1953	152,731,181
1923	41,304,320		
1924	48,704,604	Total	$3,217,915,859
1925	61,492,242		

TABLE III.—QUANTITY AND VALUE OF MINE PRODUCTS FOR YEARS 1944 TO 1953

Description	1944		1945		1946		1947		1948	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Principal Metals		$		$		$		$		$
Gold—placer, crude oz.	11,433	361,977	12,589	398,591	15,729	475,361	6,969	200,585	20,332	585,200
„ lode, fine oz.	186,632	7,185,332	175,373	6,751,860	117,612	4,322,241	243,282	8,514,870	286,230	10,018,050
Silver oz.	5,705,334	2,453,293	6,157,307	2,893,934	6,365,761	5,324,959	5,707,691	4,109,538	6,718,122	5,038,592
Copper lb.	36,300,589	4,356,070	25,852,366	3,244,472	17,500,538	2,240,070	41,783,921	8,519,741	43,025,388	9,616,174
Lead lb.	294,797,469	13,265,886	353,497,689	17,674,884	347,990,146	23,489,335	306,400,709	41,884,977	332,996,351	60,072,542
Zinc lb.	280,356,477	12,055,328	301,737,902	19,431,921	270,718,128	21,143,086	268,450,926	30,147,039	296,012,941	41,234,603
Totals		39,677,886		50,395,662		56,995,052		93,376,750		126,565,161
Miscellaneous Metals										
Antimony lb.	1,937,933	281,000	1,679,878	292,635	642,145	96,322	1,150,463	384,255	310,062	113,173
Bismuth lb.	123,875	154,844	189,815	260,047	234,020	327,628	284,357	560,183	222,000	444,000
Cadmium lb.	365,112	401,623	510,432	505,328	632,539	771,698	547,248	941,266	617,226	1,126,437
Mercury lb.	735,908	1,210,375							679	3,735
Platinum oz.							1	59	242	21,175
Tin lb.	516,626	299,643	849,983	484,490	874,186	480,802	714,198	517,794	691,332	688,567
Tungsten (WO_3) lb.	271,765	236,788	366	331			496,023	680,792	1,409,297	1,409,297
Totals		2,584,273		1,542,831		1,676,450		3,084,349		3,806,384
Industrial Minerals										
Barite tons	12,373	48,007	31,155	45,780	2,728	19,000	2,875	26,650	1,632	16,317
Diatomite tons	7	190	22	498	40	1,027	59	1,472	24	817
Flux (quartz, limestone) tons	63,443	100,283	45,221	70,266	55,732	71,531	102,918	174,655	83,389	248,977
Granules (slate and rock) tons	949	17,903	969	16,272	1,116	19,917	1,156	19,686	4,958	68,937
Gypsum and products tons	26,442	103,937	23,718	127,434	40,900	318,500	67,112	523,298	77,055	546,707
Iron oxides tons	482	8,200	397	1,985	427	2,135	58	464	3,386	30,472
Mica lb.	924,000	15,382	1,284,000	17,136	1,616,000	23,420	1,808,000	24,240	894,000	9,494
Sodium carbonate lb.	43	473	286	3,146	210	2,310	163	1,793		
Sulphur tons	113,374	1,123,868	127,653	1,267,350	126,622	1,258,576	157,161	1,503,714	144,448	1,409,156
Totals		1,418,243		1,549,867		1,716,416		2,275,972		2,330,877
Structural Materials										
Brick—common No.	2,038,193	40,936	3,092,000	80,556	3,300,000	94,000	4,318,000	122,660	3,810,000	111,300
„ face, paving, sewer No.	1,182,784	41,495	1,319,743	49,814	2,077,683	84,353	1,232,812	64,849	2,584,752	129,268
„ firebrick, blocks		181,199		217,275		283,317		389,899		392,458
Clays tons	3,706	17,283	510	7,899	601	8,241	11,428	9,675	5,673	32,922
Structural tile, hollow blocks		26,527		70,376		105,194		158,276		116,513
Drain-tile, sewer-pipe, flue-linings		165,905		205,883		263,864		361,975		597,541
Pottery—glazed or unglazed				3,245		2,811		3,476		5,138
Other clay products		3,444		2,632		3,611		9,332		9,611
Cement		1,085,918		1,182,297		1,739,966		1,896,772		2,441,304
Lime and limestone tons	147,444	421,648	162,334	522,692	159,493	642,912	151,671	714,126	209,453	1,177,632
Rubble, riprap, crushed rock tons	44,423	40,926	71,949	65,194	154,164	158,446	222,044	216,873	896,780	839,780
Sand and gravel		935,370		865,557		1,713,138		1,828,919		3,060,535
Stone tons	2,009	64,794	4,284	127,809	4,354	99,710	19,835	119,971	3,579	54,220
Totals		3,025,445		3,401,229		5,199,563		5,896,803		8,968,222
Fuel										
Coal[1] tons	2,165,676	8,217,966	1,700,914	6,454,360	1,284,904	7,158,965	1,514,598	9,863,241	1,604,480	11,559,605
Provincial totals		54,923,803		63,343,949		72,746,446		114,497,115		153,230,249

TABLE III.—QUANTITY AND VALUE OF MINE PRODUCTS FOR YEARS 1944 TO 1953—*Continued*

Description	1949		1950		1951		1952		1953	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Principal Metals		$		$		$		$		$
Gold—placer, crude ... oz.	17,886	529,524	19,134	598,717	23,691	717,911	17,554	494,756	14,245	403,230
„ lode, fine ... oz.	288,396	10,382,256	283,983	10,805,553	261,274	9,627,947	251,393	8,615,238	253,553	8,727,294
Silver ... oz.	7,636,053	5,669,769	9,507,225	7,666,151	8,215,884	7,768,118	8,796,720	7,315,088	8,376,953	7,017,709
Copper ... lb.	54,856,808	10,956,550	42,212,133	9,889,458	43,249,658	11,980,155	42,005,512	13,054,893	49,021,013	14,869,544
Lead ... lb.	263,580,549	41,645,726	307,122,803	44,391,530	273,456,604	50,316,015	284,949,396	45,936,692	296,559,781	39,338,655
Zinc ... lb.	276,324,451	36,604,700	324,263,778	48,882,765	333,910,764	66,448,242	372,871,717	59,189,656	378,345,159	40,388,346
Totals ...		105,788,525		122,234,174		146,858,388		134,606,323		110,744,778
Miscellaneous Metals										
Antimony ... lb.	158,288	61,020	643,540	216,229	1,310,836	622,647	2,333,239	1,028,025	1,551,043	570,474
Bismuth ... lb.	102,913	210,972	162,616	369,138	191,471	451,872	142,246	312,941	71,298	157,569
Cadmium ... lb.	665,449	1,364,170	650,540	1,535,274	1,164,933	3,122,021	726,172	1,561,270	787,158	1,550,701
Indium ... oz.	689	1,550	4,952	12,132	582	1,368	404	889	6,752	14,922
Iron ore ... tons	5,472	27,579			113,535	790,000	900,481	5,474,924	991,248	6,763,105
Platinum ... oz.	99	7,468	111	9,239	22	2,085	2	176		
Tin ... lb.	619,117	633,047	796,403	828,259	346,718	495,807	212,113	250,293	1,092,228	581,746
Tungsten (WO_3) ... lb.			281,160	281,160			1,434,640	4,565,024	2,168,977	5,950,323
Totals ...		2,305,806		3,251,431		5,485,800		13,193,542		15,588,840
Industrial Minerals										
Asbestos ...								23,000		988,716
Barite ... tons	1,314	13,145	1,440	17,284	1,248	16,224	848	13,408	3,560	52,845
Diatomite ... tons	36	963	4	108	8	223	12	240		
Flux (quartz, limestone) ... tons	108,531	213,773	144,325	268,411	144,235	292,100	55,588	141,478	37,358	110,698
Granules (slate and rock) ... tons	5,941	79,661	7,886	104,590	5,727	73,767	1,610	21,026	4,620	59,321
Gypsum and products ... tons	98,977	616,490	92,882	620,108	124,729	263,072	91,112	235,453	172,665	387,655
Iron oxides ... tons	2,752	23,301								
Mica ... lb.	578,000	5,675	456,000	5,533	606,000	7,462	314,000	3,001	604,000	11,338
Perlite ... tons									1,112	11,120
Sodium carbonate ... tons	47	517								
Sulphur ... tons	160,435	1,546,798	143,343	1,421,806	194,874	1,840,992	182,607	1,745,258	151,954	1,590,055
Totals ...		2,500,323		2,437,840		2,493,840		2,182,864		3,211,748
Structural Materials										
Brick—common ... No.	3,220,000	95,075	3,980,500	117,770	1,353,000	41,820	830,815	28,248	1,382,883	51,381
„ face, paving, sewer ... No.	509,560	24,793	974,380	52,823	3,127,888	153,575	2,566,540	121,254	4,307,894	226,459
„ firebrick, blocks ...		135,391		282,962		380,742		435,681		426,783
Clays ... tons	6,500	22,339	6,706	32,264	14,786	60,255	11,483	51,797	5,226	31,990
Structural tile, hollow blocks ...		145,512		191,016		171,481		60,273		123,469
Drain-tile, sewer-pipe, flue-linings ...		265,098		428,418		410,206		468,110		627,097
Pottery—glazed or unglazed ...		5,176		5,860		4,695		6,536		30,012
Other clay products ...		9,676		11,335		10,393		11,296		19,267
Cement ...		3,029,425		3,088,296		3,311,439		3,603,273		5,071,260
Lime and limestone ... tons	179,400	1,295,087	221,454	1,133,776	241,723	1,251,327	321,710	1,552,772	338,005	1,357,958
Rubble, riprap, crushed rock ... tons	1,112,272	916,841	1,164,049	990,257	972,178	1,145,072	739,504	982,792	770,415	1,122,516
Sand and gravel ...		3,967,132		3,723,487		3,355,693		3,839,965		4,388,594
Stone ... tons	2,287	44,345	26,758	188,675	4,837	309,350	122,308	434,964	2,611	78,252
Totals ...		9,955,890		10,246,939		10,606,048		11,596,961		13,555,038
Fuel										
Coal[1] ... tons	1,621,268	10,612,925	1,574,006	10,162,507	1,573,572	10,163,438	1,402,347	9,718,452	1,384,138	9,630,777
Provincial totals ...		131,163,469		148,332,891		175,607,514		171,298,142		152,731,181

[1] For 1946 and subsequent years the quantity of coal is that sold and used. Previously gross mine output, including waste discarded in picking and washing, has been listed.

Table IV.—Mineral Production Value, 1895–1953

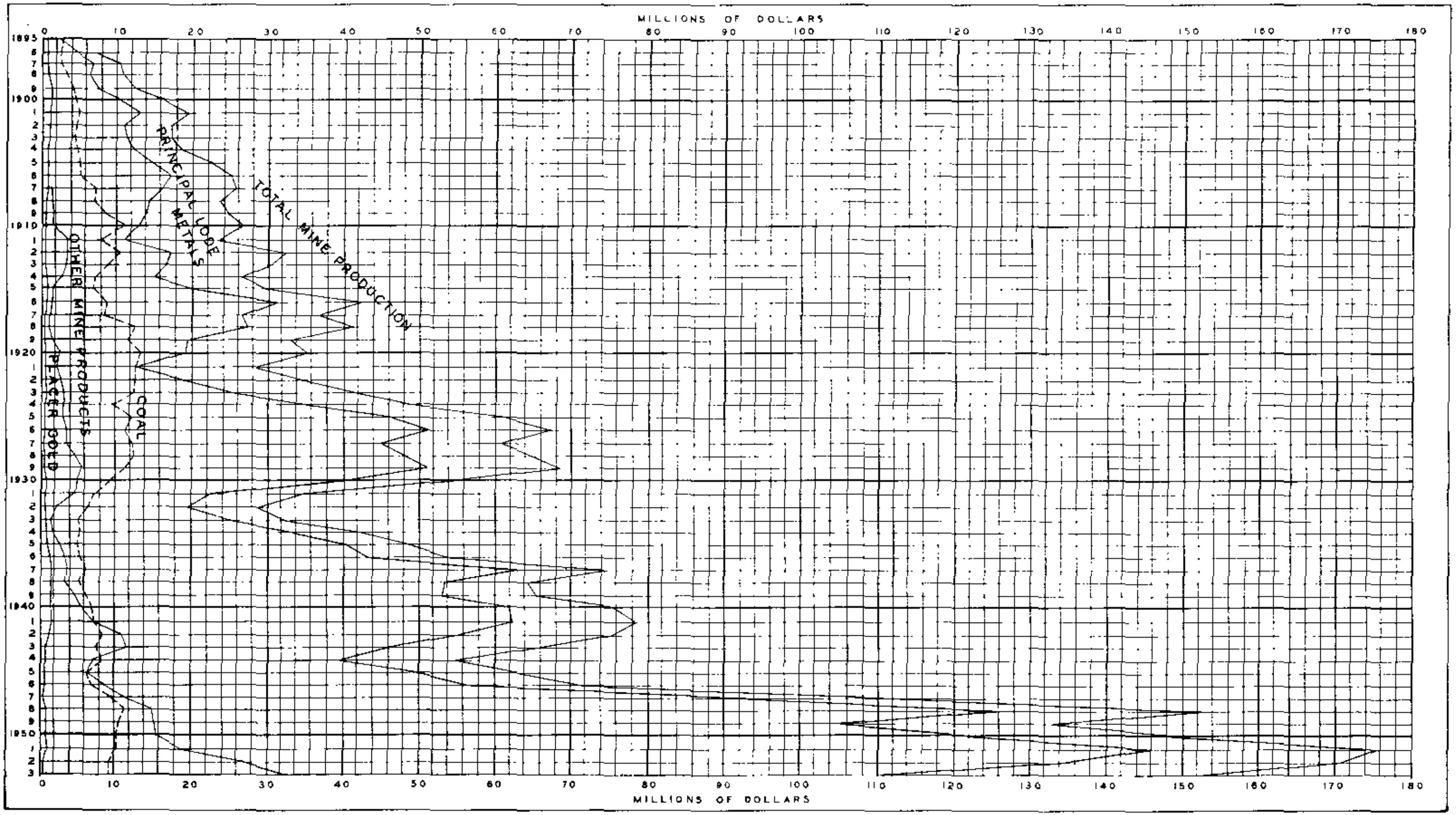


TABLE V.—LODE-MINE PRODUCTS, 1913–53

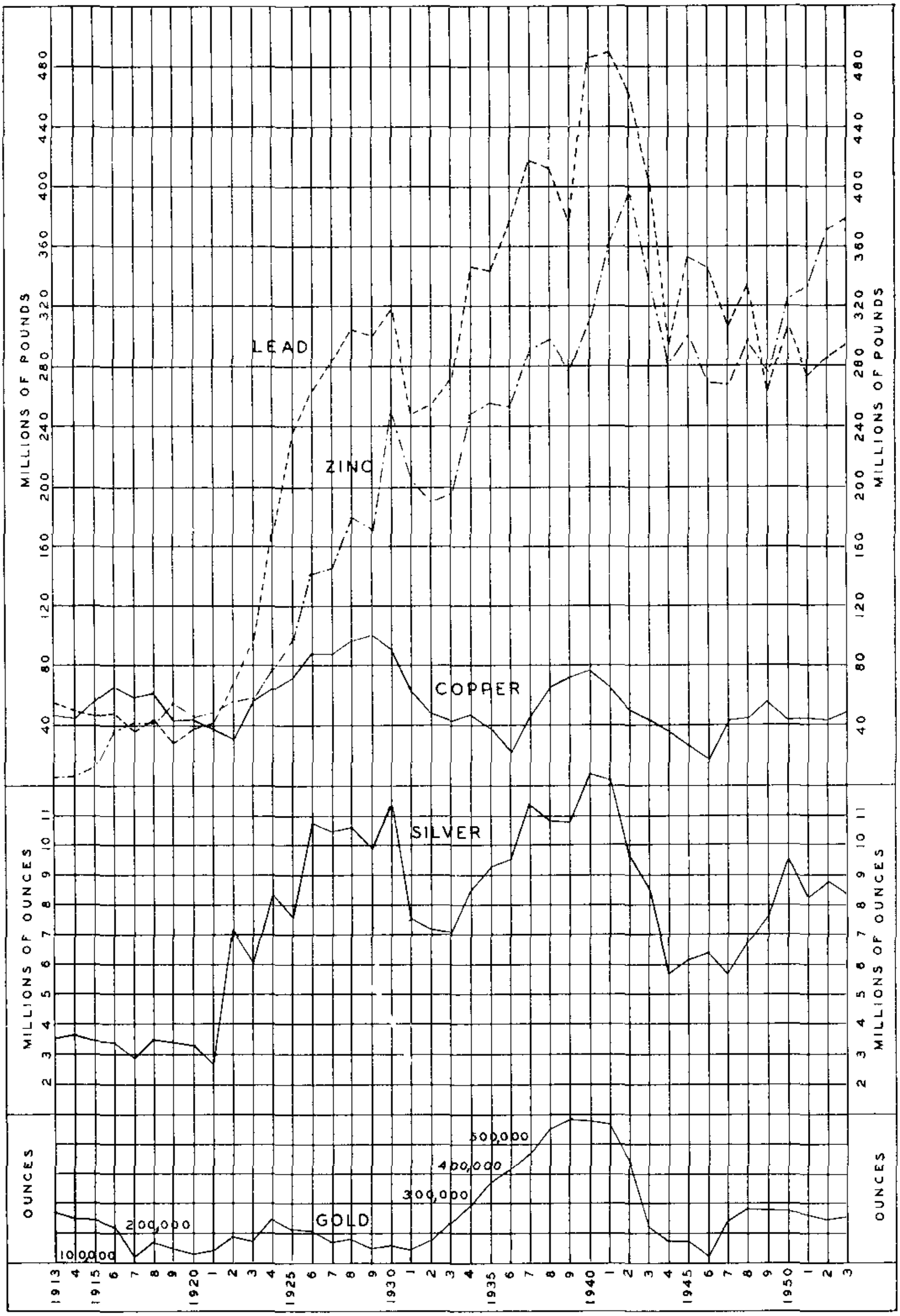


TABLE VI.—PRODUCTION OF PRINCIPAL METALS, 1858–1953

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	37,168,980	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
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

	Oz.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
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	4,658,5[illegible]5	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	42,005,512	13,054,893	284,949,396	45,936,692	372,871,717	59,189,656	134,606,323
1953	14,245	403,230	253,553	8,727,294	8,376,953	7,017,709	49,021,013	14,869,544	296,559,781	39,338,655	378,345,159	40,388,346	110,744,778
Totals	5,177,145	95,308,138	14,220,286	403,921,587	368,564,743	210,257,632	2,741,006,264	419,371,946	11,084,181,022	705,113,129	8,236,626,564	585,301,802	2,419,274,234

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

Table VIIa.—Summary of Production, 1952 and 1953, by Mining Divisions

Mining Division	Year	Gold—Placer		Principal Lode Metals	Miscellaneous Metals	Industrial Minerals	Structural Materials	Coal		Total
		Quantity[1]	Value					Quantity	Value	
		Oz.	$	$	$	$	$	Tons	$	$
Ainsworth	1952			9,096,081	16,196		12,555			9,124,832
	1953			7,599,082	7,727		8,442			7,615,251
Alberni	1952			4,450			38,984			43,434
	1953	3	85	4,654			22,742			27,481
Atlin	1952	8,751	246,645	2,809,532			171			3,056,348
	1953	6,659	188,495	4,380,271			1,375			4,570,141
Cariboo	1952	6,567	185,090	1,466,328		3,001	79,545			1,733,964
	1953	6,352	179,805	1,564,532		11,338	174,627			1,930,302
Clinton	1952	27	761				738			1,499
	1953	12	340				8,100			8,440
Fort Steele	1952	55	1,550	72,678,315	254,961	32,317	127,493	1,083,412	6,591,943	79,686,579
	1953	52	1,472	49,819,514	582,233	79,437	149,099	1,122,408	7,150,820	57,782,575
Golden	1952			2,332,066	1,246	69,908	65,210			2,468,430
	1953			1,649,262	13,875	207,545	135,133			2,005,815
Greenwood	1952			391,943		35,707	22,325			449,975
	1953			650,082		21,046	18,218			689,346
Kamloops	1952	4	113	8,733		146,636	240,645			396,127
	1953	30	849	16,909		200,838	370,894			589,490
Liard	1952	22	620			23,000	155,773	3,957	35,237	214,630
	1953	92	2,604			988,716	77,445	4,835	34,915	1,103,680
Lillooet	1952	183	5,158	4,016,421			23,038			4,044,617
	1953	177	5,010	3,747,271	2,636		12,517			3,767,434
Nanaimo	1952			9,443	5,474,924		1,585,782	270,332	2,746,107	9,816,256
	1953			9,851	6,763,105		1,396,924	206,729	2,058,355	10,228,235
Nelson	1952			11,543,583	3,294,771		394,821			15,233,175
	1953	11	311	6,907,651	4,675,474		65,031			11,648,467
New Westminster	1952					6,450	2,520,806			2,527,256
	1953	5	142			7,464	2,735,369			2,742,975
Nicola	1952			283			83,317	1,134	11,266	94,866
	1953						22,514	1,043	10,689	33,203
Omineca	1952	93	2,621	2,024,930	1,295,647		25,919	37,201	285,139	3,634,256
	1953	109	3,085	1,943,769	1,460,902	11,120	96,771	42,079	324,986	3,840,633
Osoyoos	1952			1,856,100		105,771	45,050			2,006,921
	1953			1,739,725		109,937	35,653			1,885,315
Quesnel	1952	1,815	51,155			240				51,395
	1953	478	13,531	1,357			30,965			45,853
Revelstoke	1952			933,467			21,162			954,629
	1953	4	113	702,971	21,711		47,547			772,342
Similkameen	1952	2	56	7,890,371	176		40,560	6,311	48,760	7,979,923
	1953			7,959,284			90,075	7,044	51,012	8,100,371
Skeena	1952			3,896,429	140,322		222,319			4,259,070
	1953	223	6,312	1,805,894	108,513		306,667			2,227,386
Slocan	1952			3,821,056	162,223					3,983,279
	1953			3,082,431	79,748		15,788			3,177,967
Trail Creek	1952			449,022		1,422,010	95,950			1,966,982
	1953			1,125,547		1,350,700	105,582			2,581,829
Vancouver	1952			8,882,852		337,824	1,645,378			10,866,054
	1953			7,309,860	5,325	223,607	1,761,272			9,300,064
Vernon	1952	35	987	162			105,088			106,237
	1953	30	849				130,288			131,137
Victoria	1952						4,044,332			4,044,332
	1953	8	227				5,736,000			5,736,227
Not assigned	1952				2,553,076[3]					2,553,076
	1953			8,321,631[2]	1,867,591[3]					10,189,222
Totals	1952	17,554	494,756	134,111,567	13,193,542	2,182,864	11,596,961	1,402,347	9,718,452	171,298,142
	1953	14,245	403,230	110,341,548	15,588,840	3,211,748	13,555,038	1,384,138	9,630,777	152,731,181

[1] Crude gold.

[2] Includes estimated zinc and lead recovered at the Trail smelter from current and reclaimed slags in 1953, derived from British Columbia mines in several mining divisions.

[3] Includes antimony, bismuth, and indium recovered at the Trail smelter from ores and concentrates other than those originating from British Columbia sources.

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, 1952 AND 1953, BY MINING DIVISIONS

Division	Year	Gold—Lode		Silver		Copper		Lead		Zinc	
		Quantity[1]	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$
Ainsworth	1952	754	25,840	590,258	490,841			25,751,259	4,151,360	27,894,922	4,428,040
	1953	**338**	**11,634**	**561,348**	**470,264**			**31,126,601**	**4,128,944**	**27,992,877**	**2,988,240**
Alberni	1952	129	4,421	35	29						
	1953	**133**	**4,578**	**91**	**76**						
Atlin	1952	6,959	238,485	279,653	232,551	2,196,927	682,783	2,297,463	370,374	8,097,134	1,285,339
	1953	**16,073**	**553,233**	**497,736**	**416,974**	**4,032,407**	**1,223,150**	**4,027,001**	**534,182**	**15,482,271**	**1,652,732**
Cariboo	1952	42,672	1,462,370	4,760	3,958						
	1953	**45,335**	**1,560,431**	**4,895**	**4,101**						
Clinton	1952										
	1953										
Fort Steele	1952	53	1,816	2,876,103	2,391,681			209,829,850	33,826,670	229,672,093	36,458,148
	1953	**120**	**4,130**	**2,919,080**	**2,445,430**			**199,035,581**	**26,402,070**	**196,420,460**	**20,967,884**
Golden	1952	16	548	133,240	110,798			9,607,062	1,548,754	4,233,123	671,966
	1953			**108,820**	**91,163**			**11,006,201**	**1,459,973**	**919,211**	**98,126**
Greenwood	1952	147	5,038	387,685	322,387			188,931	30,458	214,563	34,060
	1953	**210**	**7,228**	**670,596**	**561,785**			**302,770**	**40,162**	**383,200**	**40,907**
Kamloops	1952			1,102	916			39,736	6,406	8,889	1,411
	1953	**12**	**413**	**3,352**	**2,808**			**96,436**	**12,792**	**8,393**	**896**
Liard	1952										
	1953										
Lillooet	1952	116,815	4,003,250	15,839	13,171						
	1953	**108,300**	**3,727,686**	**23,378**	**19,585**						
Nanaimo	1952	105	3,598	417	347	17,692	5,498				
	1953			**235**	**197**	**31,828**	**9,654**				
Nelson	1952	783	26,833	67,207	55,887			20,848,804	3,361,036	51,025,746	8,099,827
	1953	**466**	**16,040**	**61,567**	**51,577**			**20,073,682**	**2,662,774**	**39,131,245**	**4,177,260**
New Westminster	1952										
	1953										
Nicola	1952			247	205			291	47	197	31
	1953										
Omineca	1952	2,181	74,743	976,692	812,188	295,758	91,919	2,726,039	439,465	3,821,441	606,615
	1953	**3,149**	**108,389**	**1,032,391**	**864,875**	**96,051**	**29,135**	**3,442,442**	**456,640**	**4,540,792**	**484,730**
Osoyoos	1952	52,075	1,784,610	14,012	11,652	192,252	59,750	278	45	269	43
	1953	**50,386**	**1,734,286**	**5,241**	**4,391**	**3,456**	**1,048**				
Quesnel	1952										
	1953			**675**	**565**			**5,973**	**792**		
Revelstoke	1952	706	24,195	147,650	122,781			1,307,439	210,772	3,626,802	575,719
	1953	**1,105**	**38,034**	**155,605**	**130,357**	**23,909**	**7,252**	**2,219,294**	**294,389**	**2,182,095**	**232,939**
Similkameen	1952	7,923	271,521	160,900	133,800	24,083,949	7,485,050				
	1953	**7,288**	**250,853**	**173,442**	**145,299**	**24,933,674**	**7,563,132**				
Skeena	1952	9,004	308,567	2,462,239	2,047,524			4,809,573	775,351	4,819,121	764,987
	1953	***4,977***	***171,308***	***1,233,142***	***1,033,052***	***44,601***	***13,529***	***2,568,016***	***340,647***	***2,317,174***	***247,358***
Slocan	1952	227	7,779	529,763	440,535			6,043,494	974,272	15,109,423	2,398,470
	1953	**260**	**8,949**	**672,484**	**563,367**			**8,320,269**	**1,103,684**	**13,175,000**	**1,406,431**
Trail Creek	1952	175	5,997	55,919	46,501	1,186,456	368,739	171,577	27,660	787	125
	1953	**203**	**6,987**	**156,241**	**130,889**	**2,976,358**	**902,819**	**639,668**	**84,852**		
Vancouver	1952	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
	1953	**15,198**	**523,115**	**96,634**	**80,954**	**16,878,729**	**5,119,825**	**528,415**	**70,094**	**14,200,204**	**1,515,872**
Vernon	1952			79	66			144	23	466	73
	1953										
Victoria	1952										
	1953										
Not assigned	**1953**							**13,167,432**	**1,746,660**	**61,592,237**	**6,574,971**
Totals	1952	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
	1953	**253,553**	**8,727,294**	**8,376,953**	**7,017,709**	**49,021,013**	**14,869,544**	**296,559,781**	**39,338,655**	**378,345,159**	**40,388,346**

[1] Fine gold.

Table VIIc.—Production of Miscellaneous Metals, 1952 and 1953, by Mining Divisions

Division	Year	Antimony[1]		Bismuth		Cadmium[2]		Indium		Iron Ore		Platinum		Tin		Tungsten (WO_3)		Totals
		Lb.	$	Lb.	$	Lb.	$	Oz.	$	Tons	$	Oz.	$	Lb.	$	Lb.	$	$
Ainsworth	1952					7,533	16,196											16,196
	1953	**243**	**89**			**3,877**	**7,638**											**7,727**
Fort Steele	1952					2,171	4,668							212,113	250,293			254,961
	1953					**247**	**487**							**1,092,228**	**581,746**			**582,233**
Golden	1952	2,339	1,031			100	215											1,246
	1953	**37,723**	**13,875**															**13,875**
Lillooet	1952																	
	1953															**1,677**	**2,636**	**2,636**
Nanaimo	1952									900,481	5,474,924							5,474,924
	1953									**991,248**	**6,763,105**							**6,763,105**
Nelson	1952					11,811	25,394									1,027,460	3,269,377	3,294,771
	1953					**79,353**	**156,325**									**1,549,880**	**4,519,149**	**4,675,474**
Omineca	1952															407,180	1,295,647	1,295,647
	1953	**15,392**	**5,661**			**13,555**	**26,703**									**617,420**	**1,428,538**	**1,460,902**
Revelstoke	1952																	
	1953	**9,394**	**3,455**			**9,267**	**18,256**											**21,711**
Similkameen	1952											2	176					176
	1953																	
Skeena	1952					65,266	140,322											140,322
	1953					**55,083**	**108,513**											**108,513**
Slocan	1952					75,453	162,223											162,223
	1953	**186**	**69**			**40,446**	**79,679**											**79,748**
Trail Creek	1952																	
	1953																	
Vancouver	1952																	
	1953					**2,703**	**5,325**											**5,325**
Not assigned[1] [2] [3]	1952	2,330,900	1,026,994	142,246	312,941	563,838	1,212,252	404	889									2,553,076
	1953	**1,488,105**[3]	**547,325**	**71,298**	**157,569**	**582,627**	**1,147,775**	**6,752**	**14,922**									**1,867,591**
Totals	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
	1953	**1,551,043**	**570,474**	**71,298**	**157,569**	**787,158**	**1,550,701**	**6,752**	**14,922**	**991,248**	**6,763,105**			**1,092,228**	**581,746**	**2,168,977**	**5,950,323**	**15,588,840**

[1] Antimony assigned to individual mining divisions is the reported content of concentrates exported to foreign smelters. Antimony "not assigned" is the antimony content of antimonial lead produced at the Trail smelter and antimony reported as recovered from Dore slag and flue dust exported.

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

[3] Antimony, bismuth, and indium recovered at the Trail smelter include, in addition to metal contained in British Columbia ores and concentrates, some metal from sources outside British Columbia. The Trail output of each of the three metals is shown as "not assigned."

TABLE VIID.—PRODUCTION OF INDUSTRIAL MINERALS,[1] 1952 AND 1953, BY MINING DIVISIONS

Division	Year	Asbestos		Barite		Diatomite		Fluxes (Limestone, Quartz)		Granules (Roofing)		Gypsum and Products		Mica		Perlite		Sulphur		Totals
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Lbs.	$	Tons	$	Tons	$	$
Cariboo	1952													314,000	3,001					3,001
	1953													302	11,338					11,338
Fort Steele	1952											14,363	32,317							32,317
	1953											14,274	32,117					4,732	47,320	79,437
Golden	1952			848	13,408							25,000	56,500							69,908
	1953			3,560	52,845							60,234	154,700							207,545
Greenwood	1952							35,707	35,707											35,707
	1953							21,046	21,046											21,046
Kamloops	1952											51,749	146,636							146,636
	1953											98,157	200,838							200,838
Liard	1952	20	23,000																	23,000
	1953	3,102	988,716																	988,716
Nanaimo	1952																			
	1953																			
New Westminster	1952									860	6,450									6,450
	1953									865	7,464									7,464
Omineca	1952																			
	1953															1,112	11,120			11,120
Osoyoos	1952							19,881	105,771											105,771
	1953							16,312	89,652	1,897	20,285									109,937
Quesnel	1952					12	240													240
	1953																			
Trail Creek	1952																	142,201	1,422,010	1,422,010
	1953																	135,070	1,350,700	1,350,700
Vancouver	1952									750	14,576							40,406	323,248	337,824
	1953									1,858	31,572							12,152	192,035	223,607
Totals	1952	20	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
	1953	3,102	988,716	3,560	52,845			37,358	110,698	4,620	59,321	172,665	387,655	302	11,338	1,112	11,120	151,954	1,590,055	3,211,748

[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, 1952 AND 1953, 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	1952					12,555									12,555
	1953					8,442									8,442
Alberni	1952					38,984									38,984
	1953				319	22,423									22,742
Atlin	1952					171									171
	1953					1,375									1,375
Cariboo	1952					79,545									79,545
	1953				10,000	164,627									174,627
Clinton	1952					738									738
	1953					8,100									8,100
Fort Steele	1952				8,623	118,870									127,493
	1953				3,173	145,926									149,099
Golden	1952				400	64,810									65,210
	1953					135,133									135,133
Greenwood	1952				11,844	10,481									22,325
	1953				2,134	16,084									18,218
Kamloops	1952				68,825	171,820									240,645
	1953				34,858	336,036									370,894
Liard	1952				42	155,731									155,773
	1953				405	77,040									77,445
Lillooet	1952				2,039	20,999									23,038
	1953				1,800	10,717									12,517
Nanaimo	1952		1,339,969	156,000	5,075	84,738									1,585,782
	1953		1,232,450	26,462	2,006	136,006									1,396,924
Nelson	1952			8,865	9,247	376,709									394,821
	1953			9,110		55,921									65,031
New Westminster	1952		64,343		373,295	1,074,524	12,900	107,447	364,842	51,797	42,206	429,435		17	2,520,806
	1953		82,994		319,804	945,258	9,870	226,459	426,783	31,990	78,459	572,647	22,533	18,572	2,735,369
Nicola	1952				5,461	77,856									83,317
	1953				8,659	13,855									22,514
Omineca	1952				1,464	24,455									25,919
	1953				115	96,656									96,771
Osoyoos	1952			2,750	1,200	41,100									45,050
	1953					35,653									35,653
Quesnel	1952														
	1953					30,965									30,965
Revelstoke	1952				810	20,352									21,162
	1953				17,574	29,973									47,547
Similkameen	1952				6,000	34,560									40,560
	1953				56,671	33,404									90,075
Skeena	1952		139,860		18,505	63,954									222,319
	1953		37,314		95,934	173,419									306,667
Slocan	1952														
	1953					15,788									15,788
Trail Creek	1952			11,200	8,795	75,955									95,950
	1953			7,500	3,576	94,506									105,582
Vancouver	1952			255,206	450,001	829,798	14,448	13,807	70,839					11,279	1,645,378
	1953			34,180	555,372	1,139,114	31,911							695	1,761,272
Vernon	1952		8,600	943	3,966	91,579									105,088
	1953			1,000	1,200	128,088									130,288
Victoria	1952	3,603,273			7,200	369,681	900				18,067	38,675	6,536		4,044,332
	1953	5,071,260	5,200		8,916	534,085	9,600				45,010	54,450	7,479		5,736,000
Totals	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
	1953	5,071,260	1,357,958	78,252	1,122,516	4,388,594	51,381	226,459	426,783	31,990	123,469	627,097	30,012	19,267	13,555,038

TABLE VIIIA.—PRODUCTION OF PLACER GOLD[1] AND OF PRINCIPAL LODE METALS, 1896–1953, BY MINING DIVISIONS (QUANTITY AND VALUE)

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	5,849	181,444	9,599,454	6,175,082	10,378	1,225	206,572,294	17,020,193	113,716,612	12,341,278	35,724,912
Alberni	1,610	33,052	300,091	11,231,599	161,219	77,492	2,290,699	343,518	112,888	4,473	.....	.....	11,690,134
Atlin (1898)[1]	712,986	16,746,584	273,709	9,718,848	865,636	712,149	6,434,235	1,951,622	6,625,197	946,697	23,960,546	3,013,918	33,089,818
Cariboo (1858)[1]	1,948,670	40,080,980	846,045	30,818,353	93,836	53,941	.....	.....	2,815	371	492	16	70,953,661
Clinton	10,053	239,729	23,388	827,260	31,564	14,214	57,548	5,905	193	7	.....	.....	1,087,115
Fort Steele	20,365	463,681	2,707	62,984	179,665,382	95,826,884	28,592	6,193	10,017,562,185	629,471,203	7,004,614,821	469,710,938	1,195,541,883
Golden	467	11,213	100	2,503	1,883,724	1,237,738	68,375	11,934	136,093,298	9,462,572	146,628,095	8,855,157	19,581,117
Greenwood	5,051	114,996	1,132,776	24,360,995	27,811,889	15,435,005	441,226,021	70,504,065	12,025,682	773,537	12,438,795	739,403	111,928,001
Kamloops	27,464	601,057	47,867	1,608,294	302,879	180,533	6,408,272	1,178,704	505,695	40,049	426,510	28,379	3,637,016
Liard	50,010	1,243,184	114	4,120	204	146	.....	.....	5,810	1,048	.....	.....	1,248,498
Lillooet (1874)[1]	91,324	1,877,707	2,589,119	90,951,319	658,140	359,647	400	41	62,463	2,542	.....	.....	93,191,256
Nanaimo	861	19,162	84,009	1,919,998	570,270	336,232	22,123,948	3,620,084	.....	.....	.....	.....	5,895,476
Nelson	3,489	86,320	1,327,328	41,501,846	7,252,396	4,160,181	14,702,422	1,648,622	123,619,906	13,108,392	196,332,205	27,623,799	88,129,160
New Westminster	11,418	238,328	4,416	112,407	13,259	6,072	26,489	6,379	28,425	1,119	12,755	481	364,786
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	52,187	1,381,497	18,919	564,033	6,539,698	4,985,765	6,518,018	1,466,742	16,632,875	1,938,810	19,751,704	2,566,052	12,902,899
Osoyoos	190	4,142	1,529,478	46,187,908	575,798	376,295	2,781,401	398,879	256,957	8,151	6,839	398	46,975,773
Quesnel (1858)[1]	634,952	13,325,471	218	7,871	2,601	2,086	82	17	21,745	3,353	13	3	13,338,801
Revelstoke	7,255	155,218	26,775	725,356	2,747,403	1,584,987	31,360	8,357	16,991,548	1,064,555	6,316,318	837,115	4,375,588
Similkameen	12,047	285,405	159,154	5,476,312	3,744,212	2,171,250	529,926,102	86,609,838	245,026	10,193	69,390	3,614	94,556,612
Skeena	4,589	105,172	2,392,411	60,204,952	59,190,439	35,704,864	689,106,270	98,025,648	52,582,839	4,424,521	16,377,917	2,434,713	200,899,870
Slocan	150	3,596	8,032	208,855	54,307,152	33,339,695	219,318	42,287	420,799,501	21,920,122	348,555,855	27,921,588	83,436,143
Trail Creek[4]	848	24,176	2,949,385	62,578,632	4,324,554	2,547,580	143,422,142	22,250,758	19,124,340	1,004,568	158,016,197	5,305,786	93,711,500
Vancouver	182	5,306	395,639	12,496,440	4,352,296	2,539,026	852,469,602	127,943,853	13,885,676	1,226,279	123,912,390	17,048,874	161,259,778
Vernon	2,246	59,437	5,223	176,048	8,747	4,702	654	100	11,972	1,162	7,481	799	242,248
Victoria	628	15,680	37,663	812,730	802,325	441,913	21,557,027	3,217,769	210,097	19,848	3,568,709	283,923	4,791,863
Not assigned	.....	.....	.....	.....	.....	.....	.....	.....	13,167,432	1,746,660	61,592,237	6,574,971	8,321,631
Totals	3,599,484	77,131,435	14,168,940	402,976,021	365,772,422	208,400,001	2,739,959,330	419,348,770	11,059,382,287	704,290,941	8,236,626,564	585,301,802	2,397,448,970

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, prior to 1953 and derived from mines in several mining divisions. From 1953 this recovery is listed as "not assigned."

Table VIIIb.—Production of Miscellaneous Metals, 1885–1953, by Mining Divisions (Quantity and Value)

Division	Antimony		Bismuth		Cadmium		Chromite		Cobalt		Indium		Iron Ore		Magnesium		Manganese	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	Lb.	$	Lb.	$	Lb.	$	Lb.	$	Lb.	$	Oz.	$	Tons	$	Lb.	$	Lb.	$
Ainsworth	243	89			13,144	25,741											541	8,160
Atlin																		
Cariboo																		
Clinton							126	900										
Fort Steele					2,418	5,155												
Golden	40,062	14,906			100	215												
Greenwood							670	31,395										
Kamloops													17,109	59,883				
Liard																		
Lillooet	13,466	4,321																
Nanaimo													2,061,182	13,204,949				
Nelson					174,702	357,610												
New Westminster																		
Nicola			12	17														
Omineca	104,489	15,217			13,555	26,703			1,730	420								
Osoyoos																		
Quesnel																		
Revelstoke	9,394	3,455			9,267	18,256												
Similkameen																		
Skeena					120,349	248,835							1,200	6,000				
Slocan	31,622	8,044			131,398	281,894												
Trail Creek													550	1,925	204,632	88,184		
Vancouver					109,311	291,034												
Victoria																	1,167	24,508
Not assigned[1]	28,236,308	6,199,099	3,889,583	5,987,722	15,027,074	19,966,315					13,850	36,748						
Totals	28,435,584	6,245,131	3,889,595	5,987,739	15,601,318	21,221,758	796	32,295	1,730	420	13,850	36,748	2,080,041	13,272,757	204,632	88,184	1,708	32,668

[1] *See* notes below Table VIIc.

Year of first recorded production: Antimony, 1907; bismuth, 1929; cadmium, 1929; chromite, 1918; cobalt, 1928; indium, 1942; iron ore, 1885; magnesium, 1941; manganese, 1918.

TABLE VIIIB.—PRODUCTION OF MISCELLANEOUS METALS, 1885–1953, BY MINING DIVISIONS (QUANTITY AND VALUE)—*Continued*

Division	Mercury		Molybdenite		Nickel		Palladium		Platinum		Selenium		Tin		Tungsten (WO_3)		Division Totals
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Lb.	$	Lb.	$	Lb.	$	Oz.	$	Oz.	$	Lb.	$	Lb.	$	Lb.	$	$
Ainsworth																	33,990
Atlin															273	360	360
Cariboo									3	117					27,698	21,431	21,548
Clinton																	900
Fort Steele													8,792,448	6,423,153			6,428,308
Golden																	15,121
Greenwood																	31,395
Kamloops	10,987	5,795															65,678
Liard									2	79							79
Lillooet	1,708	3,305	2,448	2,440					3	113					32,353	37,921	48,100
Nanaimo																	13,204,949
Nelson			25,058	18,378											5,287,965	10,285,806	10,661,794
New Westminster					281,453	87,724											87,724
Nicola																	17
Omineca	4,150,892	10,400,259	1,600	1,840					3	154					1,705,852	3,626,844	14,071,437
Osoyoos			1,020	1,020													1,020
Quesnel									56	2,182							2,182
Revelstoke															1,401	1,855	23,566
Similkameen									1,272	127,993							127,993
Skeena			13,022	13,020							731	1,389			366	331	269,575
Slocan																	289,940
Trail Creek							749	30,462	53	3,177							123,748
Vancouver																	291,034
Victoria																	24,508
Not assigned																	32,189,884
Totals	4,163,587	10,409,359	43,148	36,698	281,453	87,724	749	30,462	1,392	133,815	731	1,389	8,792,448	6,423,153	7,055,908	13,974,548	78,014,850

Year of first recorded production: Mercury, 1895; molybdenite, 1914; nickel, 1936; palladium, 1930; platinum, 1887; selenium, 1931; tin, 1941; tungsten, 1937.

Table VIIIc.—Production of Industrial Minerals, 1904–53, by Mining Divisions (Quantity and Value)

Division	Arsenious Oxide		Asbestos		Barite		Bentonite		Diatomite		Fluorspar		Flux (Quartz and Limestone)		Granules (Roofing)		Gypsum and Gypsite		Hydro-magnesite	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	Lb.	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$
Alberni																				
Atlin																			1,450	20,325
Cariboo																				
Clinton																	983	6,676	803	7.211
Fort Steele					8	80											101,203	272,668		
Golden					62,560	301,718											90,611	319,977		
Greenwood											40,165	783,578	1,604.219	1,354.036						
Kamloops																	1.004.597	5,614,109		
Liard			3,122	1,011,716																
Lillooet																				
Nanaimo													525,361	570.878						
Nelson													7.601	8,174	2	51				
New Westminster															3,543	38,643				
Nicola																	2,297	9.610		
Omineca	16,997	340																		
Osoyoos	22,002,423	272,861											159.126	854,965	1.897	20,285				
Quesnel									1,339	30.715					48	168				
Similkameen							791	16,858									250	1.700		
Skeena													601.019	1,050,722						
Trail Creek																				
Vancouver															26,098	359,351				
Vernon																				
Victoria													50	760	9,702	159,471				
Totals	22,019,420	273,201	3,122	1,011,716	62,568	301,798	791	16,858	1.339	30,715	40,165	783,578	2,897,376	3,839,535	41,290	577,969	1,199,941	6,224,740	2,253	27,536

Year of first recorded production: Arsenious oxide, 1917; asbestos. 1952; barite, 1940; bentonite, 1926; diatomite, 1928; fluorspar, 1918; flux (quartz and limestone), 1911; granules, 1930; gypsum and gypsite, 1911; hydromagnesite, 1904.

TABLE VIIIc.—PRODUCTION OF INDUSTRIAL MINERALS, 1904–53, BY MINING DIVISIONS (QUANTITY AND VALUE) —*Continued*

Division	Iron Oxide and Ochre		Magnesium Sulphate		Mica		Natro-alunite		Perlite		Phosphate Rock		Sodium Carbonate		Sulphur		Talc		Division Totals
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	Tons	$	Tons	$	Lb.	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	Tons	$	$
Alberni							522	9,398											9,398
Atlin																			20,325
Cariboo					8,899,200	119,605													119,605
Clinton			1,923	39,085									9,524	109,895					162,867
Fort Steele											3,842	16,894			4,732	47,320			336,962
Golden	27	920															5	356	622,971
Greenwood																			2,137,614
Kamloops			8,742	193,967									968	9,088					5,817,164
Liard																			1,011,716
Lillooet																	296	5,129	5,129
Nanaimo																			570,878
Nelson	7,292	55,901																	64,126
New Westminster																			38,643
Nicola																			9,610
Omineca									1,112	11,120									11,460
Osoyoos			3,229	21,300	1,588,800	25,938													1,195,349
Quesnel																			[1]31,183
Similkameen																			18,558
Skeena					634,250	10,815									41,624	178,678			1,240,215
Trail Creek															2,101,241	20,862,715			20,862,715
Vancouver	10,669	97,389													497,703	3,925,295			4,382,035
Vernon					160,500	3,978													3,978
Victoria	120	840															1,504	29.380	190,451
Totals	18.108	155,050	13,894	254,352	11,282,750	160,336	522	9,398	1,112	11,120	3,842	16,894	10,492	118,983	2,645.300	25,014,008	1,805	34,865	38,862,952

[1] Includes 30 tons of volcanic ash, worth $300, recorded from Quesnel Mining Division.

Year of first recorded production: Iron oxide and ochre, 1918; magnesium sulphate, 1915; mica, 1932; natro-alunite, 1912; perlite, 1953; phosphate rock, 1927; sodium carbonate, 1921; sulphur, 1916; talc, 1916.

Table IXa.—Quantity (Gross[1]) and Value of Coal per Year to Date

Year	Tons (2,000 Lb.)	Value	Year	Tons (2,000 Lb.)	Value
1836–59	41,871	$149,548	1907	2,485,961	$7,637,713
1860	15,956	56,988	1908	2,362,514	7,356,866
1861	15,427	55,096	1909	2,688,672	8,574,884
1862	20,292	72,472	1910	3,515,944	11,108,335
1863	23,906	85,380	1911	2,573,444	8,071,747
1864	32,068	115,528	1912	3,388,795	10,786,812
1865	36,757	131,276	1913	2,879,251	9,197,460
1866	28,129	100,460	1914	2,426,399	7,745,847
1867	34,988	124,956	1915	2,209,290	7,114,178
1868	49,286	176,020	1916	2,783,849	8,900,675
1869	40,098	143,208	1917	2,686,561	8,484,343
1870	33,424	119,372	1918	2,888,170	12,833,994
1871	55,458[2]	164,612	1919	2,698,022	11,975,671
1872	55,458[2]	164,612	1920	3,020,387	13,450,169
1873	55,459[2]	164,612	1921	2,877,995	12,836,013
1874	91,334	244,641	1922	2,890,625	12,880,060
1875	123,362	330,435	1923	2,848,146	12,678,548
1876	155,895	417,576	1924	2,226,037	9,911,935
1877	172,540	462,156	1925	2,737,607	12,168,905
1878	191,348	522,538	1926	2,609,640	11,650,180
1879	270,257	723,903	1927	2,748,286	12,269,135
1880	299,708	802,785	1928	2,829,906	12,633,510
1881	255,760	685,171	1929	2,521,402	11,256,260
1882	315,997	846,417	1930	2,113,586	9,435,650
1883	238,895	639,897	1931	1,912,501	7,684,155
1884	441,358	1,182,210	1932	1,719,172	6,523,644
1885	409,468	1,096,788	1933	1,416,516	5,375,171
1886	365,832	979,908	1934	1,508,741	5,725,133
1887	462,964	1,240,080	1935	1,330,524	5,048,864
1888	548,017	1,467,903	1936	1,508,048	5,722,502
1889	649,411	1,739,490	1937	1,618,051	6,139,920
1890	759,518	2,034,420	1938	1,466,559	5,565,069
1891	1,152,590	3,087,291	1939	1,655,217	6,280,956
1892	925,495	2,479,005	1940	1,867,966	7,088,265
1893	1,095,690	2,934,882	1941	2,018,635	7,660,000
1894	1,134,509	3,038,859	1942	2,170,737	8,237,172
1895	1,052,412	2,824,687	1943	2,040,253	7,742,030
1896	1,002,268	2,693,961	1944	2,165,676	8,217,966
1897	999,372	2,734,522	1945	1,700,914	6,454,360
1898	1,263,272	3,582,595	1946	1,639,277	7,158,965
1899	1,435,314	4,126,803	1947	1,923,573	9,863,241
1900	1,781,000	4,744,530	1948	1,809,018	11,559,605
1901	1,894,544	5,016,398	1949	1,917,296	10,612,925
1902	1,838,621	4,832,257	1950	1,756,667	10,162,507
1903	1,624,742	4,332,297	1951	1,824,384	10,163,438
1904	1,887,981	4,953,024	1952	1,650,619	9,718,452
1905	2,044,931	5,511,861	1953	1,576,105	9,630,777
1906	2,126,965	5,548,044	Totals	134,756,885	$508,975,481

Table IXb.—Coal Production by Districts and Mining Divisions

District and Mining Division	Total to Date			1952		1953	
	Period	Quantity[1]	Value	Quantity[1]	Value	Quantity[1]	Value
Vancouver Island District		Tons	$	Tons	$	Tons	$
Nanaimo Mining Division	1836–1953	78,868,798	297,886,698	403,723	2,377,025	265,427	1,621,890
Nicola-Princeton District							
Kamloops Mining Division	1893–1945	14,995	56,636				
Nicola Mining Division	1907–1953	2,923,606	11,042,431	1,139	6,706	1,040	6,355
Osoyoos Mining Division	1926–1927	1,122	4,238				
Similkameen Mining Division	1909–1953	4,459,847	16,844,797	6,306	37,128	7,047	43,061
District totals	1893–1953	7,399,570	27,948,102	7,445	43,834	8,087	49,416
Northern District							
Cariboo Mining Division	1942–1944	290	1,095				
Liard Mining Division	1923–1953	70,934	267,917	3,854	22,691	4,835	29,544
Omineca Mining Division	1918–1953	324,949	1,227,329	37,304	219,637	42,136	257,472
District totals	1918–1953	396,173	1,496,341	41,158	242,328	46,971	287,016
East Kootenay District							
Fort Steele Mining Division	1898–1953	48,092,344	181,644,340	1,198,293	7,055,265	1,255,620	7,672,455
Provincial totals	1836–1953	134,756,885	508,975,481	1,650,619	9,718,452	1,576,105	9,630,777

[1] Gross mine output, including washery loss and coal used in making coke; *see* Table X and discussion under "Fuel," page 12.

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

Table IXc.—Quantity[3] and Value of Coal Sold and Used,[4] 1946–53

Year	District and Mining Division	Total Sales[4]*	Used under Companies' Boilers[4]†	Used in Making Coke[4]‡	Total Sold and Used[4]		District Totals, 1953	
		Tons	Tons	Tons	Tons	$	Tons	$
	Vancouver Island	....	....	....	....	....	**206,729**	**2,058,355**
1946	Nanaimo	448,577	3,925	....	452,502	3,472,486		
1947	,,	402,650	3,380	....	406,030	3,624,949		
1948	,,	365,328	2,801	....	368,129	3,221,646		
1949	,,	451,074	3,925	....	454,999	4,055,207		
1950	,,	472,690	4,329	....	477,019	4,059,037		
1951	,,	391,687	3,425	....	395,112	3,481,137		
1952	,,	267,346	2,986	....	270,332	2,746,107		
1953	,,	**204,931**	**1,798**	....	**206,729**	**2,058,355**		
	Nicola-Princeton	....	....	....	....	....	**8,087**	**61,701**
1946	Nicola	1,714	72	....	1,786	9,947		
1947	,,	1,980	233	....	2,213	15,138		
1948	,,	1,807	....	....	1,807	15,228		
1949	,,	1,633	....	....	1,633	14,797		
1950	,,	1,507	....	....	1,507	10,286		
1951	,,	1,016	....	....	1,016	9,705		
1952	,,	1,134	....	....	1,134	11,266		
1953	,,	**1,043**	....	....	**1,043**	**10,689**		
1946	Similkameen	38,703	....	....	38,703	213,007		
1947	,,	43,842	....	....	43,842	323,738		
1948	,,	49,829	....	....	49,829	291,106		
1949	,,	49,945	....	....	49,945	333,113		
1950	,,	16,402	....	....	16,402	120,162		
1951	,,	3,824	....	....	3,824	25,345		
1952	,,	6,311	....	....	6,311	48,760		
1953	,,	**7,044**	....	....	**7,044**	**51,012**		
	Northern	....	....	....	....	....	**46,914**	**359,901**
1946	Liard	912	98	....	1,010	13,541		
1947	,,	5,327	50	....	5,377	30,299		
1948	,,	9,752	60	....	9,812	53,335		
1949	,,	12,392	....	....	12,392	76,381		
1950	,,	12,057	....	....	12,057	71,571		
1951	,,	3,199	....	....	3,199	26,095		
1952	,,	3,957	....	....	3,957	35,237		
1953	,,	**4,835**	....	....	**4,835**	**34,915**		
1946	Omineca	12,113	18	....	12,131	67,933		
1947	,,	9,592	56	....	9,648	63,377		
1948	,,	9,738	66	....	9,804	85,981		
1949	,,	11,440	63	....	11,503	94,375		
1950	,,	13,230	62	....	13,292	105,162		
1951	,,	27,904	....	....	27,904	207,781		
1952	,,	37,201	....	....	37,201	285,139		
1953	,,	**42,059**	**20**	....	**42,079**	**324,986**		
	East Kootenay	....	....	....	....	....	**1,122,408**	**7,150,820**
1946	Fort Steele	665,126	18,894	94,752	778,772	3,382,051		
1947	,,	869,070	21,574	156,844	1,047,488	5,805,740		
1948	,,	990,530	20,227	154,342	1,165,099	7,892,309		
1949	,,	842,979	19,025	228,792	1,090,796	6,039,052		
1950	,,	825,315	15,196	213,218	1,053,729	5,796,289		
1951	,,	889,669	15,977	236,871	1,142,517	6,413,375		
1952	,,	822,071	15,813	245,528	1,083,412	6,591,943		
1953	,,	**878,865**	**12,729**	**230,814**	**1,122,408**	**7,150,820**		
1953	Provincial totals	....	....	....	....	....	**1,384,138**	**9,630,777**

[3] For difference between gross mine output and coal sold refer to table "Production and Distribution by Collieries and by Districts" in section headed "Coal" or "Coal-mining" in Annual Reports of the Minister of Mines.

[4] The totals "sold and used" include:—

* Sales to retail and wholesale dealers, industrial users, and company employees.

† Coal used in company boilers, including steam locomotives.

‡ Coal used in making coke.

See also discussion under "Fuel," page 12.

TABLE X.—COKE AND BY-PRODUCTS PRODUCTION FOR YEARS 1895 TO 1925 AND 1926 TO 1953

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[1]	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
1953	310,431	2,005,551	......	......	177,790	2,090,147	60,407	525,411	238,197	2,615,558	4,857,116	238,771	21,046	7,732,491
Totals	14,342,547	54,947,577	6,223,241	35,571,124	1,506,328	13,727,463	1,613,603	9,878,283	9,342,269	59,176,870	67,559,112	2,744,377	494,701	129,975,060

[1] "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, $284,766; pitch, $5,131; sulphuric acid, $6,658; tar-paint, $2,330; and miscellaneous, $10,827.

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1953

Dividends Paid during 1952 and 1953

	1952	1953
Bralorne Mines Ltd.	$374,100	....
Britannia Mining and Smelting Co. Ltd.	1,659,954	$975,113
Bulkley Valley Collieries Ltd.	6,000	6,000
Canadian Collieries (D.) Ltd.	56,338	....
Consolidated Mining and Smelting Co. of Canada, Ltd.	27,027,345	19,656,283
Crow's Nest Pass Coal Co. Ltd.	248,336	248,472
Granby Consolidated Mining Smelting and Power Co. Ltd.	225,116	225,116
Highland-Bell Ltd.	78,292	....
Kelowna Mines Hedley Ltd.	180,000	180,000
Pioneer Gold Mines of B.C. Ltd.		175,175
Reeves MacDonald Mines Ltd.	1,169,000	....
Sheep Creek Gold Mines Ltd.	225,000	....
Silbak Premier Mines Ltd.	50,000	....
Silver Standard Mines Ltd.	514,608	214,415
Violamac Mines (B.C.) Ltd.	100,000	350,000
Western Exploration Co. Ltd.	30,867	....
Others	659,000	292,515
Totals	$32,603,956	$22,323,089

Dividends Paid Yearly, 1917–53, Inclusive

Year	Amount Paid	Year	Amount Paid
1917	$3,269,494	1937	$15,085,293
1918	2,704,469	1938	12,068,875
1919	2,494,283	1939	11,865,698
1920	1,870,296	1940	14,595,530
1921	736,629	1941	16,598,110
1922	3,174,756	1942	13,627,104
1923	2,983,570	1943	11,860,159
1924	2,977,276	1944	11,367,732
1925	5,853,419	1945	10,487,395
1926	8,011,137	1946	15,566,047
1927	8,816,681	1947	27,940,213
1928	9,572,536	1948	37,672,319
1929	11,263,118	1949	33,651,096
1930	10,543,500	1950	34,399,330
1931	4,650,857	1951	40,921,238
1932	2,786,958	1952	32,603,956
1933	2,471,735	1953	22,323,089
1934	4,745,905		
1935	7,386,070	Total	$469,459,578
1936	10,513,705		

TABLE XI.—DIVIDENDS PAID BY MINING COMPANIES, 1897–1953—*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	600,000[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	9,474,568
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			$74,887,112

[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, 1897–1953—*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	355,772,462[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	1,479,476
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	450,000
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			$371,499,244

[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, 1897–1953—*Continued*

Copper Mines

Company or Mine	Locality	Class	Amount Paid
Britannia M. & S. Co.[1]	Britannia Beach	Copper	$18,223,873
Canada Copper Corporation	Greenwood	Copper	615,399
Cornell	Texada Island	Copper	8,500
Granby Cons. M. S. & P. Co.[2]	Copper Mountain	Copper	29,309,936
Marble Bay	Texada Island	Copper	175,000
Hall Mines	Nelson	Copper	233,280
Miscellaneous mines		Copper	261,470
Total, copper mines			$48,827,458

[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	18,000
Crow's Nest Pass Coal Co. Ltd.	Fernie	Coal	15,228,366
Canadian Collieries (D.) Ltd.	Nanaimo	Coal	563,272
Total, coal mines			$31,809,638

Aggregate of All Classes

Lode-gold mining	$74,887,112
Silver-lead-zinc mining and smelting	371,499,244
Copper-mining	48,827,458
Coal-mining	31,809,638
Miscellaneous, structural, and placer gold	5,325,170
Total	$532,348,622

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	$41,342,176	$5,748,291	$12,837,114
Placer-mining	67,013	10,420	49,139
Coal-mining	5,420,028	446,138	920,806
Miscellaneous metals and industrial minerals	4,876,948	745,057	5,728,787
Structural materials industry	3,837,325	1,718,193	1,443,565
Totals, 1953	**$55,543,490**	**$8,668,099**	**$20,979,411**
Totals, 1952	62,256,631	8,557,845	27,024,500
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, 1935–53	$600,560,657	$105,228,491	$209,726,295

[1] Estimated.

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

TABLE XIII.—AVERAGE NUMBER EMPLOYED IN THE MINING INDUSTRY, 1901–53

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	3,806	....	....	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
1953	**132**	**3,145**	**2,589**	**5,734**	**1,371**	**3,901**	**1,154**	**396**	**1,550**	**1,909**	**559**	**634**	**15,658**

[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] 1901–53

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	926,162	119	78	......	......	......	$14,100,282
1902	1,009,016	124	75	......	......	......	11,581,153
1903	1,288,466	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	1,805,614	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	2,720,669	132	59	......	......	......	19,992,149
1916	3,229,942	169	81	......	......	......	31,483,014
1917	2,797,368	193	87	......	......	......	26,788,474
1918	2,912,516	175	80	......	......	......	27,590,278
1919	2,146,920	144	74	......	......	......	19,750,498
1920	2,215,445	121	60	......	......	......	19,444,365
1921	1,586,428	80	35	......	......	......	12,920,398
1922	1,592,163	98	33	......	......	......	19,227,857
1923	2,447,672	77	28	......	......	......	25,347,092
1924	3,413,912	86	37	......	......	......	35,538,247
1925	3,849,269	102	40	......	......	......	46,200,135
1926	4,775,327	138	55	......	......	$38,558,613	51,508,031
1927	5,416,411	132	52	......	......	27,750,364	44,977,082
1928	6,241,672	110	49	......	......	29,070,075	48,281,825
1929	6,977,903	106	48	......	......	34,713,887	51,174,859
1930	6,804,276	68	32	......	......	21,977,688	40,915,395
1931	5,549,622	44	22	......	......	10,513,931	22,535,573
1932	4,354,904	75	29	......	......	7,075,393	19,700,235
1933	4,063,775	109	47	......	......	13,976,358	25,007,137
1934	5,141,744	145	69	......	......	20,243,278	33,895,930
1935	4,927,204	177	72	......	......	25,407,914	40,597,569
1936	4,381,173	168	70	......	......	30,051,207	43,666,452
1937	6,145,244	185	113	$48,617,920	$4,663,843	43,954,077	62,912,783
1938	7,377,117	211	92	40,222,237	4,943,754	35,278,483	53,877,333
1939	7,212,171	217	99	45,133,788	4,416,919	40,716,869	53,522,098
1940	7,949,736	216	92	50,004,909	6,334,611	43,670,298	62,848,642
1941	8,007,937	200	96	52,354,870	5,673,048	46,681,822	62,216,019
1942	6,894,844	126	76	50,494,041	5,294,637	45,199,404	55,359,479
1943	5,786,864	48	32	37,234,070	3,940,367	33,293,703	46,089,042
1944	4,879,851	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	3,705,594	50	32	48,920,971	2,904,130	46,016,841	56,519,691
1947	5,011,271	75	33	81,033,093	4,722,010	76,311,087	93,176,165
1948	5,762,321	97	51	118,713,859	18,585,183	100,128,727	125,979,961
1949	6,125,460	118	54	99,426,678	19,613,185	79,814,604	105,259,001
1950	6,802,482	112	58	108,864,792	22,113,431	86,751,361	121,635,457
1951	6,972,400	119	64	142,590,427	25,096,743	117,493,684	146,140,477
1952	9,174,617	95	58	140,070,389	30,444,575	106,601,451	134,111,567
1953	**9,660,281**	**80**	**48**	**94,555,069**	**27,815,152**	**66,739,892**	**110,341,548**

[1] Includes mercury ores, tungsten ores, iron ores, and 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 1953

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	173,115	Zinc concentrates, 16,086 tons; lead concentrates, 4,081 tons; copper concentrates and gold concentrates, 10,210 tons	16,073	519,265	4,142,567	4,606,516	21,067,058	78,714
Liard Mining Division										
Nil										
Central British Columbia										
Cariboo Mining Division										
Cariboo Gold Quartz	Wells	Cariboo Gold Quartz Mining Co. Ltd., Vancouver	65,214	Bullion	26,140	23,331				
Island Mountain	Wells	Island Mountain Mines Co. Ltd., Vancouver	48,400	Bullion	19,195	2,564				
Clinton Mining Division										
Taylor Windfall	Hanceville	Mine Leasor's Syndicate, Hanceville	1	Concentrates	8					
Omineca Mining Division										
Bell-Grotto	Pitman	Tungsten of B.C. Ltd., Vancouver	32	Crude ore	18	554	1,686			
Emerald Glacier	Burns Lake	Emerald Glacier Mines Ltd., Montreal, Que.	Clean-up	Zinc concentrates, 12 tons	1	185		3,042	10,903	54
Nicholson Creek	Usk	Nicholson Creek Mining Co., Usk	1	Crude ore		2	129			
Red Rose and Rocher Deboule	Skeena Crossing	Western Tungsten Copper Mines Ltd., Vancouver	37,277	Copper-gold concentrates, 50 tons; **tungsten concentrates, 30,871 units WO_3**	291	462	21,285			
Sil-Van Consolidated	Smithers	Sil-Van Consolidated Mining & Milling Co. Ltd., Vancouver	26,675	Lead concentrates, 1,390 tons; zinc concentrates, 2,257 tons	1,037	149,990	26,089	1,867,022	2,190,405	13,555
Silver Cup	Topley	G. E. Galbraith and D. Carson, Perow	35	Crude ore	1	521		17,811	8,779	
Silver Standard	Hazelton	Silver Standard Mines Ltd., Vancouver	21,559	Lead concentrates, 1,631 tons; zinc concentrates, 2,770 tons	1,801	871,165	87,716	1,735,747	3,187,160	39,937
Quesnel Mining Division										
Bear Group	China Mountain	H. C. Miller, Likely	7	Crude ore		628		6,287	29	

?

2333

COAST AND ISLANDS										
Alberni Mining Division										
Privateer	*Zeballos*	*Lessees, Privateer Mine, Zeballos*	*48*	*Crude ore, 32 tons; concentrates, 16 tons*	*133*	*96*	*268*	*290*		
Nanaimo Mining Division										
Copper Road	Quadra Island	Adams Brothers, Granite Bay	178	Crude ore		247	33,558			
Iron Hill	Quinsam	The Argonaut Mining Co. Ltd., Campbell River	1,482,016	Iron-ore concentrates, 618,201 tons						
Prescott, Lake	Texada Island	Texada Mines Ltd., Vananda	567,127	Iron-ore concentrates, 373,046 tons						
New Westminster Mining Division										
Nil										
Skeena Mining Division										
East	Tide Lake	A. A. Phillips, Stewart	3	Crude ore	37	129				
Indian	Premier	Indian Mines (1946) Ltd., Vancouver	3,755	Crude ore[1]	404	15,694		392,488	492,016	
Premier Border	Premier	Premier Border Gold Mining Co. Ltd., Vancouver	6,702	Crude ore[1]	593	11,428		497,341	635,542	7,568
Silbak Premier	Premier	Silbak Premier Mines Ltd., Vancouver	29,865	Lead concentrates, 1,778 tons; zinc concentrates, 3,460 tons	3,929	51,160	65,921	1,312,311	1,702,200	47,515
Wolf	Alice Arm	Silver Prince Mines Ltd., Alice Arm	5	Crude ore	1	461	7	120		
Torbrit	Kitsault River	Torbrit Silver Mines Ltd., Toronto, Ont.	71,862	Silver-lead concentrates, 1,599 tons; silver bullion	13	1,176,759		519,035	100,019	
Vancouver Mining Division										
Britannia	Britannia Beach	Britannia Mining & Smelting Co. Ltd., Britannia Beach	839,389	Copper concentrates, 28,355 tons; zinc concentrates, 14,016 tons; lead concentrates, 97 tons; iron pyrite concentrates, 26,396 tons	15,185	101,557	17,162,279	1,173,431	16,446,565	2,703
Victoria Mining Division										
Nil										
SOUTH CENTRAL BRITISH COLUMBIA										
Greenwood Mining Division										
Highland-Bell	Beaverdell	Highland-Bell Ltd., Vancouver	15,184	Lead concentrates, 420 tons; zinc concentrates, 347 tons; jig concentrates, 153 tons	208	673,630		314,659	443,932	3,705
Wellington	Beaverdell	Messrs. Wanke, Johnson, Kleman, and McDonell, Beaverdell	13	Crude ore	1	1,571		1,328	2,179	

[1] Milled at Silbak Premier.

Table XV.—Lode-metal Producers in 1953—*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
South Central British Columbia—*Continued*										
Kamloops Mining Division			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Ex	Squilax	Trans-Mountain Mines Ltd., Kamloops	204	Crude ore	12	3,421		101,512	9,866	
Lillooet Mining Division										
Bralorne	Bridge River	Bralorne Mines Ltd., Vancouver	183,168	Bullion; gold concentrates, 3,400 tons	53,897	16,040				
Pioneer	Bridge River	Pioneer Gold Mines of B.C. Ltd., Vancouver	89,317	Bullion	38,124	7,338				
Nicola Mining Division										
Nil										
Osoyoos Mining Division										
Fairview	Oliver	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	16,312	Silica flux						
Nickel Plate	Hedley	Kelowna Mines Hedley Ltd., Hedley	121,152	Gold concentrates and precipitates, 146 tons	50,386	5,241	4,876			
Oregon (French)	Hedley	Kelowna Mines Hedley Ltd., Hedley	6,526	Gold precipitates, included in Nickel Plate						
Similkameen Mining Division										
Copper Mountain	Copper Mountain	Granby Cons. M.S. & P. Co. Ltd., Copper Mountain	1,813,787	Copper concentrates, 5,923 ~~tons~~ 59,230 tons	7,288	182,571	25,525,974			
Vernon Mining Division										
Nil										
Southeastern British Columbia										
Ainsworth Mining Division										
Black Diamond	Ainsworth	J. E. Hawes and G. Dobbs, Ainsworth	8	Crude ore		584		9,225	1,232	

Bluebell	Riondel	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	216,401	Lead concentrates, 17,286 tons; zinc concentrates, 25,447 tons		340,722	388,840	25,010,402	26,059,973	118,509
Buckeye	Ainsworth	Guichon Mine Ltd., Vancouver	457	Crude ore		897		41,798	53,268	
Caledonia	Retallack	G. E. McCready, Retallack	319	Crude ore	4	1,426		25,920	17,613	32
Cork-Province	Keen Creek	Base Metals Mining Corp. Ltd., Vancouver	29,761	Lead concentrates, 1,303 tons; zinc concentrates, 3,554 tons		76,119		1,771,656	3,900,046	32,918
Emerald Hill	Ainsworth	J. A. Jardine, Kaslo	4	Crude ore		645		1,629	341	
Flint	Keen Creek	L. H. and J. L. McPherson, Kaslo	10	Crude ore	1	220		3,955	3,991	
Highland	Ainsworth	Messrs. Dumas, Meyer, and McLellan, Ainsworth	89	Crude ore, tailings, and mill clean-up, 89 tons		2,334		91,218	7,016	
Highlander	Ainsworth	Yale Lead & Zinc Mines Ltd., Ainsworth	52,375	Lead concentrates, 4,117 tons; zinc concentrates, 1,921 tons	3	123,574		5,062,156	2,225,954	
Kootenay Florence	Ainsworth	Lessees from Western Mines Ltd., Vancouver	2,084	Lead concentrates, 197 tons; zinc concentrates, 186 tons	4	3,393		259,490	197,761	1,270
Moonshine	*Lardeau*	*B.C. Metal Mines, Vancouver*	*134*	*Crude ore*		*2,262*		*65,938*	*91,969*	
Nameless Fraction	Woodbury Creek	C. A. McLeish and W. McCulloch, Ainsworth	241	Crude ore		233		25,735	2,659	
Scranton	Woodbury Creek	Scranton Mines Ltd., Portland, Ore.	1,418	Crude ore	326	12,010		245,437	197,895	3,876
Spokane	Ainsworth	T. Hawes and S. McLellan, Ainsworth	50	Crude ore		879		55,666	8,583	
Twin	Ainsworth	W. R. Glasspoole, Ainsworth	212	Crude ore		685		25,663	11,068	48
Utica	Kaslo Creek	J. A. Cooper, Kaslo	45	Crude ore		2,572		6,552	8,855	
Vigilant	Woodbury Creek	J. A. Cooper, Kaslo	812	Crude ore		1,292		86,315	46,323	203
Whitewater	Retallack	Lessees from Retallack Mines Ltd., (Kootenay Belle Gold Mines Ltd., Retallack)	785	Crude ore	4	2,607		38,695	134,437	816
Fort Steele Mining Division										
Estella	Wasa	Estella Mines Ltd., Vancouver	3,960[2]	Lead concentrates, 1,298 tons; zinc concentrates, 721 tons	4	26,443		1,622,001	1,141,373	
Kootenay King	Fort Steele	Kootenay Base Metals Ltd., Vancouver	1,255	Lead concentrates, 86 tons; zinc concentrates, 133 tons	1	1,976		103,029	140,035	
Sullivan	Kimberley	Cons. Mining & Smelting Co. of Canada, Ltd., Trail	2,643,251	Lead concentrates, 144,573 tons; zinc concentrates, 226,772 tons; tin concentrates, 585 tons	115	2,950,234		207,786,108	229,811,128	
Golden Mining Division										
Monarch and Kicking Horse	Field	Base Metals Mining Corp. Ltd., Toronto, Ont.	Bin clean-up	Zinc concentrates, 46 tons		60		647	52,076	46
Silver Giant	Spillimacheen	Giant Mascot Mines Ltd., Vancouver	176,289	Lead concentrates, 8,747 tons; zinc concentrates, 110 tons		110,981		11,584,827	1,029,348	
Nelson Mining Division										
Arlington	Erie	New Arlington Mines Ltd., Nelson	3,500[2]	Lead concentrates, 40 tons	150	445		5,550	10,482	
Ed. No. 8	Salmo	W. J. Grant, Salmo	2	Crude ore		5		2,357	44	
Emerald-Feeney-Dodger	Salmo	Canadian Exploration Ltd., Vancouver	95,081	**Tungsten concentrates, 77,494 units WO_3**						
Granite	*Taghum*	*Leased by J. P. Dion and associates*	*1,715*	*Lead concentrates, 57 tons; zinc concentrates, 5 tons; bullion*	*184*	*1,587*		*20,591*	*12,832*	
Jersey	Salmo	Canadian Exploration Ltd., Vancouver	513,621	Lead concentrates, 11,626 tons; zinc concentrates, 38,546 tons		51,065		18,661,946	41,543,072	307,520

[2] Estimated.

TABLE XV.—LODE-METAL PRODUCERS IN 1953—*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—*Continued*										
Nelson Mining Division—Continued			Tons		Oz.	Oz.	Lb.	Lb.	Lb.	Lb.
Lakeview	Sanca	J. W. Robinson and D. A. Bourne, Ainsworth	314	Crude ore	......	1,127	......	35,659	61,361	......
Protection (Good-enough)	Ymir	J. Turk, F. Padulo, and L. Masura, Ymir	160	Crude ore	109	566	......	14,099	15,250	......
Reeves MacDonald	Remac	Reeves MacDonald Mines Ltd., Vancouver	159,791	Lead concentrates, 1,564 tons; zinc concentrates, 4,157 tons	......	7,415	......	2,360,226	4,408,106	26,602
Spokane	Bayonne	S. MacDonald and K. K. Laib, Bayonne	45	Crude ore	23	630	......	20,292	544	......
Revelstoke Mining Division										
Cromwell	Howser	Cromwell Gold Mines Ltd., Nelson, per J. Gallo	3	Crude ore	2	6	......	13	19	......
Regal Silver	Albert Canyon	Columbia Lead & Zinc Mines Ltd., Albert Canyon	......	Lead concentrates, 40 tons	......	2,345	242	48,602	......	......
Spider	Camborne	Sunshine Lardeau Mines Ltd., Vancouver	16,503	Lead concentrates, 1,793 tons; zinc concentrates, 1,964 tons	1,103	154,658	38,969	2,221,558	2,478,730	19,058
Slocan Mining Division										
Discovery Fraction	Sandon	E. H. Peterson, Sandon	6	Crude ore	......	584	......	6,908	707	......
Galena Farm	Silverton	F. S. Mills and W. D. Pengelly, Silverton	3	Crude ore	......	144	......	2,759	917	......
Lucky Jim	Zincton	Sheep Creek Gold Mines Ltd., Vancouver	52,521	Lead concentrates, 327 tons; zinc concentrates, 6,174 tons	......	27,890	......	269,414	6,776,754	34,264
Ottawa	Springer Creek	Hardex Mines Ltd., Montreal, Que.	76	Crude ore	3	11,341	......	569	261	......
Silversmith, Richmond, and Eureka	Sandon	Carnegie Mines of B.C. Ltd., Montreal, Que.	41,694	Lead concentrates, 639 tons; zinc concentrates, 3,834 tons	38	92,711	......	622,400	4,329,518	29,387
Standard, Enterprise, and Mammoth	Silverton	Western Exploration Co. Ltd., Silverton	58	Crude ore	1	6,552	......	47,241	16,306	......
Van Roi	Silverton	Leased from Van Roi Cons. Mines Ltd. by A. Day and M. Slobodzian, Silverton	6	Crude ore	......	256	......	6,765	1,031	......
Victor	Silverton	Violamac Mines (B.C.) Ltd., New Denver	27,247	Crude ore, 336 tons; lead concentrates, 6,011 tons; zinc concentrates, 3,388 tons	218	546,648	......	7,800,306	4,352,167	25,605
Vulture	Sandon	Slocan Lode Mines Ltd., Vancouver	2	Crude ore	......	112	......	1,815	460	......

Trail Creek Mining Division										
I.X.L.	Rossland	Leased by L. McLellan, J. Hermans, and H. Wuori, Rossland		High-grade crude ore (120 lb.)	28	6				
Velvet	Rossland	Velvet lessees, T. Jones, accountant, Rossland	25	Crude ore	38	29	2,160			

TABLE XVI.—LODE-METAL MINES EMPLOYING AN AVERAGE OF TEN OR MORE MEN DURING 1953[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.)	365	365	173,115	173,115	203	20
Cariboo Gold Quartz Mining Co. Ltd.	282	365	65,214	65,214	174	19
Island Mountain Mines Co. Ltd.	365	365	48,400	48,400	85	11
Silver Standard Mines Ltd.	280	355	21,559	21,559	81	14
The Argonaut Mining Co. Ltd.	280	280	1,482,016	1,482,016	245	39
Texada Mines Ltd.	365	365	567,127	567,127	111	12
Sil-Van Consolidated Mining & Milling Co. Ltd.	288	172	26,675	26,675	57	6
Red Rose and Rocher Deboule (Western Tungsten Copper Mines Ltd.)	305	357	37,277	37,277	124	18
Silbak Premier Mines Ltd.	91	91	40,322[2]	40,322[2]	57	4
Torbrit Silver Mines Ltd.	201	197	71,862	71,862	68	15
Britannia Mining & Smelting Co. Ltd.	260	260	839,389	839,389	615	187
Highland-Bell Ltd.	264	264	15,154	15,154	30	5
Bralorne Mines Ltd.	365	365	183,168	183,168	415	21
Pioneer Gold Mines of B.C. Ltd.	365	365	89,317	89,317	285	17
Nickel Plate (Kelowna Mines Hedley Ltd.)	279	364	127,678[3]	127,678[3]	152	64
Fairview (Cons. M. & S. Co. of Canada, Ltd.)	365	......	16,312	......	12	......
Copper Mountain (Granby Cons. M.S. & P. Co. Ltd.)	364	364	1,813,787	1,813,787	454	208
Bluebell (Cons. M. & S. Co. of Canada, Ltd.)	306	358	216,401	216,401	273	22
Highlander (Yale Lead & Zinc Mines Ltd.)	279	313	52,375	52,375	49	15
Sullivan (Cons. M. & S. Co. of Canada, Ltd.)	241	241	2,643,251	2,643,251	1,240	422
Giant Mascot Mines Ltd.	365	365	176,289	176,289	83	19
Emerald-Dodger-Feeney (Canadian Exploration Ltd.)	365	365	95,081	95,081	75	27
Jersey (Canadian Exploration Ltd.)	365	365	513,621	513,621	382	31
Reeves MacDonald Mines Ltd.	156	190	159,791	159,791	58	8
Regal Silver Mines Ltd.	([4])	([4])	([4])	([4])	30[5]	5[5]
Spider (Sunshine Lardeau Mines Ltd.)	310	270	16,503	16,503	49	11
Silversmith (Carnegie Mines Ltd.)	279	305	41,694	41,694	40	11
Violamac Mines (B.C.) Ltd.	365	......	27,247	27,247	63	......
Standard, Enterprise, and Mammoth (Western Exploration Co. Ltd.)	213	239	58	58	19	16
Lucky Jim (Sheep Creek Gold Mines Ltd.)	152	152	52,521	52,521	28	7
Estella Mines Ltd.	([4])	([4])	([4])	3,960[5]	([4])	([4])
Non-shipping Mines						
H.B. Mine (Cons. M. & S. Co. of Canada, Ltd.)	......	......	......	......	27	......
Mastodon Zinc Mines Ltd.	......	......	......	......	14	......
Northwestern Exploration (exploration only)	......	......	......	......	15	......
Noble Five (Cody-Reco Mines Ltd.)	......	......	......	......	16	......
Mineral King (Sheep Creek Gold Mines Ltd.)	......	......	......	......	24	......

[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] Includes ore milled for Indian Mines Ltd. and Premier Border.

[3] Includes ore mined and milled from French mine.

[4] Not available.

[5] Estimated.

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. Geological and analytical work on well samples is done in laboratories in No. 3 temporary building.

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. Effective September 1st, 1953, P. J. Mulcahy was appointed Controller and K. B. Blakey, J. D. Lineham, and R. E. Moss were appointed Deputy Controllers under the "Petroleum and Natural Gas Act."

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 a mineral claim as required by the "Mineral Act" and upon a placer claim or a placer-mining lease as required by the "Placer-mining Act" must be made at the office of the Mining Recorder for the mining division in which the claim or lease is located. Information concerning claims and leases and concerning the ownership and standing of claims and leases in any mining division may be obtained from the Mining Recorder for the mining division in which the property is situated or from the Central Records Offices at Victoria and Vancouver. 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.

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.

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	T. G. O'Neill	T. G. O'Neill.	
Sub-office	Nanaimo			W. H. Cochrane.
Sub-office	Quatsino			Axel Hansen.
Sub-office	Tofino			R. R. Barr.
Sub-office	Zeballos			
Atlin	Atlin	B. J. H. Ryley	B. J. H. Ryley.	
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	Likely			C. W. Speed.
Sub-office	McBride			G. P. W. Russell.
Sub-office	Prince George			G. H. Hallett.
Sub-office	Quesnel			S. M. Carling.
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	W. T. McGruder	W. T. McGruder.	
Sub-office	Invermere			T. N. Weir.
Greenwood	Grand Forks	W. E. McLean	W. E. McLean.	
Sub-office	Beaverdell			L. F. Crump.
Sub-office	Greenwood			G. A. Hartley.
Sub-office	Oliver			L. M. McKinnon.
Kamloops	Kamloops	D. Dalgleish	D. Dalgleish.	
Sub-office	Ashcroft			D. H. Bruce.
Sub-office	Chu Chua			G. M. Fennell.
Sub-office	Likely			C. W. Speed.
Sub-office	Salmon Arm			R. MacGregor.
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.	
Sub-office	Haylmore			W. Haylmore.
Nanaimo	Nanaimo	W. H. Cochrane	W. H. Cochrane.	
Sub-office	Alberni			T. G. O'Neill.
Sub-office	Alert Bay			D. J. Phillips.
Sub-office	Courtenay			G. W. McFarland.
Sub-office	Quatsino			Axel Hansen.
Nelson	Nelson	K. D. McRae	K. D. McRae.	
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)	S. Tetchell.	

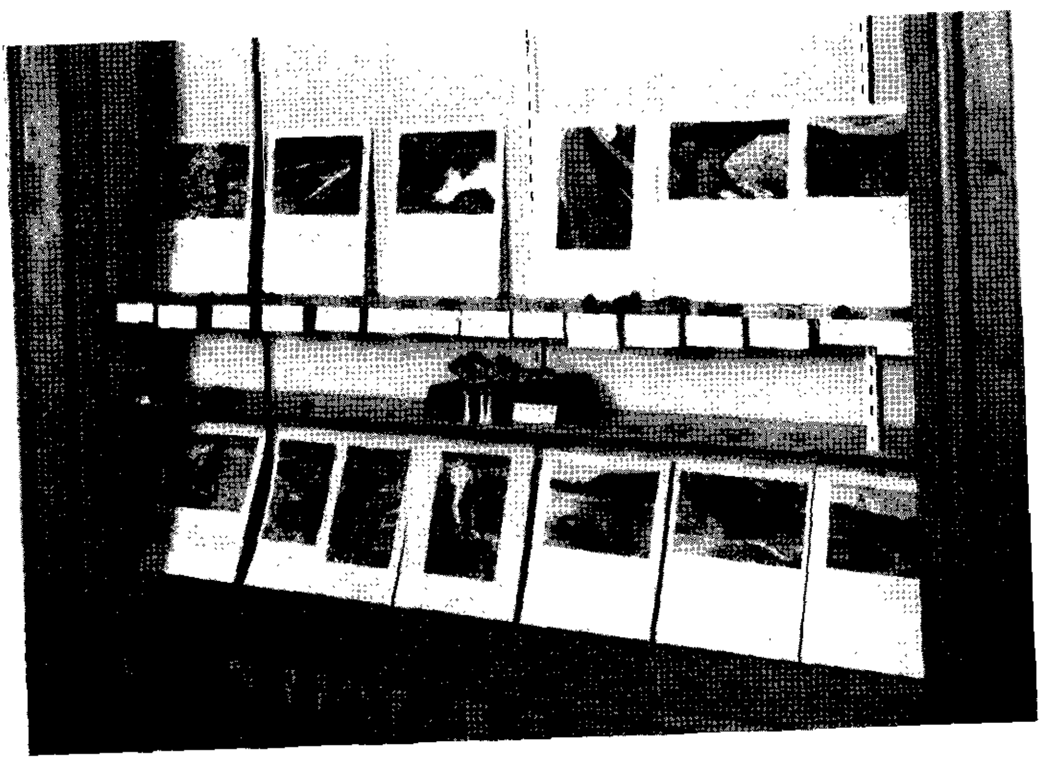
LIST OF GOLD COMMISSIONERS, MINING RECORDERS, AND SUB-MINING RECORDERS IN THE PROVINCE—*Continued*

Mining Division	Location of Office	Gold Commissioner	Mining Recorder	Sub-Recorder
Omineca	Smithers	G. H. Beley	G. H. Beley.	
Sub-office	Burns Lake			A. Fisher.
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			W. J. D. Bogle.
Sub-office	Vanderhoof			F. B. Wheeler.
Osoyoos	Penticton	T. S. Dalby	T. S. Dalby.	
Sub-office	Keremeos			L. S. Coleman.
Sub-office	Oliver			L. M. McKinnon.
Quesnel	Williams Lake	Miss J. Foster	Miss J. Foster.	
Sub-office	Barkerville			G. H. Dunlop.
Sub-office	Likely			C. W. Speed.
Sub-office	Quesnel			S. M. Carling.
Revelstoke	Revelstoke	W. G. Fleming	W. G. Fleming.	
Sub-office	Beaton			S. A. Hanham.
Similkameen	Princeton	B. Kennelly	B. Kennelly.	
Skeena	Prince Rupert	T. H. W. Harding	T. H. W. Harding.	
Sub-office	Alice Arm			Mrs. M. Carlson.
Sub-office	Burns Lake			A. Fisher.
Sub-office	Queen Charlotte			H. R. Beaven.
Sub-office	Stewart			W. S. Orr.
Sub-office	Terrace			W. J. D. Bogle.
Slocan	New Denver	C. Macdonald (Kaslo)	F. Broughton.	
Sub-office	Slocan			W. E. Graham.
Trail Creek	Rossland	W. L. Draper	W. L. Draper.	
Vancouver	Vancouver	J. Egdell	Mrs. F. Sherman (Deputy).	
Sub-office	Alert Bay			D. J. Phillips.
Sub-office	Powell River			J. V. Gaspard.
Vernon	Vernon	G. F. Forbes	G. F. Forbes.	
Sub-office	Kelowna			E. R. Oatman.
Victoria	Victoria	K. B. Blakey	R. H. McCrimmon (Deputy).	

Gold Commissioners' and Mining Recorders' Office Statistics, 1953

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	145	4	5	.....	154	572	22	78	38	.....	4	.....	8	$1,406.00	$5,458.25	$6,864.25
Alberni	79	2	1	.....	128	210	9	17	6	6	6	.....	.....	509.50	3,530.50	4,040.00
Atlin	319	2	.....	.....	700	165	.....	46	20	7	3	110	21	1,696.00	8,281.25	9,977.25
Cariboo	416	11	7	.....	106	198	.....	14	4	6	81	320	111	2,715.50	13,816.75	16,532.25
Clinton	36	1	1	4	61	146	1	11	1	.....	11	12	8	271.75	2,221.00	2,492.75
Fort Steele	215	.....	1	2	273	155	.....	30	2	.....	22	29	26	1,102.50	3,463.25	4,565.75
Golden	37	2	4	1	49	197	31	35	.....	.....	6	1	3	526.75	1,783.25	2,310.00
Greenwood	86	.....	3	3	116	228	2	21	53	2	1	5	1	437.75	2,920.00	3,357.75
Kamloops	422	3	5	.....	785	593	3	181	54	4	9	2	18	2,325.50	11,792.35	14,117.85
Liard	292	2	1	.....	301	238	.....	54	.....	.....	13	22	8	1,330.50	4,747.41	6,077.91
Lillooet	174	3	3	2	112	340	7	24	9	.....	10	35	11	1,154.00	4,658.50	5,812.50
Nanaimo	163	2	3	1	284	445	.....	76	30	1	.....	.....	.....	866.25	4,083.50	4,949.75
Nelson	340	13	12	6	179	879	11	82	21	1	3	6	.....	2,772.00	14,859.75	17,631.75
New Westminster	249	2	7	14	373	138	2	31	.....	.....	5	17	8	1,271.50	8,225.00	9,496.50
Nicola	17	.....	.....	1	35	116	4	10	.....	.....	.....	.....	.....	76.50	427.50	504.00
Omineca	321	9	4	.....	351	979	33	97	66	4	6	65	15	2,200.25	17,888.65	20,088.90
Osoyoos	139	2	4	.....	111	209	2	21	8	.....	.....	1	.....	846.25	2,398.25	3,244.50
Quesnel	182	5	2	3	59	116	.....	10	14	.....	19	96	6	1,148.50	5,038.00	6,186.50
Revelstoke	96	6	.....	.....	131	284	.....	43	35	.....	5	15	9	843.00	10,750.75	11,593.75
Similkameen	141	3	7	.....	98	140	3	10	7	2	6	14	5	900.25	2,675.50	3,575.75
Skeena	281	3	4	.....	678	503	2	779	127	1	.....	.....	.....	1,625.50	9,517.75	11,143.25
Slocan	71	3	1	.....	39	94	.....	11	.....	2	.....	.....	.....	563.00	2,001.75	2,564.75
Trail Creek	80	2	2	.....	53	22	.....	7	2	.....	.....	.....	.....	592.50	1,302.25	1,894.75
Vancouver	1,218	150	36	6	208	182	.....	28	35	.....	.....	1	.....	19,119.50	4,040.10	23,159.60
Vernon	141	.....	2	17	84	43	.....	32	2	.....	2	1	3	741.25	986.75	1,728.00
Victoria	229	13	4	.....	140	56	.....	24	12	.....	1	3	.....	2,135.50	3,992.27	6,127.77
Totals for Province, 1953	5,889	243	119	60	5,608	7,248	132	1,772	546	36	213	755	261	$49,177.50	$150,860.28	$200,037.78
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

Department of Mines mineral exhibit, Victoria—industrial minerals, metals, coals.



Department of Mines exhibit, Victoria—placer.

Coal, Petroleum and Natural Gas

The Administration Branch has been responsible for the administration of the "Petroleum and Natural Gas Act" and for the "Coal Act" since April 1st, 1953. Information concerning applications for permits, licences, and leases issued under the "Petroleum and Natural Gas Act" and concerning the ownership and standing of them may be obtained upon application to the office of the Controller, Department of Mines, Victoria, B.C. Similar information may be obtained respecting licences and leases issued under the "Coal Act." A series of maps showing the locations of permits and licences under the "Petroleum and Natural Gas Act" is provided, and copies may be obtained upon application to the office of the Surveyor-General, Department of Lands, Victoria, B.C., accompanied by payment of $3 per sheet. Monthly reports listing additions and revision to permit-location maps and giving information listing changes in title to permits, licences, and leases and related matters are available from the office of the Controller upon application and payment of a fee of $1 per annum.

Petroleum and Natural-gas Statistics, 1953[1]

Permits—		
Issued		36
Renewed		408
Assigned		182
Licences—		
Issued		252
Renewed		153
Assigned		8
Leases issued		*Nil*
Permit fees	$69,500.00	
Permit rents	1,615,055.23	
Licence fees	7,550.00	
Licence rents	33,965.42	
Lease fees	*Nil*	
Lease rents	*Nil*	
Tender bonuses	29,489.35	
Miscellaneous	1,299.00	
		$1,756,859.00

Coal Statistics, 1953[2]

Licence fees	$75.00	
Licence rents	160.00	
Lease fees	35.00	
Lease rents	96.00	
		366.00
Total		$1,757,225.00

[1] For nine-month period commencing April 1st, 1953.
[2] For two-month period commencing November 1st, 1953.

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

ANALYTICAL AND ASSAY BRANCH

By G. C. B. Cave, Chief Analyst

Rock Samples

During 1953 the chemical laboratory in Victoria issued reports on 1,822 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 radiometric 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:—

* 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.

	Samples	Spectro-graphic Analyses	Assays
Prospectors (not grantees)	1,110	1,001	2,319
Prospectors (grantees)	201	185	427
Engineers	511	437	1,110
Totals	1,822	1,623	3,856

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

Coal, Petroleum, and Natural-gas Samples

On April 1st, 1953, the chemical laboratory of the Coal, Petroleum and Natural Gas Branch of the Department of Lands and Forests was combined with the chemical laboratory of the Department of Mines. K. C. Gilbart, Chief Chemist for the Coal, Petroleum and Natural Gas Branch, then became a permanent member of the staff of the Analytical and Assay Branch, and he continues to perform all the analytical services which were previously offered.

Altogether a total of eighty-eight samples were analysed. Of these, eighteen were samples of coal, thirty-eight were samples of formation water, three were samples of petroleum, thirteen were samples said to represent oil seepages, and sixteen were samples of gas.

The coal samples were submitted by this Department and by the Department of Public Works for proximate analysis and calorific value. The samples of water were for mineral analyses and were taken from wells being drilled for oil and gas in the Province. Of the suspected oil seepages, one group of samples represented a seepage of asphalt through soil near the site of an abandoned asphalt plant. Twelve of the gas samples consisted mainly of carbon dioxide and were from shallow wells drilled during a search for that gas, one sample was from a gas well being drilled, and three samples were of diesel-engine exhaust gas.

Police and Coroners' Exhibits

For the Attorney-General's Department and the Royal Canadian Mounted Police, seventy-five cases of a chemico-legal nature were undertaken. They involved a scientific examination and analyses of 310 individual exhibits.

Of the seventy-five cases, twenty-five were analyses for narcotics under "The Opium and Narcotic Drug Act," twelve were toxicological analyses for possible poisons in viscera, fourteen were analyses of liquids for their alcohol content, five required the determination of the alcohol content of blood, and for the "Coloured Gasoline Tax Act" four samples required the identification of marker dyestuff in gasoline. The remaining fifteen cases were of a different and diversified nature, requiring the examination of materials such as hairs, paint, burglar tools, nitro-glycerine, charred wood, sawdust, volatile solvent, soil, oil, and blasting-caps. Expert evidence was presented in Courts of law on four occasions.

Miscellaneous Samples

For the Purchasing Commission, specification analyses were made on six samples of soap, on seven samples of anti-freeze, and on one sample of weed-killer.

For the Taxation Branch of the Department of Finance, fourteen samples of gasoline were analysed for marker dyestuff.

For the Department of Agriculture, four samples of soil were analysed for potash and magnesia, one sample of limestone for phosphorus, and ten samples of limestone for lime.

For the Department of Lands and Forests, analyses were made on one sample of battery additive, and on one sample of water for total hardness.

For the Department of Health, one sample of a deposit in a water-main was analysed; and for the Department of Public Works, a surface incrustation on pebbles was analysed.

For the British Columbia Research Council, spectrographic analyses were made on four samples of steel, on four samples of ore, on two samples of water deposits, and on two samples of dust; three samples of ore were assayed for precious metals.

For the Department of Mining and Metallurgy of the University of British Columbia, radiometric assays were made on ten samples and spectrographic analyses were made on five samples.

Research

The acquisition of additional floor space enabled extensive expansion and modernization of the laboratory to be made. These changes have resulted in analyses being made more expeditiously, and they have made feasible a restricted amount of research. New and more accurate analytical methods were developed for the analyses of copper, lead, zinc, cadmium, and molybdenum in low-grade ores. Recently published chemical methods for uranium and thorium in ores were studied carefully, and were finally adopted for routine use. A new radiometric method was devised whereby the percentages of uranium and of thorium in ores can be obtained separately.

An experimental study was commenced on methods for identifying minute samples of material of petroleum origin.

A theoretical study was undertaken to determine by thermodynamic methods the pressure, and therefore the depth of burial, at which a gypsum deposit becomes unstable and is transformed into anhydrite. The theoretical findings agreed rather well with the experimental data obtained from geological studies.

Examinations for Assayers

Provincial Government examinations for certificates of competency and licence to practise assaying in British Columbia were held in May and in December. In May one candidate was examined; he was granted a supplemental examination in wet assaying. In December, eight candidates were examined; the results of this examination have not yet been released.

Purchase of Placer Gold

As of January 1st, 1953, the purchase of placer gold from individual placer-miners was discontinued.

INSPECTION BRANCH

Organization and Staff

Inspectors and Resident Engineers

H. C. Hughes, Chief Inspector	Victoria
Robert B. Bonar, Senior Inspector of Mines	Victoria
J. D. Lineham, Senior Inspector and Acting Chief Conservation Engineer	Victoria
L. Wardman, Electrical Inspector	Victoria
J. A. Mitchell, Senior Inspector of Mines	Victoria
J. W. Patterson, 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
R. R. McLeod, District Petroleum Engineer	Dawson Creek
Mrs. A. E. Davis, Secretary	Victoria

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.

J. D. Lineham is responsible for the administration of regulations governing the drilling, completion, and abandonment of all wells drilled for oil and gas in British Columbia.

R. R. McLeod undertakes inspection work in connection with drilling, completion, and abandonment of all wells drilled for oil and gas in the Peace River area.

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 April 1st, 1953, J. D. Lineham assumed the duties of Senior Inspector and Acting Chief Conservation Engineer.

On April 1st, 1953, R. R. McLeod assumed the duties of Inspector for the drilling, completion, and abandonment of all wells drilled for oil and gas in the Peace River area.

MINERALOGICAL BRANCH

Field work by officers of the Mineralogical Branch includes geological mapping and examination of mineral deposits, and studies related to ground-water and engineering geology. 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. Since April 1st, 1953, the Mineralogical Branch has been responsible for preparing and logging samples representing the bit cuttings from wells drilled for petroleum and natural gas and cores from the wells.

Professional Staff

On December 31st, 1953, the professional staff included the following engineers classified as geologists or mineral engineers: H. Sargent, Chief of the Mineralogical Branch; M. S. Hedley, S. S. Holland, W. R. Bacon, G. E. P. Eastwood, J. W. McCammon, A. F. Shepherd, J. T. Fyles, N. D. McKechnie, S. S. Cosburn, H. W. Nasmith, A. Sutherland Brown, and C. B. Hewlett.

Technical editing of the Annual Report of the Minister of Mines and of other publications was directed by M. S. Hedley. Copy for printing was prepared under the direction of Mrs. C. C. Savage, who serves as editor for English. Messrs. Hedley and Holland assisted in directing and supervising field work. Most of the other members of the technical staff are assigned to mapping the geology of the selected areas and of mineral deposits. The following have special assignments: J. W. McCammon, industrial minerals and structural materials; H. W. Nasmith, ground-water and engineering geology; S. S. Cosburn, preparation and logging of well samples; A. F. Shepherd, records and library.

Staff Changes

J. M. Black and G. G. L. Henderson resigned before the beginning of the 1953 field season. N. D. McKechnie and S. S. Cosburn were transferred to the staff on April 1st, previously having been on the staff of the Controller of Coal, Petroleum and Natural Gas. Cecil B. Hewlett, who had been employed by the Department in the summers of 1952 and 1953, was appointed as Assistant Geologist in December.

Field Work

An Acting Assistant Geologist and eight field assistants were employed for the 1953 season to work under permanent members of the professional staff who had the following assignments.

M. S. Hedley supervised work in the southern Kootenays and made reconnaissance observations in the southern Rocky Mountains.

S. S. Holland supervised work in Lardeau, Cariboo, and Hazelton areas and made reconnaissance observations in northern British Columbia.

W. R. Bacon examined and mapped the new copper prospect at the Leduc glacier, examined prospects at Mackay Lake, Quadra Island, and studied the geology of copper deposits at several points in the Coast Mountains and in southwestern British Columbia.

G. E. P. Eastwood mapped in detail a small area in the Ainsworth camp and continued mapping near Ferguson in the Lardeau area.

J. W. McCammon examined shale and clay deposits on Vancouver Island, the lower Fraser Valley, and the Princeton area, in search of material that could be bloated for light-weight aggregate. Bloating tests on the shale samples are being made in the laboratory.

J. T. Fyles and C. B. Hewlett, with two field assistants, continued mapping in the Salmo-Pend d'Oreille River area.

N. D. McKechnie examined prospects on Tofino Inlet, near Quatsino Sound, and on Burke Channel. With S. S. Cosburn he spent six weeks in northeastern British Columbia collecting information relative to and derived from drilling for petroleum and natural gas.

A. Sutherland Brown completed geological studies in the Wells-Roundtop Mountain area and began detailed mapping on Rocher Déboulé Mountain, in an area that includes the Red Rose tungsten mine.

H. W. Nasmith made studies of ground-water in the Duncan area on Vancouver Island, as part of an investigation of the feasibility of a district irrigation project. He also demonstrated the usefulness of the earth auger in searching for well-sites and sites suitable for dugouts in the Prince George area. He investigated possible gravel-pit sites in search of material suitable for use in road construction and maintenance in the Colwood-Goldstream and the Willow River-Hansard areas, and in the Okanagan Valley examined silt deposits to gain information relative to problems they are believed to present in the construction of foundations or in engineering construction.

Petroleum and Natural-gas Well Samples

During the year 13,860 samples were washed and bottled from the twenty-nine wells listed on page 202. A part of each sample is sent to the laboratory of the Geological Survey of Canada in Calgary. In the course of field work, core was examined at various wells, and visits were made to almost all wells at which drilling was in progress.

Throughout the year, oil company geologists used the facilities for examining samples, core, and electrical logs in the sample laboratory.

GRUB-STAKING PROSPECTORS

Each year since 1943 the Department of Mines has provided grub-stakes to applicants who were able to qualify. During 1953 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
1953	17,850	41	201	141

Samples and specimens received from grub-staked prospectors are spectrographed, assayed, and tested for radioactivity. Mineralogical identifications are made on request.

There were 106 applications for grub-stakes for the 1953 season.

Of the forty-one grantees, fourteen received assistance for the first time. Six of the forty-one proved unsatisfactory and will not receive further assistance. The following notes compiled from the diaries of the grantees and from observation of the field supervisor briefly cover the activities of prospectors grubstaked during 1953.

Atlin Mining Division.—One man prospected westerly from Mile 88 on the Haines road to the Tatshenshini River and watershed of the Alsek River north of the O'Connor River. Some interesting mineralization was found but not in deposits of sufficient size to suggest commercial possibilities. A little prospecting was also done in the Blanchard River-Kusawa River area east of the Haines road near the Yukon Boundary.

Two men prospected points of interest along both sides of the Taku River from the International Boundary to the Nakina, thence up the Nakina as far as the canyon above the Sloko River.

Occurrences of magnetite, rhodochrosite, and barite were discovered, as well as a gold-bearing vein which may be of commercial importance.

Liard Mining Division.—Prospectors, interested principally in occurrences of asbestos, investigated exposures of basic rocks in the Teslin Lake area, in the Tuya Lake, Maria Lake, and Cottonwood River areas, also west of the Cassiar Asbestos camp, and on the headwaters of the Blue River north of the Cassiar Asbestos property. Some prospecting was also done on the serpentine belt in the vicinity of King Mountain on both sides of the Turnagain River, and some narrow stringers of asbestos were observed. The entire serpentine belt north and south of King Mountain is worthy of further prospecting. For the most part, the area can be traversed with horses. Other work in this division drew attention to the presence of beryllium in pegmatites and pyroxenite rocks.

A small amount of prospecting was also done in the vicinity of the Hot Springs at Mile 497 on the Alaska Highway and west of the Lower Liard River bridge.

Some work was done along the highway in the vicinity of Toad River. One man did considerable work south of Mile 420 on the Alaska Highway from the junction of Racing River and McDonnell Creek to the headwaters of all four branches of Racing River. Copper mineralization was found, and the area apparently warrants further prospecting.

Skeena Mining Division.—In the Alice Arm area a continuation of last year's work in the Upper Kitsault Valley resulted in a discovery of copper ore on which further work is to be done in 1954. Some prospectors worked on Maroon Mountain east of Kitsumkalum Lake, where numerous porphyry dykes cut through the exposed granite. The same prospectors also worked east of Kitsumkalum Lake and in the area between Lakelse and Kitimat.

About 20 miles east of Bella Coola, several mineralized zones carrying copper have been known for some time. These were investigated to gain information that would prove useful in further prospecting the area. No new discoveries were reported.

In the King Island area south of Ocean Falls, further work was done in the vicinity of recently discovered zinc occurrences.

Omineca Mining Division.—In the Stuart Lake area and from Gaffney Creek to Silver Creek several granite-limestone contacts were prospected. Some prospecting was also done west and northwest of Old Hogem and in the Wolverine Range. Interesting mineralization was discovered.

A short exploratory trip was made west from Hudson Bay Mountain, where rock outcrops along a westerly fork of the Zymoetz River were examined. No conclusive results were obtained.

Near the headwaters of Mud Creek on Rocher Déboulé Mountain further prospecting was done, and several more veins were discovered during the season. Some samples yielded assays indicating commercial grade.

Cariboo Mining Division.—Considerable prospecting was done south of Crescent Spur (west of McBride on the Canadian National Railway) along the Dome River. This work was confined to an exposure of garnet schist where radioactive material had been reported. Nothing of a commercial nature was found.

Some work was also done on Cunningham and Antler Creeks in the Barkerville area.

Quesnel Mining Division.—Along the Chilcotin River about 25 miles west of Williams Lake, green-stained outcrops were prospected and tested for possible nickel content. Prospecting was continued on an outcrop of low-grade copper on the river bank.

A copper showing near Likely was also investigated.

Clinton Mining Division.—Work was continued near Clinton on small showings of magnesite, and several new outcrops were discovered. Some narrow stringers of asbestos were also investigated.

Southwest of Taseko Lake a copper showing was staked.

Kamloops Mining Division.—Near Skwaam (Agate) Bay, on Adams Lake, prospecting was continued on and close to an old copper property. The results were inconclusive. On Spillman Creek on the east side of the lake, some small sheets of mica were found in a talus slope. No staking was done in this area. Northwest of Little Fort on the

North Thompson River, in the vicinity of Bridge Lake road, and on Johnson Mountain a short time was spent investigating rock outcrops. Nothing of apparent interest was found.

A small amount of prospecting was also done in the Blind Bay area of Shuswap Lake.

Close to the Kamloops–Merritt road, about the centre of Highland Valley, some work was done close to several old copper properties.

The western end of the Kwoiek Creek watershed was prospected for a short period. This area is west of Kanaka on the Fraser River and extends southerly into the New Westminster Mining Division. The rocks examined were chiefly altered serpentine; some narrow bands of asbestos and some mineralized quartz stringers were noted.

Nicola Mining Division.—West of Romeo an attempt was made to get back to the headwaters of the Anderson River. This was not successful. The area prospected was underlain by coarse-grained granite.

Vernon Mining Division.—Some work was done on Joss Mountain, and in the Mabel Lake area a reported occurrence of graphite was investigated. No finds of economic interest were reported.

Osoyoos Mining Division.—On the old Hedley Mascot road between Dividend Mountain and Mount Riordan, occurrences of pyrrhotite and scheelite in skarn were prospected.

At Cameo Lake, about 25 miles due west from Kelowna, some work was done on surface exposures of dunite which showed fairly good but scattered chromite mineralization. This work extended west across into the Nicola Mining Division.

Ainsworth and Revelstoke Mining Divisions.—East of Trout Lake, some prospecting was done early in the season. The area prospected included ground in both the Ainsworth and Revelstoke Mining Divisions.

In the Westfall River area, minor amounts of galena, sphalerite, and chalcopyrite were discovered in several outcrops.

East of the road from Howser to Gerrard, field work was carried on in the valleys of Poplar, Glacier, Marsh Adams, and Hall Creeks, and in the vicinity of Duck Lake. Some good float was found.

Further work in the vicinity of Bear Lake at the headwaters of Fosthall Creek was inconclusive.

Golden Mining Division.—Near Kinbasket Lake, further work was done on large exposures of kyanite close to the main highway.

New Westminster Mining Division.—Along the east side of Pitt Lake, close to the north end, shear zones and faulted areas in greenstone were prospected, but the samples taken showed no commercial values. A small amount of work was done in the Silver Peak Mountain area near Hope.

Vancouver Mining Division.—Some work was done in the Jervis Inlet area, extending from Deserted Bay to Jervis Inlet. The valleys of Osgood, Seshal, and Deserted Rivers, and Crabtree Creek area received some attention.

On Loughborough Inlet, considerable work was done on ground close to the old holdings of Loughborough Gold Mines Limited, and several quartz veins carrying fair values in gold were discovered. These were too narrow to be of importance. Along Gray Creek and at Hayden Bay across the inlet from Roy, further work was done.

Victoria Mining Division.—In the Shawnigan Lake area close to Mount Baldy, work was done on copper showings in a quartz vein near a large outcrop of magnetite, and other mineralized zones were observed.

Alberni Mining Division.—Near Zeballos, further work was done in the Lime Creek area, in the watershed of the Artlish River, and along the Blind River. Samples taken from a wide shear zone discovered on the Nomass River contained an encouraging amount of copper.

At the headwaters of the main fork of the Megin River, some progress was made in prospecting toward the northeast. The country was found to be very steep and difficult to approach.

Prospecting was continued at the eastern end of Pipestem Inlet, where further encouraging occurrences of galena, sphalerite, and chalcopyrite were found in the limestone formation close to a granite contact.

Nanaimo Mining Division.—In the Quatsino area, some scattered occurrences of chromite were investigated.

Twenty miles northwest of Campbell River along the Sayward road, a great deal of prospecting was done on high-grade but narrow bands of chalcocite associated with both sedimentary and volcanic rocks. Work was also done on a large area of exposed volcanic rocks containing visible specks of native copper.

MUSEUMS

The Department has a large exhibit of mineral and rock specimens in the Douglas Building, Victoria; collections are also 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 284.

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 received by the museum in 1953:—

From George Winkler, Victoria, three suites of mineral specimens from Hedley, Portland Canal, and Vancouver Island areas.

From The Consolidated Mining and Smelting Company of Canada, Limited, an inverted display bottle of Elephant Brand Zinc M-N-S fertilizer.

PUBLICATIONS

Annual Reports of the Minister of Mines, bulletins, and other publications of the Department, with prices charged for them, are listed on pages 281 to 283.

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 285.

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. 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 the Federal Government Departments of Mines and Technical Surveys and of National Defence.

In addition to this, the Legal Division of the British Columbia Surveys and Mapping Branch makes various types of cadastral surveys which, in the 1953 season, consisted of approximately 20,000 acres of Crown land surveyed in the Peace River District for settlement purposes; 93 miles of control and right-of-way survey on the Alaska Highway, including fifty-two district lots covering gravel pits, home-sites, etc.; 12 miles of right-of-way on the Cariboo Highway; 15 miles of right-of-way on the Hope–Princeton Highway; 66 miles of right-of-way survey on the John Hart Highway; and numerous subdivisions, public reserves, etc., scattered over the Province.

Interim maps based on air photographs and existing ground control are compiled by the Air Division of the British Columbia Surveys and Mapping Branch. On a scale of 2 inches to 1 mile, they include planimetric and cadastral information and also show the centres of the vertical air photographs used, but do not show contours. They are proving of great value as base maps, since they will cover at least the southerly half of the Province and act as the stop-gap until standard topographic maps can be produced. The 1953 season has seen 33,000 square miles of interim maps completed or under way, bringing the total area in hand to some 145,000 square miles.

During 1953 the Topographic Division of the British Columbia Surveys and Mapping Branch completed the field work to control some 800 square miles of standard topographic mapping on a 2-inches-to-1-mile manuscript scale with 100-foot contours. This represented only about one-seventh of the Division's potential, since the major portion of its manpower was used to obtain horizontal control in the northeastern section of the Province north of the Peace River. This work was planned in the early spring of 1953 as a three-year project, when it was realized that locations under the " Petroleum and Natural Gas Act " on an individual basis would be chaotic and extremely costly unless a planned network of ground control was established immediately. At that time the whole of northeastern British Columbia was blanketed with oil permits and, except for perimeter surveys along the Provincial boundaries and the Alaska Highway, was devoid of survey control.

By building forty-six observing towers some 80 to 90 feet in height throughout the area, and using aircraft, including a helicopter, the Division was able to establish some 7,500 square miles of valuable triangulation control. It is hoped to be able to add another 10,000 square miles in the 1954 season, which should push the controlled area northerly to or near the north boundary of the Province. The result of this work is already being felt in the elimination of confusion in petroleum and natural-gas locations, and it is hoped now to be able to keep ahead of the current exploratory and drilling activity. A network of ground control accurately co-ordinated and permanently marked has been left at 10- to 15-mile intervals for all concerned to use in any new locations or surveys under oil and gas or any of the other development bound to follow.

The Federal Government Departments of Mines and Technical Surveys and of National Defence, working in close co-operation, together, during 1953, completed the field work for seventy-four 1-mile and three and a half 4-mile topographic sheets in the Province.

Air photographs are an integral part of all current mapping and may be purchased or, under some circumstances, borrowed from the Air-photo Library in Victoria.

In the Annual Report of the Deputy Minister of Lands for 1953, coverage by air photographs and by topographic and interim maps is indicated on a series of base maps. Further information about these or the corresponding Federal mapping may be obtained from the Director, Surveys and Mapping Branch of the Department of Lands and Forests.

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, 1953

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

J. E. Armstrong completed the mapping of four 1-mile map-areas near Vancouver (longitude 122° 30′ to 123° 30′, latitude 49° to 49° 30′), and commenced the mapping of the Tertiary, Pleistocene, and Recent sedimentary deposits of the lower Fraser Valley.

W. E. Cockfield was associated with the National Research Council project to investigate the possibility of removing Ripple Rock in Seymour Narrows by mining. He also undertook other incidental studies logically handled from the British Columbia office of the Geological Survey.

S. Duffell commenced geological mapping of the Terrace area (longitude 128° to 130°, latitude 54° to 55°).

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

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

E. Hall continued to assist the Engineering and Water Resources Branch, Department of Resources and Development, by examining drill cuttings and cores at the damsites on Columbia River and by correlating the geological information.

J. A. Jeletzky continued detailed stratigraphic studies of the fossiliferous Mesozoic and Tertiary rocks on the west coast of Vancouver Island between Kyuquot Sound and Quatsino Sound.

G. B. Leech commenced geological mapping of the Canal Flats area (longitude 115° 30′ to 116°, latitude 50° to 50° 15′).

H. W. Little continued geological mapping of the Kettle River area, east half (longitude 118° to 119°, latitude 49° to 50°).

J. E. Reesor commenced geological mapping of the Lardeau area (longitude 116° to 117°, latitude 50° to 51°).

J. A. Roddick commenced geological mapping of the Coquitlam 4-mile map-area (longitude 122° to 123°, latitude 49° to 50°).

J. Souther commenced a study of the granitic rocks of the Terrace area (longitude 128° to 129°, latitude 54° to 55°).

H. W. Tipper completed 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 1953:—

- National Advisory Committee on Research in the Geological Sciences, Third Annual Report, 1952–53.
- Paper 53-21: Notes on Triassic Ammonoids from Northeastern British Columbia, by F. H. McLearn.
- Water Supply Paper 322: Ground-water Resources of Surrey Municipality, British Columbia, by J. E. Armstrong and W. L. Brown.

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 1953 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. 833: Industrial Water Resources of Canada, Water Survey Report No. 1: Scope, Procedure, and Interpretation of Survey Studies, by J. F. J. Thomas.
- Mines Branch No. 835: The Canadian Mineral Industry in 1950.
- Mines Branch No. 838: Industrial Water Resources of Canada, Water Survey Report No. 4: Columbia River Drainage Basin in Canada, 1949–50, by J. F. J. Thomas.
- Mines Branch No. 839: Industrial Water Resources of Canada, Water Survey Report No. 5: Skeena River Drainage Basin, Vancouver Island, and Coastal Areas of British Columbia, 1949–51, by J. F. J. Thomas.
- Mines Branch No. 841: The Canadian Mineral Industry, 1951.
- Technical Paper No. 1: The Determination of Thorium in Ores by the Column Method, by R. J. Guest.
- Technical Paper No. 2: The Constitution of Bone China, Part I, by P. D. S. St. Pierre.
- Technical Paper No. 3: The Colorimetric Determination of Copper with 2,2-Diquinolyl in Minerals and Ores, by R. J. Guest.
- Technical Paper No. 4: The Determination of Aluminum by the Fluorophotometric Method, by J. B. Zimmerman.
- Technical Paper No. 5: Effect of Germanium on the Transformation of White to Grey Tin at Comparatively Low Temperature, by R. R. Rogers and J. F. Fydell.
- Technical Paper No. 6: The Determination of Uranium in Concentrates by the Fluorophotometric Method, by J. B. Zimmerman, F. T. Rabbitts, and E. D. Kornelsen.

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 1953, on British Columbia ores:—

Investigation No.	Title
MD2950.	Flotation Tests on a Gold-Silver-Lead-Zinc Ore from Teddy Glacier Mine, Revelstoke, B.C. (Columinda Metals Corporation Limited).
MD2990.	Flotation and Heavy-media Separation Tests on Samples of Gold-Silver-Lead-Zinc Ore from Atlin Ruffner Mines (B.C.) Limited, Atlin, British Columbia.

Lode Metals

CONTENTS

GENERAL REVIEW

The quantity of ore mined, the quantity of each metal and its value, the average number employed, for 1953 and preceding years, and other data are tabulated under "Statistics," in the section that begins on page 11. Table XV lists the production of individual properties and gives the name and address of the owner or agent of each producing property. Before 1951 the production of individual properties was incorporated in the property descriptions. The statistical tables are listed on page 5.

In 1953 the average prices of lead and zinc were below those for 1952 and well below those for the peak year of 1951. The New York quotation for lead was 14.5 cents at the start of the year, dipped to 12 cents at the end of April, and was 13.5 cents at the end of the year. The St. Louis quotation for zinc was 12.5 cents at the beginning and 10.0 cents at the end of 1953. The price of silver increased fractionally from the 1952 figure, but the price of copper dropped slightly.

Gold, silver, copper, lead, and zinc produced at British Columbia lode mines in 1953 had a gross value of $110,341,548. Miscellaneous metals, including iron ore, tungsten, tin, and minor metals recovered at the Trail smelter had a gross value of $15,588,840. The total quantity of ore mined at all lode mines amounted to 9,660,281 tons and came from eighty mines, of which forty-eight produced 100 tons or more. The average number employed in the lode-mining industry in 1953, including mines, concentrators, and smelters, was 11,006.

In 1953 thirty-nine mills, including two magnetic concentrators, were operated. Of these, five were operated for the first time, and eight others were closed before the year's end. The H.B. mill was completed but was not operated. Production started at the Sil-Van and from small mills at the Velvet, Waterloo, and Regal Silver mines, and the Can-Amer custom mill near Ainsworth. Closures included the Silbak Premier, Reeves MacDonald, Kootenay Florence, Cork Province, Lucky Jim, Silversmith, Kootenay King, and Estella. The Whitewater mill was operated under terms of a lease, and the Western Exploration mill was operated solely on Violamac ore on a custom basis. The capacity of the mill at Tulsequah was increased from 300 to 500 tons per day. At the end of 1953 twenty-three mills were being operated steadily on a domestic ore-supply. Most of the eight closings were attributable to the continuing low prices of lead and zinc, and although some of these mines merely await a moderate improvement, others require greatly advanced prices for their reopening.

Conditions of treatment and marketing at the Trail smelter were such that considerable amounts of lead and zinc concentrates were sent to the United States smelters, some of which offered fractionally better net prices than were obtained at Trail. The Trail smelter recorded custom receipts of 970 tons of crude ore, 6,100 tons of lead concentrates, and 48,900 tons of zinc concentrates from properties in British Columbia. Shipments to the Tacoma smelter included copper concentrates from the Britannia, Copper Mountain, Red Rose, and Tulsequah mines. The Tulsequah concentrates contained appreciable amounts of zinc and lead. Concentrated iron ore was shipped to Japan. Tungsten concentrates were sold under government contract in Eastern Canada and in the United States; some were shipped to Great Britain.

The Silbak Premier closed in May, 1953, and a long and profitable operation came to an end, a casualty to high costs and low prices. Since 1921 this great mine had produced gold, silver, lead, and zinc that contributed a total of $21,283,075 in dividends, a figure exceeded only by Granby and Consolidated.

Exploration of silver-lead-zinc deposits was largely restricted to the West Kootenay District, principally in the Ymir and Salmo areas. Tunnelling was done on the Yankee Girl and Jack Pot properties, and stripping and diamond drilling were done on other properties to the south.

At the Mineral King on Toby Creek, Sheep Creek Gold Mines Limited erected a 500-ton mill, using some of the equipment from the Lucky Jim mill at Zincton. Following geophysical surveys made in 1952 on the B.C. Nickel property, a low-level adit was being driven in 1953 by Western Nickel Limited with the intention of a thorough investigation by diamond drilling of the nickel-bearing ore zone.

Interest in exploration of copper deposits centred on the Granduc and A.M. properties. The former was diamond drilled with encouraging results to date, with indications of copper ore of a grade sufficient to offset the physical difficulties of the situation. At the A.M., exploration of a low-grade copper-bearing zone continued.

Three deposits containing niobium and uranium were under preliminary investigation. One deposit containing the mineral pyrochlore consisted of mineralization in carbonate rock near Lempriere, and pyrochlore-bearing placer deposits were sampled in the Bugaboo Creek area. The third deposit, on Moose Creek southeast of Yoho National Park, contains a complex mineral association. The present high prices for niobium and tantalum have spurred interest in the possible occurrence of these metals which may be associated with titanium and uranium. A uranium-bearing deposit near Birch Island is being investigated, on ground for many years known to contain fluorspar and celestite.

A uranium discovery at the shore of Atlin Lake resulted in a rush of activity, during which approximately 1,000 claims were recorded.

A fluorspar deposit was discovered just north of the hot springs on the Liard River at Mile 497 on the Alaska Highway.

NOTES ON METAL MINES

ATLIN*

104N-1 **Husselbee Uranium**

(59° 133° N.W.) In the winter of 1952–53 W. J. Husselbee, of Atlin, discovered that some of the rocks at his cabin were radioactive. He knew the source of the samples, and in the spring of 1953 found that over an area several hundred feet long a Geiger counter registered radiation counts of several times the normal background. In June ten claims—the Asbestos, Bee, Betty, and Discovery claims, the Eva Nos. 1 to 4, and the Coronation Nos. 1 and 2—were located by W. J. Husselbee and E. A. Goodridge, of Atlin, and Paul Lemieux, of Whitehorse, to cover Husselbee's discovery. Conwest Exploration Company Limited obtained an option on these claims and located about twenty more. However, on August 10th the company relinquished its option, and the original claims as well as those located by the company reverted to Husselbee and his partners.

News of the discovery of radioactive material created a considerable amount of interest in the area, and by early August about 700 claims had been located around the original discovery.

The discovery was made on the west side of Atlin Lake about 12 miles north of Atlin. The original showing is on top of a small rocky hill projecting through drift and rising to a height of about 250 feet above lake level. The hilltop is about 3,000 feet west of Atlin Lake and about 4,500 feet south of Deep Bay (*see* Fig. 1). A second showing of radioactive material is on the east side of a small slough about 1,200 feet west of Discovery Hill. A third showing, not seen in August, 1953, is reported by Husselbee to be about 300 to 400 feet from the slough. All these showings are on the Discovery and Asbestos mineral claims.

The rocks exposed around the shores of Deep Bay, near Red Island, and beside the lake southwest of Discovery Hill are granite and granodiorite, which show a considerable variation in granularity and mineral proportion. One common rock is a granodiorite which has a definite pinkish cast and may be slightly porphyritic with pink feldspar phenocrysts, others are grey and more micaceous; a pink- to brick-coloured phase outcrops on the point north of the Discovery claim. In areas underlain by some of the more highly feldspathic granites it was found that radioactive counts of as much as twice normal background were recorded. This probably is due to the high potash content of the granite rather than to the presence of any uranium minerals.

These granitic rocks are presumed to intrude both grey quartzites, which outcrop in an area just south of Logger Bay and on the lake 2,500 to 4,000 feet west of Discovery Hill, as well as amphibolite rock that underlies Discovery Hill. The contact relationships of the various phases of the granitic rocks were not observed.

Light-grey quartzite outcrops in two areas—one just south of Logger Bay and the other on the lakeshore several thousand feet west of Discovery Hill. Near Logger Bay the rocks strike north 10 degrees west and are almost vertical. West of Discovery Hill the grey quartzite is thinly laminated with beds of white calcareous quartzite, all striking about north 40 degrees east and vertical, the quartzite is cut by a 10-foot dyke of grey porphyritic diorite.

An outcrop area about 600 feet long on the top of Discovery Hill and a second outcrop beside a small slough about 1,200 feet west are underlain by amphibolite. The amphibolite varies from a dark greenish-black rock largely composed of bladed amphibole several inches long to a greyish-green rock which is a felted mass of actinolite rosettes. The amphibolite has a reddish cast derived from a variable content of hematite. In addition, the rock contains irregular areas of red jasper and is mineralized with pyrite,

* By Stuart S. Holland.

fluorite, and galena. The rock contains small irregular areas of limestone only partly recrystallized, and some weathered surfaces display a texture that may have been inherited from an original fragmental rock. The present amphibolite is thought to be derived from

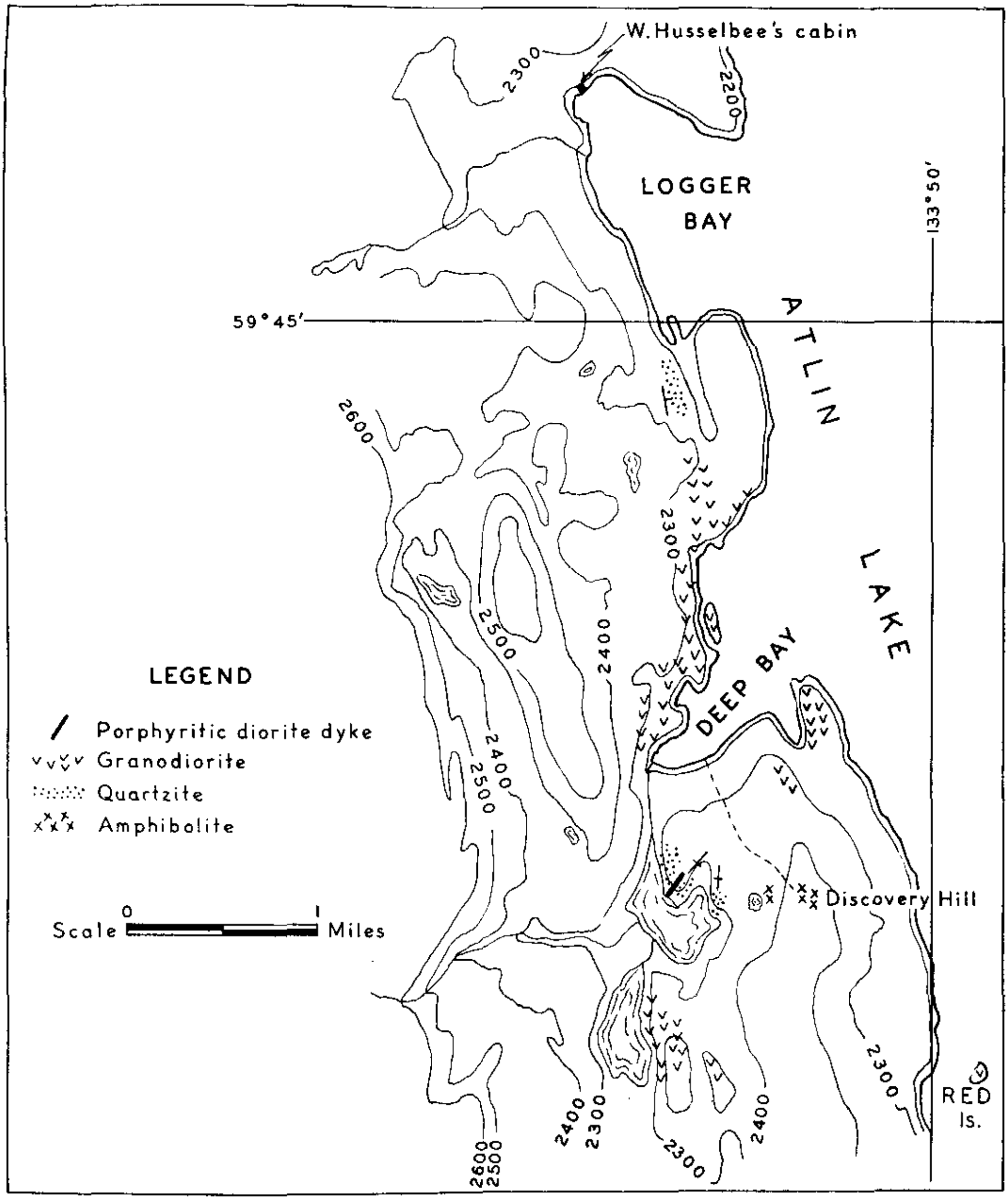


Figure 1. Vicinity of Deep Bay, Atlin Lake.

the metamorphism of a calcareous volcanic agglomerate. From the relation of the known outcrops of granitic rocks in Figure 1 one infers that granitic rocks underly the amphibolite at depth. The relative position of the amphibolite on Discovery Hill, which is on the eastern side of an area of northerly striking quartzite, suggests that the low ridges on the eastern side of the quartzite area south of Logger Bay should be closely examined for amphibolite outcrops.

The amphibolite underlying Discovery Hill was found to be radioactive, and the four original claims owned by Husselbee are clustered around the hill. Chemical analyses of radioactive material indicate the presence of both uranium and thorium. Mineralogical work by the Radioactivity Laboratory of the Geological Survey of Canada and by Dr. R. M. Thompson, of the University of British Columbia, confirms the presence of uraninite (the crystalline form of uranium oxide); the thorium-bearing mineral remains undetermined. Apatite was also found to be present.

Two open-cuts were made; one is 100 feet south of the top of Discovery Hill and the second about 300 feet north. A sample from the northern open-cut was specially selected of material that gave the highest count with a Geiger counter. This sample assayed: Uranium oxide, 0.014 per cent; thorium oxide, 0.16 per cent.

A second sample selected from the amphibolite beside the slough to the west of Discovery Hill assayed: Uranium oxide, 0.070 per cent; thorium oxide, 0.17 per cent.

probably surface impregnant

In December, 1953, a sample was received from W. T. Husselbee from a discovery made subsequent to the writer's examination in August. It is said to be from an outcrop 300 to 400 feet from the amphibolite by the slough. This sample assayed: Uranium oxide, 0.16 per cent; thorium oxide, 0.04 per cent.

Ice moved northward along Atlin Lake and amphibolite float probably derived from Discovery Hill or near by is to be found on the shore of Logger Bay and elsewhere. A sample of float from Logger Bay assayed: Uranium oxide, 0.019 per cent; thorium oxide, 0.18 per cent.

During the autumn a small amount of drilling was done from a set-up beside the small slough, but no detailed information is available.

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 and has leased the Polaris-Taku mill, which treats the ore from both mines.

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

	Tulsequah Chief	Big Bull	Total
	Ft.	Ft.	Ft.
Shaft raising	153	......	153
Stations	30	......	30
Drifting	1,649	390	2,039
Crosscutting	505	42	547
Subdrifting	176	386	562
Raising	3,255	1,510	4,765
Diamond drilling (underground)	7,245	587	7,832
Diamond drilling (surface)	314	1,562	1,876

Production, ore milled: Tulsequah Chief, 67,605 tons; Big Bull, 105,510 tons.

In late February the milling rate was increased from 300 to 500 tons per day. Two new barges were obtained to handle the increased tonnage of concentrates.

Early in 1953 the change-house and recreation hall were destroyed by fire; new buildings were constructed to replace them. Other construction at the mill-site consisted of one private dwelling, extensions to the garage and cook-house, and installation of three hot-air furnaces in three newly constructed fire-proof furnace-rooms adjacent to the large bunk-houses and cook-house.

* By J. W. Patterson.

To permit the use of larger aircraft, the length of the landing strip was increased from 2,800 feet to 4,000 feet.

Parts of the bridges across the Tulsequah River were destroyed by three separate floods, necessitating construction of 1,065 feet of new bridging.

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

UNUK RIVER AREA*

The region drained by the Unuk River and its tributaries has received intermittent attention from both placer and lode miners for more than fifty years, yet it remains the sole major unmapped area on the eastern flank of the Coast Range. The only published geological map, covering part of the area, is a small-scale sketch map in the 1935 Annual Report (facing p. B 8).

The reader is referred to the 1935 Annual Report (pp. B 7–12) for a general description of the area and an outline of its history to that year. Since then, further exploratory work has been done by various companies along a mineralized fault zone on the Mackay group, 2 miles east of Tom Mackay Lake. In 1946, interesting lode-gold showings were discovered by T. McQuillan on the west bank of the south fork of the Unuk River. Halport Mines, Limited, was formed to develop these showings and, in 1948 and 1949, did some testing by trenching and diamond drilling.

Current investigation of extensive copper mineralization on the east bank of the south fork of Leduc glacier is of considerable interest. First official reference to these showings is in the 1931 Annual Report (pp. 47–49). It is stated therein that Wendell Dawson and the late W. Fromholz ascended the Leduc River in 1931 and located three claims at the head of the valley. From the brief account it seems clear that their Mineral Lode claim covered certain of the copper showings now being tested.

Working for Helicopter Exploration Co. Ltd., E. Kvale and T. McQuillan located claims on the Leduc glacier showings in 1951. Additional claims were located in 1952, and in August and September of that year the showings were examined by engineers of The Granby Mining Smelting and Power Company Limited. Subsequently, Granby assumed direction of the property through a newly formed company, Granduc Mines, Limited. During the summer of 1953, crews were engaged in exploratory work on the Granduc property and on the Mackay group. Figure 2 shows the location of these prospects and of the Halport in relation to several well-known properties near the head of Portland Canal.

Access to the mountainous Unuk terrain has proved exceptionally difficult because of the numerous glaciers and the general lack of feed for pack-animals. A fairly well defined trail exists between Boundary Lake and McQuillan's cabin near the mouth of the south fork of the Unuk River. From the cabin, a trail of sorts follows the east bank of the south fork to the toe of the glacier at the head of the south fork. The distance from Boundary Lake to the Granduc, 39 miles, can be covered in four days of foot travel. A good trail extends from the Big Missouri mine to the East group on the west side of the Tide Lake valley. From there, prospectors and trappers have occasionally entered the Unuk River area by way of the Frankmackie glacier and Cabin Creek valley.

Aeroplanes can be landed on Boundary Lake and on Tom Mackay Lake, which is usually ice-free by July. Float-equipped aeroplanes have been landed on the Leduc glacier, and probably this feat can be duplicated by experienced pilots on certain other glaciers during periods when there is sufficient snow covering the rough surface of the ice. The area is one in which helicopters can be used to great advantage.

* By W. R. Bacon.

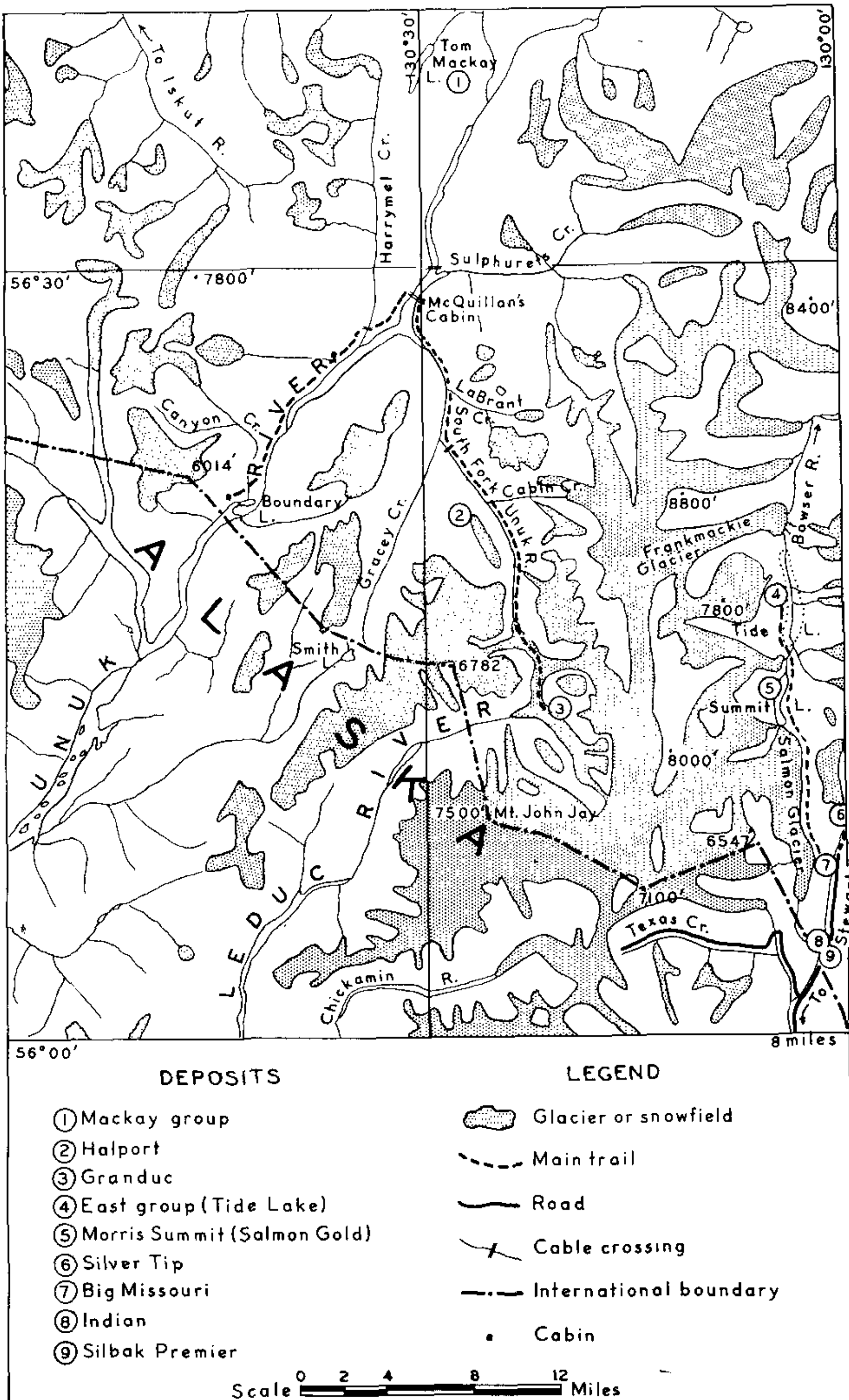


Figure 2. Location of mineral deposits in the Unuk River-Stewart area.

Copper

Granduc (Granduc Mines, Limited) (56° 130° S.E.) Company office, 675 West Hastings Street, Vancouver. Directors: L. T. Postle, Copper Mountain; K. J. Springer, Toronto; C. K. Guild and W. G. Lane, of Vancouver; J. Drybrough, Winnipeg; manager, J. J. Crowhurst. Capital: 4,000,000 shares, $1 par value. In December, 1953, Newmont Mining Corporation joined Granby in providing funds for the development of the property, purchasing 250,000 shares of Granduc Mines, Limited treasury stock for $1 per share. Subsequent stock options are to be shared equally by Granby and Newmont.

Granduc Mines, Limited holds by record 207 claims and fractional claims at the head of the Leduc River. The property is 25 miles north 35 degrees west of Stewart.

In 1953 the company made an impressive start on exploration of the ore occurrences. A mining plant, diamond drills, and assaying equipment were flown into the property, and a comfortable tent camp was erected near the 2A showings. Eight hundred and thirty feet of tunnelling was completed. Thirteen surface holes, totalling 2,550 feet, and twelve underground holes, totalling 2,294 feet, were diamond drilled.

The deposits are in the Coast Mountains immediately east of the large granitic complex that forms the backbone of the range. Figure 3 shows the geology in the vicinity of the showings. The rocks near the head of the south fork of Leduc glacier are volcanic, consisting of dark-green flows, tuff, agglomerate, and breccia. Augite porphyry, in which some of the phenocrysts measure more than one-half inch in length, outcrops on the high ridge east of the adit. Chlorite and epidote are conspicuous in the volcanics. Specular hematite was observed at several places on the east side of the south fork, and quartz veins and stringers are not uncommon. Some galena and a little chalcopyrite were noted in quartz float.

Sedimentary rocks outcrop over a considerable area west and north of the volcanics. These rocks consist largely of metamorphosed sandy and silty greywackes. Sandy limestone and chert are present in minor amounts. The sediments are in general thinly bedded, and in many places individual beds are measurable in fractions of an inch.

An area of granitic rock is shown in the southwestern corner of Figure 3. It has not been examined, but, from the almost exclusively granitic boulder-train extending down the west side of the south fork of Leduc glacier, it is presumed to be predominantly granodiorite. The volcanics at the southern edge of the figure are extensively shattered, and are intruded by dykes and irregular masses of granitic rock, as are the volcanics along portions of the volcanic-sedimentary contact. In the northwest corner of the figure leucogranitic sills in the sediments constitute 25 per cent of the rock exposed. With the exception of one sill which is 40 feet wide, all sills in the sediments are less than 10 feet wide.

The Granduc showings are known as the 1A, 2A, 2B, and 2C. Their locations are indicated in Figure 3. The mineralized outcrops are characterized by a thin coating of limonite and a minor amount of green copper stain. They stand out as reddish-brown patches against the more sombre grey and green shades of the surrounding rocks. In the region as a whole, however, rather extensive areas of reddish-brown rock are fairly common, and consequently the Granduc showings are not particularly conspicuous.

The 2A, 2B, and 2C deposits are mineralized shear zones in metamorphosed sediments. They occur in steeply dipping sediments that strike east of north. Chalcopyrite, pyrite, and pyrrhotite occur as disseminated grains and in stringers, veinlets, and massive bands that are conformable with the enclosing rocks. Small amounts of magnetite were observed in several places, notably the lower part of zone 2B, where it occurs in a solid band 1 foot wide, conformable with the surrounding beds. Galena was noted in a 2-inch quartz stringer in an outcrop of zone 2A.

The lowermost outcrop of zone 2A is at an elevation of 3,260 feet, 75 feet above the surface of the glacier. A 50-foot width of well-mineralized material is exposed in this

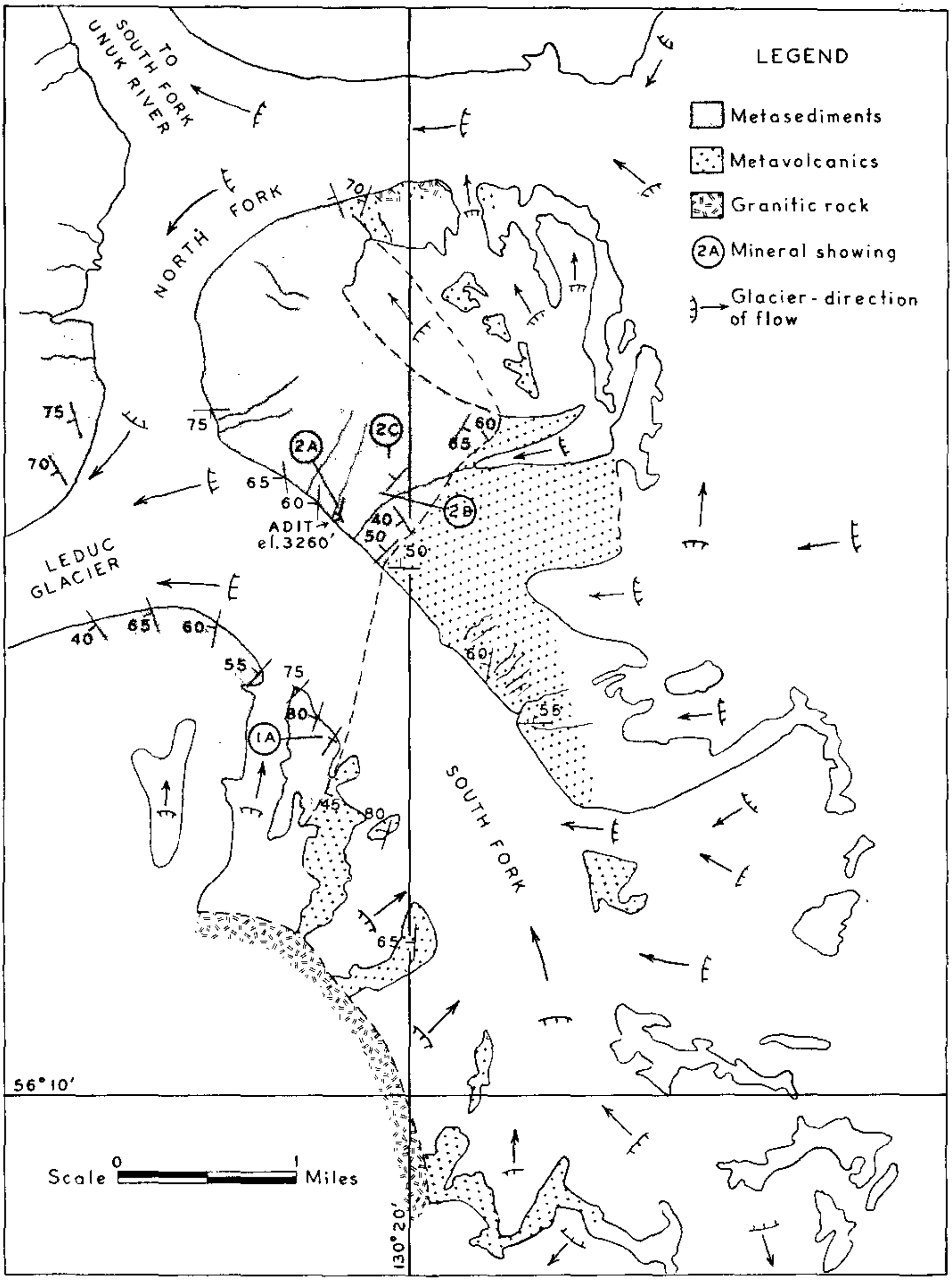


Figure 3. Geology in vicinity of Granduc adit.

outcrop. The zone extends up the slope, where it is partly exposed in several outcrops. It strikes north 12 degrees east for 400 feet and persists for an additional 200 feet with a strike of north 28 degrees east. The highest outcrop of the zone is at an elevation of 3,600 feet. Overburden obscures the extension of the zone.

The main rocks in the vicinity of the 2A ore zone are sheared, crushed metasediments in which corrugations and dragfolds are fairly common. Quartz, biotite, and chlorite are important constituents of these rocks, which, in general, may be termed greywackes. A band of sandy limestone, 10 to 20 feet wide, borders the mineralized zone on the west except where narrow bands of chert intervene. Cherty beds also occur within the mineralized zone.

The rock in the ore zone is, in general, darker than the wallrocks, possibly because of a greater abundance of biotite. An unmineralized specimen from the 2A zone was examined microscopically and was found to contain 48 per cent quartz, 15 per cent biotite, 15 per cent white mica, 12 per cent carbonate, and 8 per cent chlorite. A well-mineralized specimen contained 30 per cent biotite, a fact which tends to substantiate the impression that the darker colour is caused by biotite.

Development work has been confined to zone 2A and the immediate vicinity. An adit was collared 35 feet east of the southernmost outcrop of zone 2A at an elevation of 3,260 feet. It was driven 213 feet in a north 31 degrees east direction, thence 419 feet north 6 degrees east. A crosscut and four horizontal holes drilled westward to reach the zone from the adit indicate that, at this elevation, the 2A zone is strong and continuous, and that it extends at least 100 feet north of the northernmost mineralized outcrop. Surface drilling has proved that the zone extends beneath the glacier at a point 200 feet south of the southernmost outcrop. To date, the 2A zone has been shown to be vertical, to have a minimum length of 900 feet and an average width of 27 feet, and to have a probable grade of approximately 2 per cent copper. Within this zone, mineralization has been proved to extend over a minimum vertical range of 600 feet.

The results of work on the 2A zone are impressive, but the most significant development to date is the discovery of a new zone which has only a few square feet of surface outcrop. Two horizontal holes drilled eastward from the adit intersected a wide, well-mineralized zone in biotite-rich rock, 450 feet east of the 2A zone. The two underground holes and a surface hole indicate continuous mineralization for a minimum length of 350 feet. Should this zone, like the 2A, be vertical as the evidence suggests, it is much wider than the 2A zone. The better of the horizontal underground holes intersected 124 feet of mineralization without reaching the eastern border of it. Eighty-two feet of this core assayed 2.49 per cent copper (company assay).

The 2B and 2C showings were examined briefly. The former consists of a northeasterly trending series of mineralized outcrops at elevations from 3,750 to 4,000 feet. Mineralization occurs across widths up to 20 feet for a horizontal distance of 450 feet. The exposures are not sufficient to prove whether or not the mineralization is continuous.

The 2C showings outcrop between elevations of 4,500 and 4,800 feet. Disseminated copper mineralization occurs in steeply dipping, northeasterly trending metasediments. The mineralization is relatively sparse, but in one outcrop extends across a width of 110 feet. The exposures do not appear to indicate continuous mineralization.

The 1A showing was not examined, as it is near the top of a 300-foot cliff on the southwestern side of the valley. It appears to be similar to the other showings and occurs in the sediments. Chalcopyrite-bearing float is seen beneath the showing, but mineralization does not extend to the base of the cliff.

Mineralization was seen on the volcanic-sedimentary contact south of the 1A showing. In one place, quartz, galena, pyrite, and chalcopyrite were found across a width of 4 feet.

Gold-Silver-Lead-Zinc

Mackay

(56° 130° N.E.) The name Mackay group is applied here to thirty-six claims that American Standard Mines Limited holds by record and by option agreements. Pioneer Gold Mines of B.C. Limited and New York-Alaska Gold Dredging Corporation are associated with American Standard in the exploration of these claims.

In 1932 a prospecting party headed by T. S. Mackay discovered a wide, northeasterly trending fault zone approximately 2 miles east of Tom Mackay Lake. Investigation revealed the local occurrence of gold values, and work was continued by the Mackay syndicate in 1933 and 1934. In 1934 the Unuk Valley Gold Syndicate did some work on sixteen claims immediately northeast of the Mackay Syndicate holdings. During the period 1935 to 1938 the ground held by these syndicates was under examination by Premier Gold Mining Company Limited. Extensive stripping and considerable diamond drilling were done by this company.

In 1939 Mackay Gold Mines Limited further explored the fault zone and drove an adit for 276 feet into a part of it where encouraging gold values had been found. This adit was extended to a total length of 360 feet by Canadian Exploration Limited in 1946.

The group of claims being investigated by American Standard Mines is at a general elevation of 3,500 to 3,700 feet. A camp consisting of cook-house and bunk-house is near the southern end of the property and is reached by 3 miles of trail from Tom Mackay Lake.

From about a mile west of Tom Mackay Lake east to the Unuk River valley is a small area of plateau country dissected by northeasterly trending valleys. Vegetation is sparse and good exposures are plentiful.

The rocks from Tom Mackay Lake east to the western boundary of the property consist of folded argillites, sandstones, and minor conglomerate. They strike northeastward, and the prevailing dip is 50 degrees or more to the northwest. Easterly dips were observed in the vicinity of the lakeshore.

The eastern part of the property is largely underlain by greenish tuffs, agglomerates, and minor amounts of sandy sedimentary material. Shearing is common, and in many places the rock may be accurately described as a schist. The strike of the schistosity is northeasterly, and a steep southeasterly dip is most common. As shown in Figure 4, these rocks are intruded by a stock of feldspar porphyry.

Between the sediments on the west and the sheared green tuffs on the east is a zone 1,500 feet wide that is interpreted as a fault zone. It can be traced for at least 2 miles southwest of the southern boundary of Figure 4. Northeast of the figure it is obscured by overburden.

The fault zone is marked at irregular intervals by great orange-red bluffs that can be seen for miles from the air. (These bluffs attracted the attention of Mackay and his associates to the area.) Examination of the bluffs revealed an abundance of disseminated pyrite in silicified rock.

Widespread silicification is the dominant characteristic of the fault zone. Where silicification is less intense or in some places absent, the rocks can be identified. In the valley of what is locally called Eskay Creek, argillites, argillaceous tuffs, sandy tuffs, and agglomerates are present. On the western slope of the valley, dark-green flows and volcanic breccia occur. Breccia is fairly common in the silicified fault zone, and, because volcanic breccia is a recognizable component of the zone, it is not always clear in examining the silicified rock whether the brecciation is primary or secondary. Certainly some of the brecciation is of secondary origin, presumably related to the faulting.

A great deal of work has been done on the Mackay group, and only the more interesting showings are described. Near the southern edge of Figure 4 an adit penetrates silicified rock for 360 feet in a south 47 degrees west direction. Narrow bands of highly

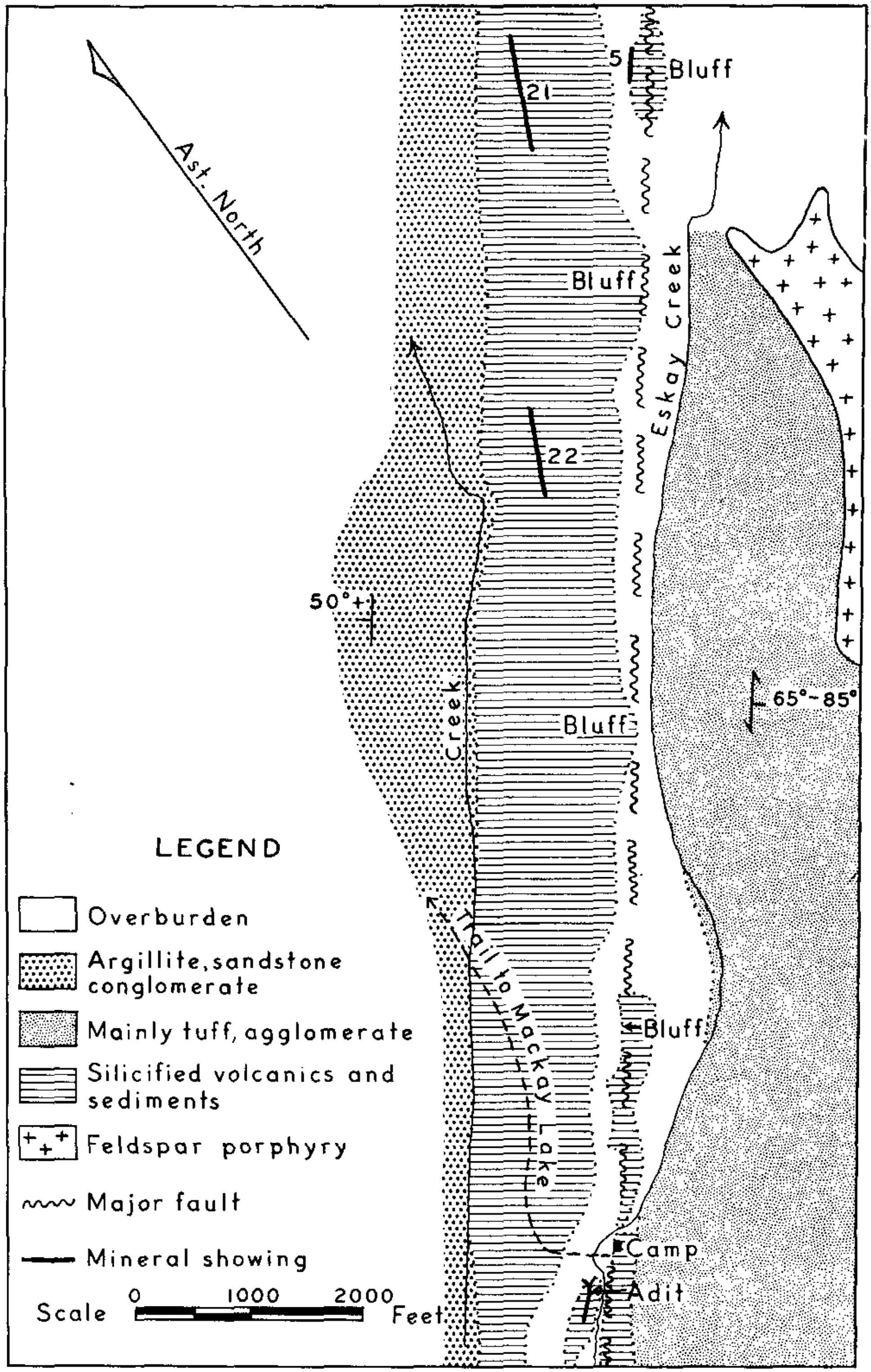


Figure 4. Geology of Mackay group.

contorted argillaceous material are present. Although phenocrysts of plagioclase are discernible in some of the rock, its original nature remains uncertain. Pyrite and less arsenopyrite occur sporadically. Minute amounts of chalcopyrite, sphalerite, and galena were observed in narrow fractures that traverse the rock. In addition to the adit, thirteen closely spaced holes have been diamond drilled from the surface in this area. Some gold assays of more than 1 ounce per ton were obtained, but all evidence points to an erratic, seemingly patternless distribution of gold.

In the No. 21 outcrop area, silicified rock has been trenched at irregular intervals for a distance of 1,050 feet in a north 25 degrees east direction. Brecciation is rare, but the rock is well fractured. Certain narrow fractures, commonly north dipping, are filled with comb quartz. Others, commonly south dipping, are filled with tetrahedrite and minor amounts of galena and sphalerite. These fractures are generally less than 2 inches wide. For much of the 1,050-foot length, the mineral-bearing fractures are too few to be of more than academic interest. For 250 feet near the middle of the investigated distance, however, they are somewhat more abundant. Here the ground has been tested by seven diamond-drill holes, and narrow sulphide-filled fractures have been intersected that assayed hundreds of ounces of silver per ton. Unfortunately, these fractures are not sufficiently abundant to constitute an orebody.

Similar showings are exposed in the No. 22 outcrop area. About twenty trenches have been cut at intervals over a distance of 800 feet in a north 25 degrees east direction, and two holes have been diamond drilled.

In the No. 5 area six trenches have been dug at intervals over a distance of 300 feet in a northeasterly direction. They expose relatively massive sulphide mineralization, consisting of sphalerite, galena, and pyrite. A 5-foot band in the northernmost trench assayed: Gold, 0.05 oz. per ton; silver, 3.4 oz. per ton; lead, 5.9 per cent; zinc, 9.3 per cent. Overburden obscures much of the bedrock between the trenches and the area to the northeast of the northernmost trench.

PORTLAND CANAL*

Salmon River (56° 130° S.E.)

Gold-Silver-Lead-Zinc

Silbak Premier Mines Limited

Company office, 907 Birks Building, Vancouver. D. L. Pitt, managing director. In February, owing to the drastic drop in lead and zinc prices, all development and ore breaking in the the Silbak Premier and Premier Border mines was stopped, and in May both mines were closed for an indefinite period. The mill treated 29,865 tons from the Silbak Premier mine and 6,702 tons from the Premier Border.

Indian Mines (1946) Limited.—Company office, 615 Credit Foncier Building, Vancouver. Early in the spring, owing to the low prices of lead and zinc, Silbak Premier Mines Limited stopped all work at this mine. A total of 3,755 tons of ore was transported to the Premier mill by 2 miles of aerial tramway.

Silver-Lead-Zinc

Silver Tip (Silver Tip Gold Mines Limited)

Company office, 303 Times Building, Victoria. George Winkler, managing director. This property, north of the old Big Missouri camp, is connected to Stewart by about 21 miles of road, the last 5 miles of which is suitable only for trucks or jeeps. Between July 19th and October 9th about 215 feet of drifting was done on the Blind and the May P.J. veins. An average of five men was employed.

* By J. W. Patterson.

SUMMIT LAKE (56° 130° S.E.)

Gold-Silver

East

The East group, about 4 miles north of Summit Lake, is owned by A. A. Phillips, of Stewart. Aeroplanes can land on Summit Lake, which is connected to the East group by 5½ miles of tractor-road. Owing to several unexpected machinery-maintenance problems, little mining was done. A two-story building measuring 12 by 24 feet was completed, and forty-five sacks of ore were shipped to the Trail smelter.

ALICE ARM*

Silver

Toric (Torbrit Silver Mines Limited)

(55° 129° N.W.) Registered office, 309 Royal Bank Building, Vancouver; executive office, 44 King Street West, Toronto. G. B. Tribble, manager; A. M. Cormie, mine superintendent; R. W. Burton, mill superintendent. Capital: 3,000,000 shares, $1 par value. A 17-mile road along the west bank of the Kitsault River connects the mine to Alice Arm. Between May 15th and October 27th the mine and mill were closed by a strike. During the remainder of 1953, the mill treated 71,862 tons of ore, from which 149,595 ounces of silver was recovered as bullion by the cyanidation of flotation tailings, and 1,599 tons of concentrate was produced, containing 1,027,164 ounces of silver and 519,035 pounds of lead.

A summary of work performed underground follows:—

Work Done	Level	Advance	Ore	Waste
		Ft.	Tons	Tons
Drifting	800	523	1,897	2,475
	900	237	801	963
Total		760	2,698	3,438
Raising	1000	124		310
Stope drifting	800	389		1,397
	900	326	102	1,183
	1000	6		19
Total		721	102	2,599
Stope raising	800	385	388	942
	900	536	1,039	827
	1000	56	55	160
Total		977	1,482	1,929
Stoping	900		33,969	
	1000		13,945	
Total			47,914	

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

Wolf (Silver Prince Mines Limited)

(55° 129° N.W.) Company office, 607 Vancouver Block, Vancouver. This property consists of one Crown-granted claim just north of Alice Arm and adjacent to the Torbrit Silver mine road. The property had been idle for some years until acquired by the present owners. Some open-cutting and drifting were done, and 4.5 tons of sorted ore, assaying high in silver, was shipped to the Trail smelter.

[Reference: *Geol. Surv., Canada*, Mem. 175, Portland Canal Area, p. 86.]

* By J. W. Patterson.

Leduc glacier. Looking north to Granduc property; tent camp invisible at lower right.

Air-dropping a 10-gallon drum of fuel on Leduc glacier.

OBSERVATORY INLET*

Copper

Anyox (The Consolidated Mining and Smelting Company of Canada, Limited).—(55° 129° S.W.) Between May 15th and November 1st, 3,905 feet of diamond drilling, 60 cubic yards of trenching, and some detailed geological mapping and geophysical work were done on the Double Ed and Ed groups of claims. Nine miles of trail servicing these two groups was constructed from Granby Bay. Nine men were employed.

USK*

Copper

Nicholson Creek Mining Corporation.—(54° 128° N.E.) Mine office, Usk. W. D. Galbraith, manager. Two miles of road connect this property with Usk. Exploration work consisted of 80 feet of drifting, 18 feet of crosscutting, 290 feet of diamond drilling, and 1,485 feet of trenching and stripping. An average of four men was employed.

[Reference: *Geol. Surv., Canada,* Mem. 205, 1937, pp. 53–56.]

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. Two miles of tractor-road along the north side of Hardscrabble Creek connect this property to the railway at Pitman. Underground work consisted of drifting in No. 1 and No. 2 adits and subdrifting from a 20-foot winze sunk from No. 2 adit. A 32-ton shipment of sorted ore from No. 2 adit was reported to assay: Gold, 0.57 oz. per ton; silver, 17.07 oz. per ton; copper, 2.60 per cent. Work was discontinued on June 15th. The average number of men employed was eight.

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

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 property is on Glen Mountain about 5½ miles north of Hazelton. The results of 5,921 feet of surface and 4,006 feet of underground diamond drilling, although not spectacular, outlined several new mineralized zones and assisted in determining the orientation of these and other known mineralized zones. A total of 5,200 feet of bulldozer stripping and 250 feet of trenching on the 6, 7, 8, 9, 10, 12, and Black Prince veins revealed five small oreshoots with a total length of 225 feet and an average width ranging from 0.25 feet to 0.8 feet. Systematic sampling of these shoots indicated high-grade ore.

Two hundred twig samples were taken as a test of biogeochemical prospecting. Distinct anomalies were shown over several of the known oreshoots, and over one unknown oreshoot which, when stripped, was 30 feet long and 0.5 feet wide and was high in grade.

All ore below the 1300 level is now moved through an ore-pass system to the 850 level shaft loading-pocket. The development figures given below include 75 feet of crosscutting started at surface and 56 feet of drifting on the Black Prince vein.

Development and stoping were as follows:—

* By J. W. Patterson.

Development

	Feet
Drifting	664
Subdrifting	97
Crosscutting	628
Raising	2,025
Total	3,414

Stoping

	Tons Drawn
No. 4 vein	3,193
No. 6 vein	22,655
No. 7 vein	1,994
No. 8 vein	1,472
No. 12 vein	170
Total stoping	29,484
Development ore	2,008
Ore transported to mill	31,492

Of the 31,492 tons of ore taken from the mine, 21,559 tons was treated in the mill and 9,933 tons was sorted out as waste. The mill operated continuously, averaging about 60 tons per day.

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

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 manager. Capital: 3,000,000 shares, $1 par value. The mine is on Rocher Déboulé Mountain, 11 miles by road from Skeena Crossing. The mill operated continuously throughout 1953. Due in part to mechanical failures at the mine-site caused by severe winter weather, daily tonnage in the early months of the year was about 75 tons, compared to 100 tons in November and December of 1952. By June the tonnage had been increased to about 140 tons per day and was maintained at this level for the remainder of the year, bringing the total for 1953 to 37,277 tons. The mill staff had considerable difficulty producing a satisfactory concentrate, but by adding a leaching plant and a magnetic separator to the mill circuit some improvement was made.

Mine development consisted of 533 feet of drifting, 1,487 feet of subdrifting, 1,813 feet of raising, 300 feet of shaft timber installation, 76 feet of sinking, and 3,378 feet of exploratory diamond drilling. Several small new buildings and additions to others were constructed at the mine-site.

At the mill-site a power-house and a combined machine-shop and garage were built to replace the buildings destroyed by fire earlier in 1953. Several additions were made to the mill, and a small school and three private dwellings were erected.

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

* By J. W. Patterson.

office, Smithers. A. C. Ritchie, general superintendent. Capital: 3,500,000 shares, no par value. The property is on Hudson Bay Mountain, 15 miles by road from Smithers. Milling began on July 1st, and during the remainder of 1953, 26,675 tons of ore was milled. The levels on which stoping was done and the tonnage produced on each level were as follows:—

Level	Tons Stoped	Level	Tons Stoped
4250	4,872	3300	1,374
4100	10,784		
3950	6,698	Total	27,840
3800	4,112		

Surface construction was stopped on October 31st, 1952, but underground development continued. In 1953, 1,324 feet of raising, 563 feet of drifting, and 287 feet of slashing were done. There was no new construction. An average of sixty men was employed.

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

WHITESAIL LAKE*

Gold-Silver-Tungsten

E-19

Harrison (Deer Horn Mines Limited) (53° 127° N.E.) Company office, 44 King Street, Toronto. R. Macrae, manager. This property, on the north side of Lindquist Lake, is reached most easily by air from Burns Lake. Between July and October a large amount of mining equipment was moved by barge to the west end of Whitesail Lake, and about half the 5½ miles of road needed for transportation of this equipment to the mine-site was built. A log building was put up on the north shore of Lindquist Lake, and three holes were diamond drilled to check the westward continuation of the gold-, silver-, and tungsten-bearing ore zone.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1945, p. 71.]

OMINECA*

Lead-Zinc

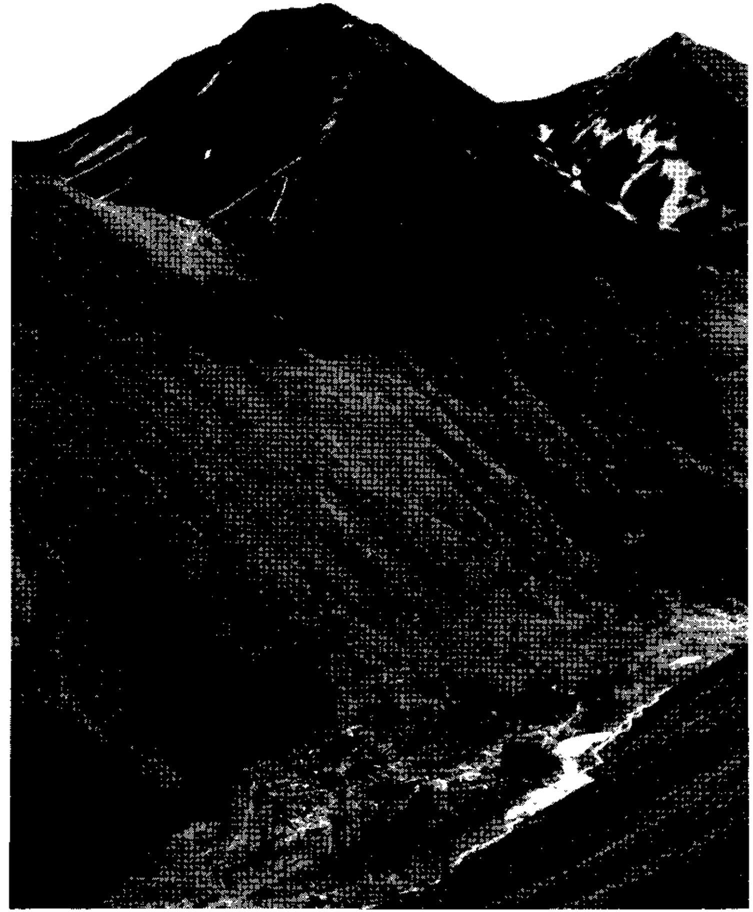
Northwestern Explorations Limited (56° 124° S.W.) This company reports that the area between the Omineca and Osilinka Rivers west of the Wolverine Range and in the vicinity to Nina Lake was prospected and mapped in detail. Some rock work and stripping were done on lead and zinc showings within this area. Twenty-five miles of pack-trail was completed from Nina Lake to the Davis group of claims near the Osilinka River.

Gold-Silver

Lustdust (Bralorne Mines Limited) (55° 126° N.E.) This group of claims is on Kwanika Creek north of Tsayta Lake. It is reached from Germansen Lake by a road suitable only for jeep and truck travel. Between July 4th and September 30th, twelve men under the direction of P. T. Bloomer did 2,897 feet of diamond drilling and 17,140 feet of trenching. Several frame buildings were erected, 16 miles of old road was reconstructed, and 2 miles of new road and 3 miles of trail were built.

* By J. W. Patterson.

Looking up Antler Creek—Beggs Gulch on right, Roundtop Mountain in distance.



Red Rose mill in creek bottom and connecting road to mine camp above.

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; F. E. Rutquist, 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.

Production was obtained principally from the No. 1, Tailings, and Rainbow zones. The No. 2 shaft in the Rainbow zone was again placed in operation, and rehabilitation of some of the main productive zones in this area was completed. Mining was suspended early in the year in the Goldfinch zone near the B.C. shaft.

A hydraulic stripping operation was started on the surface above the 1200 level portal in the area where the Rainbow fault is known to outcrop, and 3,000 cubic yards of gravel was removed. The purpose of the work is to expose any ore occurrences that may exist in this area. Winter conditions halted the work before it was completed.

New development work comprised 1,994 feet of drifting, 1,575 feet of crosscutting, and 2,265 feet of raising and box-holing. A total of 8,087 feet of diamond drilling was done in seventy-nine holes.

On the surface the central heating plant was changed from low-pressure steam to an automatic, oil-fired, hot-water system. In the mill, a Denver mineral jig and amalgamating equipment were added to the circuit.

The average number of men employed was 199, of which 123 were employed underground.

Production: Tons of ore milled, 65,214.

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. I. 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 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.

No major exploration work was done, and only such local development as was necessary to investigate known ore-bearing zones. The major part of the ore mined was obtained between the 750 and 1300 levels. This ore was mined by cut and fill, shrinkage, and longwall advance stoping methods.

Development work comprised 234 feet of raising and 1,359 feet of drifting and crosscutting. In addition, 5,856 feet of diamond drilling was done in a total of seventy-five drill-holes.

The average number of men employed was 101, of which sixty-six were employed underground.

The mill treated 48,400 tons of ore.

Tungsten

Cariboo-Hudson Gold Mines (1946) Limited

Company office, Royal Bank Building, Vancouver; mine office, Wells. F. Field, president; R. R. Rose, manager; J. W. Wylie, engineer in charge. Capital: 3,000,000 shares, $1 par value. The property, comprising twenty-three Crown-granted and nine claims held by record, is at the head of Peter Gulch, tributary to the headwaters of Cunningham Creek, and is 27 miles southeast of Wells by road.

* By J. E. Merrett.

The south or No. 2 adit, begun in the autumn of 1952, was extended 200 feet to a total length of 400 feet, and three crosscuts, each approximately 40 feet in length, were driven off the main drift. Considerable heavily faulted ground was encountered that required timbering throughout, and no additional scheelite mineralization was disclosed. A third adit was started on the west bank of Peter Gulch, 220 feet north of the original adit. This adit was intended to intersect the continuation of the scheelite zone 50 feet beyond the north face of the old drift. Work was suspended after 55 feet of crosscutting was completed. The average number of men employed was seven.

QUESNEL*

YANKS PEAK (52° 121° N.E.)

Gold

Jim.—Lieut.-Col. F. H. M. Codville, of Duncan, employing two men, did 197 feet of drifting and crosscutting on the Jim group near Yanks Peak, about 11 miles by road from Keithley Creek P.O.

CLINTON*

LONE CABIN CREEK

Gold

Empire Valley Mining Company Limited

(51° 122° S.E.) Company office, Suite 3, 5 Princess Avenue West, Chilliwack. W. E. Brett, president; J. C. Cooper, manager. This company optioned twelve mineral claims and fractions on the north and west slopes of Porcupine (Black Dome) Mountain at the headwaters of the north fork of Lone Cabin Creek. In addition, six placer leases are held on upper Fairless Creek, a westerly flowing tributary of Churn Creek.

A total of 25 miles of road was constructed by bulldozer, including 19.5 miles of access road from the end of Empire Valley road to the mine camp located at 6,500 feet elevation on the Saddle claim at the north end of the property, 4.5 miles of road from the camp to the placer operation on Fairless Creek, and 1 mile of road from the main access road to the Sugar Bowl claim at the south end of the property.

The bulldozer was used for trenching and stripping on the various veins. By this means the Giant vein, located on the Pinion Pine claim, was exposed for a length of 500 feet. On the Bonanza and Eldorado claims, the Red Bird Nos. 1 and 4 veins were exposed for a length of 200 feet each. Crosscut trenches intersected the Red Bird Nos. 3 and 4 veins in several places. An additional 3,000 feet of stripping was done for exploration purposes on one long crosscutting strip.

A sluice was installed on the Fairless Creek placer leases, and the recovery from a trial test run was reported to average about 50 cents per cubic yard of gravel. A survey was made of the mineral claims. A crew of six men was employed from May 3rd to September 1st.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1948, pp. 92–95; 1949, p. 103.]

TASEKO RIVER*

Gold

Taylor Windfall Gold Mining Company Limited

(51° 123° S.E.) Company office, c/o G. C. Hyatt, 789 West Pender Street, Vancouver. This property has been leased to M. J. St. Clair, 630 Rosewood Avenue, New Westminster, and associates. In 1952 three men on a partnership basis began reconditioning the camp, mill, and mine in order to resume mining. Between

* By J. E. Merrett.

June 26th and October 1st, 1953, a crew of five men completed this work and dewatered the lower main level.

Twenty-five feet of drifting was done in a southerly direction off the main shaft at a point 25 feet below the shaft collar. A small underhand stope was opened at the end of this drift.

A classifier was added to the mill circuit, and 70 tons of ore was milled. Two tons of jig concentrate and 5 tons of table concentrate were recovered. The jig concentrate was shipped to the Trail smelter, and the table concentrate was stored for retreatment.

LILLOOET*

Blue Creek

Gold

Elizabeth, Yalakom (Bralorne Mines Limited).—(51° 122° S.W.) 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. A small crew removed all salvable equipment and shipped it to the Bralorne mine.

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 5,049 feet of drifting, 3,975 feet of crosscutting, 1,163 feet of raising, 130 feet of shaft sinking, and 6,106 feet of diamond drilling in forty-six holes.

In July the necessary preparatory work commenced for the sinking of a new vertical shaft, the Queen shaft, to develop the mine below the 2600 level. By the end of 1953 the necessary crosscuts and stations on the 2500 and 2600 levels were completed, and the shaft, with external timbered dimensions of 15 by 7½ feet, was raised from the 2600 level to the 2500 level. A hoistroom and transformer station were excavated on the 2500 level, and the installation of a 24-by-36 Ingersoll-Rand, Class P.E.I. electric hoist was almost completed. Timbering in the shaft was completed to the top of the station on the 2600 level. Ore- and waste-pocket raises were connected with the dump pocket. It is intended to sink four levels initially, and the lowest level, the 3000, will be about 20 feet above sea-level. The shaft is located in the footwall of the 77 vein adjacent to the east end of a large oreshoot developed on that vein.

Development work was directed mainly to the opening and extension of the 77 vein drifts below the 2000 level and to exploration beyond the Empire fault on the 2400 level. Some work was done also on the 51 vein on the 1600 and 2100 levels, east of the Crown shaft, and on the 2500 and 2600 levels, west of the Crown shaft. Minor amounts of drifting were done on the 53 vein on the 2000 and some higher levels.

Work commenced in April on the 2000 level on the crosscut toward the Taylor (Bridge River) Mines property, and 1,820 feet of crosscut was completed. This crosscut intersected two minor veins—the 95 vein at 970 feet and the 97 vein at 1,810 feet. On the 95 vein, 47.5 feet of drifting was done. The assay values obtained on this section were very low.

* By J. E. Merrett.

The average number of men employed was 410, of which 294 were employed underground.

Ore was mined principally by cut-and-fill stoping methods, and lesser amounts were obtained by shrinkage stoping. A total of 189,321 tons of ore and 45,050 tons of waste were mined. The total ore milled was 183,168 tons.

Pioneer Gold Mines of B.C. Limited

(50° 122° N.W.) Company office, 711 Yorkshire Building, 525 Seymour Street, Vancouver; mine office, Pioneer Mine. Victor Spencer, president; H. T. James, managing director; W. B. Montgomery, mine manager; H. A. Rose, general superintendent; M. M. Hunt, mine superintendent; T. Bevister, mill superintendent. Capital: 2,500,000 shares, $1 par value. Pioneer mine is on Cadwallader Creek, a tributary of 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 73 feet of drifting, 562 feet of crosscutting, 492 feet of stope raising, 746.5 feet of shaft sinking, and 217 feet of diamond drilling in two holes.

The sinking of the No. 5 inclined internal shaft (outside timber dimensions 7 feet 8 inches by 16 feet 1 inch) from the 2600 level to the sump below the 2900 level and the excavation of the necessary stations and pockets was completed, and was the main development project of the year. The excavation of the shaft stations, pockets, and slashes produced 53,122 cubic feet of waste which, in addition to that produced in the shaft-sinking operations, was used for backfilling in stopes.

Further underground development work was the starting of an exploratory crosscut on the 2000 level to investigate, in an easterly direction, 5,000 feet of ground between the present workings and the east boundary of the property, and the driving of a crosscut between the mill on the surface and the ventilation shaft. The purpose of the latter crosscut is to provide access for the pipe-line for conducting sand from mill tailings to the stopes where it will be used for backfilling.

All new stopes put into production during the year were on the cut-and-fill system of mining, and a start was made on the use of rock bolts in place of timber support. The jack-leg type of drilling equipment with tungsten-carbide-tipped drill rods or bits is now in use in all stopes.

The present 18-cubic-foot end- and side-dump cars are being replaced with 24-cubic-foot rocker-dump cars, and the old battery locomotives are being replaced with modern equipment. In order to support adequately this new and heavier rolling stock, considerable lengths of secondary mine haulageways were changed from 12-pound to 16-pound rail.

The installation of No. 5 shaft machinery and equipment, including hoist, transformer station, skips, and dumps, was completed.

A block signal system was installed on the 2500 level main haulageway, and a 65,000-cubic-feet-per-minute capacity axial-flow fan was installed at the top of the ventilation raise but has not yet been brought into service.

An addition was made to the mill building to house the equipment for the hydraulic sand-fill preparation plant, and the installation of equipment was 75 per cent complete at the end of 1953.

Construction was started of a truck bridge near Pioneer dam on the Hurley River. This bridge will give access to timber limits in this area that are being operated by the mine.

The average number of men employed was 250, of which 147 were underground.

A full-time safety director was employed, and plans were made for improvement of working conditions and of the accident record.

Production: Tons of ore mined, 49,916; tons of waste mined in stopes, 916; tons of waste mined in development operations, 18,244; tons of ore milled, 89,317.

92J-113

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.

On No. 4 adit level a crew of five men extended the main crosscut 30 feet in a westerly direction, extended the Jupiter north drift a distance of 105 feet, and did 20 feet of crosscutting from the Jupiter drift.

Antimony

92J-164

Gray Rock (Gray Rock Mining Company Limited)

(50° 122° N.W.) Company office, 207 West Hastings Street, Vancouver. G. H. Clark, president. Capital: 3,000,000 shares, $1 par value. This property, comprising 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 continued operations on the property until the end of September. No. 1 west drift was extended 241 feet to a total length of 505 feet. Raises were driven on the best mineralized sections of the east and west drifts. That on the east drift was driven for a distance of 40 feet and that on the west drift was driven 37 feet. In addition, three exploratory diamond-drill holes, totalling 742 feet, were completed. One drill-hole intersected No. 1 vein below the level, and the other two were directed in a southerly direction to intersect No. 2 vein, which parallels No. 1 vein.

Work was suspended when it was decided that the information obtained by exploration did not warrant further development. A crew of ten men was employed.

Tungsten

92O

Tungsten Queen.—(51° 122° S.W.) This property, owned by E. Phillips, of Gold Bridge, is on the east bank of Tyaughton Creek about 17 miles north of Minto. A crew of two men did 25 feet of exploratory drifting.

Cobalt-Gold-Uranium

92J-107

Little Gem

(50° 122° N.W.) This property, composed of eight Crown-granted claims and one located mineral claim, is on Roxey and Jewel Creeks, tributaries to Gun Creek. The joint owners, J. M. Taylor, 1949 Beach Avenue, and R. R. Taylor, 7111 Beechwood Avenue, Vancouver, optioned the property to Estella Mines Limited, 917 Vancouver Block, Vancouver.

Under the direction of Evan Harris, mine manager, this company constructed a log-stringer bridge with a 60-foot span over Gun Creek, at the end of the Gun Creek road; built 5 miles of road, including two small bridges over Roxey Creek, from the end of the Gun Creek bridge to the mine camp; and erected a camp located conveniently near the mine.

Underground, twelve diamond-drill holes with a total length of 751 feet were drilled. This drilling showed a westerly extension of the ore exposed in the lower drift, and demonstrated a mineralized section at this level in excess of 70 feet long, but did not locate a downward extension of the ore exposed in the upper drift. Work was suspended early in September and the option was allowed to expire. An average of nine men was employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1948, pp. 112–119.]

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 holds nineteen claims on the north slope of McGillivray Creek, 4 miles by pack-trail from McGillivray Falls on the Pacific Great Eastern Railway. The property is reached from Marne station by 5 miles of tractor-trail.

Development work comprised 115 feet of drifting and 110 feet of crosscutting on the lowest or "Pep" level. In addition, 722 feet of diamond drilling was done in six holes. The work was directed to pick up the faulted extension of the east vein, but was not successful because the fault zone proved to be wider than anticipated.

Approximately $10,000 worth of new equipment, including a battery locomotive and a 10-inch ventilation-pipe air booster, was purchased to facilitate the development work. The surface dump was cribbed to provide additional dumping room. A crew of eleven men was employed, of which seven were underground.

SKWAAM (AGATE) BAY†

Gold-Copper-Silver-Lead-Zinc

Twin Mountain (Camoose Mines Limited) (51° 119° S.W.) Michael Hretchka, manager. This property, formerly owned by Henry Height and associates and more recently by C. C. Keller, is on Twin Mountain, near Skwaam (Agate) Bay, on the west side of Adams Lake. A road 7½ miles long was built from the lake at Skwaam Bay to the mine workings in the autumn of 1952. In 1953 a new cook-house and bunk-house were built at the site of the old mine camp at an elevation of 4,500 feet. At approximately 5,000 feet elevation an exploratory crosscut adit was driven 307 feet in a northeasterly direction to locate the downward extension of a vein found higher up the hillside. When work was discontinued in this adit in August, a quartz vein 2½ to 3½ feet wide was seen at the face. The vein was very sparsely mineralized. At about 150 feet from the portal a zone 22 feet wide containing abundant pyrite was passed through. A sample across 5 feet of this material assayed a small fraction of 1 per cent lead and a trace in gold. In September another crosscut adit was started 1,200 feet west of and 115 feet lower in elevation than the first adit. On December 18th this had been driven 425 feet. It was reported by the management that at 300 feet from the portal a vein 6 feet wide was encountered. This vein was followed by a drift for 35 feet to the west. Seven men were employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1936, p. D 39.]

BIRCH ISLAND†

Fluorite-Celestite-Uranium

Rexspar Uranium & Metals Mining Co. Limited (51° 119° N.W.) W. F. Atkins, manager. This company has ninety-eight claims in the Red Ridge area, 2 to 3 miles in a straight line southeasterly from Birch Island on the Canadian National Railway, 90 miles north of Kamloops. A new camp, including bunk-houses, cook-house, and an office, was built on the site of the old Smuggler camp. A new road 7½ miles long was built from the bottom of the hill at the railway to the property. Most of the lower part of the road followed the old Foghorn Creek road. Diamond drilling and surveying were done, and in November a contract was let to drive an adit on the Black Diamond No. 2 claim. The adit is at an

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

elevation of 3,720 feet, and on December 17th was 164 feet long. In the zones outlined by surface diamond drilling the presence of uranium oxide was indicated in sufficient amounts to warrant further exploratory work. The total crew ranged from eighteen to twenty-five men.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, p. 250.]

ADAMS PLATEAU

Silver-Lead-Zinc

Ex (Trans-Mountain Mines Ltd.)*

(50° 119° N.W.) This group consists of the Ex No. 1 and fifteen other recorded claims near the headwaters of Gold Creek on Adams Plateau. It is under option by Trans-Mountain Mines Ltd., 207 Second Avenue, Kamloops, from the Bischoff brothers, of Celista. Adams Plateau lies between Adams Lake and the north fork of Scotch Creek, at an elevation of about 6,000 feet. Access is by old trails from Adams Lake and, since 1949, by road from Shuswap Lake. From the mouth of Corning (Lee) Creek, 5 miles from Squilax, a logging-road is followed for 7 miles and a rough road suitable for vehicles with four-wheel drive extends 9 miles northward to the showings. The camp is a large log cabin on the Mosquito King group, about 2 miles south of the showings.

The rocks are sediments of the Eagle Bay formation, including argillites, quartzites, and limy members, altered to schists and phyllites. Mineralization consists of pyrrhotite and pyrite, and sphalerite and galena, with small amounts of chalcopyrite. It occurs in the foliation of the schists and is further localized in minor crumples. Exposures are not plentiful, and the structure is not clear beyond the fact of a general northeasterly strike and northwesterly dip, with local variations, principally in dip. The mineralization is not confined to a single horizon.

A series of small open-cuts extends from the meadow on Gold Creek for upwards of 2,000 feet to the southwest, roughly aligned along the regional strike but not confined to a single horizon. All cuts contain abundant iron sulphides and also some sphalerite and galena across widths of a few inches to a few feet. This mineralization appears to be fairly typical of widespread occurrences on the plateau that, to date, has only locally been found to be sufficiently concentrated for mining.

One showing, found recently on the Ex No. 1, contains a concentration of galena and sphalerite in a local fold. In 1952 the Bischoffs shipped 59 tons to the Trail smelter, and in 1953 Trans-Mountain Mines shipped 204 tons to the Kenville mill for concentration. The average grade of all ore shipped was: Gold, 0.046 oz. per ton; silver, 19 oz. per ton; lead, 30 per cent; zinc, 9 per cent, taken from smelter returns and calculated to restore milling losses.

The ore is in a small dragfold that plunges at a low angle to the southwest, in schist that dips at a variable but moderate angle to the northwest. Most of the ore, including that of better grade, is localized in the nose of the dragfold in an area with a cross-section of about 10 by 15 feet. Lower-grade ore occurs abreast of the main body, particularly down the northwest-dipping limb. The workings, as of July 15th, 1953, consisted of one trench about 60 feet long on the strike of the formation, north 60 degrees east, and, joining it on the southwest end, a second trench which extends east about 50 feet along a small vertical fault. At the junction of the trenches, beneath a low rock brow, a hole had been excavated about 6 by 10 feet and 15 feet long (in July, 1953). There was water 2½ feet deep in this hole, and ore in the face showed about 2 feet above water-level. Remnants of ore on the walls indicated that the outline of the orebody was somewhat irregular and subject to change.

About 300 tons of ore of shipping grade had been mined from the intersection of the open-cuts and from the above-mentioned hole. This ore consists almost entirely

* By M. S. Hedley.

of sulphides. A sample across 37 inches of a remnant on the wall assayed: Gold, 0.01 oz. per ton; silver, 19.6 oz. per ton; copper, 0.16 per cent; lead, 31.1 per cent; zinc, 8.4 per cent.

Ore of lower grade is exposed in the northwest wall of the open-cut, conforming with the cleavage of the rock. This ore is as much as 5 feet thick and extends for 55 feet along the open-cut, but as it is the downward extension of the cigar-shaped high-grade body that has been mined above it, only a limited tonnage is indicated, extending 10 to possibly 20 feet down the dip of the strata. Similar ore is indicated locally in the east-west open-cut, representing a more erratic marginal phase of the main orebody. A sample 30 feet from the intersection between open-cuts across 55 inches assayed: Gold, trace; silver, 2.7 oz. per ton; copper, 0.27 per cent; lead, 4.5 per cent; zinc, 3.9 per cent.

This is an impressive concentration of galena and sphalerite, although unfortunately it is localized by a relatively minor structure which contains a cigar-shaped orebody of about 15 tons of shipping ore per foot of advance, exclusive of lower-grade fringing ore. Nothing can be told of the extent of the structure beyond the fact that, being small and not clearly defined, the present visible outline may not be maintained for more than 30 or 40 feet on strike. In order that sufficient ore be present to warrant installation of a mill, material in addition to the high-grade pod and lower-grade fringes would have to be found. Investigation of the possibility of more ore could best be made by carefully laid-out diamond drilling.

Under the direction of Eric Larsen, of Kamloops, a start was made to build a new camp near the showings. A total of 2,500 feet of diamond drilling was done, and a magnetometer survey was made. Work stopped for the winter on December 5th.

[References: *Minister of Mines, B.C.*, 1936, pp. D 39–41; 1949, pp. 132–137.]

TULAMEEN RIVER*

Summit Camp (49° 121° S.E.)

Silver-Lead-Zinc

Silver Hill Mines Ltd. Company office, 402 Bank of Nova Scotia Building, Vancouver. E. Borup, president. This property, in the Summit Camp on the south slope of Treasure Mountain, was inactive in 1953 except for a few weeks in the early winter. Preparations were made to build a mill and work was done on the foundations, but no mill machinery arrived at the property and work was suspended in November.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1952, p. 119.]

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; J. A. C. Ross, general superintendent; D. W. Pringle, 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, No. 1 and No. 2 vertical shafts, No. 3 inclined shaft, the 4-260 service raise, and an auxiliary raise. No. 1 shaft

* By E. R. Hughes.

is a service shaft that extends from the 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. The No. 3 shaft is inclined at 45 degrees and extends for 1,026 feet from No. 6 level to the surface near the camp mess-house. Permanent timbering was completed from the surface to No. 4 level, and timbering as a manway continued to No. 6 level; no further work was done, and the shaft is used as a ventilation airway and auxiliary exit. The 4-260 service raise is equipped with a ladderway, skipway, and compressed-air pipe-line. This raise extends from No. 6 level to the surface and provides an air-course and manway to the east and north ends of the mine workings. 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 approximately the elevation of the old No. 1 level.

Exploration work at Copper Mountain was reduced to a minimum in 1953. Apart from minor miscellaneous advances totalling 274 feet, the only exploration done during the year was in the Wolf Creek adit, which was advanced 1,003 feet, bringing the total length of the adit to 1,700 feet. Eleven diamond-drill holes, totalling 4,395 feet, were drilled at Wolf Creek, but the results were not sufficiently encouraging and this exploratory work was discontinued. Exploratory diamond drilling was done on the surface at Kennedy Mountain, 1½ miles northwest of Copper Mountain, at the Red Eagle and Princess Maude areas at the main camp, and at Voight's Camp, 1½ miles northeast of Copper Mountain. Core drilling amounted to 23,464 feet, of which 5,377 feet was for underground development, 7,936 feet was for underground exploration, and 10,150 feet was for surface exploration. The all-time high was 97,819 feet drilled in 1952. The curtailment of exploratory work was sharply reflected in lessened reserves of ore.

Exclusive of exploration work, a total of 4,139 feet of drifting and crosscutting and 8,186 feet of raising was done in 1953. Of these totals, 3,757 feet of drifting and 7,772 feet of raising was for the purpose of preparing known orebodies for production, and 796 feet was in connection with the new surface ore-storage system. The practice of concreting scraper-drifts, draw-points, and raises was continued where the ground was poor, and for this purpose 620 feet of drifts and raises were concrete-lined. Two new chutes and sixteen new grizzlies were built. Three of the new grizzlies were built on the main haulage level to permit scraping directly into ore-cars.

The change-over from diamond drilling to percussion drilling in blast-hole work that was started in the latter part of 1952 was continued, and early in 1953 the diamond drills were completely replaced with 3½-inch-diameter percussion machines. This change resulted in considerable saving in the cost of primary ore-breaking. Further experimental work in varying the burden, testing various types of explosives, and the use of short-period blasting-caps resulted in reduced secondary blasting by obtaining better fragmentation. During the year 42,656 feet of blast hole was drilled by diamond drills and 220,044 feet by percussion machines. Light-weight stopers and jack-leg machines were used exclusively for all development work. Although several types of tungsten-carbide-tipped steel and bits were tried out, no radical change was made from the practice of using the integral chisel-bit steel for drifting and four-wing bit for raising. Twenty-three jack-leg machines and twelve Holman Silver Bullet stoping machines were used.

The mine is ventilated by mechanical means, and air is brought into the mine and distributed through the workings by means of eleven fans strategically located on the various levels. Ventilation doors installed in some of the workings serve to direct the flow of air and prevent contamination of active workings with dust-laden air currents. Ventilation raises, equipped with auxiliary fans, provide each scraper unit with fresh air. At the time tests were made, it was found that dust concentrations underground in 1953 were slightly higher than in similar tests during the previous four-year period. The average dust concentration found underground, exclusive of drilling operations, was 482 particles per cubic centimetre of air. The continual development of new ore blocks requires that periodic changes be made in the direction and rate of flow in order that sufficient fresh air may be brought to the active workings. 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.

Open-pit mining was started at Copper Mountain in 1952, and this surface method of mining was continued with success in 1953. The pits were operated continuously throughout the year. Production was increased from the No. 2 and No. 3 pits, while work was suspended at the No. 1 pit. In July a second mechanical shovel was added to the surface operations to enable production to be maintained simultaneously from two pits, and a Canadian Ingersoll-Rand X-72 wagon drill was purchased. Late in the year a start was made on the construction of a road leading from No. 3 pit to No. 4 pit on the Oriole mineral claim. Drilling is done from the top of 20-foot benches, and short-period blasting-caps are used in the ore-breaking operations. A CD-48 Dupont electric blasting machine, capable of firing 1,000 shots, is used in the open-pit blasting. To facilitate the handling of ore from the open pits, a storage bin on the hillside adjacent to the crusher was cut in the solid rock. The bin has a storage capacity of 20,000 tons. Early in August the storage bin, dumping ramp, and auxiliary roads were completed and put into service. This installation will materially reduce the haulage charge on ore from the open pits.

All ore mined at Copper Mountain, both from the surface and underground, 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. Ore shipments during the year totalled 1,813,787 dry tons, an all-time record for this property. The average content of copper in the ore was 0.879 per cent. The average daily tonnage shipped was 4,983 tons for 364 operating days. The ore from the open pits amounted to 11.9 per cent of the total shipments.

Additions to equipment included a new swing jaw supplied by Vancouver Engineering Works and installed at the crushing plant in August. The new high-pressure 100-horsepower electric pump purchased in 1952 was installed early in the year. This Gardner-Denver pump is entirely automatic, and its installation has resulted in elimination of the operating crews formerly employed at the pumping station. The reduction in development and exploratory work resulted in a surplus of labour and consequently there were several lay-offs of employees at different times during the year. During 1953, 96 men were hired and 260 men either quit or were laid off, and thus the working force at Copper Mountain was reduced by 164. The total number of persons employed at Copper Mountain at the end of the year was 464, of which 264 were employed underground. Because of the reduction in crew the No. 1 and No. 2 bunk-houses were closed.

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. The competitive bonus system, started in 1952, under which shiftbosses are awarded merits or demerits for standards of safety and efficiency, was extended to include the crusher plant, concentrator, and power plant. Under this system each shiftboss is credited or penalized for conditions found in the part of the operation under his jurisdiction. Financial awards are made each month to shiftbosses with top ratings. This system is credited with the continued improvement noted in the company's frequency rating for accidents involving more than six shifts of lost time; for 1953 this was 0.07 per 1,000 man-shifts worked. This is believed to be the lowest accident frequency rating ever attained by any major metalliferous mine in Western Canada since the keeping of official records was first introduced some years ago. 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. Courses in first aid and mine-rescue were conducted, and trained teams competed in the mine-rescue and first-aid field-day held in Princeton on June 20th.

HEDLEY*

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. Development in the newest part of the mine, the 4150 winze, proved to be disappointing. The winze was equipped in 1952 to handle men and material from the 4150 level down to the newly established stations at elevations of 4,050 feet, 3,900 feet, and 3,850 feet. The orebody was found to be quite small, and after it was mined out the machinery was removed and the winze abandoned. There were no major additions to plant or equipment at the mine, and there were no major underground developments.

Mining is done in open and timbered stopes, and the broken ore is scraped into mill-holes above chute draw-points. Drilling is done with Copco and Gardner-Denver 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. Standard leyner machines are used to drill long holes for ring blasting. Total development consisted of 1,464 feet of drifting, 1,249 feet of raising, and 181 feet of crosscutting. Of this, 941 feet of drifting, 252 feet of raising, and 181 feet of crosscutting was for exploration, and the remainder was for stope preparation. Diamond drilling amounted to 14,575 feet, of which 13,712 feet was for exploration work and the remainder for stope preparation. At the end of the year 192 persons were employed, of whom 121 were on the mine payroll, including 96 men underground.

The percentage production of ore from the main parts of the mine was: Nickel Plate, 66.8 per cent; Morning, 17.9 per cent; and Sunnyside, 15.3 per cent. Production: Ore milled, 121,152 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. The major changes to the mill, started in 1952, were completed early in 1953, and, as the result of these changes, all gold recovery since January 12th, 1953, has been in the form of a cyanide precipitate which is shipped to the United States for refining. This revision of the mill flow-sheet has eliminated the former production of an arsenical concentrate. The revision has been highly satisfactory, both from an operational and metallurgical standpoint.

French Mine.—Brian T. Stephens, mine foreman. This mine is on the Oregon mineral 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 has been developed from an adit level at an elevation of 3,910 feet. Originally there were two open stopes, but as mining progressed the two stopes were connected.

* By E. R. Hughes, except as noted.

A second adit was made in 1952 about 300 feet east of the initial opening, and from this a connection was made to the stope. The broken ore is scraped from the stope into an ore-pocket in the second adit and 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. 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. Development work consisted of 550 feet of drifting and 35 feet of raising. In addition, a total of 2,016 feet of exploratory diamond drilling was done. The mine is operated only during the spring, summer, and autumn months. The 1953 season started on March 2nd, shipments to the mill recommenced on April 20th, and operations were suspended for the winter months on December 23rd. Six men were employed. Production: 6,526 tons.

Mount Riordan (49° 119° S.W.)

Tungsten-Copper

Billie Goat, Shamrock, etc.*

In the summer of 1953, through the efforts of the Alocin Mining Syndicate, of Penticton, interest was revived in a scheelite occurrence on Mount Riordan, 4 miles northeast of the Nickel Plate mine at Hedley. The showings are on the Billie Goat claim, an old Crown-granted mineral claim now assessed to W. J. Bromley, of New Westminster. The Billie Goat claim is surrounded by the Shamrock claim, a reverted Crown grant, and the Afterthought, Jimmie, Riordan, and Northey claims, all recorded in the name of Frank Taylor, of Penticton.

The showings are at an elevation of 6,900 feet on the peak of Mount Riordan, half a mile north of the Apex Mountain road. Access to the showings is by means of a blazed trail from a point on the Apex Mountain road that is 13.7 miles east of the Hedley to Keremeos highway and 8.1 miles west of the Green Mountain road.

The Billie Goat claim has been mentioned in the Annual Reports of the Minister of Mines as far back as 1900. Original interest in the claim centred on copper mineralization. Toward the end of World War II, scheelite was recognized in the deposit. Since then the property has been examined by several companies, but little development work has been done.

The ground around the showings is relatively open, drift-covered terrain strewn with granodiorite erratics. Although overburden is shallow, few natural outcrops can be seen on the north and west slopes of the mountain. Scattered patches of bare rock are exposed on the rounded peak of the mountain, and steep bluffs are a dominant feature of the southeast face.

Scheelite occurs on the property as scattered blebs and as isolated irregular patches in skarn. All of the rock examined in the workings and the area immediately adjoining them consists of skarn. The skarn is composed mainly of reddish-brown garnet and green diopside with minor amounts of quartz, calcite, scheelite, epidote, wollastonite, pyrrhotite, pyrite, and chalcopyrite. The colour of the rock varies from dark brown to green, depending on the ratio of garnet to diopside present. A few small quartz veins and one narrow granitic dyke were noticed.

The workings consist of thirteen small pits and shallow open-cuts arranged in a north-south line. They are spaced along a horizontal distance of 325 feet. The southernmost pit is about 200 feet northeast of the cairn on Riordan peak.

With the aid of an ultraviolet lamp, some scheelite was detected in all of the workings and in several scattered natural outcrops to the west and south. Most commonly the scheelite seen was in tiny scattered specks, but occasionally isolated patches half an

* By J. W. McCammon.

inch in diameter and short, narrow irregular seams were visible. A small pile of picked material, reputedly from the southernmost pit, contained skarn with patches as much as 4 inches wide and 6 inches long that contained about 50 per cent of scheelite crystals. Much of the material on the dumps of the various trenches contained specks of scheelite.

FAIRVIEW CAMP*

Silica-Gold

E/5W-8 **Fairview (The Consolidated Mining and Smelting Company of Canada, Limited)**

(49° 119° S.W.) G. S. Ogilvie, mine superintendent. This mine is about 5 miles west of Oliver. Mining is done above No. 6 level, which is the main haulage adit. No. 6 level was extended 83 feet to a total length of 3,083 feet. Development consisted of 134 feet of drifting and 12 feet of raising. 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. In November a start was made to clean out and rehabilitate the old No. 3 level in order to develop ore at a higher elevation and by-pass some of the old stopes which are partly caved and in which the ground is blocky and difficult to support. Nine men were employed underground and five on the surface. Operations were continuous throughout the year, with production averaging about 1,350 tons per month.

BEAVERDELL*

Silver-Lead-Zinc-Cadmium

d. file **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, manager; P. R. Clarke, mill superintendent; J. DeYaeger, mine foreman; G. W. West, mine engineer. 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 with No. 7 and No. 8 levels. A second winze connects No. 8 with No. 9 and No. 10 levels. Mining in 1953 was done on Nos. 7, 8, 9, and 10 levels, and, although No. 7 level continued to be the largest producer, increased amounts of ore were obtained from the lower levels. During the summer, rejects from old hand-sorting operations on the surface were sampled and subsequently milled at a small profit. Low-grade material from surface dumps and abandoned stopes augmented the regular mine output and assisted in maintaining daily mill tonnage. Considerable success was obtained in locating ore in the hangingwalls and footwalls of previously abandoned stopes, and this type of exploration is continuing.

The ore from the mine is trucked to the mill, which is adjacent to a spur of the Canadian Pacific Railway at Beaverdell. The mill operated at capacity throughout the year. Development work consisted of 9,528 feet of diamond drilling, 694 feet of drifting and crosscutting, and 247 feet of raising. The total ore milled was 15,182 tons. On October 9th a fire completely destroyed the office building, which housed the offices and the staff-house. Temporary office accommodation was then provided at the curling-rink. At the end of the year forty-four men were employed, of which twenty-four were underground.

Sally

(49° 119° S.E.) This mine on Wallace Mountain is owned by Highland-Bell Limited, and the underground workings are connected to the Wellington mine. Early in 1953 the owners gave a lease to E. Wanke, O. Johnson, and J. S. Kleman, to mine a small remnant of ore that was accessible from the Wellington workings. This amounted to 29 tons.

* By E. R. Hughes.

Silver-Lead-Zinc

Wellington (Silver Bounty Mines Limited)

(49° 119° S.E.) Company office, 633 Hornby Street, Vancouver. G. S. Eldridge, president. 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. The company did no mining in 1953. E. Wanke, O. Johnson, and J. S. Kleman, all of Greenwood, obtained a lease on the Wellington mine in November, 1952, and mined remnants of ore in various parts of the mine. Six tons of ore was mined and was shipped to the Trail smelter, netting $500.30 after transportation, smelter charges, and royalty were paid. The lease was given up in May, 1953.

J. McDonell and R. Meyers obtained a lease, and in November, 1953, started to mine in the old workings accessible from the No. 5 main haulage level. In December they shipped 6.4 tons of ore to the Trail smelter. They then moved to an area between No. 1 and No. 2 levels, where they continued to search for and mine small remnants of ore left by previous operators.

LIGHTNING PEAK*

Silver-Lead-Zinc

Waterloo (Paycheck Mining and Development Company Limited)

(49° 118° N.W.) 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. 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. All activity in 1953 was at the Waterloo mine, which is situated 18½ miles by poor road from Inonoaklin Crossing on the Monashee Highway.

Due to the closing of the Monashee Highway during the winter months, operations did not begin until June. A few changes were made in the 75-ton mill built in 1952, but because of various difficulties, mainly electrical, mill operation did not start until December. No underground work was done, but during the summer months several hundred tons of dump ore was recovered from near the four portals of the Waterloo mine and trucked to a stockpile at the mill. It is estimated that 500 tons was milled, and the recovery from this was 20 tons of zinc concentrate and 8 tons of silver-lead concentrate. No concentrates were shipped in 1953. Operations were continuous until Christmas, the Monashee Highway being kept open. The number of men employed averaged ten. G. Kvist was mill superintendent.

ROCK CREEK†

Gold-Silver-Lead-Zinc

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. Thomas Bingham, owner, and Gus Johnson did some surface work, endeavouring to locate the vein previously mined on the adjoining Imperial claim. Two small pits were excavated near the cabin, but insufficient work was done to indicate the value and extent of the showings.

GREENWOOD†

Gold-Silver-Lead-Zinc

E/SE-1 **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 1953 work was done by lessees in different

* By J. W. Peck.
† By E. R. Hughes.

parts of the mine. Leo Madden, Mark Madden, and Gwyn Jones drove a raise up 125 feet from the south end of the 600-foot level at a point 320 feet southerly from the No. 2 shaft. From the face of the raise, drifting was started to the north and south following a thin stringer of ore which at one place reached a maximum width of 5 inches. Small occasional blebs of ore were encountered in driving the raise. No ore was shipped, and this development was discontinued in January, 1953.

R. Barker and S. Downham obtained an option and lease on the property, and in July, 1953, a contract was let to E. Wanke, O. Johnson, and J. S. Kleman to sink a winze and do some drifting. The collar of the winze is approximately 850 feet north of No. 2 shaft on the 600-foot level. The winze followed the vein, which varied in width and averaged from 2 to 4 inches of mineralization. The winze was sunk 103 feet at an average inclination of 38 degrees to the southeast. At the foot of the winze the 700-foot level station was formed, and drifting was done 45 feet to the north and 22 feet to the south. Some retimbering was done in No. 2 shaft, and repairs were made to the surface ore-bin. The three contractors were the only persons employed, and the work was carried on continuously from July to the end of the year. No ore was shipped, although several tons recovered in the development work was stored at the mine.

Silver-Lead-Zinc

82E/SE-8 -9

Dynamo (49° 118° S.W.) This property, at the south end of the city of Greenwood, is owned by a syndicate represented by M. M. Butorac and J. McDonell. The new lower adit on the Mamont claim was extended 40 feet to a total length of 90 feet. This adit was driven for the purpose of reaching the downward extension of the vein found in the underhand stope on the level above. The quartz vein is from 6 inches to 2½ feet wide. Assays reported by the owners indicated some values in tungsten, gold, and silver in the lower adit. No ore was shipped. Work was discontinued in August and had not been resumed at the end of 1953. Two men were employed, with hand-steel and wheelbarrow.

D.A. and Gold Bug (49° 118° S.W.) This property, consisting of four Crown-granted claims and one recorded claim, is held by E. Ruzicka, Grand Forks. The claims are on the west side of the valley, at the north end of the city of Greenwood. The Crown-granted claims are the D.A. (Lot 824), Gold Bug (Lot 890), Elk Horn (Lot 818), and Gold Pick Fraction (Lot 1092). The claim held by record is the St. Paul, which adjoins the D.A. on the west. The old Gold Bug adit was retimbered, and 90 feet of crosscutting and drifting was done on a vein 1 to 8 inches wide, from which approximately 6 tons of ore was recovered. The portal of the adit is on the Gold Bug, and the drifting was done northward on to the D.A. claim. Eighty feet of surface trenching was done on the Gold Bug, uncovering a quartz vein 2 to 14 inches wide sparsely mineralized with pyrite and galena, with occasional specks of visible gold. A 12- by 18-foot cabin was built on the property. Two trenches, each about 50 feet long, were bulldozed on the Elk Horn claim in an unsuccessful attempt to find the continuation of the vein southwest of the old shaft. On the St. Paul claim, surface stripping was done as assessment work. The work was done by the owner and his sons. Operations were suspended in November for the winter months.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1927, p. 235; 1932, p. 129.]

Phoenix Camp (49° 118° S.W.)

Copper-Gold

Stemwinder (Columbia Copperfield Mines Ltd.).—Samuel Ciglen, president; E. H. Kellner, vice-president; 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 mine was again closed on January 15th, 1953, and work has not been resumed.

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 at 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. This work was discontinued in the late summer.

FIFE*

Copper-Gold

Fife (49° 118° S.E.) Mrs. Irene Buckland held under lease from the Crown the following six Crown-granted claims: Fife, Lot 1185 S; Three Bells, Lot 1182 S; Big Chief, Lot 962; Benhar, Lot 1183 S; Dykehead No. 2, Lot 1184 S; and Dempster Fraction, Lot 1186 S. The claims straddle the Kettle Valley Railway between Fife and Christina Lake. The greatest period of activity at this property appears to have been in 1909 and 1910, when several hundred feet of drifting and crosscutting was done and a shaft was sunk 50 feet. One small stope was then developed, from which 200 tons of ore was mined. On at least one occasion since 1910 the workings have been partly cleaned out and rehabilitated. In the summer of 1953 Miners Western Limited cleaned out the old adit and drove around some badly caved ground to connect with the old workings. The new connecting drift is 140 feet long. Two men were employed in this work. Operations were suspended at Christmas for the winter months.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1910, p. 122.]

CORYELL†

Silver-Lead-Zinc

W.S. (Cascade Lode Mines Limited) (49° 118° S.E.) Registered office, 736 Granville Street, Vancouver. C. J. L. Lawrence, president; Leo H. Bettin, manager; C. M. Campbell, consulting engineer. This group of recorded claims is on the west side of McRae Creek, about 1 mile northwest of Coryell. The adit is reached by a steep switchback road from the McRae Creek road. This is an old property once owned by the late Hugh Breckell, and was relocated in 1947 by W. W. Schwartzenhauer, of Castlegar, who optioned it to the present company. Shipments of 18 tons of sorted ore in 1949–50 assayed 20 ounces of silver per ton, 33 per cent lead, and 14 per cent zinc.

There are two old adits and some stripping on the steep hillside. Mineralization is in limestone or lime schist, chiefly as fracture fillings but including a small amount of replacement associated with chloritization. There is little apparent continuity of mineralization.

The upper adit is about 50 feet long, and at 30 feet from the portal a small mineralized zone dips 30 degrees eastward toward the portal. There is some chloritic replacement mineralization at the portal, striking with the hillside, and 50 feet below the adit a well-mineralized chloritic zone is about 8 feet long and 3½ feet wide, vertical, and striking north 75 degrees east. No. 2 adit, 90 feet below No. 1, is about 250 feet long in an average direction of south 70 degrees west. A crosscut 75 feet from the portal extends 120 feet to the south. Mineralization, in limestone and limy rocks, is in irregular fractures dipping northward at about 45 degrees. Some mineralization occurs also in fractures striking north to northwest and vertical or dipping steeply westward.

* By E. R. Hughes.
† By M. S. Hedley.

A raise driven 70 feet on the best showing leads to a sublevel 48 feet long 70 feet above. A little stoping was done from the raise, and a pod of galena 5½ feet wide was reported. Most occurrences of mineral are a few inches to 1 or 2 feet wide, and sorting to a high-grade lead product is difficult. A grab sample of about 15 tons of sorted ore on the dump assayed: Gold, 0.01 oz. per ton; silver, 25.3 oz. per ton; lead, 43.5 per cent; zinc, 9.4 per cent.

In September diamond drilling was in progress under the direction of Mr. Schwartzenhauer to investigate the downward extension of the best mineralized section.

ROSSLAND*

Gold-Copper

Velvet

(49° 117° S.W.) This old gold-copper producer on the Cascade Highway, 13 miles west of Rossland, is owned by H. F. Kenward, of Vancouver, and W. W. Sweet, of Seattle, Wash. The mine is under lease to J. C. Urquhart, H. W. Lefevre, R. Lefevre, and B. W. Price. The Towser mill machinery from the Silver Cup mine at Ferguson was moved to the property late in 1952. Mill erection continued throughout most of 1953 on a site near the dumps to the north of the shaft headframe. The essential machinery included: 8- by 14-inch jaw crusher, 4- by 4-foot Eimco ball mill, 27-inch by 15-foot rake classifier, four Kraut flotation cells, thickener, and filter. The jaw crusher was independently powered by a gasoline engine, but all other equipment was driven by line shafts and belting from a 66-horsepower Crosley diesel engine. Milling started in August, and by December 550 tons of dump material had been milled. The mill is rated at about 30 tons per day capacity, but was only operated with two men on an intermittent basis. Snow and freezing weather hampered operations. About 50 tons of concentrate was produced, and 22 tons of this had been shipped to the Tacoma smelter before the end of 1953.

Production: Concentrate shipped, 22 tons. Gross content: Gold, 38 oz.; silver, 29 oz.; copper, 2,160 lb.

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 controls a group of claims in the South Belt, adjacent to Rossland. Mine development continued in the Bluebird No. 2 or lowest adit, the portal of which is at 2,900 feet elevation. An orebody located in 1952, and developed in that year by a 78-degree two-compartment winze sunk at a point 190 feet from the portal, was further explored by deepening the winze to a vertical distance of 145 feet. The vein-like orebody, where exposed in the winze, averaged about 2 feet wide, with chalcopyrite and pyrite the main visible minerals. At the bottom of the winze a crosscut was driven 85 feet into the hangingwall. From this crosscut eight diamond-drill holes were drilled fanwise back toward the shaft to investigate the orebody. Other development in the No. 2 adit was the extension of a crosscut which had been started at 770 feet from the portal to investigate diamond-drilling results obtained in 1952. This crosscut was driven northeast a total distance of 210 feet. At 120 feet a well-mineralized zone was intersected with a width of about 10 feet. Drifting was done about 25 feet both ways. The back was taken down in the best section and a small amount of diamond drilling was done, but this work showed the zone to be a small pocket.

All work ceased by July. About seven men were employed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1952, pp. 142–143.]

* By J. W. Peck.

Gold

O.K. and I.X.L. (49° 117° S.W.) The O.K. mine is owned by Mrs. J. Pike, of California, and J. Wey and Mrs. Anabelle, of Seattle, Wash. It is under lease and option to M. J. Doran, Rossland. The No. 3 adit was used as an access to the workings. Rehabilitation work was done during 1953, and no ore was shipped.

The I.X.L. mine is under lease to L. McLellan, J. Herman, and H. Wuori, of Rossland and Trail. A pocket of high-grade ore was discovered and shipped to the Trail smelter. The partners worked only intermittently.

The compressor at the portal of No. 3 adit was shared by both lessees. It is an Ingersoll-Rand 220-cubic-feet-per-minute compressor driven by a 30-horsepower electric motor. Electricity was purchased from the West Kootenay Power and Light Company Limited.

Production: Ore shipped from I.X.L. mine, 0.06 tons. Gross content: Gold, 28 oz.; silver, 6 oz.

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. This concentrator is located at the Granite Poorman mine, 7 miles by road west of Nelson. It was formerly a cyanide gold-mill. In January a lease was obtained by J. P. Dion, D. H. Norcross, and W. W. Cooper, of Nelson. The mill was operated intermittently on custom ore, supplemented by dump material from the 275 portal of the Poorman. Ore milled: Scranton Mines Limited, 1,418 tons; Trans-Mountain Mines Ltd., 204 tons; Poorman dumps, 1,715 tons.

Gold-Copper

Eureka (Eureka Copper Syndicate) This property was optioned from Copper Leaf Mines Limited by the following partnership: F. Christofferson, G. LaVigne, O. Alm, F. P. Mahre, and W. Hoggatt. The ground, at one time part of the Kenville holdings near Nelson, contains the following claims: Eureka, Toronto, Alambra Fraction, Imperial, Gold Leaf, Gold Leaf Fraction, Gold Hill, Viking, Viking Junior Fraction, and Champion. The Eureka mine is 2¾ miles by steep road from the Kenville Base Metals Concentrator. In 1951 Copper Leaf Mines Limited endeavoured to locate the sublevel below the caved 250 adit by raising about 100 feet from the bottom or 450 adit, but the effort was not successful. The present owners finally located the sublevel 20 feet in the hangingwall near the top of the raise. When the crosscut connection was made, the sublevel was found to be about 150 feet long. It followed a quartz vein, containing chalcopyrite, ranging in width from a crack to as much as 3 feet. The back was taken down in the widest sections and shipments made to the Kenville mill. These shipments, totalling about 80 tons, were made late in the year and were not milled in 1953.

At the portal of the 450 adit a compressor was installed, an ore-bin built, and tent facilities provided. Some relocation of the road to the Kenville mill was made. S. Kohar was foreman in charge, with about five men employed.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, p. 135.]

Gold

Granite This old gold mine, about 7½ miles from Nelson, is part of the holdings of Kenville Gold Mines Limited. These holdings were under lease during 1953 to J. P. Dion and associates, of Nelson.

* By J. W. Peck.

In October the lower portal of the Granite mine was retimbered and the level rehabilitated. At approximately 600 feet from the portal an old raise, about 65 feet long, was extended, with the object of reaching the footwall of the Granite vein. After raising 18 feet, a 15-inch quartz vein in granite was intersected. This was slashed and a sublevel was driven 25 feet. About 110 tons of ore was mined in this work. The ore was trucked to the Kenville Base Metals Concentrator but was not milled in 1953.

A general-purpose building was erected at the lower portal. Compressed air was supplied by an Ingersoll-Rand 500-cubic-feet-per-minute compressor driven by a Waukesha diesel engine. Nine men were employed at the end of 1953.

Hall Creek (49° 117° S.E.)

Gold

Sun Fraction This property was optioned from Copper Leaf Mines Limited by 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. During the past few seasons W. Rozan, assisted in recent years by R. Gauthier, has been developing a quartz vein in granite. The vein, where exposed in the lower adit, ranges from a crack to 16 inches wide. Shipments in the past were made up of honeycombed quartz containing visible gold, but assays taken in 1952 indicated that soft granular pyrite also contained gold values. The property was not visited in 1953, but the partners reported that 50 feet of drifting was done to extend the lower adit to a length of 392 feet from the portal. At 372 feet from the portal the vein turned 40 degrees to the east. There were no shipments in 1953, and no work was done in the latter half of the year.

Rover Creek (49° 117° S.E.)

Dixie The Dixie group of six claims, owned by H. McLean, J. E. Marquis, and I. C. Marquis, all of Nelson, is at the head of Whitewater Creek, a northerly flowing tributary of Rover Creek. The property is reached by trail up Rover and Whitewater Creeks or by tractor-road, built in 1952, from the Second Relief mine on Erie Creek. The road extends up Erie Creek and Rush Creek to a pass at an elevation of 6,500 feet, then continues down to the log-cabin camp at 6,200 feet, a total distance of about 6 miles from the Second Relief mine, which is about 15 miles from Salmo. About 1,000 feet lower in elevation than the camp, high-grade gold-quartz float is scattered along Whitewater Creek, and the source of this float has been searched for intermittently over a period of at least fifty years. (*See* Bull. 1, 1932, Lode-Gold Deposits of British Columbia, p. 101.) Exploration at the upper end of Whitewater Creek has been difficult because the ground has a gentle slope and the overburden is quite deep. Above this area, talus covers the lower ends of rock ridges that rise toward Siwash Mountain. On the slope of one of these ridges, at an elevation of 6,600 feet, a barren quartz vein in granodiorite is exposed with an east-west strike and a south dip of 50 degrees. Four large cuts were made with a bulldozer to the southeast of the outcrop and about 400 feet lower in elevation, but the vein could not be located at this horizon.

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. Padulo, of Ymir. These partners worked only intermittently during the year. Air for mining purposes was supplied by a port-

* By J. W. Peck.

able compressor installed in a building near the No. 2 portal. The ore obtained was hand-sorted and trucked to the Trail smelter.

Yankee Girl, Dundee (Yankee Dundee Mines Limited)

(49° 117° S.E.) Company office, Suite 207, 445 Richards Street, Vancouver. A. B. Goodridge, 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, which are situated east of Ymir between Oscar and Ymir (Wild Horse) Creeks. All production in the past has come from adits on the Oscar Creek slope. The lowest adit there was the 1235 level, but a winze, now flooded, is reported to have reached a depth of 400 feet below the level. On the Wild Horse slope, about 3 miles from Ymir, an adit was started by previous operators to intersect the Yankee Girl vein system 765 feet vertically below the 1235 level, and 2,950 feet had been driven when the project was abandoned in 1929. When work started in February, 1953, the portal had to be retimbered for 120 feet, but the remainder of the 9- by 8-foot adit was found in excellent condition, with only minor amounts of timber required. Air and water lines, track, and fan pipe were installed. The adit was advanced on a reduced cross-section of 6½ by 7½ feet. By the end of December 1,435 feet of new work had been done and the face had reached 4,385 feet from the portal. The adit encountered diorite for 3,870 feet; from this point to the face, chiefly argillite was encountered, with tongues of diorite from 4 to 40 feet wide exposed at irregular intervals. At 3,820 feet from the portal a narrow quartz vein was intersected. Another vein, about 4 feet wide, was intersected at 4,092 feet from the portal, at the contact of argillite and a diorite tongue. This vein is a mixture of quartz and sheared rock mineralized with pyrite, sphalerite, and galena. No drifting was done on these veins. Work was concentrated on the main drive, as it was expected to reach the Yankee Girl vein early in 1954.

On the surface a compressor-house and a fuse-house were erected. Air was supplied by a Le Roi 500-cubic-feet-per-minute compressor. A battery locomotive was used for haulage. Ventilation was supplied through 14-inch-diameter fan pipe by Mecca compressed-air blowers. Use was made of two farm buildings on the opposite side of Ymir Creek, one for a change-house and one for an explosives' magazine. About seven men were employed.

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 northward 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. At the Jack Pot, which is south of Porcupine Creek, a new adit was started at an approximate elevation of 4,100 feet. It was driven westward, and 2,000 feet of a proposed 3,500 feet had been completed by December. At about 1,700 feet from the portal the formation changed from limestone to argillaceous quartzite. A flat diamond-drill hole was drilled from the face and a down hole was drilled from the level above, before the adit was continued. Development was also done in the adit above (approximate elevation, 4,400 feet), which was driven in 1951, and 800 feet of a proposed 1,400 feet had been completed by December. All this work was under contract to R. Golac, of Nelson, who employed a crew averaging thirteen men. At the portal of the lower adit, two bunk-houses, a cook-house, change-house, and core-shed were erected. Air for drilling was supplied by portable compressors, which had a total delivery of 850 cubic feet per minute.

At the Oxide, which is north of Porcupine Creek, two men were employed in driving the Ox 4 adit. During most of 1953 considerable water was encountered, and close timbering was necessary to keep the adit from being filled with sediment deposited from flows of water encountered in the drive. However, at about 700 feet from the portal the ground improved, and a further 100 feet was driven without use of timber. No interesting mineralization has been encountered in this adit. E. Livingstone was engineer in charge. An office was maintained in Ymir.

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; B. Golac, vice-president; A. H. Shrieves, secretary-treasurer; W. Maybank, consulting engineer. Capital: 3,500,000 shares, $1 par value. This company was formed late in 1951 to develop the Arlington mine on Rest Creek, 7 miles by road from Salmo. In December, 1952, a crew was employed to advance the 110 adit, which is about 130 feet below 80 level, the lowest producing level. The work continued in the early part of 1953 but was stopped at a distance of 915 feet from the portal. Argillites and quartzites were encountered in this adit, but no mineralization was discovered. The property was then idle until summer, when work started on enlarging the capacity of the mill from its former 50 tons per day. Two 22-inch by 6-foot Hardinge ball mills were obtained from the old Alamo mill near Three Forks. The former power units, totalling 320 horsepower, were replaced with two English Electric sets which are rated at 250 horsepower each. A thickener and filter were also included in the circuit. Capacity of the mill is now expected to reach 125 tons per day. A pipe-line, 10,000 feet long, was constructed to bring water from Rest Creek. Milling started in October, but only dump material was treated. About 2,600 tons was milled, and a bulk concentrate was made, which was trucked to the Trail smelter. No further underground work was done, but some stripping was done on the vein outcrop. The number of men employed averaged nine.

Sheep Creek (49° 117° S.E.)

Silver-Lead-Zinc

Amco

The Amco group of claims, owned by The American Metal Company of Canada Limited, extends south from Sheep Creek between Billings and Bennett Creeks. During the summer months two diamond-drill holes, each about 1,500 feet deep, were drilled—one at an elevation of about 4,000 feet on the old road that extends from the Queen mine to the Ore Hill mine and the other at an elevation of 4,950 feet about 2,000 feet west of the road. W. W. Moorehouse was in charge of this work. A crew of eight men was employed.

Tungsten

Victory (Victory Tungsten Ltd.)

Head office, 404 Randall Building, 535 West Georgia Street, Vancouver. V. Dolmage, consultant. Capital: 3,000,000 shares, no par value. The Victory group is owned by J. Sapples, of Salmo, but has been under option to the present company since 1952. The property, at one time known as the Little Keen, is west of Bennett Creek and south of Sheep Creek. Diamond drilling has been in progress since May, 1952, and by the end of July, 1953, had amounted to more than 15,000 feet in sixty-four holes. Drilling continued until the end of October. Most of the holes were drilled west of Bennett Creek on the Last Chance and Victory Fraction claims. These holes were concentrated in a zone 450 feet long between elevations of 3,250 and 3,500 feet. The drilling sites were

* By J. W. Peck.

reached by a short access road which leaves the Sheep Creek road just east of its junction with the Aspen Creek road. A. J. Ingraham was in charge of the diamond drilling.

Silver-Lead-Zinc

SW-6 SW-7 **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. D. I. Hayes, of Metaline Falls, Wash., holds an option on the group from L. R. Clubine, of Salmo. The surface diamond-drilling programme which was started in 1951 and continued through 1952 ceased in June, 1953. Five holes totalling 2,388 feet were drilled in 1953, to make a total since the programme started of 18,979 feet in thirty-seven holes. It was reported that, although extensive lead-zinc mineralization was encountered, commercially the drilling continued to be negative. Geochemical work was also done, and an anomaly was indicated on the northern end of the claims to the west of the H.B. ground. This anomaly was, however, not investigated in 1953. As in previous years, the work was directed by H. F. Mills, of Metaline Falls.

ASPEN CREEK (49° 117° S.E.)

H.B. (The Consolidated Mining and Smelting Company of Canada, Limited) — J. E. McMynn, property superintendent; H. G. Barker, mine superintendent. The H.B. mine is on the west side of Aspen Creek, a southerly flowing tributary of Sheep Creek. The main or mill haulage level is the 2800 level, connected by an interior shaft to the 3500 adit level, 710 feet vertically above. The main development in 1953 was the driving of the 3300 level, together with stope preparation above this level. The shaft was ready for handling men with installation of cage and guides. On the surface the concentrator of 1,000-tons-per-day capacity was completed. It did not operate, except that the crushing plant was used to crush development rock for use as road material. On March 31st all operations were suspended, and only watchmen were employed thereafter. Before that date the number employed averaged 150.

IRON MOUNTAIN (49° 117° S.E.)

Lead-Zinc-Tungsten

SW-10 SW-11 **Emerald, Jersey, Dodger, Feeney (Canadian Exploration Limited)** — Head office, Royal Bank Building, Vancouver; mine office, Salmo. G. A. Gordon, general manager; G. W. Walkey, assistant general manager; J. D. Little, mine superintendent, lead-zinc operations; H. V. Maxwell, mine superintendent, tungsten operations; E. A. Erickson, superintendent, lead-zinc concentrator; R. MacLeod, superintendent, tungsten concentrator. This company is a wholly owned subsidiary of Placer Development Limited. The Emerald, Feeney, Dodger, and Jersey mines, the tungsten concentrator, and the main camp are located on the summit between Sheep Creek and Lost Creek. The property is reached by two roads which leave the Nelson–Nelway Highway 4 and 5½ miles respectively south of Salmo. The lead-zinc concentrator is on the Nelson–Nelway Highway and is served from the mine by tram-line and a recently installed conveyor system. About 900 men and women were employed at all operations in January, but this number was gradually reduced until only 350 were employed in December.

SW-10 *Emerald.*—This tungsten mine continued to produce most of the ore for the tungsten concentrator. About 7,000 tons per month, with an average grade of close to 1.0 per cent tungstic oxide, was delivered to the mill. Considerable tonnage was produced from remnants of ore in previously mined sections. Bulldozer stripping was done on the orebody where it outcropped. This disclosed oxidized sections which were of ore grade and which, when mined, greatly enlarged the glory-hole area. Most of the ore was removed via the 3800 level, which is the main haulage to the concentrator. Investigation of the orebody below the 3800 level was begun by sinking a winze from that level. The winze is inclined at 32 degrees and had reached 200 feet of a proposed 700 feet by December.

Dodger.—The Dodger 4400 mine is a 14- by 15-foot adit driven south 1,050 feet at a portal elevation of 4,405 feet. A tungsten orebody known as the Government Block was mined from an access point 200 feet inside the portal. The broken ore was loaded directly into diesel trucks by means of a mobile electrically operated scraper-ramp. The area was about mined out by the end of 1953. Another orebody, about 50 feet directly above the adit, has been mined and explored over a 500-foot length starting at a raise 400 feet from the portal. All Dodger 4400 ore is trucked by diesel trucks direct to the concentrator located near the 3800 portal of the Emerald mine. Production was small during the first half of 1953 but reached 2,000 tons per month by autumn. Grade averaged 0.6 per cent tungstic oxide.

The Dodger 4200 mine is a 14- by 15-foot crosscut adit driven eastward 2,500 feet, at a portal elevation of 4,125 feet, from a point on surface 5,000 feet south of the Dodger 4400 portal. At 2,350 feet from the portal an 8- by 8-foot drift has been driven north. It had reached 1,200 feet by the end of 1953, with approximately 1,900 feet of drifting still to be done to connect with the Dodger 4400 mine. A tungsten orebody was located by diamond drilling 70 feet above this drift and was explored by three raises and a sublevel 350 feet long. The development rock in the drift was moved by battery haulage to the main crosscut, where it was transferred to diesel trucks. It could then be trucked direct to the tungsten concentrator or to a waste dump.

Feeney.—This tungsten mine is located to the north of the Emerald workings. It is served by one adit, and the orebody has been stoped from the adit through to surface. During the summer months ore was removed from near the surface, and the mine was then idle until December, when mining of ore remnants above the adit level was started.

Tungsten Concentrator.—This mill is located at the 3800 portal of the Emerald mine. It can receive ore by track haulage from this mine, by conveyor from the underground crushing chamber on the Emerald 3800 level, or by truck from outside sources. It has a capacity of about 650 tons per day but operated during 1953 at between 9,000 and 10,000 tons per month. Recovery was mainly by flotation and tabling. Difficulties in obtaining a marketable product were gradually overcome with the supervision of the Wah Chang Corporation of New York. The tungsten was sold to the United States Government under a long-term contract.

Jersey.—The Jersey lead-zinc mine is serviced by three adits—the 4000, 4100, and 4200. Orebodies known as the " A," " B," " C," and " D " occur in close proximity to one another in folded dolomitized limestone beds which rise gently to the north. As the orebody is as much as 25 feet thick, room-and-pillar methods have been found most suitable. Roof bolting is employed where necessary.

Below the 4200 level the ore is slushed to draw-points and removed by battery haulage on the level below. During the first half of 1953 all ore was removed via the 4000 level to a crushing plant at the portal, but in the latter half of 1953 the underground crushing plant at the Emerald mine was in operation and the ore could be trammed direct on the 4000 level to a dump above the crusher. Above the 4200 level the ore is removed by " trackless mining." All drilling was done by three leyner machines mounted on a diesel tractor. This jumbo can be operated remotely from controls at the front of the tractor and is so equipped that a 10-foot round can be drilled with no changing of steel. Loading was done by Eimco overhead loaders. All ore was removed via the 14- by 15-foot 4200 Jersey adit by means of Euclid or Dart trucks or by Koehring dumptors. All equipment was diesel-powered and supplied with scrubbers. Ventilation was provided through 30-inch-diameter fan pipe by two Joy 50-horsepower axivane fans installed in the raise that was driven in 1952 from the 4100 level to surface. This raise had a break-through to the 4200 level at 850 feet from the portal. Ventilation will be further improved by two raise connections—one in the " C " zone from the 4100 level and the other in the "A" zone from the 4200 Dodger. Total lead-zinc production reached a peak of 2,000 tons per day in the summer, but was then gradually reduced as the track area (4000 and 4100 levels) was closed down. Production was increased from the trackless 4200 level because all mining here has been in the "A" zone, which has shown a higher lead content. By December nearly all production was from the 4200 level at a rate of about 1,200 tons per day.

Lead-Zinc Concentrator.—The capacity of this concentrator was increased to about 2,200 tons per day by the installation of an 8- by 12-foot Allis-Chalmers rod mill and two 72-inch Wemco classifiers. During the first half of 1953 ore was delivered to the mill by road and tram-line, but in the latter half the conveyor system carried all the ore. Secondary crushing was eliminated as the underground crushing chamber in the Emerald mine reduced the feed to minus ¾-inch. The lead and zinc concentrates were shipped respectively to smelters at Kellogg, Idaho, and Black Eagle, Mont. Zinc concentrates were also shipped to the Trail smelter. Six new dwellings were built at the mill-site.

LOST CREEK*

Tungsten

Tungsten King (49° 117° S.E.) This group is on Lost Creek northeast of the Truman group. It is owned by R. Oscarson and E. Oscarson, of Spokane, Wash., and L. R. Clubine, of Salmo. Work in 1953 was restricted to bulldozer stripping. Minor amounts of lead-zinc replacement in limestone were reported to be exposed.

Silver-Lead-Zinc

Truman (49° 117° S.E.) The Truman group of 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. The main showings are on the mountain ridge forming the angle between Lost Creek and the South Fork of Salmo River. In 1928, when the property was known as the Mona, these showings were diamond drilled by The Consolidated Mining and Smelting Company of Canada, Limited. Four holes totalling 2,073 feet were drilled at that time. In 1947 in the same area the Valley Mining Company drilled five holes totalling 741 feet. In 1953 the same area was further explored by the drilling of fourteen holes totalling 6,485 feet. This drilling included the deepening of two of the Valley Mining Company holes and included a hole that was completed on January 5th, 1954. Three holes totalling 1,407 feet were drilled prior to 1953, to the north of the main drilling area; one hole was on the south bank of Lost Creek and the other two were north of Lost Creek at the northern end of the claims. All drilling was suspended indefinitely in January, 1954.

NELWAY*

Silver-Lead-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.

* By J. W. Peck.

The Reeves orebody adjacent to the interior shaft is fully developed above the 1900 level. Ore was produced from all levels at over 1,000 tons per day until April. Mining of ore ceased in February, but milling of development and broken ore continued until July. Mill-feed averaged 0.9 per cent lead and 3.5 per cent zinc. Development of the Reeves orebody below the 1900 level was started by the sinking of a 9- by 7-foot, 52-degree inclined winze a distance of 567 feet. Shaft stations were cut at 55-foot vertical intervals, as was an ore-pocket below the bottom or 1500 station. Diamond drilling was done from three of these stations. The 1900 level was extended to reach the downward projection of the O'Donnell orebody at a point about 7,000 feet from the portal. Diamond drilling and drifting was then done, and this work indicated that mineralized stringers extended over a width of about 80 feet. A shaft raise, inclined at 55 degrees, was started in the footwall of the zone to connect with the old O'Donnell adit 450 feet above. This raise was 100 feet long when work ceased. Other development was the extension of the 2350 level from the main Reeves shaft toward the B.L. orebody, which was expected to bottom at this horizon. A 1,200-foot drive was planned, but only half of this had been completed when work ceased.

The lead concentrates were shipped to Bunker Hill Mining and Concentrating Company at Kellogg, Idaho. The zinc concentrates were stockpiled at the property, and 5,100 tons remained on site at the end of 1953. The number employed averaged 185 until February, after which date the crew was gradually reduced until only the staff was left by July 15th. The staff was employed removing and servicing mine equipment until December 31st, after which date only watchmen were retained.

Ed No. 8 (International Lead and Zinc Mines Ltd.)

(49° 117° S.E.) Company office, 507 Metropolitan Building, Hastings Street, Vancouver. E. G. Brown, president. Capital: 5,000,000 shares, no par value. This company holds a group of claims lying east and west of Nelway. There was little activity in 1953, but W. J. G. Grant made a small shipment from the Ed. No. 8 claim, which is situated southeast of the west branch of the South Fork of Salmo River. Production: Ore shipped, 1½ tons. Gross content: Silver, 5 oz.; lead, 2,357 lb.; zinc, 44 lb.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1952, pp. 150–153.]

SOUTH KOOTENAY LAKE*

Next Creek (49° 116° S.W.)

Gold-Silver-Lead-Zinc

82F/SE-32 **Spokane**

This mine is on Wall Mountain, 18 miles by rough road from Tye. The owner, K. K. Laib, of Bayonne, mined about 70 tons of ore and made one carload shipment to the Trail smelter before winter forced closure of operations. Production: Ore shipped, 45 tons. Gross content: Gold, 23 oz.; silver, 630 oz.; lead, 20,292 lb.; zinc, 544 lb.

Sanca† (49° 116° S.W.)

/SE-10 **Lakeview**

This mine, near Sanca and midway on the highway between Kootenay Bay and Creston, is owned by E. G. Timmons, of Boswell. J. Robinson and J. McIsaacs obtained an option on the property and started work on April 1st. The lower adit level and a connecting raise to the upper level were rehabilitated. The south drift on the upper level was extended about 70 feet, and lead-zinc ore was sorted from an underhand stope in this section and trammed to a bin near the portal of the lower adit. Approximately 100 tons of this ore was milled

* By J. W. Peck, except as noted.
† By H. N. Curry.

at the Yale Lead & Zinc Company's concentrator at Ainsworth, but returns were much lower than anticipated, and the option agreement was terminated in mid-September. A small shipment was also sent to the Trail smelter. Three men were employed.

/SE-38 **Valparaiso (Akokli Tungsten Mine Ltd.)** This property is on the east side of Kootenay Lake 1 mile south of Akokli (Goat) Creek and at an elevation of 2,200 feet above the lake. It is reached by a 3½-mile jeep-road which starts from a point on the Creston–Kootenay Bay Highway 4 miles south of Boswell. The property was known prior to 1900 and was worked intermittently as a silver-gold prospect until 1933. During this period it was operated successively by the Valparaiso Gold Mining Company, the Associated Mining and Milling Company, and finally by Sanca Mines Limited, who in 1933 shipped 322 tons of ore which assayed: Gold, 0.35 oz. per ton; silver, 3.5 oz. per ton.

Early in 1953 N. E. Willson and associates, of Boswell, obtained leases on two reverted Crown grants—the Valparaiso (Lot 4907) and the Government (Lot 4908)—and, in addition, fifteen claims were located. Prior to this Mr. Willson had found tungsten mineralization on the old surface dumps, in various open-cuts, and in the old Valparaiso adit. A small private company was formed to explore these showings, and a crew of three men under Mr. Willson worked steadily throughout the year.

A jeep-road was completed from the main highway to the old workings on the Government claim, and the bunk-house erected by the previous operators was renovated. The 230-foot Valparaiso tunnel lies 1,000 feet to the north, and the strong quartz vein which persists between the two workings was open pitted and sampled. Extensive stripping was also done to the south of the Government workings. The tungsten mineralization was identified as wolframite, and sampling of the vein between the Government and Valparaiso workings has indicated a surface oreshoot 200 feet long and 5 to 6 feet wide.

The Valparaiso tunnel was cleaned out and retimbered, and both north and south drifts were opened up. Wolframite mineralization is evident in both drifts, and a 1,000-pound sample from the south drift responded well to preliminary metallurgical testing. Early in 1954 an attempt is to be made to block out tonnage by extending the south Valparaiso drift about 800 feet to a position 130 feet below the surface shoot on the dip of the vein. The vein dips 40 degrees into the hillside.

Plans for a pilot mill have been postponed due to the low price of tungsten concentrates.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1926, p. 285; 1927, p. 320.]

NORTH KOOTENAY LAKE*

Riondel (49° 116° N.W.)

Silver-Lead-Zinc

Bluebell (The Consolidated Mining and Smelting Company of Canada, Limited)† D. S. Campbell, superintendent; J. B. Donald, mine 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. Electrical energy is supplied by company-owned power plants on the Kootenay River. The concentrator began production in April, 1952, and operated steadily during the past year at a rate of 600 tons per calendar day. Ore was obtained mainly from the Kootenay Chief ore zone and a small amount from the Comfort ore zone in the latter part of the year.

* By J. W. Peck, except as noted.
† By H. N. Curry.

Development during the year was directed toward deepening and equipping No. 1 production shaft and preparing stopes in the Kootenay Chief and Comfort ore zones. The drift south on the 375 level was completed, and the orebody was outlined by diamond drilling. Two raises were driven for mining and ventilation to the level above. This work included 1,486 feet of drifting, 1,204 feet of crosscutting, 2,978 feet of raising, and 164 feet of main-shaft sinking. In addition, 1,129 feet of workings was timbered, 62,525 cubic feet was cut for main stations, shaft ore-pockets, and pump stations, and 82,159 cubic feet of slashing was done. Underground diamond drilling to delimit known ore-shoots and to explore newly opened ground amounted to 8,233 feet, and blast-hole diamond drilling to 5,305 feet. A total of 31,976 yards of gravel, 193 tons of mine waste, and 652 tons of mill tailings were used for backfill.

Sinking of the three-compartment No. 1 production shaft, between the Bluebell and Kootenay Chief orebodies, was continued to a point 135 feet below the newly established 525 level. This shaft has an over-all dimension of 7 by 21 feet and is driven on a 35-degree slope. The muck skip has a capacity of 5 tons, and eighteen men can be carried on the man skip. In conjunction with shaft-sinking, the 525 station cut-out was made, ore and waste pockets for the 375 and 525 levels were excavated, and dumps were installed on the lower level. The main pumping station, 25 feet below the 525 level, was 75 per cent completed, and a 12-inch discharge-line was laid up the shaft to the surface. This shaft has been used for production down to the 225 level since milling started, and late in the year a cable change-over was made to permit servicing to the 525 level. Simultaneous deepening of the shaft to the 675 level and lateral development on the 525 level are to follow. Plans are complete to install new 5-ton skips and obtain balanced hoisting from the lower levels. The Bluebell shaft was used only for handling development muck, and the Comfort shaft was rehabilitated and used for partial servicing of the development in that orebody.

Production from the Kootenay Chief ore zone was obtained from stopes above the 225 level. The mining system was unchanged from the previous year, the narrower sections being mined in the open by benching and scraping to draw-points in the vein and the wider sections by a horizontal cut-and-fill system. The diamond-drill blast-hole stope was completed. Further experimenting was done with roof bolting in the open stopes and in drifts in bad ground. Gravel backfill for the cut-and-fill stopes is obtained from a moraine at the north end of the property. Thirty-seven per cent of the year's production came from the horizontal cut-and-fill stopes.

Two stopes were prepared in the Comfort zone at the north end of the property, and development work was done to open up more ore. Consideration is being given to the use of shrinkage stoping in this area because the walls are somewhat weak. The open pit at the outcrop of the main Comfort orebody was opened up in the latter part of the year and produced 12,000 tons.

Testing was started in the use of de-slimed tailings for backfill. Part of a stope was filled with this material, which is being observed for oxidation.

An air lift chute gate was developed to replace the old hand-operated type. Granby side-dump cars were purchased to replace the V-bottom hand-dump type on the new levels on which heavier rails were installed.

A 25,000-cubic-foot-per-minute fan was installed to ventilate the Comfort workings. Plans were made for additional ventilation in the new lower levels.

A 400-gallon-per-minute electric pump was put in operation at the main pumping station in No. 1 shaft. This installation will serve until development is completed on the lower levels. Water is pumped to the 225 level, ditched across to the Bluebell shaft, and taken to surface by the pumping installation in that shaft. Mine water is discharged up the Bluebell shaft at the rate of 1,100 gallons per minute.

No major additions or alterations were made to the concentrator or to the surface plant. Improvements were made in the dust-collecting system in the crushing plant.

A fire-hall was built and a fire-truck made available. An ambulance was placed on the property.

Approximately twenty-five new houses were built by employees on the townsite. These were serviced with streets, alleys, water, and power. Street-lights were installed. Additional lots were laid out for further building in the spring. An addition was built to the school, and a hardware store and a drug store were opened by private interests.

First-aid and mine-rescue training were carried on during the year, and teams from the Bluebell mine competed in the Department of Mines first-aid and mine-rescue competition at New Denver. The accident record was greatly improved.

Labour turnover was light, and the average number of men employed in 1953 was 295. Production: 216,401 tons.

AINSWORTH (49° 116° N.W.)

Little Donald Area*

This area of 26 acres covers the greater part of the Little Donald, Black Diamond, and Little Phil mineral claims. It is 2½ miles by road from Ainsworth. The Highlander-Hot Springs area, mapped in 1951, adjoins on the east and the Black Diamond-Townsite area, mapped in 1952, overlaps on the north. The history and production of the Black Diamond and Little Phil mines have been summarized in the Annual Report for 1952. The Little Donald was operated intermittently from 1888 to 1908, and about 400 tons of silver-lead ore was shipped.

This area was studied intensively in 1953 in an attempt to resolve difficulties of interpretation at the western edge of the Highlander-Hot Springs area and the south end of the Black Diamond area. Plane-tabling at 100 feet to the inch and mapping of the Black Diamond, lower Little Phil, and Maestro adits at 30 feet to the inch yielded a wealth of lithologic detail which can only be outlined in Figure 5 and the following description. The abundance and pattern of faults has become clear, but the dips and displacements on many of them are unknown. In other respects the difficulties have merely been elaborated and brought into sharper focus.

General Geology.—The bedrock of the Little Donald area comprises a motley assortment of west-dipping schists, quartzites, and limestones (*see* Fig. 5). It contains bodies of aplitic granite and is shattered by faults. Major folding has not been recognized, but minor folding may be responsible for thickening of some of the units at several places. The structure is not fully understood and, therefore, the true stratigraphic sequence is uncertain. In particular, the dips of the Bench and Loon Creek faults are unknown, the amount of displacement on them is problematical, and a considerable part of the lithologic sequence appears to be missing from the Highlander adit. No entirely satisfactory set of explanations can yet be offered, and in its absence the sequence of units outlined in the reports on the Highlander-Hot Springs and Black Diamond-Townsite areas is retained as a lithologic breakdown. It is probably incorrect stratigraphically, but serves the purposes of description and reference.

A thin, discontinuous cover of mixed talus and glacial drift is general over the area and probably attains considerable thickness along the topographic bench near the western edge of the area. Recent muck deposits occupy the valley of Loon Creek and Loon Swamp to an unknown depth.

The bedrock sequence, as pieced together from surface exposures, is from west to east:—

Unit 20—hornblende schist with quartzitic intercalations.
Unit 19—quartzite.
Unit 18—calcareous rocks, with white dolomite at east edge.
Unit 17—miscellaneous metasediments.

* By G. E. P. Eastwood.

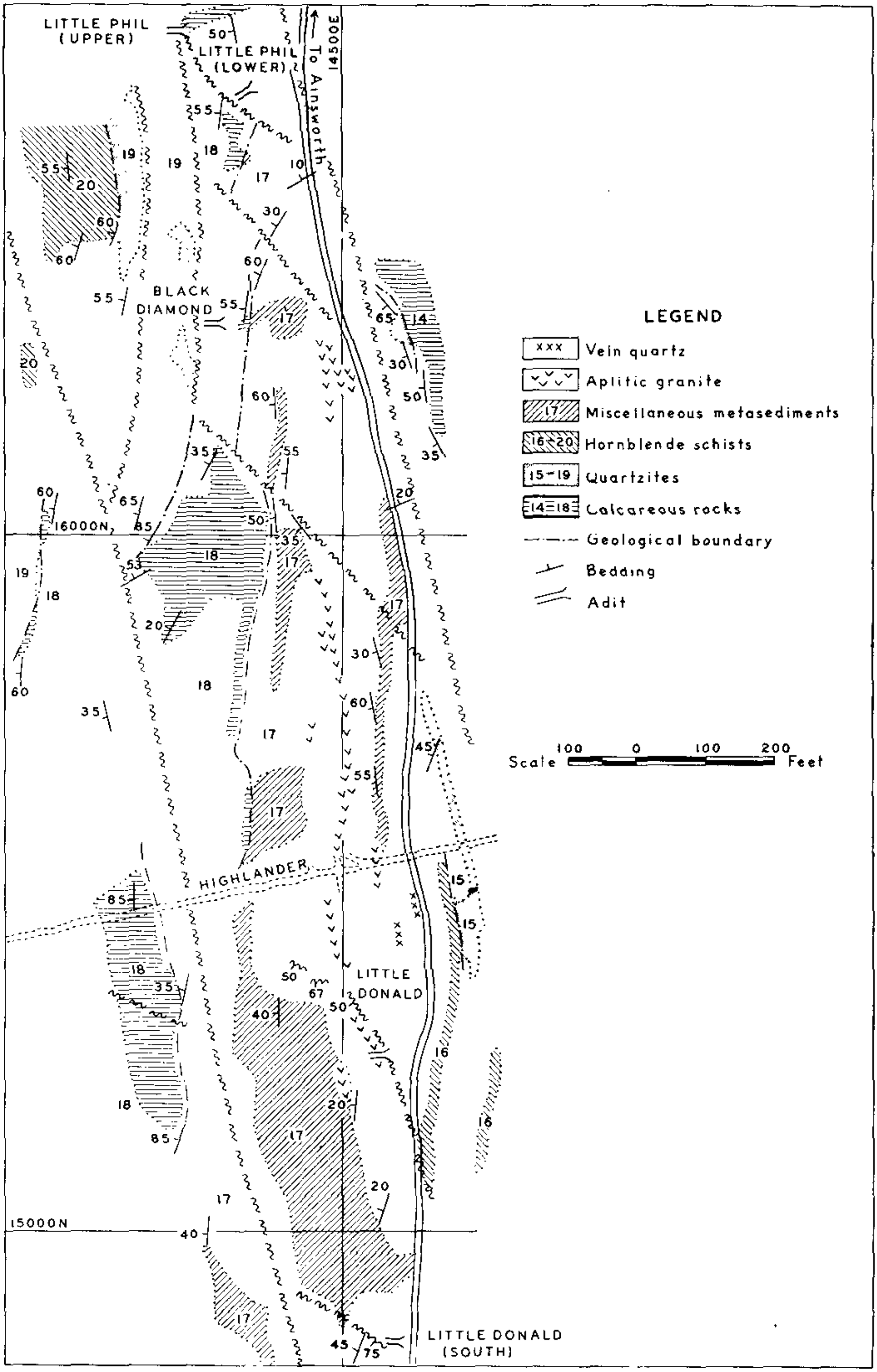


Figure 5. Geology of Little Donald area.

Unit 16—hornblende schist, pinching northward into unit 15.
Unit 15—quartzites.
Unit 14—quartzose limestone.
Unit 13—carbonaceous limestone.
Unit 12—sugary, nondescript limestone.
Unit 11—silver schist.

Units 11 to 13 and most of 14 lie to the east of the Little Donald area, but are included here for reference in the discussion of structure.

The small piece of the western part of unit 14 that is included in the present area grades westward from somewhat odd-textured carbonaceous quartzose limestone through cream-banded calcareous quartzite with grey inter-bands to non-calcareous quartzite of unit 15. These textures are described below.

Unit 15 has in previous reports been taken to include the small exposure of quartzite east of Loon Creek and opposite the Black Diamond and the more extensive outcrops of quartzite west of the creek farther south. There is no definite evidence for or against this identification. The quartzite west of Loon Creek in this area is intercalated between two tongues of hornblende schist of unit 16. The lower part of this quartzite is cream-banded. The striking white to cream-coloured bands average about one-tenth of an inch in thickness and consist of fairly pure, medium-grained quartz. The inter-bands average about half an inch and are coloured brown by mica. Unit 15 is not distinguishable from the eastern, quartzose beds of unit 17, where the hornblende schist is absent.

Unit 17 comprises an eastern heterogeneous part, a middle part of silver schist, and a thin western part of greywacke and hornblendic greywacke. The heterogeneous part consists in the south of siliceous greywacke and greywacke, hornblendic locally, and in the north of an alternation of greywacke with hornblende schist, quartzite, and silver schist. One prominent band in this last assemblage is of massive white calcareous quartzite, which weathers to a pitted, channelled surface. Most of unit 17 disappears at the former Black Diamond dump, but the greywacke has been doubtfully identified at the Maestro portal. Tourmaline occurs sporadically in units 17 and 19.

Unit 18 comprises, from east to west, white dolomite, nondescript limestones, carbonaceous limestones and quartzites, and calcareous quartzite. The white dolomite is the most distinctive unit seen in the Ainsworth mining camp. It is normally pure white, but contains pockets of cream-coloured fibrous tremolite near faults. It is a mere 9 feet thick just south of the Little Phil lower adit, but appears to thicken southward, possibly to 30 feet at the south end of the area. Fault H has cut it out from the Little Phil lower adit, and it has not been recognized in surface exposures northward. However, it is believed to be represented in the Maestro adit by a strongly tremolitized calcareous schist 30 feet from the portal. The nondescript limestones are variably quartzose, and range in colour from light grey to buff, orange, or reddish. The carbonaceous rocks exhibit considerable variation in texture and in the ratio of quartz to carbonate. Some parts are rather uniformly fine-grained and almost massive, whereas the remainder of the rock shows all gradations to a marked odd texture. In hand specimen this odd-textured rock appears to contain bits of charcoal, but in thin section these bits are seen to be quartz aggregates containing swirls of carbonaceous material and minor mica. The origin of this texture is not known. In parts of unit 13 there are vague suggestions that it may be organic, but in unit 18 there are indications that it may have arisen by wholesale granulation of the rock followed by recrystallization of carbonate as matrix to the bits.

Unit 19 is essentially fine-grained quartzite, but contains two narrow bands of hornblende schist, one of which forms the footwall of shear A and hence of the west vein. The eastern and western parts of the unit are mostly cream-banded.

In the Highlander adit, units 11 to 14 can be identified with assurance, and quartzite and hornblende schist at the west end of the adit resemble units 19 and 20, but the intervening rock does not correspond with the surface sequence. The parts of this assemblage that were shown in Figure 10 of the 1951 Annual Report as downward continuations of unit 15 have been shown by more careful study to differ distinctly from the surface exposures. They are markedly micaceous and contain an intercalation of limestone, whereas the remainder of the intervening rocks are alternating quartzite and hornblende schist and cannot conceivably grade up to units 17 and 18.

Thin sills of aplitic granite are common in unit 17, and the distribution of outcrops of this rock near the central part of the area suggests that a single body 100 feet wide may be present, as indicated in Figure 5. No granite has been identified in the corresponding part of the Highlander adit.

Barren white vein quartz outcrops at intervals along the west side of the Loon Creek fault. Very little is known about it, but it does not seem to bear any relation to mineralization.

Structural Geology.—Major folds have not been recognized in the Little Donald area, although dragfolds are common. Bedding and schistosity are parallel and dip west. Two large faults near opposite edges of the area define a central block which has been considerably broken up by smaller faults (*see* Fig. 6). The lack of match between rock sequences on either side of Loon Creek fault and between surface and underground demonstrates that there must be additional structural complications, but no simple set of explanations can be made to fit the available facts.

Most of the dragfolds have wave-lengths and amplitudes of a few inches, but at least three were seen with wave-lengths of 2 to 20 feet. These large dragfolds are all close to diagonal faults and appear to be a result of movement on them. The small dragfolds are of two types:—

(1) Strike-slip dragfolds plunging almost directly down the dip of the bedding and indicative of strong right-hand drag. They are restricted to beds close to the Bench and Loon Creek rifts.

(2) Dip-slip dragfolds plunging gently either north or south and variously indicating either up-dip or down-dip movement of the overlying bed.

No systematic pattern has been found in the distribution of either kind of dip-slip dragfold; therefore, it does not seem likely that they are related to otherwise unrecognized folding. Extensive contortion has occurred in the vicinity of the Little Phil and Maestro adits, where faulting is intense.

Most of the faults, both identified and inferred, are referable to four groups, which may have been initiated at somewhat different times. The twelve principal faults in and near the area have been given names or letter designations:—

(1) Bedding shears—faults A to C, possibly the Highlander shear.

(2) Longitudinal faults—Loon Creek and Bench faults.

(3) Diagonal faults—faults D to J.

(4) Water-bearing fractures—sharp, clean breaks, slickensided in part; most are in the Highlander adit.

The relative movement on the bedding shears is unknown. Faults A and B are occupied by the west and east veins respectively of the Black Diamond-Spokane vein system, and C is the shear along which the Little Mamie vein was introduced. It is significant that shear A follows the hangingwall of the hornblende schist band around its drag on the Bench fault. This would tend to suggest that the bedding shears are older than the longitudinal faults and were dragged on them. Possibly the growing shearing stresses were initially relieved in the Little Donald area by movement along certain of the weakest bedding planes. The carbonaceous, quartzose limestone in unit 18 and the contact between the strong, tough hornblende schist and the brittle quartzite might be expected to be especially weak.

The dip of the longitudinal faults is unknown, and the amount of displacement on the Loon Creek fault is uncertain. The strikes of these two faults are markedly parallel. Over most of the area they strike about 15 degrees to the left of the bedding, but north

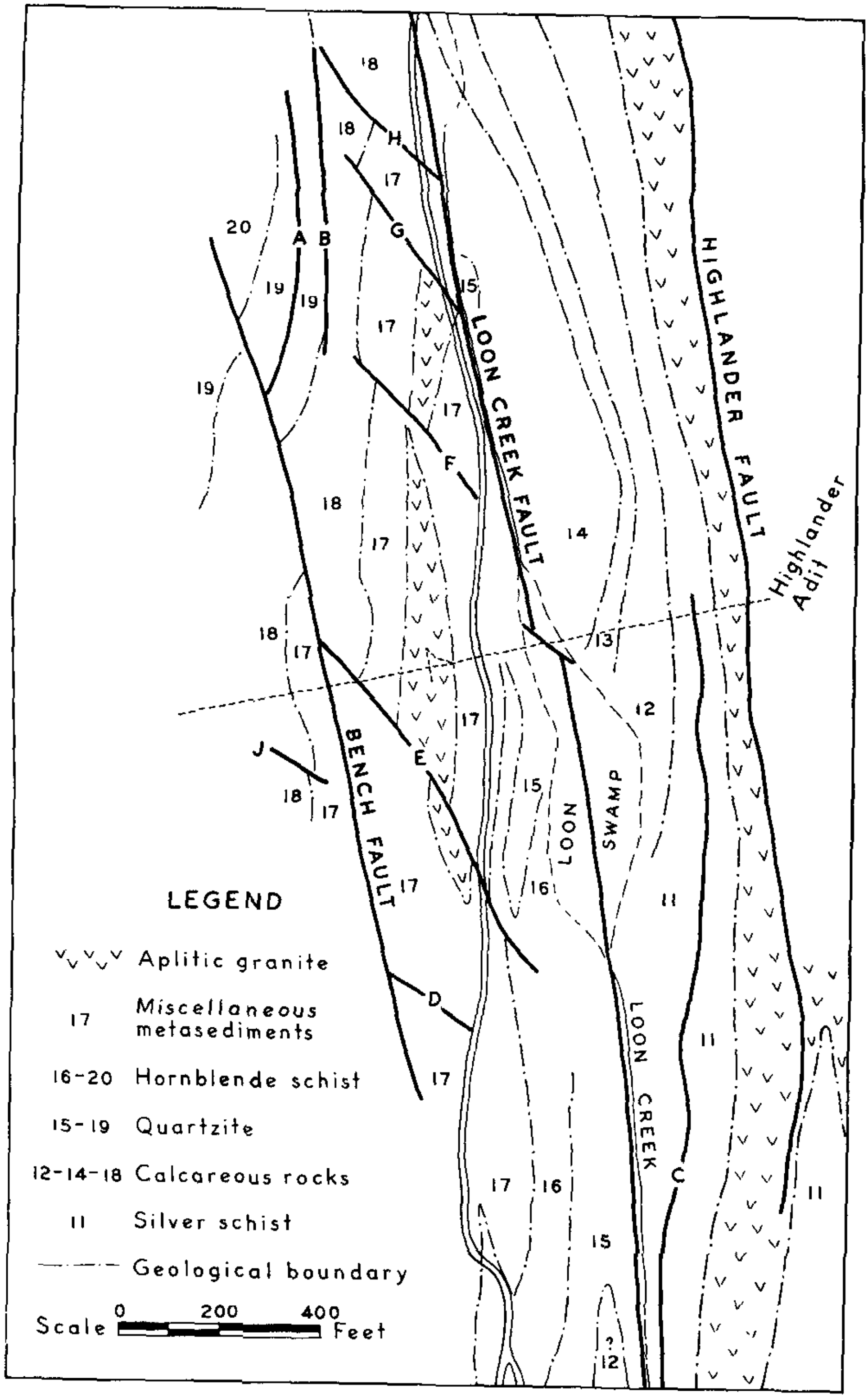


Figure 6. Structural plan of the Little Donald area.

of the area the bedding swings to parallelism. The Bench fault is named from its occurrence along a marked topographic bench, at about 3,000 feet elevation, which extends from the Black Diamond surface showings to the south end of the area. The fault trace apparently climbs northward to a shallow draw behind a shoulder of resistant rocks overlooking the Little Phil. It is nowhere exposed, but is evidenced by the right-hand displacement of unit 18 and by a profusion of strike-slip dragfolds in the outcrop 400 feet southwest of the Black Diamond portal. It has not been positively identified in the Highlander adit. The Loon Creek fault follows a shallow trench, which is occupied by Loon Creek and Loon Swamp through the Little Donald area and south to Loon Lake. Northward the trench extends at least to Munn Creek, and southward this lineament is marked by the straight western shore of Loon Lake. The fault is evidenced by a profusion of right-hand strike-slip dragfolds opposite the former Black Diamond dump and immediately west of Loon Swamp and by a marked curvature of bedding into the west side of it at several places.

The diagonal faults are so named because their traces are diagonal to the block between the longitudinal faults. Fault D dips 75 degrees southwest and is occupied by the Little Donald south vein. The direction and amount of movement are unknown, but the dislocation appears to be slight. Fault E dips 50 degrees southwest and contains the Little Donald main vein. It has at least three offshoots striking west-northwest and dipping steeply south; its displacement is not definitely known but appears to have a left-hand horizontal component. It is not clear whether fault E dies out east of the Bench fault, or whether one fault is displaced on the other. It cannot be identified in the Highlander adit. Fault F is not exposed, but is inferred from the observed right-hand displacement of silver schist and white dolomite. It does not reach shear A and may not cross shear B. Fault G is exposed as a sharp galena-bearing fracture in the cut of a path up to the Black Diamond portal. Greywacke and white dolomite appear to have been displaced by it to the right. Fault H is exposed in the Little Phil adit as a wide zone of brecciation, shearing, and general softening of the rock, containing pockets and lenses of ore minerals. The absence of the white dolomite from and the presence of an abnormally thick section of carbonaceous limestone in the adit are taken to indicate considerable left-hand displacement on this fault. A slight offset of the main lower drift at a short lagged section suggests that this fault may pass a few feet in front of the Little Phil upper portal and extend to shear A. No evidence of it can be seen near shear A on surface. Fault J is postulated to account for a small right-hand jog in exposures of the white dolomite west of the Bench fault.

The water-bearing fractures mostly strike parallel to the bedding, but some strike as much as 45 degrees to the right or left. The dip is usually more than 50 degrees, northwest to southwest. None show evidence of the amount of movement, and only two show clear indications of the direction of movement. One of these is a northwest-striking fracture 190 feet east of the dam in the Highlander adit, displaying slickensides that rake southeast, and indicate that the footwall (northeast side) moved up and northwest. The other is a northeast-striking fracture 220 feet west of the dam, where a contact between hornblende schist and quartzite has been displaced an unknown distance to the right.

There are numerous bedding shears and diagonal faults in the Maestro and Highlander adits that are not referable to any faults exposed on or inferred from surface. In addition, there are several strike faults dipping at various angles, both east and west. Any theory of the structure of the Little Donald area must account for the following:—

(1) Northward disappearance of the silver schist and of a considerable thickness of underlying heterogeneous rock and quartzite.

(2) Northward disappearance of unit 14 and southward disappearance of units 12 to 14 at Loon Swamp.

(3) Right-hand strike-slip movement on the Loon Creek fault.

(4) Presence of only one band of the white dolomite in the entire Little Donald-Highlander-Hot Springs area.
(5) Different rock sequences east and west of Loon Creek fault.
(6) The middle part of the section in the Highlander adit does not resemble the spatially equivalent section on surface.
(7) The Loon Creek fault does not appear underground at the west contact of unit 14.

Of a dozen possible alternative explanations, the least unsatisfactory is as follows: The Loon Creek fault has displaced the rocks 3,000 feet to the right. The white dolomite pinches northward and the overlying limestones are the southerly continuations of units 12 to 14. The underlying greywackes, silver schist, and quartzites are the southerly continuations of unit 11. The absence of the Loon Creek fault from the Highlander adit may be explained by the fault dipping less steeply than the bedding or by displacement across the adit on the slickensided fracture already referred to. No simple explanation can be offered for the absence of part of the sequence from the Highlander adit.

Economic Geology.—The principal mineralization is in the Black Diamond-Spokane and Little Donald vein systems. The Black Diamond-Little Phil-Spokane system has been described at some length in the Annual Report for 1952, and it will suffice here to mention a minor find made in the Little Phil lower adit in 1953. Slashing disclosed a pocket of galena-sphalerite mineralization in a brecciated section of the upper part of the carbonaceous limestone of unit 18, and a few tons of ore was mined from it. This would seem to be associated with shear B.

The Little Donald vein system consists of galena-sphalerite mineralization along faults D and E and their offshoots. A trench in fault D exposes about 3 inches of nearly massive lead-zinc sulphide in the hangingwall, but in the adit there is only very sparse mineralization in quartz and carbonates. The fault appears to constrict westward through the outcrop, but a more northerly striking offshoot contains 3 to 4 inches of massive galena where it traverses the outcrop. Aplitic granite is strongly sheared and contains disseminated sphalerite and galena for about 3 feet on either side of fault E. Only a short section of this mineralized part is now exposed. The presumed southeasterly continuation of the fault is filled with barren white vein quartz. Three west-northwest-striking offshoots have been exposed. A short adit has been driven on the most southerly offshoot, but it contains only 2 feet of vein quartz and altered granite, without visible mineralization. The middle offshoot was apparently followed by drifting from the fault; any mineralization is now hidden by caving. The north offshoot is exposed in a trench as 2 feet of vein quartz and carbonate with sparse galena.

The occurrence of a 1-inch veinlet of massive galena in the cut of a path up to the Black Diamond portal has been noted above. Sparse mineralization in a quartz vein at the north end of the road-cut outcrop of massive calcareous quartzite, southeast of the Black Diamond, has been noted in the Annual Report for 1952. Disseminated galena-sphalerite mineralization occurs in three newly exposed road-cut outcrops northeast of the Black Diamond. These exposures are located on Figure 5 at the attitude symbol with 10-degree dip.

[References: *Minister of Mines, B.C.*, Ann. Rept., 1951, p. 144; 1952, p. 156.]

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 crushing plant are above and the mill is below the Nelson–Kaslo Highway, about three-quarters of a mile south of Ainsworth. Steady production of slightly over 4,300 tons per month was maintained throughout 1953. About 75 per cent of the production came from the Highlander mine, and the remainder from other company mines and custom shippers.

The Highlander mine is serviced by the 2150, or main haulage, level. From this level raises extend to the 2600 adit level in the Albion section, and to the 2500 adit level in the Banker section. The ore shear dips 45 degrees west, and the orebody rakes north and has an average mining width of 7 feet. In the Albion section the orebody south of the raise was about mined out by the end of 1953, but a considerable tonnage remained in pillars which had to be left to support the weak hangingwall. The only development work was the driving in November of a crosscut from the south drift on 2150 level to investigate a parallel vein in the hangingwall. In the Banker section the 2300 sublevel was driven, and stoping started in the latter half of 1953 from this level and from the 2150 level. Further development in the Banker section was the driving of a raise from the 2500 level to connect with the bottom of the old Banker shaft workings.

At the Krao the old 75-degree shaft was rehabilitated and a small headframe erected. This shaft was sunk in the hangingwall of an orebody that follows the north-south striking limestone beds. There are short levels at 35 feet, 100 feet, and 200 feet. In 1953 stoping was done adjacent to the shaft above the 100 level. The stope north of the shaft was broken through to surface. This operation was under contract to three men, who produced up to 500 tons per month in the latter half of 1953.

At the Trinket a vein conformable with the quartzite and limestone bedding has been developed in the past by an adit crosscut and by drifts on the vein. In the latter half of 1953 the mine was rehabilitated and an ore-bin built near the portal. A contract crew of four men was engaged in stoping, with an objective of 500 tons per month. The vein, where this stoping was done, was about 5 feet wide and had a dip of 45 degrees. Pillars and stulls were required to support the hangingwall.

In November the McCune adit was rehabilitated preparatory to being placed on contract mining. This adit is a crosscut driven westward for 1,380 feet, and contains several hundred feet of drifts to north and south at 1,300 feet from the portal. Additional development work was planned near the face of the crosscut. Diamond drilling was done near the face of the south drift, with the object of exploring the Crow Fledgling vein at this horizon.

Work continued throughout the year at the Eden and Crescent, also on a contract basis. A vein about 5 feet wide and dipping 45 degrees west has been developed in the past by about 600 feet of adit crosscut and a raise on the vein to surface. As in 1952, stoping was done in the vicinity of the raise. A stope about 50 feet long was carried up with pillars left for support. Five men were employed. The production goal was 500 tons per month.

Other properties operating under contract were the Spokane, Jack Pot, Townsite, Black Diamond, and Little Phil. These were not active in the latter half of 1953. The Black Diamond was, however, leased to J. E. Hawes and G. Dobbs, who shipped 8 tons to the Trail smelter.

Total ore milled from all sources is tabulated as follows:—

		Tons
Highlander		38,570
Trinket	1,614	
Eden and Crescent	5,734	
Black Diamond and Little Phil	3,010	
Jack Pot	388	
Townsite	752	
Spokane	113	
Spokane dump	214	
United dump	271	
Krao	1,709	
		13,805
Total, Yale properties		52,375
Custom ore (concentrates shipped with Yale's)—		
Vigilant	770	
Moonstone (B.C. Metals Ltd.)	445	
Buckeye (Guichon Mine Limited)	450	
Lakeview	300	
		1,965
Custom ore (concentrates shipped separately)—		
Twin	212	
Highland	208	
		420
Total custom ore		2,385

Development: Raising, 215 feet; stope raising, 213 feet; crosscutting, 276 feet; drifting, 1,638 feet; diamond drilling, 114 feet. The number of Yale employees averaged sixty-five.

Spokane

This mine is owned by Yale Lead & Zinc Mines Limited. Company contract mining produced 113 tons, which was trucked to the Yale mill. In addition, 214 tons was milled from a stockpile of dump material. The property was idle for most of 1953, but there was also a shipment to the Trail smelter by lessees T. Hawes and S. McLellan.

Production: Ore shipped, 49 tons. Gross content: Silver, 879 oz.; lead, 55,666 lb.; zinc, 8,583 lb.

Kootenay Florence (Western Mines Limited)

Company office, 1768 East Hastings Street, Vancouver; mine office, Ainsworth. H. M. Wright, president; Hill and Hemsworth, consultant. Capital: 3,000,000 shares, $1 par value. This company acquired the Kootenay Florence property in 1951. The Crown-granted claims held are Laura M, Carter Fraction, Silver Fox, Jennie, Rand, Hope Fraction, Twin, Fergus, James R. Fraction, Noah, Snelling, Carey Fraction, Illinois, Florence Silver Fraction, Skylark, Sally Fraction, U.T.K. Fraction, Hoover Fraction, Giges Fraction, Lake View, Nicolet, Ainsworth, and Bat Fraction. There are ten located claims. The property covers an area of 2 by 1½ miles, extending westward from the mouth of Princess Creek. 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. Work was on a reduced scale throughout 1953. Diamond drilling was done in the No. 5 adit, and this work (six holes) indicated that the Florence vein was north of and parallel to the adit. The 506 crosscut, 640 feet from the portal, was extended 101 feet and intersected the vein at 95 feet. Where intersected, the vein is of the fissure type, striking across the limestone formation at north 70 degrees west. It has a steep dip to the south and is 8 feet wide. Drifting to east and west totalled 208 feet. All this work was timbered. It is reported that an oreshoot 70 to 80 feet long was developed with a grade of 5 per cent lead and 4 per cent zinc. About 1,000 tons of ore was obtained from this development and stored in one of the stopes above No. 9 level.

On the surface a new vein, the Turner, was discovered on the Carey Fraction claim. It is an east-west fissure dipping 58 to 75 degrees south and is as much as 42 inches wide. A total of 150 feet of trenching and stripping was done. Diamond drilling totalled 498 feet in three holes, two of which were reported to have intersected the vein. Additional detailed geological mapping was done on the Ainsworth formation from the south boundary of the property to the Florence vein. In addition, numerous old workings were explored. The number of men employed ranged from four to eight.

Leases were given on the Carey Fraction, Twin, and Lakeshore mines. A lease was also obtained by V. Ostir on the 502 stope in the Kootenay Florence. The latter lease produced 579 tons with gross content in concentrates: Silver, 793 oz.; lead, 51,574 lb.; zinc, 37,128 lb.

The mill operated until March 31st, treating custom and lessees' ores as follows: Nameless Fraction, 241 tons; Buckeye mine of Guichon Mine Limited, 457 tons; Carey Fraction lease, 389 tons; Twin lease, 97 tons; Lakeshore lease, 238 tons; Florence lease of V. Ostir, 579 tons.

Carey Fraction

This Crown-granted claim is part of the Western Mines holdings in the Ainsworth camp. It was leased by Messrs. Baker and Hansen, of Ainsworth, who mined ore from the same area as in 1952. The ore was sold to the lessor and milled at the Kootenay Florence mill. The work was done early in 1953.

During the summer Western Mines Limited carried out surface work on a new discovery; this work is described under " Kootenay Florence."

Production: Ore milled, 389 tons. Gross content in concentrates: Silver, 790 oz.; lead, 42,826 lb.; zinc, 41,584 lb.

Lakeshore

This old mine is part of Western Mines holdings in the Ainsworth camp. It was reopened in 1952. Early in 1953 M. Cretain worked a sublevel under lease. (Described in the 1952 Annual Report, p. 163, under " Kootenay Florence.") Ore obtained was sold to the lessor and milled at the Kootenay Florence mill.

Production: Ore milled, 238 tons. Gross content in concentrates: Silver, 363 oz.; lead, 21,694 lb.; zinc, 20,998 lb.

Twin

This Crown-granted claim is part of Western Mines holdings in the Ainsworth camp. It was leased by Messrs. Glasspoole and Hartland. Ore mined early in 1953 was sold to the lessor and milled at the Kootenay Florence mill, but when the mill closed in March the ore was then custom-milled at the Yale mill. No work was done in the latter half of 1953.

Production: Ore milled at Kootenay Florence mill, 97 tons. Gross content in concentrates: Silver, 192 oz.; lead, 10,560 lb.; zinc, 7,306 lb. Ore milled at Yale mill, 212 tons. Gross content in concentrates: Silver, 685 oz.; lead, 25,663 lb.; zinc, 12,068 lb.; cadmium, 48 lb.

Ayesha

This Crown-granted claim is part of the Logan McPhee group of claims on Cedar Creek. S. A. Liening, of 311 Douglas Street, Seattle, Wash., held an option on this group, which consists of six Crown-granted and three recorded claims. The Ayesha mine is reached by a 4-mile truck-road from the Kootenay Florence camp or by a 2½-mile jeep-road from Ainsworth. The property was idle until September, when underground work started under the direction of consulting engineer C. Rutherford. Two fissures have been developed in the past by shallow shafts and short adits, which did not reach the veins at depth. The Ayesha adit had been driven northwestward and contained a total of about 250 feet of drifting and crosscutting. Work in 1953 consisted of extending the adit northward to a distance of 380 feet from the portal. Narrow veins were intersected at 190 and 340 feet from the portal. On the second vein, 90 feet of drifting was done and a raise was started to surface from this drift. The only machinery on site was a small portable compressor. The crew was transported daily from Kaslo. C. Lind was in charge of the work, with three men employed.

In December, Triumph Mines Limited (company office, 355 Burrard Street, Vancouver) acquired the property.

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, and were under lease to F. Dumas, of Ainsworth; E. Meyer, of Ainsworth; and S. McLellan, of Kaslo. Messrs. Dumas and Meyer made respective shipments to the Trail smelter of 14 and 63 tons, while Mr. McLellan's ore was milled at the Yale concentrator.

Production: Ore shipped, 77 tons. Gross content: Silver, 2,088 oz.; lead, 75,921 lb.; zinc, 5,324 lb. Ore milled: 208 tons. Gross content in concentrates: Silver, 460 oz.; lead, 25,346 lb.; zinc, 3,295 lb.

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 mine, 3½ miles by road from the Kootenay Florence camp. The mine consists of an adit containing about 400 feet of drifting and crosscutting and a raise-shaft connection to surface 110 feet above. At 40 feet below the surface a short sublevel has been driven on a narrow fissure vein. Replacement of the intersected limestone beds provided a mining width of about 15 feet into the hangingwall. During January lead-zinc ore was mined from this section and milled at the Kootenay Florence mill. Except for some diamond drilling in the adit, the property was then idle until the summer months. Mining was then done by Kootenay Mining Services, of Ainsworth. Two men, working under the direction of H. D. Forman, removed ore which was milled at the Yale mill.

Production: Ore milled at Kootenay Florence mill, 457 tons. Gross content in concentrates: Silver, 897 oz.; lead, 41,798 lb.; zinc, 53,268 lb. Ore milled at Yale mill, 450 tons.

Woodbury Creek

Daisy Bell, Budwiser No. 2, Amazon (Woodbury Mines Limited)

(49° 116° N.W.) Company office, 850 West Hastings Street, Vancouver. H. D. Forman, consulting engineer. Capital, 3,000,000 shares, 50 cents par value. This company owns a group of claims extending from the shore of Kootenay Lake west of Woodbury Creek and south of Lendrum Creek. Late in 1952 an adit was started on the south bank of Woodbury Creek, just above the Nelson–Kaslo Highway. It was driven westward for 230 feet and then turned to follow the direction of Woodbury Creek until it was advancing in a northerly direction. At 400 feet from the portal a break-through was made to the canyon of Woodbury Creek. All work ceased early in 1953, with 830 feet of a proposed 1,200 feet having been completed. The work was contracted by Kootenay Mining Services, of Ainsworth, with W. Hogg in charge.

Woodbury (Nameless)

(49° 116° N.W.) The Nameless Fraction, which has been under lease to C. A. McLeish and W. McCulloch, both of Kaslo, is part of the Woodbury group of claims owned by Dr. L. D. Besecker, of Ainsworth. This group is near the mouth of Woodbury Creek and extends northwest from the shore of Kootenay Lake. The Nameless workings are below the Nelson–Kaslo Highway at the base of a precipitous bluff and just above high-water mark of the lake. Ore was removed by underhand stoping on the " B " vein. This stope is serviced by a 25-degree, 120-foot incline which starts just inside the portal of " B " adit. The ore mined in 1953 came from a sublevel at the bottom of the incline. Some sorting was done to provide higher-grade ore to be trucked to the Kootenay Florence mill, while the lower-grade ore was stockpiled for the Can-Amer custom mill which was being erected near by. All underground work ceased in March and the mine was allowed to flood.

Production: Ore milled at Kootenay Florence mill, 241 tons. Gross content in concentrates: Silver, 554 oz.; lead, 42,898 lb.; zinc, 26,510 lb. Ore milled at Can-Amer mill, 250 tons. Gross content in concentrates: Silver, 233 oz.; lead, 25,735 lb.; zinc, 2,659 lb.

Vigilant

(49° 116° N.W.) This claim is owned by J. A. Cooper, of Kaslo. The workings are on the east bank of Woodbury Creek, about one-half mile by road from the Nelson–Kaslo Highway. An easterly striking fissure vein is developed by two adits 100 feet apart vertically. No underground work was done in 1953. A short access road was made below the upper portal, and dump material was trucked to the Yale mill.

Production: Ore milled, 812 tons. Gross content in concentrates: Silver, 1,292 oz.; lead, 86,315 lb.; zinc, 46,323 lb.

Can-Amer Mining & Milling Company Ltd.

(49° 116° N.W.) Company office, 609 Baker Street, Nelson. G. Forsythe, Richland, Wash., president; S. D. Wheeler, Kennewick, Wash., manager; G. Green, Ainsworth, mill superintendent. Capital: 200 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. Construction started in November, 1952, and the mill was completed late in 1953. The main items in the mill were three 200-ton coarse-ore bins, 9- by 15-inch Wheeling jaw crusher, Kue-Ken size 20 balanced crusher, 6-foot by 22-inch Hardinge ball mill, Aikens 54-inch spiral classifier, two banks of six flotation cells, and two thickeners. Power was supplied by Caterpillar and Cummins diesel motors, each of 125 horsepower. The plant buildings were roofed with a unique stress-skin corrugated-steel arch which required no interior supports. Milling started in November, but the only custom ore obtained was from the Nameless and Caledonia mines. This amounted to 250 and 260 tons respectively.

Scranton (Scranton Mines Limited)

(49° 117° N.E.) Company office, 1519 Marine Building, 355 Burrard Street, Vancouver. H. L. Jestley, president; C. J. Bailer, general manager. 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.

During the first half of 1953 underground operations were continued in the Pontiac workings. In the lower adit a vein, dipping about 18 degrees, has been mined by overhand and underhand stoping in an area 160 to 300 feet from the portal. At 200 feet from the portal a winze was sunk 90 feet on the vein, and a sublevel established at 75 feet. About 145 feet of drifting was done on this sublevel, and stoping was carried through to the underhand stope above. All ore obtained was trucked to the Kenville mill.

In the latter half of 1953 underground work was suspended in favour of a surface diamond-drilling programme on the Sunset ground. A trail 2 miles long was built to the drill sites from the Scranton camp. About 1,800 feet of drilling was completed before winter conditions forced a shut-down in December. The number of men employed reached a high of eighteen under J. Scott during the mining programme, but only three were employed under W. M. Sharp for the drilling programme.

Kootenay Florence mine camp, north of Ainsworth.

Three Forks, Slocan.

Production: Ore milled, 1,418 tons. Gross content in concentrates: Gold, 326 oz.; silver, 12,010 oz.; lead, 245,347 lb.; zinc, 197,895 lb.; cadmium, 3,877 lb.

Baltimore (Victoria Mines Limited)

(49° 117° N.E.) Company office, 510 MacLean Block, Calgary, Alta. C. K. Hansen, manager. This company controls the Baltimore group of claims situated on the southern slope of Woodbury Mountain east of Silver Spray Creek. The property is reached by a steep newly constructed road 3 miles long, which leaves the Scranton road at a point 9 miles from the Nelson–Kaslo Highway. Most of the underground work was done prior to 1907. A quartz vein, striking east-west and dipping 63 to 77 degrees north, has been developed by five adits between elevations of 6,000 and 6,500 feet. The country rock is granodiorite, but sediments, principally quartzite, were observed along one short section of the vein. Most of the past work has been in the upper three adits, which are largely inaccessible. Stopes have been carried through to surface. Nos. 4 and 5 adits are drifts on the vein less than 10 feet long. No. 5 adit is 300 feet lower and 500 feet west of the upper workings. The vein has been explored by trenches between No. 3 and No. 4 adits and between No. 4 and No. 5 adits, but the mineralization so exposed was negligible. Just above the No. 5 adit the vein was 10 inches wide and contained quartz, galena, and a suspected silver mineral. A sample taken here assayed: Gold, 0.02 oz. per ton; silver, 102.0 oz. per ton; lead, 1.8 per cent.

In September the road was completed to a camp-site on Silver Spray Creek at 5,800 feet elevation. Three buildings were erected. At the No. 5 adit a portable compressor was set up, the portal was retimbered, and drifting started. By December, 150 feet of drifting had been completed. The number employed averaged eight.

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. Capital: 3,000,000 shares, no par value. The property is on Keen Creek, about 10 miles by road from Kaslo. The main level is the No. 3 adit, connected by raise to the No. 1 adit above and by a 70-degree winze to Nos. 4, 5, and 6 levels below. A new vertical interior shaft, started in 1952, was completed in 1953 to a total distance of 555 feet below No. 3 level. Considerable difficulty was experienced in sinking the shaft because of the large flows of water encountered. Crosscut connections were made to Nos. 5 and 6 levels, and new levels, Nos. 7 and 8, were established 100 and 200 feet respectively below No. 6 level. These new levels required crosscuts, each about 200 feet long, to reach the vein shear. The vein on No. 8 level was followed by a drift for 100 feet, and a raise was driven to No. 7 level. On No. 7 level 140 feet of drifting was done and a stope prepared. A raise was also driven to No. 6 level. The vein on the new levels appeared to contain ore of average mine grade, but not sufficient work was done to determine the extent of the ore or to ascertain if there was a parallel shear or split such as occurs vertically above on Nos. 6 and 5 levels.

Production was maintained at an average of 2,700 tons per month. All concentrates were shipped to the Trail smelter. The ore came from stopes on Nos. 5 and 6 levels and from development headings. Shrinkage stoping was done and no filling was required, except in the 604 stope. This stope was mined 20 feet wide and had to be filled to protect the parallel 606 stope. By November low metal prices had forced closure of the mine. All broken ore was drawn and the mine allowed to flood. The number of men employed averaged fifty-seven.

* By J. W. Peck.

Silver Bear (Abacot Mines Limited) (49° 117° N.E.) Head office, Calgary, Alta.; company office, 373 Baker Street, Nelson. W. Belzberg, president; S. Hallgren, managing director. Capital: 250,000 shares, no par value. This company was formed in 1953 to develop the Silver Bear and Broughton Crown-granted claims on the lower southeast side of Keen Creek, 14 miles by road from Kaslo. Work in 1953 was restricted to rehabilitating the lowest level and the main raise to the upper workings. A compressor-house was built on surface.

Flint (49° 117° N.E.) The Flint mine is at the head of Dago Creek, a southeasterly flowing tributary of Keen Creek. It is owned by L. H. MacPherson and J. L. MacPherson, of Kaslo. A trail about 3½ miles long extends to the property from a point on the Keen Creek road a short distance below the Cork Province mine. The Flint lode has been developed in the past by about 1,500 feet of drifting and crosscutting in three adits. In 1953 a new bridge was built across Keen Creek and the trail widened so that a narrow-gauge tractor could be used on it. L. H. MacPherson and J. R. Stravens made two shipments to the Trail smelter.

Production: Ore shipped, 9.6 tons. Gross content: Silver, 220 oz.; lead, 3,955 lb.; zinc, 3,991 lb.

PADDY PEAK*

Silver-Lead-Zinc

Utica (49° 117° N.E.) The Utica mine is at the head of Twelve Mile Creek, about 15 miles by road from Kaslo. It is owned by Utica Mines (1937) Limited, but a lease was obtained in 1953 by J. A. Cooper, of Kaslo. The mine had been idle since October, 1950. The main level is the No. 7 adit, which is connected by a raise to the No. 4 adit. A sublevel, the No. 5, has been driven from the raise to follow two parallel veins known as the East and West veins. On No. 5 level a stope was made by the former company on the East vein, which contained in this section a 1- to 6-inch width of galena. J. A. Cooper, with two men, did some underhand stoping below this stope. Horse haulage was used on No. 7 level. Air for drilling was supplied by the old water-driven compressor. Ore obtained was trucked to the Trail smelter. The lessees used the cook-house as living-quarters, as this was the only building not damaged by previous accumulations of snow.

RETALLACK-THREE FORKS*

Silver-Lead-Zinc

Caledonia (50° 117° S.E.) The Caledonia mine is east of Rossiter Creek, a southerly flowing tributary of Kaslo Creek. A short access road leads to the workings from Blaylock. The property is owned by G. E. McCready, of Retallack. An east-west fissure zone with a steep southerly dip has been developed by surface workings and two adits. The upper adit is a drift on the zone for 290 feet. At 100 feet from the portal a short section was mined up 20 feet and down 12 feet. It was from this stope that ore was produced in 1952 and milled at the Kenville mill. The portal of the lower adit is 240 feet southwest and nearly 100 feet below the upper portal. The lower adit is a crosscut driven northwest for 155 feet, intersecting the fissure at 140 feet from the portal. Drifting extends 100 feet east and 220 feet west. There is a raise to surface just east of the crosscut. In the east drift, between 170 and 200 feet from the crosscut, the fissure zone is well mineralized with sphalerite and galena over an average width of 4 feet. During 1953 a stope was carried up about 25 feet in this area, which is under the previously stoped area in the upper adit. Mining was done by the owner and later by lessees J. B. Jordon and E. H. Dowker.

* By J. W. Peck.

Shipments were made to the Can-Amer custom mill. Some sorted ore was trucked to the Trail smelter. Air for drilling was supplied by a Le Roi 105-cubic-foot-per-minute compressor.

Production: Ore milled, 259 tons, but concentrates not sold in 1953. Ore shipped, 6 tons. Gross content: Silver, 297 oz.; lead, 6,509 lb.; zinc, 970 lb.
Ore shipped, 6 tons. Gross content: Silver, 297 oz.; lead, 6,509 lb.; zinc, 970 lb.

[Reference: *B.C. Dept. of Mines*, Bull. 22, p. 31.]

Whitewater (Kootenay Belle Gold Mines Limited)

(50° 117° S.E.) Company office, 475 Howe Street, Vancouver. Capital: 3,000,000 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. Operations were suspended in December, 1952, and soon afterwards all assets of Kootenay Belle Gold Mines Limited were taken over by Canada Trust Company. D. A. Sloan, the former mine superintendent, was empowered to complete a diamond-drilling programme laid out by the former company. Five holes were drilled below the No. 14 or lowest level, with interesting results reported. A lease was given to D. A. Sloan and P. Gilchrist, who mined 355 tons from the 1300 level. From May to September, lessees F. Garrett, J. Turner, and E. Garrett mined 460 tons from No. 9 level. The Whitewater mill was used to mill the ore from both leases.

Lucky Jim (Zincton Unit, Sheep Creek Gold Mines Limited)

(50° 117° S.E.) Company office, K.W.C. Block, Nelson. H. E. Doelle, managing director; J. S. McIntosh, general superintendent. Capital: 2,000,000 shares, 50 cents par value. Full production was maintained during the early part of 1953. Most of the ore came from the 1000 level, with small amounts from the 850, 750, and 100 levels. The average grade of ore was 6 per cent zinc and less than 1 per cent lead. The zinc and lead concentrates were shipped respectively to smelters at Black Eagle and East Helena. Low metal prices forced closure of the property in July. Most of the power units and considerable mill equipment were removed for use at the company's Mineral King property. In March eighty-eight men were employed.

SANDON*

Silver-Lead-Zinc

Silversmith, Richmond-Eureka (Carnegie Mines of British Columbia, Ltd.)

(49° 117° N.E.) Head office, 276 St. James Street, Montreal; mine office, Sandon. T. R. Buckham, mine manager; D. Edwards, mine superintendent; W. H. McLeod, mill superintendent. Capital: 3,000,000 shares, no par value. This company owns the Silversmith, Slocan Star, Richmond-Eureka, Ruth Hope, and Slocan King mines on Sandon Creek, south of Sandon. The new mill, erected in 1952, is on the western outskirts of Sandon. A truck-road extends from the mill to all mines.

The Slocan Star produced about 75 tons per day throughout most of 1953. This ore came from stopes on Nos. 3, 4, and 5 levels, but by the end of the year most of the easily available ore had been mined. Shrinkage and open-stope methods were used, but difficulty was experienced in supporting the hangingwall. Roof bolting was used with some success.

The Richmond-Eureka produced about 70 tons per day except during March and April, when travel to the mine was suspended because of the danger from snowslides. Stoping was done between Nos. 6 and 5 levels in much the same area as in 1952.

The old Slocan King adit was rehabilitated. This adit, at 4,580 feet elevation, is 260 feet below No. 6 adit of the Richmond-Eureka and explores the same lode. The

* By J. W. Peck.

adit was reopened with some difficulty because oxygen-deficient air was encountered. At about 2,000 feet from the portal a raise, 350 feet long, was driven to connect with the No. 6 level of the Richmond-Eureka. A sublevel was established 100 feet below the break-through, and 120 feet of drifting was done. The last 20 feet of drifting was reported to be in ore. Fifty feet of exploratory raising was done in this section. On the surface, diamond drilling, amounting to 1,635 feet in five holes, was done on the Morning Sun claim below the Slocan King adit.

In the Ruth Hope the No. 5 level drive was suspended, with about 100 feet remaining to connect with the No. 10 level of the Silversmith.

No mining was done in the Silversmith, but ore mined in 1952 and stockpiled on the No. 10 dump was milled in 1953.

The mill operated continuously at about 140 tons per day until November, when milling ceased due to low metal prices. The ore milled averaged 2 to 3 ounces of silver per ton, 6 per cent zinc, and less than 1 per cent lead. The zinc concentrate was shipped to smelters at Trail and Great Falls. The lead concentrate went to the East Helena smelter.

Noble Five, American Boy, Deadman (Cody Reco Mines Limited)

(49° 117° N.E.) Head office, 721 Eastern Avenue, Toronto. James A. Taylor, president; D. M. Kline, consultant; W. J. Bull, manager. Capital: 3,000,000 shares, $1 par value. 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, American Boy, and Deadman. A new mill was built at Cody in 1952 but operated only briefly in that year and not at all in 1953. The main camp is at Cody, but living accommodation is also provided near the lower portal of the Noble Five. A newly completed road system extends from the mill to all the chief workings, ending at the American Boy at over 6,000 feet elevation.

In the Noble Five mine a raise connection was made on the Noble Five vein from Nos. 18 to 16 levels. Drifting was done on this vein on No. 16 level. On the No. 18 level the Spur vein was investigated by some stoping. At the American Boy the No. 9 adit was reopened and some drifting done. Similar work was done in the No. 4 adit of the Deadman. About fifteen men were employed.

Bluebird (Bluebird Slocan Mines Limited)

(49° 117° N.E.) Company office, 850 West Hastings Street, Vancouver. 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 main claims in the group are the Bluebird, Stranger, Rawdon, Idaho No. 2, and Grey Copper. Work during 1951 and 1952 was in the Idaho No. 2 adit at 6,250 feet elevation. Work in 1953 was in the Grey Copper No. 3 adit at 5,965 feet elevation. A camp consisting of two prefabricated buildings was built near the latter adit, just off the road built by Cody Reco Mines Limited from Cody to the American Boy. The No. 3 adit extends northeastward for 650 feet exploring a narrow zincy lode. At 250 feet from the portal there is a raise to the inaccessible No. 2 adit, 60 feet above. Near the face of the adit a drive was started to the northeast, but only 150 feet of a proposed 540 feet had been completed when all work ceased in April. All machinery was removed from the property in November.

Vulture (Slocan Lode Mines Limited)

(49° 117° N.E.) Company office, 502, 751 Granville Street, 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. The property was idle throughout most of 1953. A small shipment of sorted ore was made to the Trail smelter by W. Kinhincki.

Production: Ore shipped, 1.6 tons. Gross content: Silver, 112 oz.; lead, 1,815 lb.; zinc, 460 lb.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1952, p. 175.]

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 southwest of Sandon, including the Wonderful. A mineralized lode, discovered in 1951 in the Wonderful No. 2 adit, was explored in 1952 by a new No. 3 adit and a raise between the two levels. No. 4 adit was started in 1952 and continued in 1953. At about 1,000 feet from the portal a lode was intersected in the approximate projected position of the lode exposed in No. 3 adit. The lode, where intersected, was 30 inches wide but sparsely mineralized. It was further explored by drifting and diamond drilling, but the results of this work are not known. Other development work was the driving of short crosscuts from the footwall of the raise between Nos. 3 and 2 levels to intersect the lode which had been lost when the raise was driven. W. H. Holmes, and later J. R. Kenney, Jr., was in charge of this work, with an average of six men 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 or 2½ miles by road southeast of Three Forks. The nearly vertical Victor vein has been developed by several adits, but production by the present company has been through adits Nos. 4, 5, and 7. The vein ranges from a crack to as much as 6 feet wide. Clean galena is noticeable in many sections; in others the vein matter is sphalerite, pyrite, siderite, calcite, and quartz as well as galena. The ground is heavy and requires close timbering. Much of the known ore has been removed above No. 5 level, and about 85 per cent of the 1953 production came from stopes on No. 7 level. The No. 7 level is the best level to date, with a more than 700-foot length of developed ore. Production of over 2,000 tons per month was maintained throughout 1953. The ore had an average grade of 22 ounces of silver per ton, 8 per cent zinc, and 16 per cent lead. The clean galena was hand-sorted and shipped to the Trail smelter, but most of the ore was trucked to the Western Exploration mill at Silverton. The zinc concentrates went to the Black Eagle smelter, and the lead concentrates went to the smelters at Trail and East Helena.

The main development was the starting of a new low level. No. 9 adit was collared on the Cinderella claim, 530 feet east of and 235 feet lower than the No. 7 portal. By the end of 1953, 1,250 feet of a proposed 1,800 feet had been driven. At the portal a large service building was erected, complete with the necessary power units. The small mill at the portal of No. 7 adit did not operate. The number of men employed averaged fifty-six. An excellent safety record was maintained; the safety trophy of the West Kootenay Mine Safety Association was won in 1952 and again in 1953.

Ore was milled on a custom basis at the Western Exploration mill at Silverton.

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 No. 4 adit, started in 1951, has been driven in a northwesterly direction to investigate the downward continuation of the Lone Bachelor vein, reported to be exposed in the inaccessible No. 3 adit. The adit was advanced to a length of 950 feet from the portal, but no strong vein was encountered at the projected location. Four veins (numbered 1 to 4) were intersected at 380, 465, 525, and 765 feet respectively from the portal. Drifting was done east and west on No. 2 vein and west on No. 4 vein, but no worthwhile mineralization was found. A diamond-drilling programme followed. A raise was then driven and a sublevel established 75 feet above the adit. Additional diamond drilling found the No. 3 level, and a raise was driven from the sublevel to connect with it. About 100 tons of ore was salvaged from the work in 1953. A compressed-air locomotive was used for haulage on No. 4 level. Three men were employed.

Min, Cork (Mincor Mines Limited) (49° 117° N.E.) Company office, suite 215 Pemberton Building, 744 West Hastings Street, Vancouver. George Schuster, president; A. Lakes, managing director. Capital: 2,000,000 shares, 50 cents par value. This company was formed in 1953 to develop the Min and Cork claims, which are south of the Monitor mine and adjacent to Violamac ground. During June and July a Nelson contractor, R. Golac, was engaged to extend the upper Min adit. This adit is at an elevation of 3,600 feet and is reached by a half-mile of road from the new Violamac mine road at a point 1.2 miles from the Three Forks–Sandon road. It is reported that 173 feet of drifting was done, to make the adit 453 feet long. The number of men employed averaged five.

Discovery Fraction (49° 117° N.E.) This is a located claim near the summit of Mount Payne, north of Sandon. It is owned by E. H. Petersen, of Sandon, who made a small shipment to the Trail smelter. Production: Ore shipped, 6.2 tons. Gross content: Silver, 584 oz.; lead, 6,908 lb.; zinc, 707 lb.

SLOCAN LAKE*

Silver-Lead-Zinc

Bosun (New Santiago Mines Limited) (49° 117° N.E.) Company office, Suite 4, 423 Hamilton Street, Vancouver. 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 No. 6 or main haulage level is driven beneath the highway from a site 40 feet above the lake. In the winze zone a raise was driven on the vein from No. 7 to No. 6 level from a point about 200 feet east of the winze. From the raise two intermediate levels were driven 30 and 70 feet above No. 7 level. These were driven 20 feet west and 35 feet east respectively. About 3 tons of zincy ore was obtained from the west intermediate but was not shipped. In the centre zone of the mine a crosscut was extended about 100 feet to investigate old diamond-drill intersections. Three men were employed in this work. The mine was inactive during the latter half of 1953, and the winze was allowed to flood.

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, Monarch, 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 2-mile road from the Standard camp and by a 16,000-foot aerial tram to the mill at Silverton. Operations ceased late in 1952, and the mine was idle during 1953.

Monarch.—The Monarch adit is alongside the Standard–Mammoth road, 900 feet west of the Mammoth mine. It is a crosscut for 570 feet and crossed the Mammoth lode at 490 feet from the portal. The lode was unmineralized, but a westerly drift, 760 feet long, was driven in 1952 in the hangingwall of the lode. This work started again in May, 1953, and the drift was advanced to a distance about 2,300 feet from the main

* By J. W. Peck.

crosscut. Short crosscuts were driven every 200 feet to intersect the lode. About 1,000 feet from the main crosscut the lode turned from north 75 degrees west to south 70 degrees west. The lode was mineralized west of the turn but not east of it. Diamond drilling of the western section was in progress at the end of 1953.

Standard.—This mine was operated by lessees during 1953. J. Kelly and R. Welch mined and shipped 21 tons. W. Nelson and W. Brown obtained 4 tons from the 704 stope. Messrs. Nelson and Chmelar also mined 7 tons from the same area. C. E. Towgood and J. Nesbitt rehabilitated the No. 2 adit and found some zincy ore in the wall of an old stope about 100 feet inside the portal. A short access road was built to the No. 2 portal, and an ore-bin constructed. Air-lines were extended from the Western Exploration air-supply at the Standard camp. Several truckloads of ore were taken to the Western Exploration mill at Silverton and stored there for possible milling in 1954.

Enterprise.—O. Meurling and E. Meyers operated a lease from May, 1953. Twenty-seven tons of ore was mined and shipped to the Trail smelter; all but 4 tons came from the 701 stope.

Standard Mill.—The mill at Silverton operated throughout 1953, handling Violamac ore on a custom basis at a rate of over 2,000 tons per month. The number of men employed by the company averaged seven underground and twenty-five on the surface.

Fisher Maiden

(49° 117° N.E.) The Fisher Maiden property consists of the Troy and St. Helena Crown-granted claims on the north side of Silverton Creek, 8 miles by road from Silverton. It is owned by F. S. Mills and S. Dewis, both of Silverton, but was optioned in the latter part of 1953 to Violamac Mines (B.C.) Limited. The lowest adit is 30 feet above Silverton Creek and was reported to be 800 feet long. In 1953 it was rehabilitated, and the face was reached at 1,330 feet from the portal. Considerable repair work was done on the last 3 miles of road. Two men were engaged in this work under F. S. Mills.

Van Roi

(49° 117° N. E.) The Van Roi mine and camp is 6½ miles by road southeast of Silverton. It is owned by Van Roi Consolidated Mines Ltd. (company office, 532 Burrard Street, Vancouver) but was under lease in the latter half of 1953 to A. Day and M. Slobodzian. On No. 3 level, in the southwest end of the workings, underhand mining was done below the 346 stope, which was considered mined out in 1952. The best ore was sorted out and removed via the No. 3 adit, while the lower-grade ore was stored in the main ore-pass to No. 5 level to await economic milling facilities. Air for mining purposes was supplied by a portable compressor set up at the No. 3 portal.

At the mine camp all machinery, the main haulage track (No. 5 level), and plumbing, heating, and light fixtures have been removed and sold. The buildings are intact and in good condition.

Production: Ore shipped, 6 tons. Gross content: Silver, 256 oz.; lead, 6,765 lb.; zinc, 1,031 lb.

Galena Farm

(49° 117° N.E.) This mine is about 2 miles by road south of Silverton. It was under option throughout most of 1953 to Hardex Mines Limited, of Noranda, Que. The main adit is the 150 level, but there is an inaccessible shaft which bottoms on the 200 level. Diamond drilling was done in the main adit at a location 165 feet past the Noonday lode, 720 feet from the portal. One hole, 389 feet long, was put down to explore ground ahead of the 200 level. Core recovery was poor, and the hole had to be cemented. Results were reported as negative.

Frank S. Mills and W. D. Pengelly, both of Silverton, made a small shipment under lease to the Trail smelter.

Production: Ore shipped, 3 tons. Gross content: Silver, 144 oz.; lead, 2,759 lb.; zinc, 917 lb.

SPRINGER CREEK*

Silver

Ottawa (Hardex Mines Limited) (49° 117° N.E.) Company office, 1408, 675 West Hastings Street, Vancouver; mine office, Slocan City; P. Harrison, Noranda, Que., president. Capital: 5,000 shares, $10 par value. This company, formerly known as Harrison Drilling & Exploration Co. Ltd., has under option the Ottawa mine, which is north of Springer Creek, about 5 miles by road from Slocan City. Work in recent years has been in the lowest, or No. 6, adit, which is at an elevation of 4,428 feet. The adit is a crosscut for 1,600 feet, from the end of which a quartz vein has been followed for more than 500 feet. Stopes numbered A to D have been carried up the 25-degree dip in the best sections, but no connection has been made to No. 5 adit level (elevation, 4,170 feet). In the early part of 1953 the drift was extended a total of 500 feet past "D" stope with the object of finding another mineralized zone of fissuring in the granite. Diamond drilling was done from this drift, but the results are not known. The Morris drive to surface on No. 6 level, started in 1952, was not completed, and the winze below "B" stope was stopped at a depth of 40 feet. A small amount of stoping was done early in 1953. The property was idle during the summer, but diamond drilling was started in November.

On the surface the compressor-house was completely destroyed by fire on February 25th, but portable compressors were then used. During the early programme fifteen men were employed under G. E. Smith.

Production: Ore shipped, 76 tons. Gross content: Silver, 11,341 oz.; lead, 569 lb.; zinc, 261 lb.

LOWER ARROW LAKE*

Silver-Lead-Zinc-Tungsten

Renata (49° 118° 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 south of Renata. The claims are adjacent to the old Mountain Chief property and cover ground that was at one time held as the Peggy and Rickward claims. The workings consist of several open-cuts exposing metamorphosed limestone intruded by granite. The main open-cut at the north end of the workings was deepened and extended a length of 60 feet in 1953. The first 10 feet of this open-cut exposed skarn lying in a small granite trough. A sample taken across 2½ feet of this skarn assayed 0.2 per cent tungstic oxide. At 25 feet there is a 1-foot band of skarn adjacent to granite. A sample taken here assayed 0.2 per cent tungstic oxide. From this point to the face of the cut, limestone was exposed containing traces of scheelite seen under the ultraviolet lamp. The other open-cuts, south of the main cut, show mostly limestone and would have to be deepened to reach the granite.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1952, p. 181.]

NORTH LARDEAU†

Silver-Lead-Zinc

Spider (Sunshine Lardeau Mines Limited) (50° 117° N.W.) Company office, 525 West Pender Street, Vancouver; mine office, Camborne. H. E. Holcombe, president; Percy L. Clark was replaced by D. R. Wilson as manager late in the year; C. Blaney, mill superintendent. Capital: 3,000,000 shares, no par value. An agreement was made in 1952 whereby Berens River Mines Limited assumed control. The mine camp and mill are at Camborne, and the mine is on Pool Creek, 2 miles distant by very steep road. The main development was the driving of a new adit, No. 10, 240 feet below No. 8 adit and about 100 feet

* By J. W. Peck.

† By J. W. Peck, except as noted.

above Pool Creek. The western vein zone was encountered at 540 feet from the portal, and 560 feet of drifting was done. In most of this drift the vein was of drift width. Mineralization was mine average except for a barren section, 100 feet long, at the end of the drift. A crosscut was driven into the hangingwall for 130 feet for diamond-drilling purposes. On the No. 8 level, drifting on the vein exposed an oreshoot about 350 feet long. A raise was driven to No. 6 level, and a sublevel, No. 7 level, established about half-way. Drifting on No. 7 level amounted to about 190 feet. Ore was produced from stopes on No. 8 level and from development headings. Some oxidized high-grade ore was obtained from the 643 stope on No. 6 level. This was sacked and shipped direct to the smelter.

On the surface a large ore-bin was built at No. 10 portal. There was considerable difficulty in maintaining transport of ore to the mill because of road conditions. Production ranged from a low of 550 to a high of 2,000 tons per month. Some lead and zinc concentrates were shipped to Trail and some to smelters at Kellogg, Idaho, and Black Eagle, Mont., respectively. The number of men employed averaged sixty.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1952, pp. 182–183.]

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. This property is on the north slope of Trout Mountain, due west of the settlement of Trout Lake. Figure 7 accompanying this brief note is intended to illustrate and supplement a more complete report in the 1952 Annual Report, pages 183 to 187. A tape and compass survey of the showing was made by the company in the autumn of 1952, and this plan was used when plotting the two skarn bands in the figure.

Some surface stripping was done on the property in 1952, and in May and June, 1953, a small amount of additional stripping was done on the skarn that extends northwest from the Copper Chief adit.

The Copper Chief skarn band is extremely dark in colour because of its high content of dark greenish-black diopside. In contrast, the skarn extending northward from the more southerly showing is light coloured, and at one place where it is grey to white it is a wollastonite and calcite rock containing a very few pinkish-brown garnets. These two skarn bands are enclosed in iron-stained quartzite, whose pale-green cast is the result of the development of diopside in an originally impure quartz sandstone.

Dragfolds within the isoclinally folded strata are believed to account for the several fish-hook shapes of the skarn bands.

During the early summer some road work was done and a building erected. Work was under the direction of W. Bryant.

Silver-Lead-Zinc

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. It was optioned in 1952 by The Consolidated Mining and Smelting Company of Canada, Limited, from the Blue Jay Mining Syndicate of Victoria. A band of limestone rising nearly vertical on the north side of McDonald Creek was explored in the past for lead-zinc mineralization by trenches and one short adit. In 1953, from August to September, the limestone was further explored by diamond drilling. Eight holes, totalling 3,177 feet, were drilled from one drill station.

* By S. S. Holland.

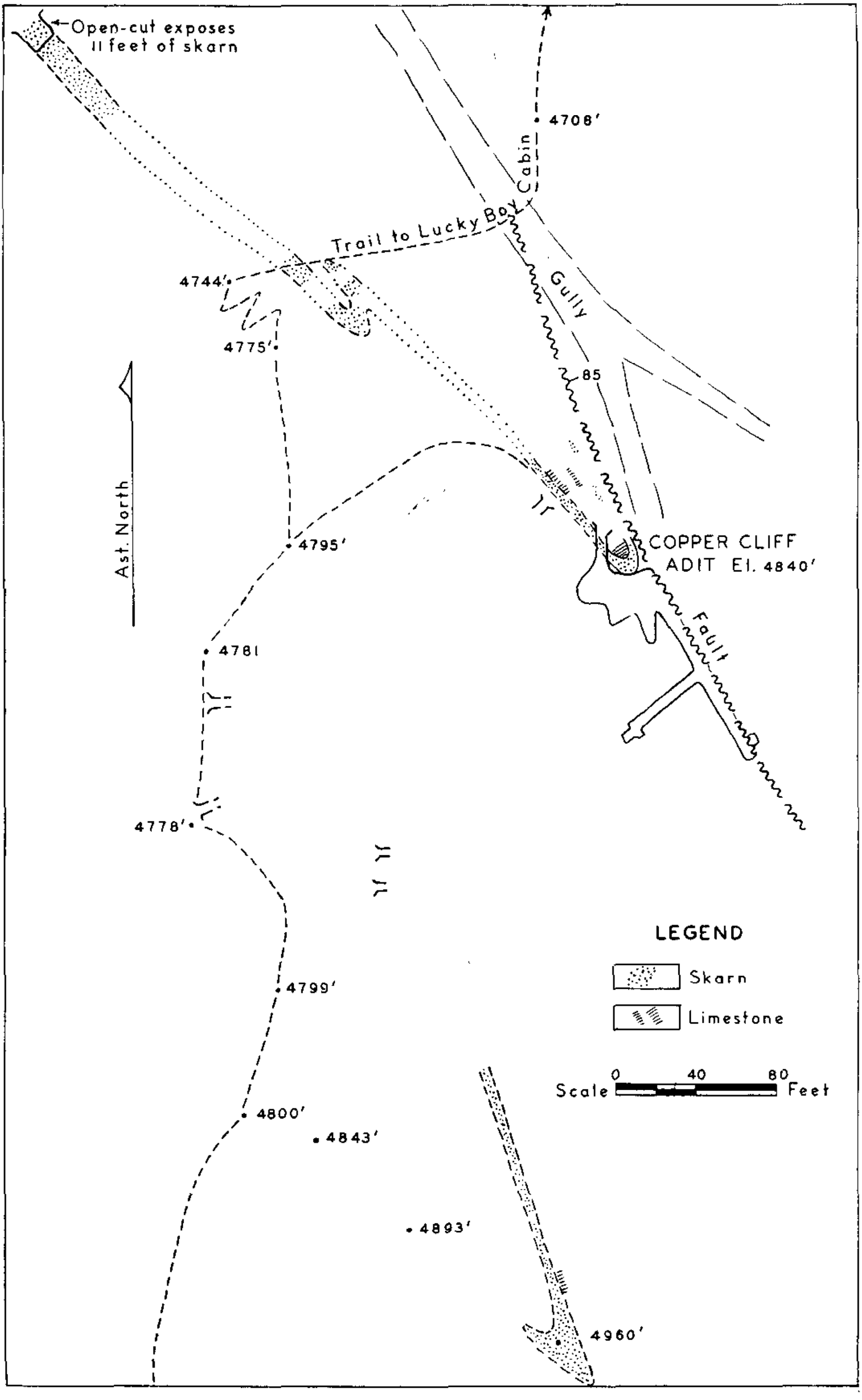


Figure 7. Major Explorations Limited—skarn exposures on the Lucky Strike claim.

A tent camp was established in McDonald Creek basin and supplied by pack-train from Ferguson. Supplies were also dropped from the air. Twelve men were employed under D. Malcolm. The option was dropped by the end of 1953.

Silver Chief No. 2 (Samson Mining Corporation).—(50° 117° N.E.) Company office, 516 Burns Building, Calgary, Alta. A. E. Peterson, field superintendent. The Silver Chief property is at the head of Index Creek, a northwesterly flowing tributary of Gainer Creek. Work in 1953 was restricted to building an access road.

Gold

Cromwell (Cromwell Gold Mines Limited)

(50° 117° N.E.) Company office, 415 Baker Street, Nelson. J. Gallo, president; T. D. Rosling, secretary-treasurer. Capital: 100,000 shares, $1 par value. This company owns the Cromwell No. 1, Cromwell No. 2, Golden Reef, Tarzan, Tarzan No. 1, Tarzan No. 2, Nelson, and Trafalgar Crown-granted claims, lying between the headwaters of Brown Creek and its north fork, which are northeasterly flowing tributaries of Lardeau Creek. The main workings are on the Cromwell No. 2 claim. They are on the north fork of Brown Creek and are reached by 3½ miles of trail from the Winslow mine, which is 6 miles by tractor-road from the Trout Lake–Gerrard road. The trail crosses a 7,000-foot summit and then descends to the camp at an elevation of 6,200 feet. A quartz vein, cutting a series of black slates, has been developed by an adit at an elevation of 7,100 feet. During the summer of 1953 the portal was cleaned out and the back mined to surface for a length of 40 feet. This work revealed a quartz vein, averaging 2½ feet wide, with a strike of north 7 degrees west and a dip of 65 degrees east. The vein was mined 1 foot below the sill for a length of 18½ feet to form a bulk sample. The ore was sacked and transported by pack-horses for transhipment to the Trail smelter. This large bulk sample assayed: Gold, 0.58 oz. per ton; silver, 2.0 oz. per ton. At the south end of this sample cut the vein swings to a strike of north 10 degrees east and has been followed by a drift 30 feet long. A sample taken across the 15-inch vein at the face assayed: Gold, 0.23 oz. per ton; silver, 1.0 oz. per ton. The vein is mineralized with pyrite and small amounts of galena and chalcopyrite. To the north of the sample cut the quartz vein increases in width and numerous small fissure veins diverge from the main vein, but mineralization is less pronounced. A sample taken 300 feet north of the sample cut, at an elevation of 7,150 feet, across 7 feet of vein assayed: Gold, 0.06 oz. per ton; silver, 0.1 oz. per ton. To the northeast of the adit, and 800 feet lower, another adit has been driven to intersect the vein but is now inaccessible. It is reported to be over 550 feet long, but the dump would indicate that it remained in slates.

There is another quartz vein exposed southwest of the Cromwell workings on what is probably the Tarzan No. 1 claim. Open-cuts and a 10-foot shaft (at an elevation of 7,150 feet) indicate that the vein strikes north 40 degrees east and dips 55 degrees southeast. In the shaft the vein is 20 inches wide, and a sample taken here assayed: Gold, 1.17 oz. per ton; silver, 2.0 oz. per ton.

Production: Ore shipped, 3.2 tons. Gross content: Gold, 1.9 oz.; silver, 6.5 oz.; lead, 13 lb.; zinc, 19 lb.

[Reference: *Geol. Surv., Canada,* Mem. 161, p. 45.]

SOUTH LARDEAU*

Silver-Lead-Zinc

J.G.

(50° 116° S.W.) This group of claims lies northwest of Glacier Creek and extends across a mountain ridge to the lower arm of Duncan Lake. It was under option in 1951 to Lardeau Lead & Zinc Mines Ltd., the option being taken up in 1952 by Berens River Mines Limited. The latter company did a small amount of surface work for a few months in 1953. The option

* By J. W. Peck.

was then dropped, and the property reverted to the former owners, J. Gallo and associates, of Howser.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1952, pp. 192–193.]

St. Patrick (Hamil Silver-Lead Mines, Limited) (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. Activity was on a minor scale throughout 1953. One man was employed doing bulldozer stripping in the vicinity of the old shaft. Limestone sparsely mineralized with galena was exposed in a few places.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1952, pp. 193–194.]

Moonshine, Right Bower (B.C. Metal Mines Ltd.) (50° 116° S.W.) Company office, suite 207, 445 Richards Street, Vancouver. M. C. Macpherson, president. Capital: 3,000,000 shares, $1 par value. This company holds 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. No work was done in 1953, but ore mined in 1952 was trucked to the Yale mill.

Production: Ore milled, 445 tons. Gross content: Silver, 2,262 oz.; lead, 65,938 lb.; zinc, 91,969 lb.

Silver

Surprise (50° 116° S.W.) This property is on the west side of Glacier Creek, 3 miles by road from the Argenta–Howser road. It is owned by J. Gallo and associates, of Howser. A quartz-tetrahedrite vein has been developed by two adits, but most shipments (the last was in 1951) have come from the upper adit, which is 1,300 feet vertically above the camp on Glacier Creek. No ore was shipped in 1953, but the upper adit was driven a further 50 feet on the vein. About 100 tons of ore was obtained from this drifting and from a small amount of stoping. It was stored in an ore-bin at the portal. Three men were engaged in this work.

CRESTON*

Copper

F/ E-42 **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 recent years the property has been held by F. R. Smith and R. Seneseal. In 1952 it was taken over by the Bon Ton Mining Syndicate, and a limited amount of surface exploration was done prior to late autumn. Work was resumed in mid-March of 1953, and in the succeeding four months the property was extensively prospected and known outcrops were extended by stripping. Sparse copper and iron mineralization persisted in two outcrops, but all work ceased in mid-July. A programme of underground diamond drilling is being considered for next season. A crew of three was employed under R. Seneseal.

ST. MARY RIVER*

Silver-Lead-Zinc

Boy Scout (Thomas Consolidated Mines Incorporated) (49° 116° N.E.) Head office, 640 Peyton Building, Spokane; mine office, Marysville. David E. Watson, secretary-treasurer. This property, consisting of the Warhorse, three other Crown-granted claims, and twenty-four located claims, is on Hellroaring Creek, 5 miles by new road from St. Mary Lake. Three adits, the highest one being at an elevation of 5,400 feet, were driven on the

* By H. N. Curry.

shear zone by early operators, but the present company has been engaged for the past two years in exploring the zone at depth. The low-level adit (4600) is at an elevation of 4,500 feet, about 360 feet above the creek and 475 feet below the lowest of the old adits.

In 1953 approximately 900 feet of drifting extended the 4600 adit to a total length of 3,200 feet. Oreshoots, each about 100 feet in length and containing interesting amounts of lead and zinc, were opened up at distances of 2,300 and 3,000 feet from the portal. No effort has been made to date to determine the vertical extent of these shoots. The last 100 feet of the tunnel contains no mineralization.

At the end of the year, diamond drilling from the face encountered a strongly mineralized vein at 70 feet on the hangingwall side. This drilling is continuing. A total of 115 feet of diamond drilling was done during the year.

A second 5-horsepower electric fan was installed to assist ventilation.

Equipment consists of a Universal air trammer, an Eimco air trammer, a Neyman side-stepper, a Sullivan mucking-machine, a UD-24 International diesel, and a 500-cubic-foot-per-minute Gardner-Denver compressor. A crew of four 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; A. G. Robertson, 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 1953 operation:—

" SAFETY.—Accident-prevention at the Sullivan mine was once again to the fore during 1953, with all supervisors and their crews taking an active part and giving their fullest co-operation in the work.

" The highlights of the year were:—

"(*a*) The new section safety record of 400 days without a lost-time accident (to the end of December) established by the open-pit operation. The previous section record of 343 days established by the surface section during 1952–53.

"(*b*) The presentation of the Ryan Regional Award to the Sullivan operations for the third successive year.

" The underground school of instruction was attended by thirty-eight employees during the year. The school is of four days' duration, and all matters pertaining to accident-prevention are thoroughly explained. Since the school started in 1946, a total of 1,803 employees have received training.

" St. John Ambulance Association first-aid classes were held for employees during the year; 235 senior awards were granted by the association.

" The East Kootenay mine-rescue and first-aid competitions were held in Fernie during 1953. First-aid and mine-rescue teams from the Sullivan took part in the competitions.

" Mine-rescue training was actively carried out during the year. Twenty-three employees successfully completed the Department of Mines course.

" Local mine-rescue and first-aid competitions were held, with five teams taking part in the mine-rescue and seven teams taking part in the first aid. A first-aid team took part in the Similkameen first-aid competition at Princeton and placed first in the Bocking Cup competition.

" Mine-rescue personnel were active on fume-control areas during the year.

" VENTILATION.—(*a*) *General.*—The primary circuits continued their same function as in the previous year for both intake and return air flows. No alterations were made to the surface primary mine fans. One fan underground was altered to reverse the flow in No. 28 shaft. It was again necessary to provide considerable secondary circuits by mechanical draught with controls for both mine divisions. Total air-flow by primary circuits amounts to 497,000 c.f.m.

"(*b*) *Developments.*—On July 16th the return circuit by No. 26 fan for fume and dust control was placed under complete exhaust draught. Two rubber-coated high-capacity Joy HH60-43D mine fans were installed at No. 26 collar, which released the two other fans previously on this duty from underground locations. The new units are designed for parallel operation by direct drive from 125-horsepower motors located in separate motor-houses. The installation is fully concrete and steel design.

" The underground development for the major airways was practically completed at the year-end. No. 29 shaft was holed through to surface, on which two 125,000-cubic-foot fans will be installed in early 1954. Purchasing orders for this equipment with 150-horsepower direct drives have been placed. The other airways will have mechanical draught at a later date, which will then finalize all systems to surface for either intake or return air.

"(*c*) *Miscellaneous.*—The contaminated air, arising from float-filled stopes and hot-muck locations, were successfully carried to surface by separate return systems. The placement and maintenance of seals continued as a factor in fume control.

" The discharges of the dust-collecting fans in the two underground crushing plants were directed to surface return. Conditions at these crushing operations were further improved.

" Special ventilation adjustments were made prior to and after the large pillar blasts.

" Considerable work was done by instrumentation for the analyses of air contaminants and dust sampling. All gas analyses were again done locally.

" The average dust count for all mining operations was 342 particles per cubic centimeter of air as obtained by Konimetry.

" GENERAL HIGHLIGHTS.—During the year, work was continued on the new ventilation system for all mine workings down to and including the 2850 level. At the end of 1953, the development work for this system was 97 per cent complete.

"A record pillar blast for the Sullivan mine of 506,000 tons was made during the year with the blasting of 0-14 (463,000 tons) and 0-13-5 (43,000 tons) pillars together. A total of 2,250 diamond-drill holes and 1,000 percussion-drill holes were loaded with 62,189 pounds of powder for the blast.

" Very high temperatures, causing the formation of SO_2 fume, developed in R-14 pillar during the year. This condition was caused from an old cave of sulphide ore. Mine-rescue crews were employed for six months in drawing 100,000 tons of this ore, with no unusual incidents. Excellent work was done by these trained men.

" Production from the open pit for the year was 806,513 tons or 30.5 per cent of the total mine tonnage. A start was made on extending the present pit to the east by stripping the gravel off an area 500 feet long by 220 feet wide. Approximately 8,200 feet of surface core drilling was done to investigate this and adjacent areas for open-pit mining.

" Construction of a new road for the proposed 1954 gravel filling programme was started. No gravel backfilling has been done since 1949.

" The new blacksmith-shop of reinforced-concrete, concrete-block, and glass-block construction was completed during the year.

" During the year 76,779 cubic yards of float fill was placed in three stopes below 3900 level.

" Undiluted pillar production was 54 per cent of the undiluted underground tonnage.

"*Personnel.*—The total number of men employed at the mine and mill averaged 1,660.

"*Development.*—Drifting and crosscutting, 2,917.5 feet; raising, 23,328.5 feet; sublevels, 14,082 feet; and winze sinking, 117 feet."

Production: 2,643,252 tons.

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.

The operation was suspended in December, 1952, because of low metal prices. Winter snowslides carried away the mine ore-bin and partly destroyed the compressor-house and change-house. In August, 1953, the ore-bin was rebuilt and a small crew was engaged in removing the broken ore remaining in the mine. This ore was obtained from shrinkage stopes on Nos. 1 and 2 levels and amounted to some 1,500 tons. A small stockpile at the mill was also treated.

During this milling period a further drop in the price of lead wiped out the margin of profit, and the property was completely closed down on October 1st. All mine machinery, compressors, and tools were taken down and stored at the mill camp, and a watchman was left in charge.

Blocked-out ore totals approximately 9,000 tons, containing 15 per cent combined lead and zinc.

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 Tracy Creek.

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.

Milling continued during the early months of the year, the concentrator treating 200 tons per day with a content of 18 to 20 per cent combined lead and zinc. Lead concentrates were shipped to Trail and zinc concentrates to Mathiewssen and Hegler, La Salle, Ill.

Ore was obtained mainly from a stope above the north end of the Estella (lower) level. This stope proved very disappointing as the ore failed to extend for more than 30 feet below the Rover (upper) level. The sill on the Rover level was taken out for a distance of 200 feet and subsequently timbered. Ore was also obtained from the prospect winze sunk at the south end of the Estella level and from two shrinkage stopes on the Rover level.

The available ore was exhausted in February, 1953, and the mill was forced to shut down. Only development crews were retained thereafter, and a programme of exploration below the Estella level was started.

* By H. N. Curry.

During the milling period 3,960 tons of ore was treated at the concentrator.

The minus 75-degree prospect winze sunk from the Estella level had disclosed ore of better than average grade to a depth of 90 feet before it was cut off by a series of intersecting faults. From a point 75 feet below the collar a sublevel was driven 18 feet southward and 25 feet northward, confirming persistence of the ore that far, but excessive water forced cessation of this work.

A development shaft was collared 500 feet north of the winze and near the intersection of the main crosscut with the vein. The two-compartment, minus 42-degree shaft was sunk in the footwall of the vein in a southerly direction, and a station was cut 125 feet vertically below the main level. Crosscutting to the hangingwall showed the extension of the Estella orebody to be a narrow stringer along which subsequent drifting, to a point 100 feet south of the winze, failed to find ore of commercial width or value. This new level (5950) is 26 feet vertically below the bottom of the winze.

Diamond drilling from the new level was inconclusive. A limited amount of work on a sublevel above a stope on the Rover level failed to disclose commercial values, and a small amount of work was done in R-14 raise on the upper level. The connection between this raise and No. 2 shaft was not completed.

The disappointing results obtained in this development programme forced a complete shut-down of the property in December. A watchman remains at the mill camp.

Development: Drifting, 340 feet; crosscutting, 104 feet; raising, 75 feet; shaft sinking, 176 feet; cutting out for loading pocket, 1,200 cubic feet; diamond drilling, 931 feet.

WINDERMERE*

Silver-Lead-Zinc

Paradise (Sheep Creek Gold Mines Limited)

(50° 116° S.E.) Company office, K.W.C. Block, Nelson. 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.

Milling was suspended in December, 1952, because of current low metal prices, and a development crew remained to deepen No. 2 winze below the 7700 level, which is 150 feet below the main haulage level (7800). This work ceased in early February, with the winze 71 feet below the 7700 level, and no further work was done during the year.

Development: Shaft sinking, 54 feet.

Mineral King† (Sheep Creek Gold Mines Limited)

(50° 116° S.E.) Company office, K.W.C. Block, Nelson. H. E. Doelle, managing director; F. R. Thompson, superintendent. This property is on the Toby Creek slope of the ridge between Toby and Jumbo Creeks, at an elevation of about 5,500 feet. It is reached by 26 miles of road from Athalmer. A permanent camp has been built on the Toby Creek flat, and a 3-mile road leads to the workings, 1,200 feet in elevation above the camp.

The property was diamond drilled in 1950, 1951, and 1952. The decision was reached early in 1953 that sufficient ore was in sight to justify an operation of 500 tons per day, and preparations were at once made to bring the property into production.

Exploration work to date has outlined an ore zone which is in dolomitic and siliceous limestone of the Mount Nelson formation of pre-Cambrian age. A few hundred feet uphill from the surface showings, part of the ridge between Toby and Jumbo Creeks is capped with Toby conglomerate which lies unconformably above the Mount Nelson.

* By H. N. Curry, except as noted.
† By M. S. Hedley and H. N. Curry.

The regional geology has been mapped by Walker,* but the detailed local geology has not been mapped.

The surface showing consists of an open-cut and stripping 100 feet along the hillside. About 40 feet beneath it, at 5,692 feet elevation (5700 level) is an old adit 130 feet long with two branches. Mineralization on surface and in the adit consists of sphalerite and galena in a gangue of barite and limestone. The ore and associated barite replace the limestone, although at the west end of the stripping there is quartz suggestive of fracture filling. The ore is fine grained for the most part, and the sphalerite is light in colour. Beneath the 5700 adit and immediately east of the open-cut are slates. The ore zone appears to lie in a fold above slate, but the outline of the fold is obscure. Diamond drilling from the 5700 adit indicated the presence of ore, but inasmuch as the drilling was, of necessity, done along the strike, blocking out of tonnage was unsatisfactory.

A crosscut adit in slate, 250 feet to the south, was driven north to intersect limestone beneath the 5700 adit. This is the 5600 level (elevation, 5,582 feet). At 340 feet from the portal a drift was driven 800 feet northwest, and diamond drilling was done from it, at right angles to the drift and diagonally from it. Mineralization in parts of the drift is apparently marginal to an orebody indicated to lie immediately to the southwest and very nearly parallel to the drift. This is the "A" orebody, which has not been investigated except by diamond drilling.

A subparallel and smaller orebody, the "B" orebody, lies 30 to 50 feet northeast of the "A" and apparently merges with it at the surface. Intersected by diamond drilling, the "B" orebody was further investigated by two crosscuts and a raise driven 90 feet at 45 degrees. The northwesternmost of the two crosscuts was extended 135 feet to the northeast to check one of two drill intersections in the "C" orebody, which is a subparallel body known only from this crosscut and from a second drill-hole, 115 feet apart. A hole drilled northeastward from the face of the crosscut for 365 feet in limestone contained a 50-foot mineralized intersection 80 feet northeast of "C." This is termed the "D" orebody or zone, which has not been investigated further.

A third adit was driven north-northwest from a point 380 feet from the 5600 portal. This is the 5450 level (elevation 5,449 feet). At 1,100 feet from the portal it would be below known mineralization of the "A" orebody, about 600 feet from surface as measured along the strike of the orebody.

No geological work has been done by the company, and none was attempted by the writer. The following brief remarks refer to the major features as they are understood at present, largely from the evidence of diamond drilling. The "A" orebody, from surface to the limit of investigation, has a length of 750 feet, and 100 feet from the northwest end has a maximum horizontal width of 72 feet and a known vertical extent of 80 feet. It tapers gradually for 400 feet east of this point to a width of 45 feet, then narrows to 29 feet and maintains an average width of about 30 feet for 240 feet to surface. These are indicated horizontal widths. The "B" orebody is 30 to 50 feet from "A" and merges with "A" near surface. It is about 550 feet long, is 25 feet wide in two crosscuts, and is exposed for 85 feet in a raise driven at 45 degrees in the direction of strike. The "C" orebody is about 125 feet northeast of "B" and is outlined only by a crosscut and a drill-hole 115 feet apart; it is 23 feet wide in each case. The "D" ore zone is indicated by one drill-hole intersection 80 feet northeast of "C."

The "A" and "B" orebodies apparently dip steeply and presumably rake flatly to the northwest. They are far from completely drilled, but the amount of drilling done and the general uniformity of grade indicated by it point to a substantial tonnage with a grade calculated and published by the company of 1.4 ounces silver per ton, 2.1 per cent lead, and 5.2 per cent zinc. A considerable amount of development work will be needed to outline the orebodies accurately.

* *Geol. Surv., Canada,* Mem. 148, 1926.

The apparent amount of limestone underground is much greater than on the surface. Drilling at right angles to the apparent strike shows at least 800 feet of limestone measured horizontally along one line of section. Obviously there has been folding and possibly faulting, but the nature of the structure is not known.

All limestone seen in the 5600 level working is brecciated, with the exception of the limestone in " B " orebody. The evidence of diamond drilling indicates that the limestone in "A" orebody, for the most part, is not brecciated. The single crosscut in " C " orebody shows brecciated limestone. In short, ore deposition appears to have occurred preferentially in blocks or remnants of bedded limestone within a zone of general brecciation. Ore does occur in breccia, but the greatest concentrations of mineralization appear to be in rock whose bedding is largely preserved, the possible reason being that the rock possessed a fissility that favoured ingress of solutions.

Much of the breccia is a blocky rock with well-defined fragments of assorted sizes, but much is a finely spotted or flecked rock that is believed to represent the product of comminution and recrystallization. Nothing is known of the extent of the breccia or of the relatively undeformed banded limestone. The structure is undoubtedly complex, involving folding and brecciation, and it is almost a certainty that structural factors influenced the deposition of ore more than chemical factors such as dolomitization. At the present stage of development there has been partly outlined a general ore zone of a form and extent unforeseeable from surface indications, but of a general grade similar to that at the surface.

In midsummer of 1953 construction of a 500-ton concentrator was started. The 5450 haulage level is 140 feet below the 5600 level, and all ore coming from the mine will be drawn along it. Despite a stoppage of underground work during the peak of mill construction, this tunnel was 1,000 feet long by the end of 1953, and near the 1,000-foot mark connecting raises to serve as ore-passes and for ventilation were started. These raises are also exploratory in nature, as very little is known of the lower limits of the orebody.

Development: 5600 level—drifting and crosscutting, 528 feet; raising, 97 feet; diamond drilling, 3,089 feet. 5450 level—drifting and crosscutting, 1,071 feet; raising, 5 feet; adit slashing, 204 cubic feet.

A surface incline connecting the 5450 haulage level to the coarse-ore bin was installed, and a combined hoistroom, motor-repair shop, and lamproom was erected at the portal. Ore will be handled by gravity in two 2-ton skips in balance, and a 25-horsepower electric hoist equipped with a simple clutching device is installed to permit application of power when hoisting men and materials.

The 500-ton concentrator, of wooden construction, has been compactly laid out. The crushing plant is equipped with an 18- by 36-inch jaw crusher, and a two-stage gyratory reduction crusher and 4- by 8-foot screen, with a conveyor arrangement for closed-circuit crushing. Ore is fed from the 500-ton coarse-ore bin to the jaw crusher with a pan feeder.

The concentrator flow-sheet is as follows: The 500-ton fine-ore bin feeds by belt feeder to a 7- by 5-foot primary ball mill in circuit with a 4- by 26-foot 6-inch rake classifier which in turn is in closed circuit with a 6- by 3-foot ball mill. Classifier overflow goes direct to a lead flotation rougher circuit of six 21-inch Denver cells, with cleaning and recleaning in a two-cell 15-inch Denver Sub A cell. Lead circuit tailings are sent to a conditioner and then to the zinc flotation circuit which consists of eight 21-inch Denver cells. Zinc cleaning and recleaning is done in a two-cell 21-inch Denver machine. Tailings are impounded, and lead and zinc concentrates are thickened, filtered, and stored. Milling is scheduled to start in late February of 1954.

The power-house, of steel " Armco " construction, contains three Fairbanks-Morse diesel engines totalling 1,125 horsepower. Installed compressor capacity is 1,000 c.f.m. with an additional 1,000 c.f.m. to be added.

The 14-mile road from Jackpine Flat was widened, relocated where necessary, and gravelled.

Additional surface construction includes a combined warehouse and office, a change-house, bunk-house, central heating plant, school, and six private dwellings. Most of these buildings are of prefabricated construction. The average number of employees in 1953 was forty-six.

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 and Hemsworth; L. P. Starck, resident manager; H. Shuttleworth, mine superintendent; J. M. MacDearmid, mill superintendent. This company is a merger, effected May 1st, 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 2, 3, 5, and 6 levels. In late 1952 a new No. 6 haulage level was completed to provide a more direct route to the main workings. It is 15 feet higher at the portal than the old adit and is 750 feet long. All ore is drawn through this new adit and trammed over a surface trestle to a 200-ton coarse-ore bin.

The ore occurs in steeply dipping, diverging ore zones striking eastward from a " nose " orebody. By the end of 1953 both footwall and hangingwall zones had been mined out above the main level. The open pit on the footwall zone worked steadily during the year and accounted for 50 per cent of the mill-feed. The No. 2 level sill pillar was removed in this operation, and available ore from the open pit was depleted toward the end of the year. A small tonnage remaining in the hangingwall zone will be removed by open-cut methods. By-pass raises from the underground workings have replaced the former truck hauling on surface.

Underground, the No. 3 level sill pillar in the footwall zone was removed by long-hole drilling using extension steel and tungsten-carbide bits, and drilling is continuing on the No. 5 level sill pillar. The hangingwall zone proved somewhat disappointing. The ore was narrower and of lower grade, the values were erratic, and the ground was blocky and " heavy." This zone was developed by a series of sublevels, exploratory raises, and small shrinkage stopes, and some mill-feed was obtained from the better-grade sections. By the end of the year, mining in this zone had been discontinued.

Early in 1953 a three-compartment shaft was sunk from No. 6 level to develop the orebodies indicated by previous diamond drilling. The shaft has over-all dimensions of 6 by 18 feet and is driven on a 49-degree slope. No. 7 level was established 150 feet in slope distance below No. 6, and drilling on No. 7 level showed both footwall and hangingwall ore zones to be the same size as on No. 6 and of higher grade.

The shaft was raised 125 feet above No. 6 level, and two 600-ton ore-pockets were installed. A hoistroom was cut on No. 6 level, a rope raise connected to the top of the shaft, and a 50-horsepower Mead-Morrison two-drum electric hoist installed. Two 1½-ton self-dumping skips were placed in the shaft, and a 400-ton pocket, equipped with air-operated loading chutes, was put in operation below No. 7 level. A 15,000-gallon sump was cut on No. 7 station and equipped with a 25-horsepower electric pump.

By the end of the year, crosscuts on the new level to both footwall and hangingwall ore zones had been completed and a raise connection made to No. 6 level. Mining of these orebodies by shrinkage methods is to follow immediately, and a 60-horsepower Joy

* By H. N. Curry.

electric scraper hoist has been installed on No. 7 level to handle the ore coming from these stopes.

Development: Drifting and crosscutting, 1,219 feet; raising, 879 feet; shaft sinking, 253 feet; and diamond drilling 1,460 feet.

During the year the tonnage milled averaged slightly over 500 tons per operating day. Maximum capacity on low-grade mill-feed was 650 tons per day. Early in the year the zinc circuit was discontinued in order to handle increased lead grades; however, the reinstallation of a larger zinc circuit, to handle the higher-grade ore to come from No. 7 level, was completed by the end of the year.

A pilot plant was installed for the recovery of barite from the mill tailings. This circuit has a production of from 5 to 10 tons per day of 4.3 specific gravity material, assaying 96 per cent barium sulphate. Preliminary tests indicate that the pilot-table concentrate is of exceptionally good quality, and in view of the quantity of material available for treatment an extensive study of markets for this product is to be made.

There were no major additions to the power plant or surface installations during the year. The average number of men employed was 100. Production: 176,289 tons.

HAWK CREEK*

Silver-Lead-Zinc

Hawk Creek (51° 116° S.E.) The Hawk Creek zinc deposit is in Kootenay National Park on the north side of Hawk Creek, about 2 miles east of the main Banff–Windermere Highway at a point 4½ miles north of Vermilion Crossing. A fair jeep-road leaves the highway about 100 feet north of the Hawk Creek road bridge and provides access to within 200 feet of the main showings. The first half-mile of this road may be travelled by automobile. The showings are on a gently sloping timbered hillside that forms the southern flank of Isabelle Peak. They are at an elevation of 5,700 feet, which is about 1,300 feet higher than the Hawk Creek road bridge.

The mineral deposit was discovered in November, 1929, by Fred W. Jowett, who, in partnership with J. E. Barbour, located six mineral claims known as the Albion group. In 1932 the National Parks Board refused Jowett and Barbour permission to do further assessment work on the grounds that the claims lay within the boundaries of a National park.

In 1942, Base Metals Mining Corporation Limited, under the direction of the Mines and Geology Branch, Department of Mines and Resources, carried out some exploratory trenching and diamond drilling on the showing. Since 1942 no work has been done.

The area in the vicinity of the showings is underlain by a series of interbedded grey limestones and brownish-grey argillites of probable Upper Cambrian or Ordovician age. At the showings the beds are gently dipping or horizonal and are cut by a pronounced northwest-trending shear zone that dips 45 to 70 degrees to the southwest. The shear zone extends well beyond the known limits of the mineralization and is believed to be of regional extent.

The ore zone consists mostly of massive sphalerite replacing limestone, and is localized at the intersection of the shear zone and an apparently favourable limestone bed. The ore is banded parallel to the shear planes, but lithology, rather than shearing, appears to have been the principal factor that controlled deposition of the ore. This control is demonstrated by the fact that the ore zone remains within the same stratigraphic horizon along its explored length of more than 250 feet. The ore in the surface showings is seen to be concentrated within a finely crystalline dolomitic limestone and tends to die out almost entirely in adjacent finer-grained and denser limestone, in spite of the fact that shearing is equally well developed in both rock types.

* By G. G. L. Henderson.

The ore zone as exposed at the surface consists of an irregularly shaped body about 55 feet wide and a maximum of 18 feet high. The diamond drilling done in 1942 explored this zone at variable intervals along a length of about 250 feet northwestward into the hillside. In general, the drilling indicated a pencil-like body with a low rake to the northwest and an irregular and variable cross-sectional shape. It suggested that the size of the zone decreases toward the northwest, although several of the cross-sections drilled contained too few holes to delimit the full lateral extent. The northwestern limit of the ore zone was not determined.

The mineralization consists principally of sphalerite, of which two varieties were noted. The commonest type is honey coloured and fine grained, and occurs as massive or disseminated bodies replacing limestone. The second type is darkish brown in colour and was seen only as disseminated crystals within veins and stringers of white crystalline calcite. At most places minor quantities of fine-grained pyrite is associated with the sphalerite. Galena occurs as small pods sparsely distributed throughout the ore zone, but not in large enough quantity to be an important constituent of the ore. Silver is reported but in negligible amounts. At a few of the surface exposures a thin enriched zone, composed dominantly of zinc carbonates, overlies the ore zone.

The distribution of zinc throughout the ore zone is not uniform. Bands assaying more than 25 per cent zinc across widths of 3 to 12 feet are not uncommon* and generally alternate with thin barren zones or with zones containing less than 25 per cent zinc.

An interpretation by the writer of the data obtained by the Mines and Geology Branch in 1942 indicates a total of 29,500 tons averaging 12.5 per cent zinc.

REVELSTOKE†

Silver-Lead-Zinc-Tungsten

Regal Silver, Snowflake (Columbia Lead & Zinc Mines Limited)

(51° 117° S.W.) British Columbia office, 800 Hall Building, 789 West Pender Street, Vancouver; mine office, Albert Canyon. T. R. Harrison, Toronto, president; W. Tattrie, mine manager; J. Hutchison, mill superintendent. Capital: 5,000,000 shares, 50 cents par value. Columinda Metals Corporation has operating control of this company. 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. Three quartz sulphide veins, known as Four, Five, and Six, have been developed by six adits, Nos. 5 to 10, with nearly all the work done on Five vein. Four vein, which is exposed in the old adit crosscut on No. 10 level, was developed in 1953 by 225 feet of drifting. Scheelite is visible in minor quantities in this vein. Box-holes were driven for mining purposes, but no further work was done. The best tungsten showing is in Five vein on No. 9 level, west of the old mill rise. The scheelite there is relatively massive and is as much as 2 feet wide. A stope was started here, and a raise 168 feet long was driven to No. 8 level. An ore-pass, 158 feet long, was driven from No. 10 to No. 9 level to aid in the handling of this ore. Lead-zinc ore was mined from Five vein on No. 10 level and from the same vein on No. 5 level. Most of the lead-zinc ore was produced from No. 5 level and had to be handled several times to lower it to the main haulage, No. 10 level.

The small mill operated first on tungsten ore and then on lead-zinc ore. Considerable difficulty was encountered in obtaining marketable tungsten concentrate. Gravity separation, using screen separators, spiral separators, and tables, was used together with some flotation, but too much pyrite still remained. About 2,800 tons of tungsten ore was milled, producing about 10 tons of concentrate, which was still unsold at the end of

* *Minister of Mines, B.C.*, Ann. Rept., 1930, p. 239.
† By J. W. Peck.

1953. Gravity separation was also used in the milling of 2,400 tons of lead-zinc ore. The lead concentrate obtained was shipped to the smelter at East Helena, Mont. The power-house attached to the mill was enlarged, and all power machinery concentrated there. Equipment installed was as follows: For electricity—Westinghouse 100-horsepower and Fairbanks-Morse 120-horsepower diesels; for compressed air—Broomwade 500-cubic-feet-per-minute, Chicago Pneumatic 500-cubic-feet-per-minute, and Holman 250-cubic-feet-per-minute compressors, all diesel-driven. The old camp was abandoned in favour of the new camp at Bell Point, south of the confluence of Clabon Creek and Woolsey Creek. The bridge over the Illecillewaet River at Silver Creek siding was taken out by a flash flood in July and was replaced with a bridge with an 85-foot span. The number of men employed averaged thirty-seven.

Zinc

Mastodon (Mastodon Zinc Mines Limited) (51° 118° S.E.) Head office, 844 West Hastings Street, Vancouver; mine office, Revelstoke. H. W. Knight, president; A. E. Pike, mine manager. Capital: 3,000,000 shares, $1 par value. Golden Manitou Mines Limited owns a 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 an incline and a narrow-gauge railway. Development work continued in the 5000, or lowest, adit, which was collared in December, 1952. The adit was driven as a crosscut almost due east for 1,020 feet. Narrow mineralized bands of limestone were encountered at 300, 350, and 870 feet from the portal. Drifting was done to the south on the third showing, but the expected mineralized schist-limestone contact was not located until a point was reached beneath the ore zone on the 5100 level. A raise was put up there, 1,320 feet from the main crosscut, to break through on the 5100 level below the ore-pass which extends to the 5300 level. The face on the 5000 level reached a point 1,450 feet from the main crosscut. This development work intersected two open fractures—the first in the main crosscut at 920 feet from the portal, and the second in the south drift at 370 feet from the main crosscut. Air movement through these fractures greatly assisted ventilation. Diamond drilling was done from the face of the main crosscut and also at intervals along the south drift.

The mill did not operate, and only staff accommodation was provided at the mill-site. The change-house at the mine was rearranged to provide eating and sleeping quarters for the mining crew. All work ceased on October 31st, and only watchmen were employed after that date. Fifteen men were employed before the shut-down.

SKAGIT RIVER*

Copper

A.M. (Canam Copper Company Ltd.) (49° 121° S.E.) Company office, 571 Howe Street, Vancouver. Elmer Doyle, president; G. Allen 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. During 1953 No. 10 adit, at an elevation of 4,872 feet, was driven 2,765 feet to explore the downward extension of the mineralized breccia which occurred in No. 6 adit. The portal of No. 7 adit, in which 110 feet of development work was also done, is 70 feet below and 800 feet south of No. 6 adit. Eighteen men were employed.

* By R. B. King.

CHEAM RANGE*

Copper

Lucky Four (Rico Copper Mines Limited) (49° 121° S.W.) Company office, 413 Granville Street, Vancouver. T. H. Wilkinson, mine manager. The mine is on the summit of the Cheam Range at the head of Wahleach Creek, about 15 miles from Laidlaw. In October, 1953, the adit on the Lucky Four No. 4 claim, at at elevation of 5,975 feet, was advanced 80 feet. Seven men were employed.

[References: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 214–216; 1952, pp. 206–207.]

HOPE*

Nickel

B.C. Nickel (Western Nickel Limited) (49° 121° S.W.) Company office, 744 West Hastings Street, Vancouver; mine office, Hope. B. B. Greenlee, general manager; J. Moore, mine superintendent. The mine is on Stulkawhits Creek about 4 miles from Choate. Western Nickel Limited has been exploring the property from a low-level adit at an elevation of 2,600 feet and by diamond drilling. The adit has cross-sectional dimensions of 10 by 10 feet and is being driven by three five-man crews using a three-machine jumbo. Eimco 21B mucking-machines load broken rock into 3-ton-capacity cars which are hauled by a 20 DLU Ruston-Hornsby 18-horsepower diesel locomotive to waste dump.

The adit is ventilated by a size 45 Sturtevant Planovane exhaust fan blowing through 22-inch-diameter fan pipe with auxiliary air-driven fans at definite intervals.

By the end of 1953 development work included 5,236 feet of tunnelling, 9,480 feet of underground diamond drilling, and 3,237 feet of surface drilling.

HOWE SOUND*

Copper-Zinc

126-3

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. Sharpe, 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 1953. The development work totalled 18,459 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	338	1,957	877	165	......	2,901	6,238
Crosscuts	1,192	419	97	34	65	390	2,197
Raises	945	2,279	2,467	322	310	422	6,745
Winzes	127	......	10	......	......	12	149
Powder blast workings	45	......	2,821	170	94	......	3,130
Totals	2,647	4,655	6,272	691	469	3,725	18,459

Ore is mined by caving, shrinkage, and cut-and-fill methods, and the tonnage broken in the various sections of the mine was as follows: Bluff mine, 391,552 tons; Fairview mine, 106,807 tons; Victoria mine, 95,445 tons; No. 5 mine, 59,787 tons; No. 8 mine, 160,998 tons; Jane mine, 9,602 tons; development, 20,359 tons; a total of 844,551 tons.

Explosive and blasting accessories used included: Powder, 18,196 cases; electric blasting-caps, 4,300; No. 6 blasting-caps, 321,760; safety fuse, 2,704,050 feet; primacord, 51,163 feet.

* By R. B. King.

Mine ventilation has been improved by driving two ventilation raises and relocating several auxiliary fans.

The severity and frequency rate of accidents at Britannia were higher in 1953. Compensable injuries occurred at the rate of 0.616 per 1,000 shifts worked, compared to 0.524 in 1952. The severity rate was 33.21 shifts per 1,000 shifts worked, as compared to 28.0 per 1,000 shifts worked in 1952. More than 16 per cent of the injuries were listed as back sprains. No fatalities occurred in the mine in 1953.

Total number of men on the mine payroll at the end of 1953 was 530. Total number of shifts worked in the mining department was 146,022.

The total production from all mines during 1953 was 839,389 tons, as compared to 829,652 tons in 1952.

SQUAMISH*

Copper-Zinc-Lead

92G-6

McVicar (McVicar Mining Company Limited) (49° 123° N.E.) Registered office, 475 Howe Street, Vancouver. H. J. Renn, New York, president; V. Dolmage, consulting geologist. Capital: 3,000,000 shares, 50 cents par value. One million shares are held by the parent company, Surf Inlet Consolidated Gold Mines Limited. The McVicar property consists of twelve Crown-granted claims and fractional claims and twenty-two claims held by record. The holdings are on the southwestern slope of Raffuse (Goat) Creek 6 miles east of Squamish. This creek is a northwesterly flowing tributary of the Mamquam River, which empties into Howe Sound at Squamish. A well-established camp on the Trail No. 5 claim is reached by 6 miles of logging-road and 5 miles of excellent trail from Squamish.

Short reports on the McVicar are contained in the 1925 (under "Goat Creek Group"), 1928, 1929, and 1930 Annual Reports. The reader is referred to a detailed description of the property in the 1937 Annual Report, as the present account, resulting from a brief examination made in September, 1953, is of a supplementary nature.

The property was obtained by the Surf Inlet company in 1946. In that year and in 1947 prospecting was carried out under the direction of Angus McLeod. In 1950 seventeen holes totalling 2,498 feet were diamond drilled by the present company on the Rainstorm claim. At the time of the present examination two drills were at work on the same claim.

The McVicar prospects are 6 miles north 60 degrees east of the Britannia mine Tunnel camp. The intervening ground is very largely underlain by metamorphosed volcanic and sedimentary rocks of the Goat Mountain formation.† The only break in continuity of these rocks consists of a narrow elongate mass of quartz diorite that trends north 17 degrees west along the western border of the McVicar group.

Much of the bedrock on the property is covered with overburden. Below an elevation of 3,500 feet, outcrops are mainly confined to the creeks, and only above 4,000 feet are good exposures plentiful. The rocks consist largely of intensely metamorphosed volcanics, to which the name "greenstone" is well suited. Tuffs are recognizable at several points, and a thick band of agglomerate has been traced for several hundred feet along the eastern edge of the quartz diorite.

The strike of the rocks ranges from north 30 degrees west to due north. Steep dips prevail. Shearing, where present, is essentially parallel to the primary trend. Pyrite is common and is especially abundant in the more highly sheared areas where the rock has been converted to a quartz-sericite schist.

Chalcopyrite is the most abundant ore mineral, and some sphalerite and a little galena are also present. The first two minerals occur in irregular masses and stringers and as disseminated grains within the shear zones; less commonly they are found in net-

* By W. R. Bacon.
† *Geol. Surv., Canada*, Mem. 158, Britannia Beach Map-area.

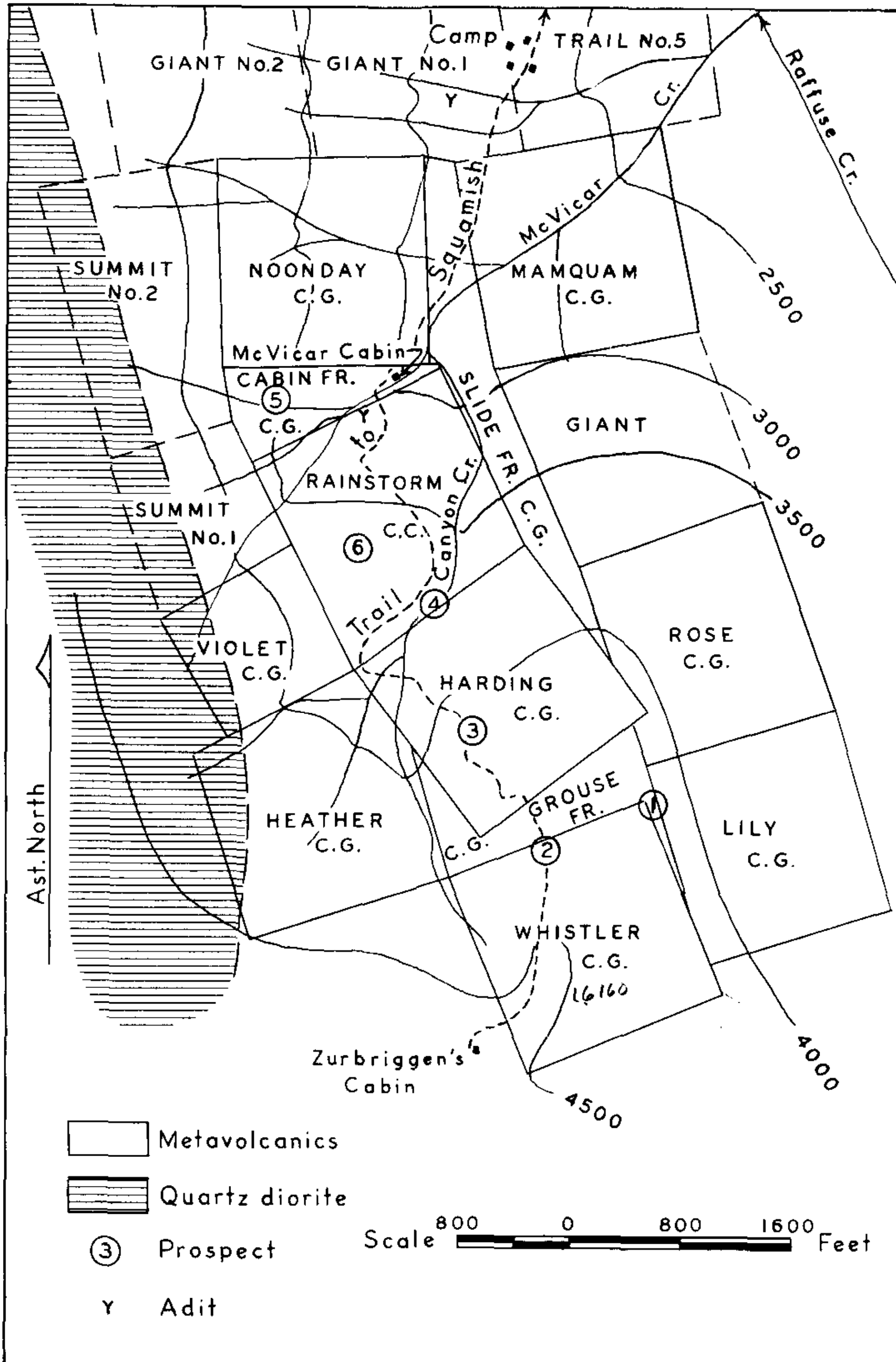


Figure 8. Plan showing McVicar prospects.

works of quartz-filled fractures. In contrast, the galena is rather restricted in its distribution, occurring mainly in massive form with sphalerite in regular bands, as much as 1.2 feet wide.

The more interesting of the numerous showings are indicated on Figure 8. Prospects No. 1, No. 2, and No. 3 are described in detail in the 1937 Annual Report under " Lily Claim," " Whistler Claim," and " Harding Claim " respectively. Both sphalerite and galena are relatively abundant in Prospects No. 1 and No. 2. Small amounts of red jasper occur in the siliceous gangue of Prospects No. 1 and No. 3. Britannia Mining and Smelting Co. Limited diamond drilled three holes under Prospect No. 2 and, after a geophysical (radiore) survey, three diamond-drill holes under Prospect No. 3.

Prospect No. 4 is known as the " iron showing." Exposures on both sides of Canyon Creek partly disclose a northerly trending shear zone which appears to be at least 100 feet wide. This zone consists of quartz, sericite, abundant pyrite, and sparsely disseminated chalcopyrite. There are three surface cuts on the east side of the canyon and one on the west. The sample mentioned in the 1937 Annual Report that assayed 1.6 per cent copper and 0.6 ounce silver across 9 feet is from one of the easterly cuts. Britannia tested this shear zone with four diamond-drill holes.

Prospect No. 5 is a strong shear zone, 200 feet wide, striking northwestward and dipping 45 degrees southwestward. It is composed of quartz, sericite, and abundant pyrite. Minor amounts of chalcopyrite and sphalerite are erratically distributed within this zone. In 1953 two holes totalling 990 feet were drilled westward into the zone, and it is understood that neither hole intersected mineralization of commercial interest.

Prospect No. 6 is known as the " copper showing." Here surface work has revealed the best mineralization found to date on the property. Britannia drilled three holes at this locality, and in 1950 the present company drilled nine shallow holes to test this zone and its possible lateral extensions. Four of these holes cut copper mineralization of interest, although of a grade not comparable to that found at the surface. In September, 1953, two drills were testing the same ground at somewhat greater depths.

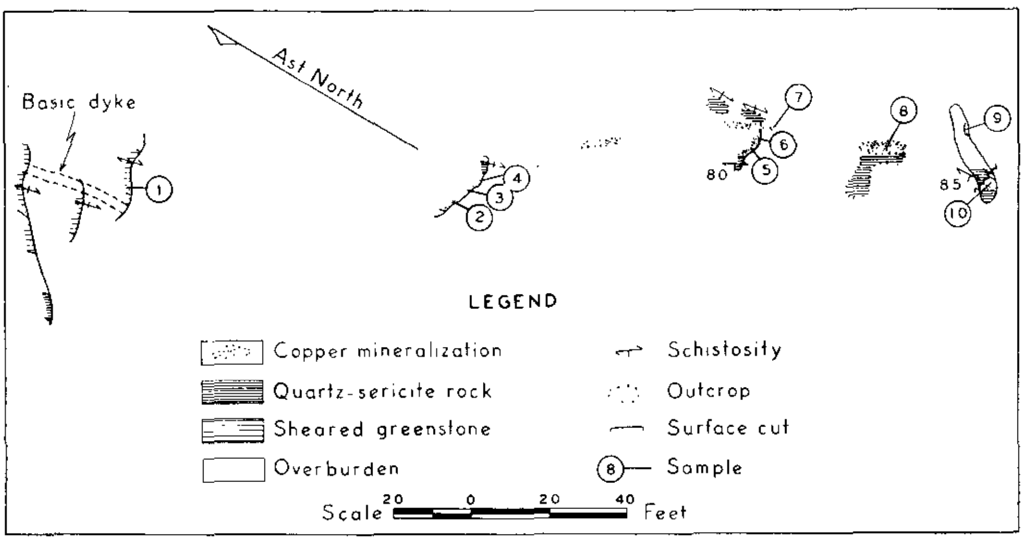


Figure 9. The " Copper Showing," McVicar property.

Figure 9 is a plan of the exposures on the " copper showing." Results of surface sampling by the writer are as follows:—

Sample No.	Width	Copper	Silver	Zinc
	Ft.	Per Cent	Oz. per Ton	Per Cent
1	5.0	3.0	0.8	0.7
2	5.0	6.0	1.4	0.3
3	5.0	9.1	1.6	0.8
4	3.5	6.7	0.4	0.5
5	3.0	1.6	0.9	....
6	4.1	5.4	0.2	0.7
7	2.0	11.6	2.6	1.7
8	3.0	8.2	1.8	0.2
9	2.5	2.2	0.5	....
10	3.0	9.7	0.9	0.5

Although exploration on the McVicar property has not disclosed a mineralized body of sufficient size and grade to warrant underground development, certain features are considered encouraging. In spite of the fact that much of the property is covered with overburden, numerous showings have been found, and the existence of wide strong shear zones, striking northward and northwestward, has been demonstrated. The accessibility of the property would permit development of a relatively low-grade orebody, should such be found.

PENDER HARBOUR*

Copper

926-23

Cambrian Chieftain (49° 123° N.W.) The Cambrian Chieftain, 6 miles by road northeast of Pender Harbour, was optioned by the Sileurian Chieftain Mining Company Limited. S. Gilmour, consulting engineer; Clayton Dunnington, mine manager. During the year about 275 feet of tunnel was driven from the lower Sheep Creek adit to intersect the downward extension of the ore previously mined in an open pit. Seven diamond-drill holes totalling 280 feet were drilled. Surface work was done on a zinc showing on the road to the property. Five men were employed.

TEXADA ISLAND*

Iron

Prescott, Paxton, Lake (Texada Mines Ltd.) (49° 124° N.E.) Registered office, 626 West Pender Street, Vancouver. A. D. Christensen, San Francisco, president; B. L. Alexander, general manager and chief engineer; J. Yuill and E. Fox, mill superintendents. The Prescott, Paxton, and Lake mines and the concentrator at Gillies Bay on Texada Island were operated throughout 1953, and the following summary of the operations includes information supplied by the management. Ore is mined from open pits in which levels are established at 20-foot intervals. Limestone waste is stripped where necessary and hauled to stockpiles. Vertical holes are drilled by Joy rotary drills and wagon drills, loaded with explosives, and blasted electrically. The broken ore and waste is loaded by 2½-cubic-yard diesel-driven shovels into 15-ton trucks and transported to stockpiles or the concentrator.

Exploratory diamond drilling to outline ore in the present pits and in two other deposits, the Cameron and Yellow Kid, totalled 8,257 feet. About 25 per cent of this drilling was done underground at the Prescott mine, 18 per cent was done on surface at the Prescott, 46 per cent at the Paxton, and the remainder on the Lake, Cameron, and Yellow Kid bodies.

During the summer a magnetometer survey was made of the favourable area.

Stripping and preparation for mining required the removal of 358,295 cubic yards of waste material.

* By R. B. King.

In 1953, 567,127 tons of magnetite ore was treated in the concentrator, the Prescott pit supplying 43 per cent, the Paxton pit 14 per cent, and the Lake pit 43 per cent; 373,046 tons of concentrate was shipped. Approximately 110 men were employed.

QUADRA ISLAND*

Copper

Dodge Copper Mines Limited† (50° 125° S.E.) Head office, 330 Bay Street, Toronto. Directors: S. A. Perry, H. W. Knight, Jr., A. Robertson, and S. Strashin, all of Toronto; V. Allen, San Francisco. Consulting geologist, W. W. Weber; manager, J. MacBeth. Dodge Copper Mines Limited holds by record 130 mineral claims on the southwestern coast of Quadra Island, in the immediate vicinity of Gowlland Harbour. The property is 110 miles northwest of Vancouver.

The claims surround a number of copper prospects that have been known for forty years. A small quantity of copper ore was shipped years ago from some of these prospects, but the original claims had lapsed and all the present claims were recorded in 1950 or later. Dodge Copper Mines Limited commenced exploration in the autumn of 1952. Old trenches were cleaned out and deepened, new trenches were dug, and on November 24th diamond drilling was begun. By the middle of June, 1953, 145 holes had been drilled to an aggregate depth of 8,800 feet. The property was visited in June.

Fire has removed much of the forest cover around Gowlland Harbour and good rock exposures are plentiful. The area is underlain by volcanics that dip gently southward and southeastward. The rocks are chiefly flows of intermediate to basic composition that vary in colour from light bright green to dark greyish-green. The flows range in thickness from 1 foot to 12 feet and more. Many are highly amygdaloidal, the cavities being filled with such minerals as calcite, quartz, chlorite, actinolite, and prehnite. The rocks are all chloritized to some extent and are cut by numerous stringers and veinlets of epidote, calcite, and quartz. They are traversed by a complex system of steeply dipping joints and fractures. Slickensides are common on the walls of many of the fractures, indicating that there has been some movement on them.

Minor thin beds of sedimentary and tuffaceous material occur at various horizons in the volcanic sequence.

The location of the several prospects is shown in Figure 10. The northernmost showing, the Pomeroy No. 1, is the highest, at an approximate elevation of 700 feet.

Green copper stain occurs on or near the mineralized outcrops. Trenches that penetrate beneath the weathered surface and drill-holes have revealed exceedingly fine-grained mineralization. Chalcocite is the most abundant copper mineral, and native copper and chalcopyrite are present in lesser amounts. Bornite and pyrite are rare. Malachite and azurite are confined to weathered surfaces.

The distribution of the copper minerals is erratic. They are found along the walls of small fractures and within irregular quartz-calcite veinlets. Less commonly, they occur within amygdules or are otherwise disseminated locally in the rock. The mineralization is not confined to one horizon within the volcanic series, and at only two of the prospects (Copper Cliff adit and Pomeroy No. 3) is there any evidence of a mineralized zone conformable with the enclosing rocks. The Copper Cliff adit penetrates a flat-lying zone for 92 feet in an easterly direction. There has been a limited amount of slashing along both walls of the adit, and the workings suggest that the mineralized zone had a maximum thickness of 7 feet. Ten vertical drill-holes have proved conclusively that most of the mineral in this small deposit has been mined.

The flat-lying Pomeroy No. 3 zone is partly exposed in two old trenches along its western border and one trench along its southern border. Here the upper part of a

* By R. B. King, except as noted.
† By W. R. Bacon.

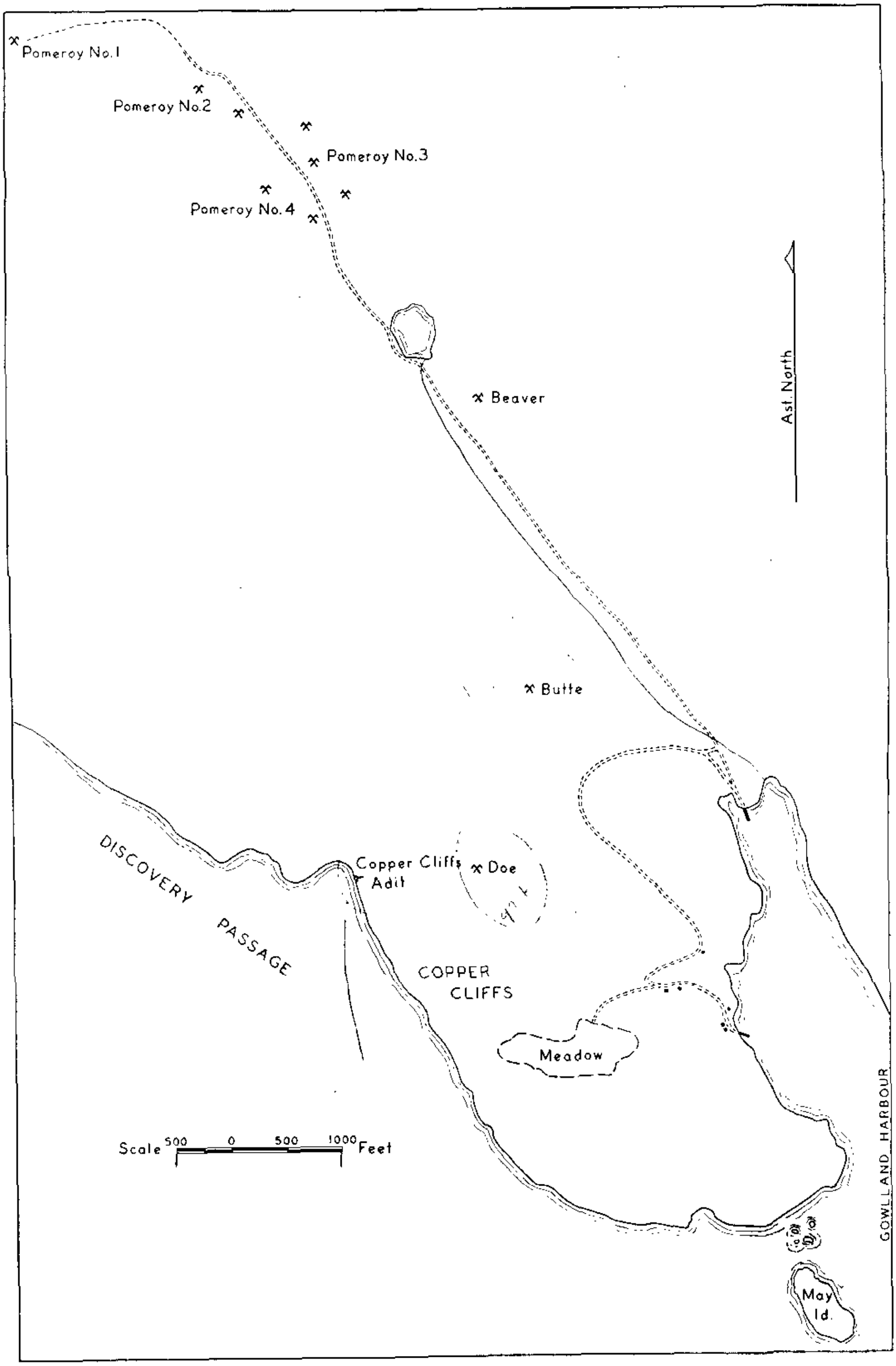


Figure 10. The Dodge Copper Mines Ltd.—prospects on Quadra Island.

massive fine-grained chloritized flow is sporadically mineralized. The overlying flow is quite distinct, being coarser grained and highly amygdaloidal. Forty-one closely spaced drill-holes, thirty-one of which are vertical, have indicated a slightly mineralized horizon extending for 700 feet in a northerly direction and 150 feet in an easterly direction. In only fourteen of the forty-one drill-holes, however, was a grade obtained of 2 per cent copper (or better) over a true width of 5 feet (or more).

Diamond drilling and trenching at the Pomeroy No. 1, Pomeroy No. 2, Pomeroy No. 4, Beaver, Doe, and Butte showings have indicated very limited amounts of copper mineralization that appear to have been controlled by small fractures. Likewise, drilling along the east shore of Gowlland Harbour has failed to disclose a commercial deposit of copper.

Dodge Copper Mines Limited has largely confined its attention to a number of widely separated copper prospects, some of which were worked in a small way forty years ago. Some of the deposits explored to date might be suitable for leasing operations.

Copper Road (50° 125° S.W.) The Copper Road group of eight claims is held by record by Messrs. Adams and Bestwick, of Granite Bay P.O. It is on Quadra Island, about 2½ miles by truck-road from Deep Bay. The showing is a quartz vein which dips almost 80 degrees south. A sample taken across a vein width of 60 inches assayed 11.2 per cent copper. 92K-10

In 1953 the property was under option to Golden Contact Mines Limited, which drilled a total of 946 feet in seven holes spaced at approximately 150-foot intervals. These intersected the vein at depths of as much as 120 feet. The owners shipped to the Tacoma smelter 178 tons of ore, which contained 1.3 ounces of silver per ton and almost 10 per cent copper.

FISH EGG INLET*

92M-6

Tungsten

Promise Well (51° 127° N.W.) This mineral claim at the north side of the entrance to Fish Egg Inlet, opposite Salvage Island, was recorded in August, 1951, by Agnes Moore, of Namu. The showing, which is at tide-water and upon which a limited amount of stripping and shallow blasting has been done, consists of a breccia of altered to highly altered sedimentary fragments in a granite-granodiorite matrix. The breccia is veined by quartz veins as much as 6 inches wide, in which, with the aid of an ultraviolet lamp, a few grains of scheelite may be seen. The attitude of the breccia is not apparent, although it passes into massive granodiorite to the north. The principal quartz veins strike north 35 degrees east and dip 50 degrees northwest.

KING ISLAND*

Molybdenite

Last Chance (52° 127° S.W.) This mineral claim is on the east side of King Island, across Burke Channel from Mapalaklenk Point of Kwatna Peninsula. It was recorded by Joseph H. Moore, of Namu, in July, 1953. The showing, in exposures about 300 feet long by 50 feet wide at tide-water, consists of a 1-foot bed of garnet-epidote skarn in sandy schists having thin (one-quarter inch) limy bands. The schistosity and bedding both strike north 50 degrees west and dip 60 degrees northeast. The sediments are cut by granodiorite dykes trending north 15 degrees east and dipping 45 degrees northwestward, which in turn are cut by pegmatite dykes which follow two sets of fractures, of which one set strikes north 50 degrees west and dips 30 degrees southwest and the other strikes north 75 degrees east and dips 65 degrees southward.

Mineralization consists of molybdenite at and near the intersection of two pegmatite dykes with the skarn. It is exposed for a length of about 10 feet chiefly in sandy schist at

* By N. D. McKechnie.

its contact with overlying skarn, much less in the skarn, and very sparsely in the pegmatite. No other occurrence of molybdenite was found in the outcrop, nor any other bed of skarn.

Iron

3D-12

Promise Well No. I and No. II

(52° 127° S.W.) These claims are on the west side of King Island at the head of Evans Arm. They were recorded by Joseph H. Moore and Agnes Moore, of Namu, in August, 1951. The showing on the Promise Well No. 1 is on the shore at the extreme easterly end of the arm and consists of magnetite in garnet-epidote skarn about 70 feet wide in contact with granodiorite on either side. The skarn is intruded by a stockwork of pegmatite. The magnetite is accompanied by a minor amount of chalcopyrite. The skarn zone appears to strike about east-west. A dip-needle traverse across the zone about 100 feet from shore did not indicate continuity in this direction, and consequently the showing may be merely a pocket.

Tests with a Geiger counter gave some indication of radioactivity. A specimen of pegmatite taken where indications were strongest showed radioactivity equivalent to 0.0065 per cent uranium oxide. This showing is briefly described in the 1918 Annual Report, page 37.

The showing on the Promise Well No. 11 is on the west side of the arm near the head, and at an elevation of about 75 feet. It consists of a stockwork of pegmatite about 200 feet wide intruding both skarn and granodiorite. The skarn-granodiorite contact can be seen on three sides, and the skarn appears to be a very limited body. The pegmatite was tested by Geiger counter, and a specimen taken where indications were strongest showed a radioactivity equivalent to 0.006 per cent uranium oxide.

SPILLER CHANNEL*

Zinc-Copper

Neekas

(52° 128° S.E.) This property of twelve mineral claims, Neekas Nos. 1 to 12, was recorded in October, 1952, by Nicholas Pohlman, Michael Solar, and M. H. McLean, of Namu. The claims are at the north end of Neekas Cove, an arm of Spiller Channel, and extend from about 1,500 feet southeast of the cove to about 4,400 feet northwest. The claims surround the Hebrew Crown-granted claim on the western side of the cove. The rocks underlying the claims consist of gneisses, schists, and skarn in an east-west trending roof pendant in granodiorite.

The mineralization consists of lenticular and scattered quartz, pyrite, sphalerite, pyrrhotite, and minor chalcopyrite in a band of skarn 3 to 10 feet wide, between a band of limestone and one of gneiss. The rock is somewhat sheared. The zone strikes north 80 degrees west and dips 70 degrees southward; across Neekas Cove it is offset some 900 feet to the left, presumably by a fault paralleling the Neekas River valley. The zone originally was exposed on the Hebrew claim by a 22-foot adit driven from the west bank at the mouth of Neekas River and about 10 feet in elevation†. Workings on the Neekas claims consist of a series of open-cuts exposing the zone for a distance of about 4,000 feet northwest and about 800 feet southeast of the cove. Three chip samples assayed: Gold, *nil;* silver, *nil;* zinc, less than 2 per cent; copper, less than 0.2 per cent.

In 1953 the showings were examined by Kennco Explorations (Canada) Limited and American Smelting and Refining Company.

---

* By N. D. McKechnie.
† *Minister of Mines, B.C.*, Ann. Rept., 1931, p. 34.

VANCOUVER ISLAND*

QUATSINO (50° 127° S.W.)

92L-52, 235

Copper

Yreka† This property, owned by Yreka Copper Company, is under option to Noranda Exploration Company Limited. British Columbia office, 1403 Royal Bank Building, Vancouver; mine office, Quatsino. B. O. Brynelson, field engineer; S. G. Bruce, superintendent; R. P. Jordan, geologist.

The property consists of sixteen Crown-granted claims and eleven claims held by record by Noranda Exploration. They are on Comstock Mountain, 2 miles south of Pender Point on the west shore of Neroutsos Inlet, the southeast arm of Quatsino Sound, and extend from tide-water to an elevation of about 2,200 feet.

The original claims were located in 1898 and 1899, and active exploration and some mining were carried on until 1903. The property was then idle until late in 1916, when exploration and mining were resumed for about six months. Nothing further was done until the autumn of 1951, when the present company began work.

The property is mentioned in Annual Reports for the years 1902 to 1906, inclusive, 1916, and 1917; descriptions in the 1903 and 1916 Reports are detailed. It is described also in the Geological Survey of Canada Summary Reports for the years 1918, Part B, page 35, and 1929, Part A, page 124.

The rocks underlying the claims are andesites, agglomerates, tuffs, and limestones correlated‡ with the Vancouver group of Triassic age. They comprise three principal units—a lower unit of andesitic lavas to an elevation of about 900 feet; a middle unit consisting of banded limestone to about 1,000 feet, overlain by tuffs and agglomerates with lenticular beds of limestone to about 2,000 feet; and an upper unit of tuffs and andesitic flows. They are intruded by dykes and sills of basalt, diabase, and quartz-feldspar porphyry. A diabase dyke cuts a basalt sill near the east boundary of the N.S. Fraction claim, but the age relationships between these and the quartz-feldspar porphyries is not known.

The basalt intrusive bodies are green aphanitic rocks composed of plagioclase feldspar (andesine-labradorite) with interstitial pyroxene and magnetite. They range from a few inches to more than 20 feet thick.

The diabase is dark grey and fine grained, and is composed of plagioclase feldspar (labradorite), augite, and magnetite. The texture is ophitic. The dykes and sills are 5 to 10 feet thick.

The quartz-feldspar porphyry is a light-grey medium-grained porphyritic rock composed chiefly of quartz and feldspar phenocrysts in a fine-grained groundmass composed almost wholly of quartz and feldspar. The feldspars are principally orthoclase and oligoclase. Augite is present as phenocrysts (about 10 per cent) and as a minor constituent of the groundmass. The bodies range up to nearly 30 feet thick.

At an elevation of about 1,800 feet and near the New Comstock-N.S. Fraction-Asa Thor corner post a light-grey diorite-like rock is conformably in contact with overlying chloritic tuff. It is composed of phenocrysts of orthoclase, oligoclase, and hornblende in a groundmass made up of a matte of microlites showing a flow structure and apparently composed in the main of feldspar. Both feldspar and hornblende phenocrysts appear to be secondary, and the overlying chloritic tuff shows no sign of alteration at the contact. The writer therefore believes this rock represents an altered flow and suggests for it the term "hornblende trachyte." It may be confused easily in hand specimen with the quartz-feldspar porphyry, a distinguishing feature being the prominence of hornblende in the flow rock.

* By R. B. King, except as noted.
† By N. D. McKechnie.
‡ Gunning, H. C., *Geol. Surv., Canada*, Sum. Rept. 1929, Pt. A, p. 94.

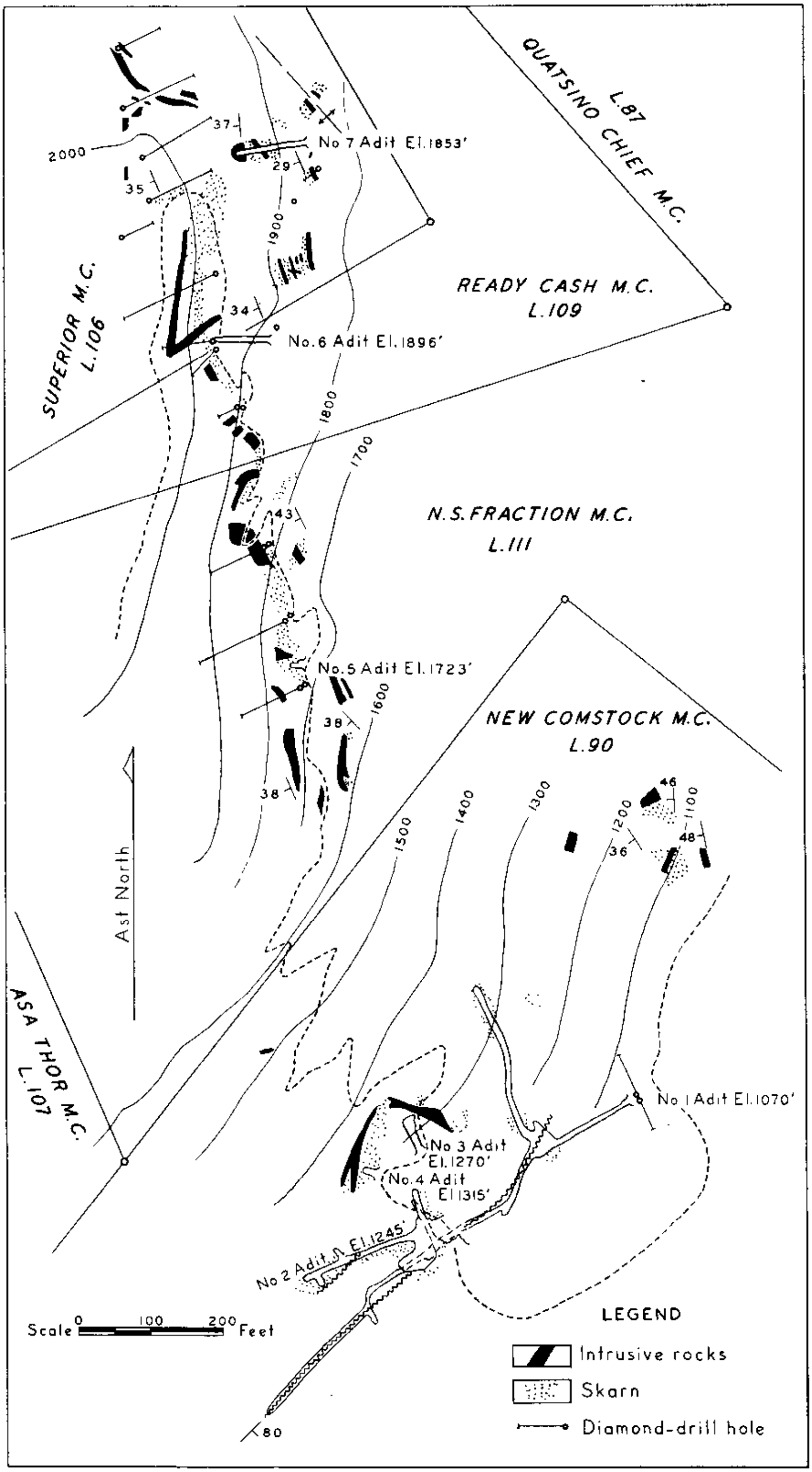


Figure 11. Part of Yreka property, showing distribution of skarn and intrusives.

The bedded rocks are folded about a northwest-southeast axis plunging 30 degrees northwest. An anticlinal nose is exposed in an open-cut near the southeast corner of the Superior claim. The beds in the southwest limb dip at 35 to 55 degrees into the face of the mountain.

A prominent shear zone, striking north 45 degrees east and dipping 70 degrees southwest, was opened by two adits on the New Comstock claim during the initial exploration of the property. Nothing is known positively of the direction of movement along the shear zone, but the fact that thick calcite fillings appear to be localized in the steeper parts may suggest that it is essentially a normal fault.

Four other directions of shearing, none of which appears to be of great significance, are: Strike north 40 degrees west, dip 80 degrees southwest; strike 80 degrees west, dip 70 degrees north; strike north 80 degrees west, dip 35 degrees north; strike north 25 degrees east, dip 30 degrees southeast.

The principal mineralized zone is part of the middle stratigraphic unit; namely, the limestones, agglomerates, and tuffs between elevations of 900 and 2,000 feet. This zone has been divided megascopically into the following rock types: Dark blue-grey recrystallized limestone, soft light-grey recrystallized limestone, silicified limestone, limy tuff and agglomerate, hard flinty agglomerate, hard flinty tuff, and epidote-garnet skarn. These types are mutually interbedded, the recrystallized limestones being markedly lenticular and the pyroclastic beds much less so.

The epidote-garnet skarn, of which there appears to be three main beds, contains almost all of the mineralization. The epidote-garnet alteration seems to have been confined to a particular type of bed which, for the following reasons, the writer believes to have been a limy tuff rather than a limestone:—

(1) Where recrystallized limestone and skarn are in contact, the contacts uniformly are sharp and regular, showing no sign of gradation from one rock type to the other.

(2) Thin bedding is visible in some of the skarn, and elsewhere is seen only in the tuffaceous beds.

(3) Some less-altered remnants in the skarn beds resemble tuff rather than limestone.

(4) Bedding planes, where visible in contiguous limestone and skarn, do not pass directly from one type to the other—they are conformable but not continuous.

Mineralization includes, in order of abundance, pyrrhotite, chalcopyrite, and pyrite; the latter is sparse. Magnetite is occasionally visible and, rarely, specularite.

Sphalerite and galena occur sparsely along Edison Creek, on the Tuscarora claim, in skarn beds from 4 to 6 inches thick, striking north 75 degrees west and dipping 70 degrees northward. These beds are interbedded with a greenish fine-grained limestone which shows no mineralization. This is the only occurrence of these minerals known on the property.

126-
235

The principal control of mineralization appears to have been the favourable tuff beds now represented by skarn. The shearing and faulting that have been observed seem to have had little, if any, effect upon the mineralization. There does, however, seem to be some tendency for the mineralization to increase where the skarn is overlain by a basalt sill, and in one instance a small but marked concentration was noted in an angle formed by the junction of a basalt sill and a basalt dyke. If the skarn beds originally were limy tuffs, a controlling factor probably was their permeability; the microcrystalline basalt could locally have formed relatively impermeable caps and dams.

Three mineralized skarn zones yielding appreciable assays in copper are exposed in the adits on the New Comstock claim. Projections on dip and strike indicate that one or more of these may correlate with similar zones exposed at elevations several hundred feet higher to the northwest on the N.S. Fraction and Superior claims. The present apparent possibilities of the property depend in large part upon the establishment of such a correlation.

A small crew has been engaged in stripping, cleaning out old workings, and X-ray diamond drilling since the fall of 1951.

UPPER QUINSAM LAKE (49° 125° N.W.)

Iron

The Argonaut Co. Ltd. Company office, Campbell River. A. F. Geiger, general manager; E. H. Willes, chief engineer. The Iron Hill property, south of upper Quinsam Lake, is in the Esquimalt and Nanaimo Railway belt and is leased from the railway on a royalty basis. The mine and mill on Iron Hill are 23 miles from the ore-loading dock near Campbell River. Ore is mined from an open pit in which levels are established at 30-foot intervals through a vertical range of 330 feet. Limestone waste is stripped where necessary and hauled to stockpiles.

Vertical holes are drilled, loaded with explosives, and blasted electrically or by primacord. The broken ore or waste is loaded by 2½-cubic-yard diesel-driven shovels into 18-cubic-yard Euclid trucks and transported to the concentrator or to limestone stockpiles.

Diamond drilling totalling 1,990 feet was done to explore the orebody extension. During 1953, 1,482,016 tons of ore was mined; 1,888,023 cubic yards of rock was stripped; 625,571 tons of concentrate, averaging 55.9 per cent iron, was produced; 618,201 tons of concentrate was shipped to Japan. The average number of men employed was 250.

COWICHAN LAKE (48° 124° N.E.)

Copper

Blue Grouse (Cowichan Copper Co. Ltd.) Osgood G. MacDonald, president and manager. The property consists of three Crown-granted claims and sixty claims held by record and covers two old properties formerly known as the Blue Grouse and Sunnyside group. The claims are on the south side of Cowichan Lake, about 3 miles westerly from Honeymoon Bay. In 1952 about 2½ miles of road was completed to the property. Development was continued on an adit which was started in 1918 at an elevation of 1,178 feet. This adit was continued for 446 feet to intersect the downward extension of a mineralized garnetite zone. A raise was started 425 feet from the portal and was driven a total of 186 feet. From this raise, 50 feet of sublevel development work was done. Ore from this development was sorted and dumped into an ore-bin. A shipment of 412 tons of ore, averaging 7.75 per cent copper, was shipped to the Tacoma smelter on January 10th, 1954. Nine men were employed.

NITINAT RIVER (48° 124° N.W.)

Bornite* The Bornite group of four claims is about 6 miles due west of the west end of Cowichan Lake. The claims are on the east side of the ridge between Worthless and Parker Creeks and cover ground between the north and south forks of an eastward-flowing tributary of Parker Creek known locally as Horse Creek. They are reached from British Columbia Forest Products Limited Camp 3 at the west end of Cowichan Lake. Logging-railway speeders run to within one-half mile of the property, and an old trail that originally extended from Cowichan Lake to Alberni Inlet passes by the main showings. The trail follows the north side of Horse Creek to an elevation of about 750 feet above sea-level, then crosses the north fork to the ridge between the north and south forks of the creek.

* By J. T. Fyles.

Lucky Four property on Cheam Range.

Looking westward down McKee Creek to Atlin Lake.

The main showings are between elevations of 1,200 and 1,700 feet above sea-level on the crest and north side of the ridge between the north and south forks of Horse Creek. Workings consist of between ten and twenty open-cuts and strippings along a northwesterly trending mineralized zone. Several drill sites, the collars of a few holes, and broken boxes of core are present near some of the workings.

The Annual Reports for 1931 (p. 165) and 1932 (p. 202) refer to the Southern Cross claims covering the ground now known as the Bornite group. Very little work had been done by 1932, and the property is not referred to in later Reports. People living around Cowichan Lake say that the property was drilled in 1937 or 1938, but a more definite record is not available. The property was relocated in 1947. It was recorded as the Bornite group early in 1953 by John C. Kay and A. J. Ostrem, of Victoria. Following the last recording, a few of the old open-cuts were cleaned out and American Standard Mines Limited is reported to have mapped and sampled the main showings.

Rocks near the mineralized zone are mainly fine-grained greenstones with small amounts of grey limestone, similar to the volcanics and Sutton limestone of the Vancouver group. Locally, the greenstones are amygdaloidal, but most are massive. The limestone is dark grey, massive, and fine grained. It occurs as pods 1 or 2 feet wide and a few tens of feet long, closely associated with skarn.

The mineralized zone is made up of skarn containing chalcopyrite. The skarn is mainly an aggregate of a black, coarsely crystalline calcium-iron-silicate, ilvaite, and medium-grained brown garnet. Relatively pure aggregates of ilvaite and of garnet are common, and ilvaite appears to be more abundant than garnet. Epidote and actinolite are present locally. Chalcopyrite and small amounts of bornite occur as massive pods a few inches wide and 1 or 2 feet long and as disseminated grains. The pods and zones of disseminated chalcopyrite are irregular in form, and factors controlling their distribution are not obvious. The skarn zone seen by the writer is about 1,600 feet long and in general 50 to 100 feet wide, though at one place it appears to be as much as 200 feet wide. Green dyke-like masses of feldspar porphyry cut the skarn zone, and small pods of limestone occur within it. At two places poor banding in some of the skarn and limestone strikes northwest and dips 45 degrees southwest. This strike is parallel to the length of the mineralized zone, but the general structure of the enclosing rocks is not known.

The following table shows assays of samples taken by the writer. Samples Nos. 2 and 3 are chip samples of what appears to be an average grade in copper. Samples Nos. 4 and 5 are adjacent channel samples taken along a horizontal line trending north 5 degrees east. They were taken to represent the highest grade of uniform copper mineralization seen. Samples Nos. 1, 6, and 7 were selected from well-mineralized broken skarn on the dumps of three open-cuts. None of the samples contains silver.

Sample No. and Location	Width	Gold	Copper
	Ft.	Oz. per Ton	Per Cent
1. Southeast end of main skarn zone	Grab	Trace	3.2
2. About 400 feet northwest of southeast end of main skarn zone	9	*Nil*	0.6
3. About 75 feet southwest of No. 2	7	*Nil*	0.5
4. About 150 feet northwest of No. 3	7	Trace	3.8
5. About 150 feet northwest of No. 3	10	0.01	2.7
6. Near northwest end of main skarn zone	Grab	*Nil*	2.5
7. Near northwest end of main skarn zone	Grab	*Nil*	1.2

Placer

CONTENTS

ATLIN*

SPRUCE CREEK (59° 133° N.W.)

Noland Mines Limited

Five partners, J. D. Ward, A. V. Mattson, T. R. Mattson, D. S. Mattson, and R. F. Smith, with J. D. Ward as manager, operated the Noland mine under an agreement with Noland Mines Limited. The Noland mine is at the junction of Dominion Creek with Spruce Creek and is 12 miles by road from Atlin.

During the period of operation from May to December 31st, excavation was as follows:—

	Cubic Yards Excavated	Per Cent
Safety drives, ventilation, and haulage	501.7	14.9
Pillar development	1,464.8	43.4
Pillar extraction	1,391.5	41.3
Mine clean-up	14.0	0.4
Totals	3,372.0	100.0

* By J. W. Patterson.

From this total of 3,372 cubic yards of gravel, 2,730.17 fine ounces of gold and 389.13 ounces of silver were obtained, having a total value of $87,395.

Development work totalling 435 feet was done to provide drainage and tramming facilities for new workings in grey gravel which is 5 feet below the original workings. This grey gravel lies in a channel which crosses the main channel obliquely.

The sluicing arrangement was altered to eliminate the trommel screen and rock-disposal chute. All large boulders are now left underground. Fourteen men were employed, including the five partners.

Enterprise Placers

Between April 15th and November 17th, ground leased from Spruce Creek Placers Limited was worked by three partners, John M. Acheson, Floyd M. Wilson, and Clyde B. Day, and their three employees. About 106,000 cubic yards of gravel was sluiced. A shovel, a bulldozer, and a dragline were used to move the gravel and tailings.

Duncan K. Falconer.—Between January and September, Duncan K. Falconer worked alone on his underground placer property.

McKee Creek (59° 133° S.W.)

Bruce Morton worked alone on his ground from May 3rd to November 26th.

The three partners Joe and Luigi Piccolo and George Watt worked their ground from May 1st to November 17th.

Boulder Creek (59° 133° N.E.)

Three partners, Norman S. Fisher, Ole Olsen, and Oscar Carlson, and three employees, worked ground leased from The Consolidated Mining and Smelting Company of Canada, Limited. Water which is obtained from the dam on Boulder Creek about a quarter of a mile above the workings was sufficient only to operate one 6-inch monitor for short periods each day. About 1 ton of black sand was produced in addition to the gold recovered.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 238–239.]

OMINECA*

Manson Creek (55° 124° N.W.)

Art Hyndman worked his placer property alone.

Slate Creek (55° 124° N.W.)

W. H. Mathews and son did some hydraulic work on his property.

Carl Nelson worked his ground alone, moving the ground by hydraulic and using a bucket-conveyor to remove the tailings.

E. A. Ostjord with a partner worked his ground on Slate Creek for a short period.

Germansen River (55° 124° N.W.)

The ground between Little Slate and Mill Creeks, formerly worked by Germansen Mines Limited, was optioned by K. H. Armstrong, of Seattle, Wash. Recovery of gold was not started until late in the season, and production was small.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1936, C 8–10.]

Lost Creek (55° 124° N.W.)

E. A. Ostjord, using a monitor and a small bulldozer, started sluicing operations late in the season on ground adjoining Lost Creek.

* By J. W. Patterson.

CARIBOO*

Hixon Creek (53° 122° S.W.)

Hixon Placers Inc. Company office, 712 Jones Building, Seattle, 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. A crew of four men hydraulicked 70,000 cubic yards of gravel in removing overburden from an old channel of Hixon Creek.

Willow River (53° 121° S.W.)

Emory Gulch.—F. G. Dumont and partner hydraulicked 250 cubic yards of gravel on Emory Gulch, a tributary of Stouts Gulch.

Williams Creek.—M. Benischke and two partners completed 120 feet of timbered drift in gravel in the right bank of Williams Creek, downstream from Barkerville.

Kumhila Exploration Company Limited.—This company, employing a crew of eighteen men, mined 68,200 cubic yards of gravel with their dragline dredge on Williams Creek near Devlin Bench on the Bowron Lake Road. Operations were suspended in early September and the washing plant dismantled when no further pay gravels were located.

Lowhee Creek.—O. K. Nason and two partners hydraulicked 7,000 cubic yards of gravel from the sides of Lowhee pit, upstream from Watsons Gulch.

Placer Creek.—H. C. Christenson hydraulicked 4,300 cubic yards of gravel on Placer Creek, which flows into the south end of Jack of Clubs Lake.

Ketch Placers.—R. E. MacDougall and partner hydraulicked 60,000 cubic yards of gravel from a channel on the bench above the Burns Creek pit on Slough Creek.

Kwong Foo Creek.—W. E. North and W. K. Nichols, of Vancouver, employing three men, hydraulicked 6,000 cubic yards of gravel in a bench pit south of Kwong Foo Creek, a tributary of Beaverpass Creek.

Hyde Creek.—C. L. MacColm continued hydraulicking on a bench lease on Hyde Creek.

Langford Mines Ltd.—A crew of three men installed a 6-inch-diameter pipe-line between Aura Fina Creek and the old Langford mine workings on the east side of Tregillus Creek. Sluices were installed and part of the old workings was removed by hydraulicking.

Rouchon Creek.—J. H. Feyer hydraulicked 15,000 cubic yards of gravel on Rouchon Creek.

Eight Mile Lake.—M. A. Anderson hydraulicked 555 cubic yards of gravel near Eight Mile Lake.

Antler Creek (53° 121° S.E.)

Upper Antler Creek.—A. Holm sluiced 150 cubic yards of gravel on Upper Antler Creek.

Guyet Creek.—D. H. Wells, employing a crew of three men, hydraulicked 3,000 cubic yards of gravel on a high bench approximately half a mile downstream from the Guyet pit on Antler Creek. A small amount of Keystone drilling failed to reveal a pay channel.

Antler Mountain Gold Ltd. A. W. Ludditt and one man hydraulicked 3,000 cubic yards of gravel on Grouse Creek near its intersection with Heron Channel. This work disclosed the existence of a much deeper channel cutting across the creek and the Heron channel. A shaft was sunk with a view to driving an exploration drift along this newly located channel. Work was suspended

* By J. E. Merrett.

in the shaft at a depth of 22 feet when a heavy inflow of water could not be handled with the equipment available.

Canadian Creek.—A. McGuire completed 20 feet of timbered shaft on upper Canadian Creek.

J. Holland hydraulicked and drifted 5,000 cubic yards of gravel on lower Canadian Creek.

Antler Creek.—G. Milbourne hydraulicked 500 cubic yards of gravel at the junction of Empire and Antler Creeks.

Lightning Creek (53° 121° S.W.)

Amador Creek.—H. D. Hadlund hydraulicked 60,000 cubic yards of gravel on three leases near the junction of Amador and Lightning Creeks. The three leases are held under option by Hedley-Gordon Mines Ltd., 406 Crown Building, Vancouver.

Grub Gulch.—Ennerdale Placers, operated by F. W. Freeman and J. Hind, hydraulicked 3,000 cubic yards of gravel on Grub Gulch.

Campbell Creek.—E. M. Johnson hydraulicked 10,000 cubic yards of gravel on Campbell Creek.

Cottonwood River (53° 122° S.E.)

Cottonwood.—Richard Cresswell, of Quesnel, did a small amount of testing on his lease located on Cottonwood River approximately half a mile east of the Pacific Great Eastern Railway bridge.

Cottonwood Canyon.—Norwood Bros. did approximately 18 feet of drifting on their lease near Cottonwood Canyon.

Stoney Creek Placers Limited.—The suction-dredge equipment was removed from the barge and assessment work only was done.

Quesnel River Area (52° 121° N.W.)

Morehead Creek.—R. C. C. Smith, of Victoria, continued hydraulic testing on leases held by H. C. Weber, of Vancouver, on Morehead Creek. In addition, a considerable amount of repair work was done on the three-quarters of a mile of ditch to the dam at the junction of Morehead and Hydraulic Creeks.

Lawless Creek Mining Company

Company office, 6930 Beverley Boulevard, Everett M 26, Wash.; mine office, Likely. Clifford V. Landon, manager. Mr. Landon and one partner continued hydraulicking on the east bank of Lawless Creek near its junction with the Quesnel River. During September and October, 2,500 cubic yards of overburden and 750 cubic yards of pay gravel were hydraulicked. This work revealed part of an old river channel, presumably of the Quesnel River, containing many large boulders and reported to contain good gold values.

Likely

E. A. Bradley, employing a crew of two men, continued drifting in the hill on the west side of Quesnel River at Likely. A compressed-air pick was being used to advance the face, which was approximately 375 feet from the portal at mid-October.

Keithley Creek (52° 121° N.E.)

Keithley Creek.—L. Fournier resumed sluicing on the east bank of Keithley Creek, approximately 1 mile north of Four Mile Creek.

V. Johnson continued underground placer-mining on his lease near the junction of Weaver and Keithley Creeks.

E. Lang brought in a Keystone drill to test ground for C. A. Pitts, of Vancouver, on Keithley Creek below its junction with Snowshoe Creek.

A. E. McGregor continued hydraulicking and sluicing with the aid of a boom dam at the junction of Snowshoe and Keithley Creeks.

Upper Keithley Creek.—J. R. Foster and associates, of Seattle, employing a crew of three men, installed a dam foundation and cleared a pipe-line route from the dam to the falls on upper Keithley Creek on leases optioned from C. G. Dunham, G. A. Goldsmith, and A. E. McGregor.

Nigger Creek.—T. Payne and one man constructed a pack-horse trail from the Yanks Peak road to the headwaters of Nigger Creek, where a small hydraulic plant is being installed.

CLINTON*

Big Bar Creek (51° 122° S.E.)

Alpine Dredging Enterprises Ltd. Company office, P.O. Box 632, Vancouver; mine office, Big Bar. T. C. McAlpine, manager. Mr. McAlpine, assisted by two partners and one employee, assembled a suction dredge with an 8-inch intake on the Fraser River at the Big Bar Ferry crossing. Some test runs were made and a reported 6,000 cubic yards of gravel was treated by the washing plant. The dredge was then moved approximately half a mile downstream to a bar near the junction of Big Bar Creek and the Fraser River, at which point the barge sank. Additional work was the digging of eighteen test pits on the bar and the construction of approximately half a mile of road.

LILLOOET*

Bridge River

Yalakom Placers.—(50° 122° N.E.) G. Haycock, employing a crew of three men, sluiced 1,100 cubic yards of gravel on eight leases between Antoine and Michelmoon Creeks on Bridge River.

McKee Leases.—(50° 122° N.E.) G. Haycock, employing a crew of three men, sluiced 1,200 cubic yards of gravel on twelve leases owned by J. H. McKee, of Vancouver, between Michelmoon Creek and the British Columbia Electric Railway Company's diversion dam on Bridge River.

Hurley River.—(50° 122° N.W.) W. Haylmore sluiced 500 cubic yards of gravel in repairing drift timbering and reopening drainage ditches on his lease near Gold Bridge.

CAYOOSH CREEK*

Cayoosh Creek (50° 121° N.W.) P. Matson and associates, of Langley Prairie, trenched and sluiced 1,500 cubic yards of gravel on Cayoosh Creek, three-quarters of a mile above its junction with Seton Creek. A Wilfley table was used and 1,500 pounds of concentrate was produced.

FRASER RIVER (50° 121° N.W.)*

Farmer Mine Enterprises Company office, Northport, Wash.; mine office, Lillooet. O. W. Harris, Jr., manager; H. E. Harris, mine manager. This company optioned a lease held by G. R. and V. G. Firman on the Fraser River immediately above the mouth of Sallus (Fourteen Mile) Creek. Hydraulic equipment was installed and 2,100 cubic yards of gravel was washed. An additional 6,200 cubic yards of gravel was removed with the aid of a bulldozer. A crew of three men was employed.

* By J. E. Merrett.

Lillooet Mining and Dredging Company Limited

Company office, 222, 999 West Pender Street, Vancouver; mine office, Lillooet. A. C. Hutton, manager. A washing plant, which uses a centrifugal machine to separate fine gold from black sand, and a stationary dragline were installed on the west side of the Fraser River approximately half a mile below the mouth of Cayoosh Creek. Approximately 300 cubic yards of gravel was washed by a crew of three men.

Taylor and Sheaves.—L. D. Taylor and G. R. Sheaves sluiced 900 cubic yards of gravel on the Fraser River, 7 miles south of Lillooet.

Black Beaver Placers Limited

Company office, 470 Granville Street, Vancouver; mine office, Lillooet. W. H. Miller, manager; A. J. Hall, secretary-treasurer. This company is working two leases on the Fraser River near the area known as the Big Slide on the Lillooet–Lytton road approximately 15 miles south of Lillooet. Approximately half a mile of road, camp buildings, and a recovery-plant barge were constructed.

LYTTON*

Kanaka Bar

(50° 121° S.W.) J. McLean, of 510, 615 West Pender Street, Vancouver, leased the suction dredge and placer-mining leases (formerly operated by the International Gold Master Mining Ltd.) from J. E. Wood, 225 West Fifteenth Avenue, Vancouver, and associates, at Kanaka Bar on the Fraser River, 2 miles south of Cisco. Prior to high water in the river the dredge boat was moved upstream into a backwater. As the boat was being moved downstream after high water, the main cable pulled loose from one of its anchors and at the same time some of the side guide cables snapped, thus allowing the boat to ground on a bar. The boat was refloated and secured in a backwater, but no operational work was done before the end of 1953.

PERRY CREEK†

Sawmill Creek.—(49° 116° N.E.) F. McIntyre is sinking a shaft to bedrock on his placer leases located just above the junction of Sawmill and Perry Creeks.

Perry Creek.—(49° 116° N.E.) D. Langevin continued sluicing operations on his leases located a mile above the Sawmill-Perry Creek junction.

Kumhila Exploration Co. Ltd.

(49° 116° N.E.) In September, L. J. Hickman, one of the principals in this private company, did some test drilling on leases near the junction of Sawmill Creek and Perry Creek and about 10 miles from the Cranbrook–Kimberley Highway. Nine 38-foot holes were drilled to bedrock with a Keystone "71," 6-inch churn drill. The results were disappointing, and no further work is planned for the area.

MOYIE RIVER†

Kumhila Exploration Co. Ltd.

(49° 116° S.E.) In the late autumn, L. J. Hickman moved the Keystone drill from Perry Creek to the Moyie River and commenced drilling on placer leases located about 10 miles upriver from the Cranbrook–Creston Highway. Before winter set in, seven 48-foot holes were drilled to bedrock. Results were inconclusive owing to the broken nature of the bedrock, but they were sufficiently interesting to encourage additional work. The equipment was stored at the drilling site, and it is expected that operations will be resumed in the spring.

WILD HORSE RIVER† (49° 115° N.W.)

Wild Horse River.—J. Holbrook continued to work his leases located 2 miles upstream from the Kootenay Base Metals mill.

* By J. E. Merrett.
† By H. N. Curry.

Structural Materials and Industrial Minerals

CONTENTS

INTRODUCTION

Progress notes and reports on structural materials and industrial minerals are contained in this section.

Production statistics for structural materials and industrial minerals will be found under those sub-headings in Table I, page 15; Table III, page 16; Table VIIA, page 22; Table VIID, page 25; Table VIIE, page 26; and Table VIIIC, page 30.

In 1953 Cassiar Asbestos Corporation completed much of the building programme of its townsite at McDame. The mill was running at an average rate of 240 tons per day for the last half of the year. A new limestone quarry was opened up at Shames, near Terrace, and from it a trial shipment was made to the Columbia Cellulose plant at Port Edward. The first major shipment of perlite was made from the Francois Lake deposit. Operation of the silica quarry at Oliver was taken over by Stucco Supply Company, of Vancouver.

Interest in asbestos was high, and survey and exploration work was carried out by several companies in the McDame, Bridge River, and South Okanagan areas and on Sproat Mountain.

A new perlite discovery was made near Uncha Lake.

The results of a programme of sampling and testing shales in the Vancouver Island-Lower Mainland areas have indicated that there may be some materials suitable for making light-weight aggregate.

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. R. Devlin, manager. Included in the buildings constructed in 1953 are a cone crushing plant, ore drier and dry-rock storage buildings, a boiler-house, seven thirty-man bunk-houses, eight family dwellings, and a recreation-hall. Construction of a dining-hall, cookery, and power-house extension was not completed.

Between the first of July and the end of December, 39,610 tons of asbestos ore was milled, giving a milling rate of approximately 240 tons per day; also 30,356 tons of ore from the open pit and 57,716 tons from the talus slope near the top of McDame Mountain were moved part way down the mountain in a 2,700-foot-long steel chute fitted with flight conveyors. Trucks hauled the ore the remaining distance to the stockpile near the mill. Underground work consisted of 271 feet of crosscutting.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1951, pp. 211–214.]

P.H.†

Bridge River (50° 122° N.W.). In the autumn of 1951 H. Reynolds, of Lillooet, located two claims, the A.S.B. Nos. 1 and 2, on a showing of short-fibre asbestos 3 miles west of Gun Lake. After further prospecting Reynolds increased his holdings by adding the P.H., P.H. Nos. 1, 2, and 3 in 1952, and the P.H. No. 4 in 1953. No development work had been done on the claims when they were examined in late August, 1953.

The showing is at an elevation of 8,000 feet across the top of the ridge that separates the head of the north fork of Walker (Walk) Creek from the valley of Roxey Creek. This is about three-quarters of a mile north of Mount Penrose peak.

The easiest route into the claims is up the Gun Creek-Roxey Creek road to the Gem mine camp and then up the east bank of Roxey Creek for 1 mile. At this point an easily ascended talus slope extends southeastward up to a saddle at the south end of the serpentine body that contains the asbestos. In August, 1953, the Gun Creek road was suitable for passenger-cars, but the road from Gun Creek bridge up Roxey Creek to the camp was only navigable by four-wheel-drive jeep.

On the claims, asbestos is found in narrow veinlets in widely spaced narrow zones that strike northward across a small serpentine body. The serpentine forms an irregular elongate mass about 800 feet wide and 2,000 feet long, oriented in a north-south direction. Except for a small patch of sediments on the southeast, the surrounding rock is granodiorite. Numerous thin, irregular dykes of granodiorite cut the serpentine. Preliminary map 43-15A, Tyaughton Lake sheet, published by the Geological Survey of Canada, shows several other larger bodies of serpentine in the surrounding area.

The asbestos is cross-fibre chrysotile. Colour varies from dark grass green to yellow green. The fibres are fairly harsh but have good strength. Fibre length varies from one thirty-second of an inch to one-half inch and averages one-eighth inch; half-inch material is rare. The asbestos veinlets are generally short and pinch and swell abruptly. They occur in parallel swarms in scattered parallel zones ranging from 6 inches to 2 feet wide. One larger zone, 80 feet wide, is exposed on the ridge 100 feet west of the No. 1 post of P.H. No. 4 claim. In this zone the veinlets are widely separated and the over-all fibre content is low.

Pedro, Sunshine, etc. (Western Asbestos and Development Ltd.)†

Shuttleworth Creek (49° 119° S.E.). Company office, 613, 475 Howe Street, Vancouver. P. D. Graham, president; Charles Maddin, general manager. Capital, 3,000,000 shares, 50 cents par value. During the summer of 1953 this company examined an anthophyllite asbestos deposit 4 miles southeast of Okanagan Falls. Numerous trenches were dug, five diamond-drill holes were drilled, and a geological map of the area was prepared. 82E/SW-110

* By J. W. Patterson.
† By J. W. McCammon.

This asbestos deposit has been known for many years. It is supposed to have been discovered originally in 1898 by G. Maynard. Claims were recorded on the ground in 1910, and Camsell* examined the showings the same year. The Annual Report of the Minister of Mines noted activity on the property in 1920.† R. C. McKay and L. E. Iverson recorded claims on the same ground in 1947 and induced a group headed by W. J. Asselstine to do some exploration work in 1948. Cummings‡ reported on the property in the latter year. Little else was done until work began in the summer of 1953.

The deposit is between elevations of 2,600 and 3,200 feet on a hillside one-half to three-quarters of a mile south of Shuttleworth Creek. It is readily accessible by means of 6 miles of road that goes east from the Penticton–Oliver Highway (Highway No. 97) at the centre of the east shore of Vaseaux Lake.

The asbestos is in a dunite mass that intrudes gneiss. Natural outcrops of dunite are rare, but exposures of gneiss are relatively abundant, particularly toward the crest of the hill.

The gneiss is light- to medium-grey granite and granodiorite gneiss of the Shuswap Complex as mapped by Cairnes. The attitude of the foliation is variable, but in the immediate vicinity of the dunite it has a general northwest strike and an average dip of 23 degrees northeast.

The dunite is a finely granular-looking rock that is dark green to black when unweathered and light brown when weathered. Thin sections show it is composed mainly of olivine, with as much as 10 per cent of what is now amphibole. The olivine is partly altered to serpentine and magnetite dust, and the amphibole is partly altered to talc. In a few places, patches and irregular veinlets of enstatite in crystals as much as 2 inches long were noted. The entire ultrabasic mass is badly fractured by joints that strike in all directions. Faults of small movement are numerous.

The dunite forms an irregular mass that is discontinuously exposed, chiefly in trenches, for a length of half a mile and a width of as much as 700 feet. More dunite, perhaps part of the same body, is reported one-quarter of a mile southeast of the map-area shown in Figure 12. Drilling appears to indicate that the dunite mass is about 100 feet thick. Drill-hole No. 2 (*see* Fig. 12), a vertical hole, went through 98 feet of dunite and continued in gneiss to 356 feet. Hole No. 4, also vertical, penetrated dunite to 82 feet, then mixed gneiss and mica-asbestos veinlets to 174 feet, and finished at 197 feet in gneiss. Hole No. 3, a vertical hole, was drilled to 198 feet in gneiss and showed dunite only in one 1-foot seam at 127 feet depth and one or two other thin layers below that. A fourth vertical hole, near the centre of the Ivormack No. 2 claim, was drilled to 336 feet and was in gneiss all the way.

The only contact seen between gneiss and dunite was in the large trench 400 feet southwest of the cabin. There is some doubt as to whether the gneiss at this spot is actually in place. At the contact, dunite appears to intrude the gneiss along a shear.

Many acid dykes and irregular pegmatite masses intrude the dunite. These bodies range from 5 inches to 7 feet wide but are most commonly 1 or 2 feet wide. The dykes dip steeply eastward and strike between north and northwest, most frequently about north 5 degrees west.

The asbestos found on the property is greyish-green to white anthophyllite. It forms irregular lenses and cross-fibre veinlets scattered through the dunite. The lenses are from 1 to 10 feet wide and as much as 12 feet long. The asbestos in these lenses is in three forms: (1) Hard, woody-looking chunks with fibres as much as 8 or 10 inches long; (2) randomly oriented sheaf-like clumps of fibres one-quarter to three-quarters of an inch long; (3) powdery aggregates of tiny needle-like fibres. Small brown mica flakes

* *Geol. Surv., Canada*, Sum. Rept., 1910, pp. 117, 118.
† *Minister of Mines, B.C.*, Ann. Rept., 1920, p. 164.
‡ *Minister of Mines, B.C.*, Ann. Rept., 1948, p. 182.

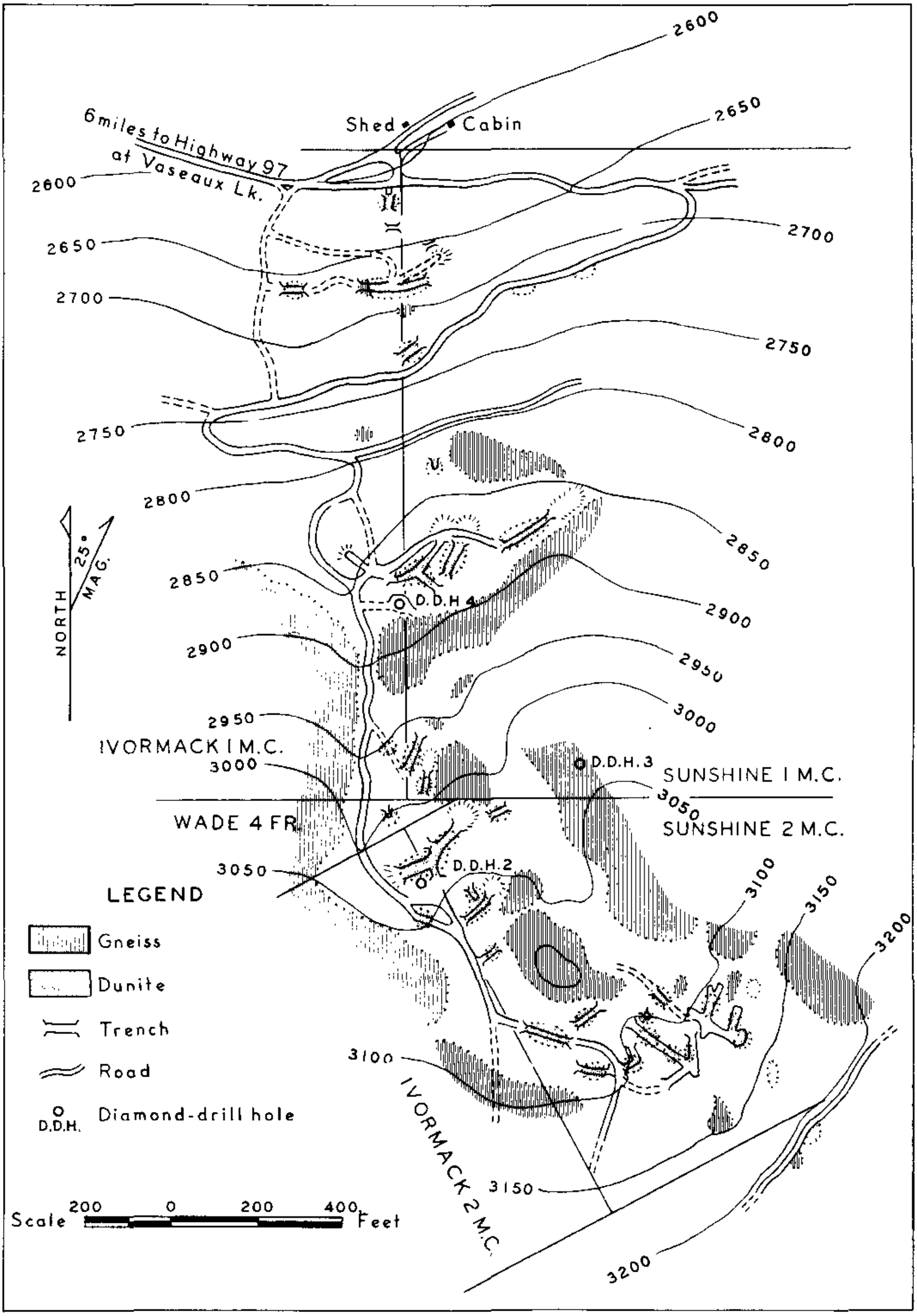


Figure 12. Shuttleworth Creek asbestos deposit.

are commonly intermixed with the fibres of types (2) and (3). Some of the type (1) fibre can be fluffed up into balls, but the fibres are not strong and soon disintegrate into powder when rubbed between the fingers. The other fibre types are quite brittle and, when rubbed between the fingers or pounded on a flat surface, readily break down into a smooth talcy powder.

The asbestos veinlets are from one-quarter inch to 27 inches wide, most commonly in the 2- to 6-inch range. In most cases trenching has been done across the strike of the veins, so no good idea of vein length was obtained. The veinlets are generally scattered and single but in places occur in close parallel groups of as many as twelve or more. The veins strike in various directions, but most belong to one of two groups with strikes between 50 and 80 degrees east of north and between 30 and 45 degrees west of north. The majority of the veins are nearly vertical.

Frequently the asbestos and associated mica form zones along the walls of the acid dykes. The common arrangement is with the dyke in the centre, a zone of mica on each wall next to the dyke, and a zone of fibre next to the mica. Normally the mica and asbestos are on both walls of the dyke, but sometimes they are only on one side, most commonly the hangingwall side.

One other mode of occurrence of fibre was noted. In some exposures, cores of dunite appear to be enveloped in layers of asbestos with the fibres oriented perpendicular to the dunite surfaces. The fibre layers are as much as 8 inches thick.

The fibre in all of the showings examined was easily reduced to a talcy powder either by rubbing between the fingers or pounding on a flat surface.

The mica associated with the asbestos is silvery green to black or brown. The green and black type is biotite. The brown type is rather brittle, soft, and slippery and appears to be a form of vermiculite altered from biotite. The vermiculite type exfoliates quite well when heated, but in so doing it breaks down into small pieces, mostly with diameters of less than one-eighth of an inch.

The workings seen on the property consist of twenty-five trenches from 3 to 20 feet deep positioned as shown in Figure 12. Variable amounts of fibre were seen in all the trenches. A few other trenches are reported to have been dug on dunite southeast of the area shown in Figure 12, but these were not examined. Because of the generally irregular shapes and discontinuous nature of the showings of fibre, no attempt was made to estimate quantities. It is considered that the volume of fibre recoverable would be limited.

Asbestos, I.X.L., and Sidmouth (Western Asbestos and Development Ltd.)*

Sproat Mountain (50° 117° N.W.). Company office, 613 Stock Exchange Building, 475 Howe Street, Vancouver. P. D. Graham, president; Charles Maddin, manager; James Purdie, resident manager. Capital: 3,000,000 shares, 50 cents par value. This company controls a group of claims on Sproat Mountain near Sidmouth, which is 24 rail-miles south of Revelstoke. The Asbestos claims Nos. 1 to 4 are under option from J. T. Lauthers, and the I.X.L. claims Nos. 5 to 8 from Margaret McIntosh. In addition, the Sidmouth claims Nos. 1 to 15 were staked. A road with grades of 15 to 35 per cent extends 3 miles from Sidmouth to the main showings. Veinlets of asbestos have been developed in the past by open-cuts and diamond drilling. In 1953 bulldozer stripping was done and a drill site established on the Asbestos No. 2 claim, about 150 feet from No. 4 cut, which exposes the best showing. Three holes totalling about 600 feet were drilled.

All work ceased by October. As many as eight men were employed.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1950, pp. 214–217.]

* By J. W. Peck.

BARITE

Mountain Minerals Limited*

Company office, Morris Building, P.O. Box 273, Lethbridge, Alta. R. A. Thrall, managing director. Capital: 2,000 shares, $100 par value. This company owns one barite quarry, 7 miles by road from Parson siding and another 5 miles from Brisco. Operations were resumed at the Parson quarry (51° 116° S.W.) on May 1st, and from it 970 tons of barite was shipped, 870 tons to Montreal for the glass and pigment trade and the remainder to the company's processing plant at Lethbridge. Readily available barite from this quarry is nearly exhausted, and an underground development programme is being considered for another season.

The Brisco quarry (50° 116° N.E.) was operated until mid-November, and from it 2,420 tons of barite was shipped to Lethbridge for use in oil-well drilling.

In both quarries the barite is benched with an air plugger using steel bits, picked up with a Hough Payloader, and trucked to the railway. William McPherson was in charge, and two other men were employed.

BENTONITE

Princeton Properties†

Princeton (49° 120° S.W.). Harold Englund, manager. Further testing was done on the bentonite deposits at Princeton. Some interest was shown in the property by other mining companies, but no development was undertaken.

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. The stone is moved by two wooden derricks to scows and transported to Vancouver for finishing. 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; 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 and 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 900 tons of stone was produced from May 5th to September 4th, 1953. 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, riprap, and rubble are produced in sizes ranging from 10 pounds to 10 tons. The quarry is worked with one face, in places reaching 200 feet in height. Wagon drills are used to drill holes for blasting. Broken rock is loaded by a 1-cubic-yard diesel-driven shovel into wire-rope nets of 10-ton capacity. These are transported by a steam-driven derrick and loaded directly on to scows. Approximately 110,000 tons of rock was produced at Granite Falls in 1953. Seven men were employed.

* By H. N. Curry.
† By E. R. Hughes.
‡ By R. B. King.

Gilpin Construction Co., Ltd.* Indian Arm (49° 122° S.W.). Company office, Park Royal P.O., West Vancouver. The name of this company was changed from Gilpin-Nash Limited. Jetty-rock and rubble are produced from this quarry. The rock is drilled with wagon drills, blasted, and loaded by a ¾-cubic-yard diesel-driven shovel into 12-cubic-yard-capacity trucks, then dumped into scows. Approximately 46,282 tons of granite was quarried during the operating period of five months.

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. Quartz diorite for jetties, dykes, and concrete aggregate is produced by this company. Rock is broken from a quarry face, which is nearly 100 feet in height, mainly by the "coyote hole" method of mining. Broken rock is loaded by a 2-cubic-yard diesel-driven shovel into 12-cubic-yard-capacity trucks. The rock is dumped 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-inch) is stockpiled. The quarry produced over 200,000 tons of rock in 1953. Thirty-four men were employed.

Valley Granite Products Ltd.* Cheam View (49° 121° S.W.). Company office, 410 Mayfair Avenue, Chilliwack; plant, Bridal Falls. The quarry and crushing plant are 11 miles east of Rosedale. The granite is drilled, blasted, and hand-loaded into a 1-ton-capacity car and transported to a crushing and screening plant. The plant produces turkey, chicken, and bird grit, stucco-dash, sand-blasting material, and sanding material for automotive vehicles. Fine material is also used as a soil-amendment product. Ten men were employed.

CLAY AND SHALE

Preliminary Report on Bloating Shales from Southwestern British Columbia†

Among the many light-weight materials used as aggregate in the building industry, the type made by bloating shale or clay is probably receiving greatest attention at present. When heated under controlled conditions, certain clays and shales will expand or "bloat" to form a porous, cinder-like material that is used in place of gravel and, to some extent, sand in concrete. The resulting concrete has from one-half to three-quarters of the weight of concrete made with gravel. This light-weight concrete is used for reinforced-concrete buildings, bridge decking, building-blocks, and roof, wall, and floor slabs for small buildings. The chief advantages of using light-weight concrete are savings in the amount of structural and reinforcing steel required, increased insulation value, and ease in handling.

Two kinds of light-weight aggregate are made from clay and shale; namely, coated type and sinter type. The coated type is the better, but the sinter type can be made more cheaply and from a greater variety of raw materials.

Coated aggregate is made by heating closely sized lumps of shale or clay pellets in a rotary kiln. The product consists of rounded particles that are porous in the interior and have a thin, strong, smooth, impervious skin.

Sinter-type aggregate is made in rotary kilns or in sintering furnaces. The product from the heat treatments consists of lumps and cakes of clinker that are crushed and then screen-sized. The final product is angular and has a rough, porous exterior.

During the 1953 field season a shale-sampling programme was undertaken to try to find shale suitable for bloating. To be of present economic interest, such material

* By R. B. King.
† By J. W. McCammon.

Columbia Gypsum Products, Inc.—quarry and crushing plant.

Cassiar Asbestos—talus of rock and crude asbestos currently being mined.

would have to be within reasonable distance of the Lower Mainland-Vancouver Island area, the only part of British Columbia which offers sufficient apparent potential market. For this reason, sampling was concentrated on Vancouver Island south of Campbell River, the Gulf Islands, and the Lower Mainland west of Hope. In addition, the Princeton-Merritt region was investigated.

Because of the abundance of good gravel deposits in the area concerned, it was felt that to be of interest a light-weight aggregate would have to be produced cheaply and be of high quality. Accordingly, it was decided to restrict sampling to shales, to test for natural bloating materials without using additives, and to aim at producing coated aggregate. It should be noted, therefore, that the following results refer only to possible use for coated aggregate, and there is a good chance that some of the materials judged unsatisfactory might well make aggregate by the sinter process. Similarly, additives might make some of the non-bloating shales amenable to processing, and undoubtedly there are clays potentially suited to sinter processing.

Preliminary testing in a gas pot furnace at temperatures between 1,800 and 2,300 degrees Fahrenheit has been carried out on all of the samples collected. Of the seventy-four samples on hand, twenty-nine have shown some promise of bloating. Further test work is proceeding.

Samples from the Ganges and Haslam formations on Saltspring Island were found to bloat fairly well but required careful preheating to prevent decrepitation.

A sample of Northumberland formation shale from the brickyard quarry on Gabriola Island bloated well but had a tendency to fuse easily.

On Vancouver Island three samples of Haslam formation shale showed some bloating possibilities. These were obtained at the falls on Cowichan River 4 miles east of Cowichan Lake; 100 yards north of the highway, 7½ miles east of Lake Cowichan P.O.; and in the bed of Haslam Creek at the road crossing 2½ miles southwest of Cassidy. This shale requires careful preheating and is easily overbloated.

Argillite of the Malahat volcanic group taken from beside the Trans-Canada Highway at Niagara Creek near Goldstream was found to bloat fairly well.

A poor bloat resulting in a heavy product was obtained with a sample of slaty argillite of the Sicker group from Genoa Bay.

Samples of the shale roof of the Wellington coal seam in the Nanaimo district varied somewhat, but with careful preheating they were found to bloat fairly well. Samples from four locations were tested: the dump of the Jingle Pot mine at East Wellington; the dump of the Wakesiah mine in West Nanaimo, near the road opposite the Harewood reservoir; and the dump of the White Rapids mine on the Nanaimo River.

A sample from the roof of the Douglas coal seam at the old No. 10 mine in South Wellington bloated, but it required careful preheating and was easily overbloated.

Shale of the Protection formation from an exposure on the east bank of the Nanaimo River about 1 mile above its mouth bloated easily but made a heavy product.

Two samples of Upper Cretaceous shale from Port Alberni bloated well and easily. There was some tendency to decrepitate if heat was applied too quickly at first. One sample was from a road cut on the highway three-tenths of a mile east of the Alberni-Port Alberni junction. The other sample was from Rogers Creek at the highway crossing.

Tertiary shales of the Mission area yielded three samples that bloated. These were obtained in Kanaka Creek near the main forks west of Twenty-fifth Avenue, and in Whonock Creek one-quarter and one-half mile south of Ninth Road. Some decrepitation occurred if initial heating was too rapid.

Argillite of the Agassiz formation from a road cut on the southwest side of the hill 1½ miles west of Agassiz gave a fair bloated product.

From the Lower Mainland area south of the Fraser River five samples were obtained that bloated: Tertiary shale from beside the road at the centre of Lot 474 on Sumas Mountain bloated poorly; Tertiary shale from the Richmix "red shale" quarry just west of Kilgard bloated fairly well; shale from the old quarry of the Fraser Valley Brick Company, on the northwest side of Sumas Mountain, bloated poorly; Mesozoic argillite from a road cut on the north face of Chilliwack Mountain bloated very well; and a sample from the Triassic Cultus formation on the Ryder Lake road, about one-third of a mile above the flats, bloated poorly.

Only three of the samples taken in the Princeton-Merritt area bloated: a sample of the Coldwater formation obtained from an old coal-mine adit beside the Quilchena cut-off road 6 miles southeast of Merritt gave a fair product; another sample of the Coldwater formation from beside the Coutlee–Mamit Lake road, about 6 miles north of the Merritt–Spences Bridge Highway, bloated well; and shale of the Princeton group from the old No. 4 mine main adit level at Blakeburn bloated poorly.

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 from a small 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 bricks.

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 producing structural tile, drain-tile, facebrick, common brick, and Roman brick. A plastic clay is dug by a ½-cubic-yard gasoline-driven shovel from pit faces about 20 feet high and is transported by truck to the plant. A covered air-drying area has been completed for the storage of clay. 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. Approximately 11,500 tons of clay products was produced in 1953.

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 adjacent to the plant. Some fireclay is trucked from Kilgard. Dry-pressed common brick and firebrick are burned in rectangular coal-fired kilns.

Clayburn Company Limited*

(49° 122° S.E.) Head office, 302 Credit Foncier Building, Vancouver; plants, Kilgard and Abbotsford. R. M. Hungerford, managing director; P. S. Jagger, plant manager. Two plants are operated by this company—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.

Three underground mines and an open-pit mine produce shale for the plants. Room-and-pillar method of mining is used in the underground mines, with the rooms 14 feet wide. Roof bolting is used extensively. Holes are drilled by tungsten-carbide-tipped augers which are driven by air-operated drills. Black powder is used in blasting down the shale. Scrapers, operated by 30-horsepower electrically driven hoists, are used to move the broken shale directly to cars. About 100 tons of shale is produced each shift.

Clay mined during 1953 totalled 49,657 tons, of which 33,232 tons was for facebrick and firebrick and 16,525 tons was for sewer-pipe and flue-lining. Nineteen men were employed in the mines.

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 intermittently by this company. Clay is drilled and

* By R. B. King.

blasted, and loaded by a diesel-driven shovel on to trucks and transported to markets. One man was employed.

Fairey & 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.

Baker Brick & Tile Company Limited†

Victoria (48° 123° S.E.). Office and plant, Victoria. J. V. Johnson and D. E. Smith, joint managers. Surface clay is mined by gas shovel and transported by trucks to storage bins. Drain-tile, hollow-ware, Roman brick, and flower-pots are formed by the soft-mud extrusion process and are dried with waste heat from kilns. Down-draught wood-fired kilns are used to burn the ware. An average of 5,000 tons of clay is mined yearly.

Bazan Bay Brick & Tile Company Limited.*—Saanichton (48° 123° N.E.). F. J. Eves, manager. This plant manufactured common brick and agricultural tile. Production was small.

GYPSUM

Gypsum Lime and Alabastine, Canada, Limited‡

Falkland (50° 119° N.W.). Head office, Paris, Ont.; British Columbia office, 1272 West Pender Street, Vancouver. Norman Jessiman, British Columbia manager; Alex. Jessiman, quarry manager; Leonard G. Hoover, quarry foreman. 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. Gypsum is produced from open quarries 500 to 1,100 feet above the railway on the steep hillside north of the village. Work was continuous throughout the year, and a crew of thirty-two men was employed. The production of gypsum averaged from 300 to 400 tons daily, which was quarried from the No. 2 and No. 10 quarries and was shipped to the company processing plants at Port Mann and Calgary.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1952, p. 119.]

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, has worked the quarry under lease for a number of years. Stripping operations were carried on in April, and quarrying at the rate of 2,000 tons per month was continuous from May until early December. The 30-foot quarry face is benched with 15-foot steel using tungsten-carbide bits; the gypsum is hand-broken to 8-inch size, and trucked to a loading-ramp on the Crowsnest line of the Canadian Pacific Railway for transhipping to the company's plant at Exshaw, Alta. Major equipment consists of a 105-cubic-foot-per-minute Ingersoll-Rand compressor and a newly purchased TD-9 Caterpillar tractor equipped with a Malo overhead shovel.

Toward the end of the season a 50-foot band of waste was encountered in the middle of the quarry face. This occurrence considerably reduced the flexibility of the operation and will necessitate an extensive stripping programme in the spring.

The number of men employed averaged six. The 1953 production was 14,274 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. The quarrying and hauling contract is held by General Construction Company, of Vancouver and Calgary, who in turn have sublet the hauling contract.

* By J. W. McCammon.
† By R. B. King.
‡ By E. R. Hughes.
§ By H. N. Curry.

The year's production came mainly from the previously cleared block in the west end of the quarry. Prior to quarrying this block, the pit bottom was lowered 12 feet, and some production was also obtained from the north or hangingwall side. The 100-foot face of the main block was taken out in 12-foot benches, using air pluggers and tungsten-carbide bits. The broken rock is picked up with a shovel and transported to the crushing plant by shuttle trucks. Late in the year a churn drill replaced the air pluggers on the remainder of the west bench, and the preliminary performance of this equipment was very satisfactory. It is highly probable that the churn drill will be employed exclusively in the future. Overburden stripping in a westerly direction is to be carried out as soon as weather conditions permit. Eighteen men were employed.

Equipment at the quarry consists of a 210-cubic-foot-per-minute and a 315-cubic-foot-per-minute Schramm compressor, a 1½-cubic-yard P. & H. shovel, a D-7 Caterpillar tractor, an H.T.-4 Caterpillar equipped with a 1-cubic-yard bucket for loading from the stockpile, and a D-13000 Caterpillar diesel as a power source.

The crushing and screening plant worked steadily during the year. It has a capacity of 100 tons per hour and produces 4-, 2-, and ½-inch material. In midsummer, stockpiling facilities were added to the plant. Two steel conveyor galleries, extending out from the final set of screens in the crushing plant, were equipped with 50-foot belt-conveyors, each 24 inches wide, and powered by 5-horsepower electric motors. The two sizes of rock are dumped on surge piles below. Wooden tunnels have been placed beneath these piles, and their contained conveyors, 55 feet long and 24 inches wide, and powered by 5-horsepower electric motors, permit trucks to be loaded independently of the plant. The crushed rock is hauled 10 miles by truck to Lake Windermere station. By the end of the year, stockpiles totalling 12,000 tons had been built up at the plant and at the company's loading area.

Production was 60,000 tons of rock gypsum. Shipments during the year were made to Canada Cement Company at Exshaw, Alta.; British Columbia Cement Company Limited at Bamberton; Lehigh Portland Cement Co., Metaline Falls, Wash.; Spokane Portland Cement Co., Spokane, Wash.; and the Columbia Gypsum plant at Spokane, Wash.

Assessment work was done on the company's gypsum claims near the Kootenay River, 7 miles above Canal Flats.

LIMESTONE AND CEMENT

Shames Quarry*

Shames (54° 128° S.W.). Office, 247 East First Avenue, Prince Rupert. Between July 8th and December 15th A. E. Barr and six employees opened a limestone quarry on a lease about 2 miles northeast of Shames. The lease is owned by J. McCulloch, G. W. Bissonnette, and the late W. Robinson, all of Terrace. A temporary camp for eight men, a railway loading-ramp, and 2 miles of road between the ramp and quarry were constructed. A total of 229 tons of limestone was shipped to the Columbia Cellulose Company Limited plant at Port Edward.

[Reference: *Minister of Mines, B.C.*, Ann. Rept., 1914, p. 152.]

Clinton Lime Holdings Limited†

(51° 121° S.W.) Company office, 805 Hastings Street West, Vancouver; plant office, Clinton. F. E. Wilkes, president. This company owns a deposit of travertine or calcareous tufa 3 miles west of Clinton on the Pacific Great Eastern Railway. The property was optioned to Cariboo Limestone Limited for a period of seven months, during which time 170 tons of bulk agricultural lime was produced by a crew of two men.

* By J. W. Patterson.
† By J. E. Merrett.

The Consolidated Mining and Smelting Company of Canada, Limited*

Fife (49° 118° S.E.). Head office, Trail; quarry, Fife. G. S. Ogilvie, engineer; Oscar Tedesco, quarry foreman. Quarrying of limestone was continued during nine months of the year, but production was suspended in July, August, and September. 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 at the railway. It is shipped to Trail for use as flux in the smelter. During 1953 the output was 2,400 tons per month during the active period. Six men were employed.

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. During the year 3,106 tons of crushed limestone was produced. Five men were 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, as well as 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 truck to a crushing plant. An Eimco rocker shovel, mounted on a D-2 Caterpillar tractor, is used for general clean-up and loading from small stockpiles. 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 was mined during 1953. Of this, 8,500 tons was processed as agricultural limestone. A new loading-dock was completed and construction was started on a new crushing and grinding plant in 1953. 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 smelter flux. The quarry is worked with one face nearly 80 feet high and sloping at 45 degrees to the horizontal. Air leg types of drills are used to drill horizontal holes, parallel to the face, for blasting. Broken rock is loaded with a ½-cubic-yard diesel-driven shovel and transported by trucks 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 the year 75,000 tons of limestone was produced. Of this, 44,000 tons was shipped to pulp and paper plants, 26,000 tons was shipped for smelter flux, and 5,000 tons was sold for miscellaneous uses.

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. Selective mining of

* By E. R. Hughes.
† By R. B. King.

irregular white masses of limestone in grey limestone is necessary. The average tonnage mined and sold is 3,000 tons a year.

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. The quarry is being worked in two levels, with faces nearly 25 feet high. Wagon drills are used to drill holes for blasting. Broken rock is loaded by a diesel-driven shovel on to 18-cubic-yard-capacity trucks and hauled to the plant. 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 fifty-three.

British Columbia Cement Company Limited* Head office, 500 Fort Street, Victoria. N. A. Tomlin, managing director; R. E. Haskins, general superintendent. Quarries are operated at Bamberton (48° 123° N.W.) and Cobble Hill (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 the quarry faces range from 70 to 85 feet in height. A Bucyrus-Erie 27 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 line of the quarry floor. About 35,000 tons is broken in each blasting operation. Broken rock is loaded by diesel-driven shovels into Euclid trucks and is transported to the crushing plant. The railway haulage was supplanted during the year by four 15-ton-capacity Euclid trucks. Rock from the crushing plant is stockpiled, and when required is loaded by conveyor-belt to scows for shipment to the cement plant at Bamberton. Twenty-seven men were employed.

A quarry at Cobble Hill was started in 1953. This deposit, known as the Raymond Limestone deposit, is in Lots 9 and 10, Range 3, Shawnigan Land District, at the western base of Cobble Hill.† The quarry is being worked with a 30-foot face, using wagon drills for drilling flat blast-holes. Broken rock is loaded by diesel-driven shovel into 15-ton trucks and is transported nearly 13 miles to the Bamberton plant. Hauling of rock was done by contract. Two men were employed by the company.

At the Bamberton quarry, rock is mined by similar methods to those used at Blubber Bay. Broken rock is loaded by an electric shovel and transported by 15-ton Euclid trucks to the crushing plant.

In 1953 installation of a third stage of crushing was completed for limestone and a similar crushing stage was installed for clinkers. The crushing plant consists of a 60-inch Stephens-Adamson feeder, a 42- by 48-inch Buchanan jaw crusher, a 5½-foot Symons cone crusher, and a Symons short head crusher in closed circuit with a Dillon screen. The mill-feed produced is minus ⅜-inch. Nineteen men were employed in the quarry.

During 1953, 501,333 tons of usable limestone and argillaceous rock was mined and 120,000 tons of waste rock was mined and discarded. Of the rock used in the manufacture of cement, 240,320 tons was quarried at Bamberton, 231,008 tons was quarried at Blubber Bay, and 25,208 tons was quarried at Cobble Hill.

Bonner's Quarry* Cobble Hill (48° 123° N.W.). Norman Bonner, owner and operator. About 50 tons of agricultural limestone a month is produced from this quarry. Rock is blasted from a 40-foot face, loaded by hand, and transported to a small crushing plant. One man was employed.

* By R. B. King.
† *B.C. Dept. of Mines*, Bull. 23, p. 54.

MARL

Cheam Marl Producers Limited* Popkum (49° 121° S.W.). A. M. Davidson, manager. Marl is mined from a deposit near the east shore of Cheam Lake. Marl is dug from the deposit by a diesel-driven dragline shovel. The marl is either stockpiled for air-drying or is dried in a rotary kiln. Over 10,000 tons of wet, semi-dry, and dried marl is produced each year. Five men were employed.

Popkum Marl Products Limited* Popkum (49° 121° S.W.). W. A. Munro, manager. Marl and humus is mined by this company from a deposit on the east shore of Cheam Lake. A ½-cubic-yard dragline digs marl and humus and loads it on to trucks for transportation to a drying plant. In the plant a sawdust-fired rotary kiln dries the marl and humus. The drying plant has a capacity of 10 tons per day. Wet, semi-dry, and dry marl and humus are produced. Three 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. The perlite quarry belonging to this company is on the north shore of Francois Lake about 4½ miles east of Francois Lake P.O. Between October 1st and October 28th approximately 1,100 tons of perlite was shipped from this quarry to the company plant in Calgary.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1949, pp. 258–261.]

Uncha Lake Perlite‡ (53° 125° N.W.) In July, 1953, forty-two claims were located on Dayeezcha Mountain, about 25 miles south of Burns Lake, to cover a new discovery of perlite. The claims, comprising the Randy Nos. 1 to 8, Jimmy Nos. 1 to 8, National Nos. 1 to 6, Shiela Nos. 1 to 7, Shallamar Nos. 1 to 8, Stewart Nos. 1 to 3, and Willow Nos. 1 and 2, were recorded by C. S. Powney and John Rasmussen, of Fort St. James; William H. Anderson, of Prince George; and others. The main showings are on the north and west slopes on the mountain at elevations of 3,200 to 3,700 feet. They are reached from Southbank on Francois Lake by 12 miles of road to the south side of Uncha Lake, thence about 3½ miles across country southward to a tent camp established at an elevation of about 3,000 feet. The northwest side of the mountain has a gentle slope, is lightly timbered, and outcrops of bedrock are not plentiful.

Perlite appears to be intercalated with light- to dark-grey porphyritic rhyolites which are probably comparable to the Eocene or Oligocene rhyolitic flows and tuffs mapped§ by Armstrong on the north side of Francois Lake. In no instance were the rocks directly overlying or underlying the perlite seen.

Three separate occurrences of perlite were visited. The highest one is at an elevation of approximately 3,700 feet. There a shallow trench exposes 6 feet of pale-greenish-coloured perlite beside 4 feet of resinous brown perlitic glass. A small exposure 75 feet away shows 6 to 8 feet consisting of alternating bands of stony porphyritic rhyolite and 4- to 12-inch layers of resinous brown perlitic glass. The flow lines strike north 70 degrees northwest.

Downhill from this exposure the rocks are dark-grey to black porphyritic rhyolite, in which the flow layers strike north 40 degrees east and dip 65 degrees northwest.

Farther to the southwest and at an elevation of about 3,550 feet, a line of holes 1 to 3 feet deep dug through the overburden indicates that perlite extends across a width of possibly 150 feet. No natural exposures of perlite are to be seen at this place.

* By R. B. King.
† By J. W. Patterson.
‡ By Stuart S. Holland.
§ *Geol. Surv., Canada,* Mem. 252, p. 73, and Map 907A.

About 2,000 feet farther southwest and at an elevation of about 3,250 feet, perlite outcrops in a bluff 20 feet across and 10 feet high. Other outcrops and pits indicate that the perlite extends across a maximum width of about 100 feet and has a length of at least 250 feet. Flow layers in this area strike northeast and dip 40 degrees southeast.

The perlite in the several showings is light grey or pale-greenish grey in colour. The glass has a definite perlitic structure and on weathering crumbles along the perlitic cracks to a granular aggregate. The glass has a few feldspar phenocrysts and displays imperfectly developed flow lines. In thin section numerous tiny crystallites are seen to be arranged in parallel orientation.

Laboratory tests on the brown resinous glass and the greenish-grey perlite indicate that both expand moderately well.

SAND AND GRAVEL

Abbotsford Gravel Sales Ltd.*

Abbotsford (49° 122° S.E.). Donald MacNeil, superintendent. This pit, formerly known as the D. F. Gosling gravel pit, is 7 miles west and 6 miles south of Abbotsford. It was purchased from D. F. Gosling and has been operated throughout the year to produce washed, sized, and crushed gravel.

Dueck's Gravel Pit*

Clearbrooke (49° 122° S.E.). Dueck Building Supplies Ltd., owner. This pit is about 1 mile north of Clearbrook. Sand and gravel is washed down from a face 15 feet high and is pushed by a bulldozer to a bucket elevator, where it is elevated to a washing plant. Washed and screened gravel is sold locally. Three 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 were operated intermittently during the year. The plant has a capacity of 60 cubic yards a day of crushed, sized, and washed material.

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. During the year a small washing and screening plant was built and put into operation. A ½-cubic-yard-capacity diesel driven shovel loads gravel on to trucks.

Deeks-McBride Ltd.*

Company office, 1051 Main Street, Vancouver. J. W. Sharpe, general manager. Three gravel pits with crushing, screening, and washing plants are operated by this company. One pit is at Coquitlam (49° 123° S.E.), one is on the Capilano River near the Cleveland Dam (49° 123° S.E.), and the third is near the mouth of Seymour Creek (49° 123° S.E.). The Coquitlam plant is capable of crushing, washing, and screening 500 cubic yards of gravel a day. Gravel is dug with a 1-cubic-yard-capacity dragline and transported by a conveyor-belt to a jaw crusher and then by a conveyor-belt to the washing plant. Ten men were employed. At Seymour Creek, gravel is mined by a ¾-cubic-yard dragline at the edge of Burrard Inlet. Gravel is transported by a conveyor-belt to the plant. This plant produces nearly 1,200 cubic yards of sized and washed gravel products in a sixteen-hour day. Twenty-five men were employed.

At the Capilano pit, gravel and boulder clay are mined by shovel, loaded on to trucks, and transported to a washing plant. Crushed, washed, and sized products are produced for concrete aggregate. Most of the production was for the construction of the Cleveland Dam. The washing plant is capable of handling 1,000 cubic yards a day.

* By R. B. King.

Capilano Crushing Co. Ltd.*

West Vancouver (49° 123° S.E.). C. W. Bridge, general manager. Crushed and sized gravel products are produced by this company at its plant on the Capilano River. Gravel is mined from the bed of the river by a dragline and is transported to the crushing plant. During the year 110,294 cubic yards of material was processed by the plant. Seven men were employed.

E. R. Taylor Construction Co. Ltd.*

Burnaby (49° 122° S.W.). Office, Maplewood; plant, Stride Avenue, Burnaby. A. G. Teed, superintendent. The Stride Avenue gravel pit is operated by this company for the Municipality of Burnaby. Gravel is mined from high faces by ¾- and ½-cubic-yard diesel-operated shovels and transported by truck to a portable crusher. In 1953, 322,194 tons of gravel and 31,011 cubic yards of fill material were mined. Of the gravel mined, 99,405 tons was sold as run-of-the-bank gravel, 121,684 tons was crushed to 1⅛-inch size, and 101,105 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 this 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 trucks. In other parts of the pit, gravel is mined from high faces by shovel on to trucks. All sand and gravel is trucked to a central conveyor-belt, which transports it to a crushing plant. This crushing plant was erected in 1953.

Highland Sand and Gravel Company Limited*

Lynnmour (49° 123° S.E.). Company office and plant, Lynnmour. W. J. Barrett-Leonard, manager; W. Hills, superintendent. Sand, gravel, crushed products, and road materials are produced by this company. Material is blasted from a low gravel bank and loaded on to trucks by a ¾-cubic-yard diesel-driven shovel. A crushing, screening, and washing plant is operated to produce sized products. A road-material plant was erected during the year to prepare boulder clay for road material. A concrete-block and concrete-tile plant is also operated. During the year 124,634 cubic yards of material was sold. Of this, 21,690 cubic yards was crushed rock, 57,424 cubic yards was sand, 27,681 cubic yards was crushed fill, and 17,839 cubic yards was bank-run fill.

Hassel's Sand and Gravel Pit*

Whalley (49° 122° S.W.). Office, Hjorth Road, Whalley. J. Hassel, owner and operator. Sand and gravel are produced by this company from a pit nearly a mile east of Whalley on the Hjorth Road. Gravel is dug by a ⅜-cubic-yard shovel and loaded on to trucks. A small washing plant is operated intermittently. Two men were employed.

Lynn Gravel Company Limited*

Lynn Creek (49° 123° S.E.). Office, 2265 East Hastings Street, Vancouver; plant, Lynn Creek. H. H. Van Kervel, plant superintendent. Sand, gravel, and crushed products are produced by this company. Gravel is dug by clam-shell bucket from the bottom of Lynn Creek and transported by truck to a crushing plant. The crushing plant is capable of handling 500 cubic yards in an eight-hour day. Seven men were employed.

McIntyre and Harding Gravel Company Limited*

Saanich (48° 123° N.E.). Company office and plant, Royal Oak P.O., Saanich. J. H. Harding, manager. Sand, gravel, and sized gravel products are produced from this pit. Gravel is mined by hydraulicking and digging or is dug directly from the gravel faces by ½-cubic-yard diesel-driven shovels and is transported to the washing plant by trucks and a conveyor-belt. The washing and

* By R. B. King.

screening plant has a capacity of 30 tons an hour. Approximately 79,000 tons of gravel was mined during the year. Of this, 36,000 tons was used as road material, 33,000 tons was sold as washed and screened gravel, and 10,000 tons was sold as crushed gravel and rock.

Butler Brothers Limited.*—Saanich (48° 123° N.E.). Office and plant, Keating Cross-road. Claude Butler, manager. Gravel is dug by diesel-operated shovels and trucked to a washing plant. Sand, gravel, and aggregate is produced for construction purposes. Three men were employed.

Producers' Sand & Gravel Company (1929) Limited*

Albert Head (48° 123° S.E.). Company office, 900 Wharf Street, Victoria; plant, Royal Bay. A. Parker, pit superintendent. This pit was originally started in 1908 under the name of The B.C. Sand and Gravel Company. All gravel was at that time mined by hydraulicking with salt water. In 1910, Producers Rock and Gravel Company took over operations and remodelled the washing plant. Later, crushers were installed to produce crushed aggregate. Electricity supplanted steam in driving the plant, and fresh water was used for hydraulicking. In 1929, Producers' Sand & Gravel Company (1929) Limited was formed and additions were made to the plant. In 1945, hydraulicking was replaced by the present method of using a scraper on a slack-line cableway to loosen packed gravel from the steep, high face. The gravel is loaded by a 1¼-cubic-yard shovel into a hopper, where it is conveyed by a series of conveyor-belts to the plant. In 1951 a new plant, with a capacity of 180 cubic yards an hour, was completed and put into operation. The gravel is crushed, screened, and washed, and classified into six grades of gravel and two grades of sand. Scows are loaded with products at the rate of 500 tons an hour.

The total production for 1953 was 348,000 tons, made up as follows: Washed and graded sand and gravel, 255,000 tons; washed and graded crushed rock, 15,000 tons; bank-run material, 78,000 tons. Nineteen men were employed.

Cassidy Sand and Gravel Ltd.†

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 ⅜-cubic-yard gasoline-driven shovel. A Hough 1-cubic-yard mobile loader is also used. The gravel is transported by truck and tipped on 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 1953 amounted to 22,849 cubic yards. Three men, two of the operators and one employee, normally worked 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 tiles of the "mortarless tile" type. Total sales of gravel products in 1953 amounted to 10,949 cubic yards. One man was employed.

* By R. B. King.
† By A. R. C. James.

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 fed by a plate feeder on to a troughed-belt conveyor that delivers it to the 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 1953 a Crompton-Parkinson 93-kw. electric generator was installed. This is driven by a 135-horsepower Crossley diesel engine. Conveyor-belts, screen, pump, and plate feeder are driven by electric motors powered by the above-mentioned generator.

A small plant is operated for the production of concrete blocks, but it only worked very intermittently during the year.

Gravel products sold in 1953 amounted to 24,725 cubic yards. Four men were employed at the pit.

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 Hough mobile loader. Much of the production from this pit is sold as pit-run gravel, but during the latter part of the year the installation of a washing and screening plant of about 30-cubic-yards-per-hour capacity was begun. This plant is expected to be completed and ready for operation in the first half of 1954.

A small Liner plant for the fabrication of concrete blocks was installed during the autumn. Up to the end of the year, production of blocks was run on an experimental basis to determine the best operating methods and conditions.

Total production from this pit in 1953 amounted to 35,647 cubic yards of gravel. Three men were employed at the pit.

SILICA

Oliver Silica Quarry†

Oliver (49° 119° S.W.). Stucco Supply Company; office, 937 Main Street, Vancouver. W. Gilmour, manager. This silica quarry is on the Gypo mineral claim, about 1 mile north of the village of Oliver. The claim is owned by The Consolidated Mining and Smelting Company of Canada, Limited, but for some years the quarry has been operated intermittently by the Interior Contracting Company, Limited. On July 22nd the quarrying was taken over by the Stucco Supply Company, of Vancouver. The silica is blasted from the quarry face and is hand-loaded and hand-trammed in 1-ton cars to a bin above the crusher. The crushing plant was built at the quarry in June and consists of a 12-inch jaw crusher, belt-driven from an electric motor, and a 12-inch roll crusher. The silica is crushed to minus ¼-inch, and is then sacked and shipped to Vancouver and Prairie points for use as stucco-dash and in ornamental work. Three men were employed.

SLAG

Granby Slag Dump†

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 benches 20 feet high at the south end of the dump. 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 at intermittent periods.

* By A. R. C. James.
† By E. R. Hughes.

Petroleum and Natural Gas*

CONTENTS

EXPLORATION SUMMARY, 1953

During 1953 most of the exploration for oil and gas in British Columbia was concentrated in northeastern British Columbia east of the Rocky Mountains. In this area, surface parties were active from the Wapiti River to the northern boundary of the Province.

West of the Rocky Mountains, surface geology was mapped on one permit in the Cariboo area and on one permit in the Vancouver-Chilliwack area, and core drilling was done by The Crow's Nest Pass Oil and Gas Company Limited in the Fernie area.

Geological reports were submitted on eighty-one permits.

Thirteen geophysical subsurface licences were issued during 1953 in addition to the thirteen licences still in good standing, making a total of twenty-six effective in 1953. Of the thirteen licences issued in 1953, three were for core drilling only, the core drilling to be done in Hudson Hope area, Fernie area, and North Okanagan (Mara Lake Gas-Ice Operations). The remaining ten geophysical licences were taken out for seismic, gravimeter, and magnetometer work in the northeastern part of the Province.

Forty-seven wells were operated in British Columbia during 1953, and at the end of the year twenty had been completed as gas wells, eighteen had been abandoned, two were standing, and seven were drilling.

Of these forty-seven wells, forty-three are in northeastern British Columbia, one in the Cariboo area near Kersley (Kersley 2), two in the Vancouver area near Langley Prairie (Siloam 1 and Outwest 1), and one in the Fernie area (Pacific Atlantic Flathead 1).

The twenty wells completed as gas wells were in northeastern British Columbia, and most of the wells were operated by Pacific Petroleum Ltd. in or near the Fort St. John gasfield. However, interesting gas finds were made by other companies in the Buick Creek and Blueberry River areas.

Formations tested for oil and gas extended from the Lower Cretaceous sandstones down through the Devonian.

Gas in commercial quantities was found in the Cadomin, Nikanassin, Triassic, and Permo-Pennsylvanian strata.

Pacific Fort St. John 31 was completed as a gas well in the Cadomin member, to be the first development gas well drilled in British Columbia.

Most of the gas wells showed a good flow of naphtha along with the dry gas, and three of the wells gave good shows of high-grade oil—Pacific Fort St. John 32 in the Cadomin member of the Dunlevy formation, Pacific Fort St. John 33 in the Permo-Pennsylvanian, and Texaco (N.F.A.) Buick Creek 1 in the Nikanassin sandstone of Jurassic age.

* Statistics showing data on permits and licences issued, renewed, assigned, etc., appear on page 54.

RECONNAISSANCE IN NORTHEASTERN BRITISH COLUMBIA

July 27th to September 3rd, 1953

By N. D. McKechnie and S. S. Cosburn

In the 1953 field season the writers spent five weeks in northeastern British Columbia visiting sites where drilling for petroleum and natural gas was in progress or had been done. Visits were also made to localities where geological and geophysical exploration have been done, and where natural exposures suggest the possibility of obtaining helpful geological data.

The field observations yielded information on current drilling, geological exploration, and geophysical exploration, and also yielded information helpful in the effective logging of well samples.

Six days, from August 1st to August 6th, inclusive, were spent on the scene of the Provincial Government drilling of 1921–22 on Farrel Creek, about 20 miles northwest of Hudson Hope. The elevation of British Columbia Government Exploratory No. 1 well was determined by plane-table survey. From here a traverse was made to the top of Butler Ridge, where a section of Dunlevy sandstones and shales is exposed. Specimens were taken of the sandstones.

The period August 7th to August 9th, inclusive, was spent near Hudson Hope. A visit was made to Fargo Butler Ridge No. 1 well, which was moving off the location. Near Gold Bar a traverse was made of the Dunlevy beds, north of the river, where two fossil horizons were examined and specimens taken. A traverse was made up the hill beyond the Packwood (Reschke) coal-mine workings across the contact of the Dunlevy and Gething formations.

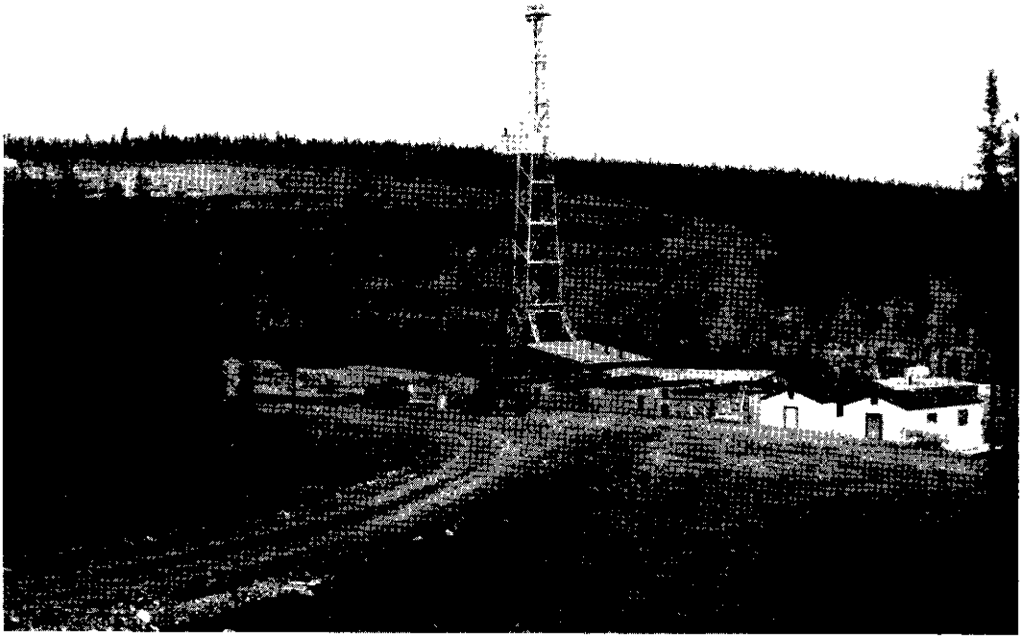
The conglomerate at the top of the Dunlevy is correlated* with the Cadomin conglomerate of Alberta. Gas has been in this member in the Fort St. John area. The Cadomin member has been recognized and mapped† in the Pine River valley about 40 miles southwest of Gold Bar. The rock type is distinctive and readily recognizable. It appears to be one of the better marker horizons in the southern half of northeastern British Columbia.

Seventeen days, August 12th to August 28th, inclusive, were spent along the Alaska Highway between Fort St. John and Liard River Crossing. August 13th to August 16th, inclusive, were taken up by the logging of core from Toad River No. 1 well, which was drilling on the Liard River near its junction with the Toad.

From the following localities along the highway, rock sections were examined and specimens taken:—

- Mile 485, sandstone at Washout Creek, of the Ramparts formation.
- Mile 482, limestone, Ramparts formation.
- Mile 472.5, a section of about 1,000 feet of limestone, coral reef limestone, and dolomitic limestone of the Ronning formation overlying Cambrian quartzites.
- Mile 465, about 300 feet of limestone overlain by dolomitic limestone with angular chert fillings, possibly a reef limestone; Ronning formation(?).
- Mile 460.5, thinly banded buff and red limy shale and some dolomite(?).
- Mile 437.6, at Toad River bridge, basic intrusive (quartz gabbro?) in Precambrian quartzites.
- Mile 426.5, thin shales with interbedded sandstone, Fort Creek formation.
- Mile 421.5, black shale, Fort Creek formation.
- On Racing River, about 2 miles upstream from highway bridge, fossils from Middle Devonian limestone.

* *Geol. Surv., Canada*, Mem. 259, Fig. 12.
† *B.C. Dept. of Mines*, Bull. 23, 1947.



Buckinghorse No. 1 well on Buckinghorse River.

Upper Devonian beds on Racing River.

Mile 398.7, Fort Creek shale outcrops about 200 yards from the highway up One Ten Creek; it overlies dolomitic limestone bearing a few corals, and in turn is overlain by limestone.

Mile 380, limy sandstone, Carboniferous-Permian.

Mile 375, Garbutt shale, friable black shale with bands of ironstone concretions 2 to 3 feet apart, and Liard sandstone and limy sandstone conformably underlying the Garbutt shale. A few fossils were found in the Liard.

Mile 200, sandstone, Sikanni formation.

The following drilling wells were visited and, where available, cores were examined and specimens taken:—

Dome Stanolind *et al.*—Buckinghorse No. 1.
Gulf State—Gundy Creek No. 1.
J. B. White—Sun Blueberry No. 2.
Texaco Nig Creek No. 1.
Pacific Fort St. John No. 23.
Pacific Fort St. John No. 30.
Pacific Fort St. John No. 31.
Pacific Fort St. John No. 32.

August 30th and 31st were spent examining outcrops of Lower Cretaceous to Jurassic formations between Little Prairie P.O. and Pine River bridge.

On August 30th Gulf State Sunset Creek No. 1 well was visited at Fellers Heights.

WELL SAMPLES

Unless otherwise directed, any operator who drills a well* for petroleum or natural gas is required to take samples of the bit cuttings representing interval depths of 10 feet, or lesser intervals. The samples are to be washed, dried, and accurately tabulated and shipped prepaid to the Department of Mines, Victoria, B.C.

The operator may be required to take samples by means of a core barrel.

All cores taken must be put in suitable boxes, accurately tabulated, must be properly protected and stored, and must be delivered as required.

So far as possible, cores taken in 1953 were examined and logged in the field. They have been left in the hands of the operators, who remain responsible for delivering the core when so directed.

Samples of well cuttings are received at the laboratory at frequent intervals. A part of each sample is washed, dried, and logged, and is then stored in a glass bottle in sequence with other samples from the same well, so that a complete set of samples from each well is available for examination. A part of each sample is sent to the laboratory of the Geological Survey of Canada in Calgary.

During 1953, 13,860 samples were washed and bottled from the following twenty-nine wells:—

Vancouver area: Siloam No. 1.
Fernie area: Pacific Atlantic Flathead No. 1.
Cariboo area: Kersley No. 2.
Northeastern British Columbia area:—
Dome Buckinghorse No. 1.
J. B. White—Sun Blueberry No. 1.
Pacific Fort St. John Nos. 4, 5, 6, 8, 9, 10, 11, 15, 16, 17, 18, 19, 25, and 26.
Pacific Gates No. 1.
Pacific Peace River British Dominion No. 1.

* Printed copies of regulations under the "Petroleum and Natural Gas Act" may be obtained from the Department of Mines, Victoria, B.C.

Pacific Sunrise No. 10.
Phillips Tenaka No. 1.
Red Willow No. 1.
Texaco Buick Creek No. 1.
Texaco Buick Creek No. 2.
Toad River Joint Venture No. 1.
Van Tor Milne No. 1.
Wilrich Stony Lake No. 1.

In August at Fort Nelson 993 feet of core (cores 1–80, 1953) from Toad River Joint Venture No. 1 was logged by N. D. McKechnie and S. S. Cosburn. Cores were examined at other wells visited during field work.

Throughout the year, oil company geologists used the facilities for examining samples, cores, and electrical logs in the sample laboratory.

Inspection of Lode Mines, Placer Mines, and Quarries

By H. C. Hughes, Chief Inspector of Mines

CONTENTS

PRODUCTION

The output of metal mines for 1953 was 9,660,281 tons. This tonnage was produced from eighty mines, of which forty-eight produced 100 tons or more.

FATAL ACCIDENTS

During 1953 there were seven fatal accidents connected with actual mining operations in metal mines, placer mines, and quarries. In addition, two fatalities occurred in ore or storage bins, making a total of nine. This was two less than in 1952.

There were 5,734 persons employed below and above ground in metal mines and 1,371 persons employed in concentrators in 1953.

The ratio of fatal accidents per 1,000 persons employed in mines and concentrators was 1.015, as compared with 1.14 in 1952.

The tonnage mined per fatal accident during the last ten-year period was 650,199 tons.

The following table shows the mines at which fatal accidents occurred during 1953, with comparative figures for 1952:—

Mining Division	Mine	No. of Fatal Accidents	
		1953	1952
Golden	Giant Mascot	1	....
Slocan	Western Exploration Company	1	....
Nelson	Emerald	....	2
Nelson	H.B.	....	1
Nelson	Yankee Dundee	1	....
Nelson	Bon Ton	1	....
Ainsworth	Bluebell	1	....
Kamloops	Falkland Quarry	....	1
Lillooet	Bralorne	....	1
Lillooet	Golden Contact	....	1
Cariboo	Cariboo Gold Quartz	1	....
Similkameen	Copper Mountain	1	....
Vancouver	Highland Sand and Gravel	1	....
Alberni	Privateer	....	1
Skeena	Torbrit	....	1
Omineca	Rocher Deboule	....	1
Omineca	Red Rose	....	1
Omineca	Lorne Creek Placer	1	....
Atlin	Big Bull	....	1
Totals		9	11

The following table classifies fatal accidents as to cause and location:—

Cause	Number	Location
Falls of ground	1	Underground.
Blasting	1	Surface.
Drilled into missed hole	1	Underground.
Falls into bins	2	Surface storage bins.
Run of muck from draw hole	1	Underground.
Drawing a chute	1	Underground.
Caught in mudslide	1	Surface placer.
Fell from side of open pit	1	Surface open pit.
Total	9	

A brief description of all fatal accidents follows.

William Henry Armstrong, aged 51, British, married, and employed as a miner at the Cariboo Gold Quartz mine at Wells, was instantly killed by a fall of ground in 18-9A stope on January 15th, 1953.

The access to 18-9A stope was through a section of the mine which had been mined out a number of years ago. In December, 1952, a raise had been driven from the 1800 level immediately west of the old workings and a break-through made to the old workings. A grizzly and chute had been put in the raise. These new workings were found to be in a fault zone. Armstrong and his partner, Daniel MacLean, both experienced miners, were preparing to drive a raise from the new working to the 1700 level.

MacLean advised that both he and Armstrong had examined and scaled the workings on the morning of the accident. E. E. Mason, the consulting engineer, spent considerable time in the workings that morning and advised that they appeared safe to him, and that he had spent several minutes in discussion with Armstrong immediately under the loose ground which fell later.

Armstrong was bending over the side of the grizzly, attempting to release the hung-up chute by running water into it, when he was struck by about three-quarters of a ton of quartz which had been released between two slips in the back of the stope. The impact of the blow threw him forward and sideways against a rock rib, inflicting severe injuries to his left side and head, as well as multiple fractures.

MacLean was standing beside Armstrong when this occurred. He removed him from the caved area and went for aid, which, including the services of first-aid attendant and doctor, was obtained without delay. Investigation by the Inspector of Mines revealed the ground to be apparently in good condition and the fault confined to a few slip planes. In spite of the seemingly safe condition, an additional section of the quartz caved the following day. It would appear that there is active movement in the fault which releases sections of the quartz.

The inquest was held at Wells, and it was brought out that Armstrong was a very capable and careful miner and that he had exercised all normal care in this working place. The Coroner's jury returned the following verdict:—

"William Henry Armstrong of the Town of Wells, B.C., was a miner at Cariboo Gold Quartz, working in stope number 18-9A. The time of the accident was approximately 11.00 a.m., Thursday, January 15th, 1953. William Henry Armstrong did come to his death accidentally, with no blame attached to anyone. We hereby commend Daniel MacLean on his prompt and efficient actions immediately following the accident."

Stephen Yadernuk, aged 38, Canadian, married, was seriously injured at the Giant Mascot mine, Golden, on March 14th, 1953, when the ground on which he was drilling in an open-cut gave way and allowed him to fall. He died of his injuries on April 4th, 1953, at the Vancouver General Hospital.

Yadernuk had been drilling on ground which was undercut by other workings in the open pit. Just as he was finished drilling, the ground caved and allowed him to drop about 10 feet, where his fall was arrested by his safety rope. An additional fall of rock occurred which cut his safety rope. He fell another 15 feet, then rolled about 15 feet on the muck pile.

The inquest was held in Vancouver on April 10th, 1953, and the Coroner's jury returned the following verdict:—

"We, the jury, find that Stephen Yadernuk's death was an unnatural one due to an injury to the left hip accidentally sustained when he fell down a stope at the Giant Mascot mine on March 14th, 1953, and we agree that he died from contributory causes due to his fall, and we recommend that under similar working conditions where Stephen Yadernuk met his death in an open pit mine, a Marlin safety rope (rope with a steel wire core) should be used."

Wayne Douglas Putnam, aged 18, Canadian, single, was fatally injured at the Bon Ton mine, Kitchener, when he was struck by a piece of flying rock during surface blasting operations on March 18th, 1953.

Operations at this mine consisted of cleaning out old open-cuts preparatory to sampling. A large piece of rock in one of the cuts was too large to manhandle, so John Wolfe, one of the owners of the property, decided to bulldoze it. He placed a stick of powder with a 3-foot fuse on the rock and covered the powder with mud.

After lighting the fuse he joined his brother, Gordon Wolfe, and Putnam behind a tree approximately 60 feet above and to the east of the cut. A piece of rock from the blast, believed to be about the size of a man's fist, struck Putnam directly on top of the head, crushing the top and splitting the sides of the miner's helmet he was wearing.* Putnam died from his injuries about twenty minutes later.

An inquest was held at Creston on March 23rd, 1953, and the Coroner's jury returned the following verdict:—

"We, the jury, find that Wayne Douglas Putnam came to his death on March 18, 1953, at the Bon Ton mine, in the vicinity of Kitchener, at about 2.00 p.m. The cause of death was fracture of the skull with injuries to the base of the brain, incurred accidentally with no blame attached to anyone, during blasting operations. We, the jury, recommend that the webbing tie, used in miner's helmets, be made equally as strong as the webbing."

* The lace used to adjust the inside webbing of the miner's helmet was found to be broken or cut.

Charles Alphonse Foisy, 35, Canadian, married, was asphyxiated when he fell into a sand-bunker at the Highland Sand and Gravel Company's pit at Lynnmour on March 19th, 1953.

Foisy's main job was at the top of the bunkers, where he diverted sand and gravel to designated chutes for loading into trucks as directed. He also attended to hang-ups in the bunkers. He operated from a catwalk which was securely guarded against falling.

At about 8.15 a.m. on March 19th, 1954, O. Thorenson, who was loading trucks from the bottom of the sand-bunker, signalled to Foisy to divert sand into this bunker. While loading the second truck, Thorenson noticed a shovel in the loading chute and, later, a rubber boot.

The plant was shut down and an attempt made to recover the body via the chute. This method proved futile, and Foisy was recovered at about 9.15 a.m. by digging the sand in the bunker from around the body.

It is thought that Foisy had either dropped his shovel and had gone into the bin to recover it or that he had gone into the bin to free a hang-up.

At the inquest, held in North Vancouver on March 20th, 1954, the jury returned the following verdict:—

"We, the jury, are of the opinion that the deceased, Charles Foisy, came to accidental death in a body of sand by suffocation. From the evidence heard it is impossible to determine how the deceased came into contact with this body of sand and recommend that the company operating the equipment where the deceased met this accidental death should familiarize all employees with precautionary measures."

Anton Iverson, aged about 63, Canadian, and working as a partner on a placer-mining lease on Lorne Creek about 2½ miles from its junction with the Skeena River north of Dorreen, was drowned when he was caught in a mud and rock slide and carried into Lorne Creek about 8 p.m. on October 27th, 1953.

Iverson and one of the partners, J. Sikora, were working on the night of October 27th in order to utilize the water while it was available. Another partner, O. Neilson, had returned to the cabin to make lunch.

Iverson and Sikora were moving ground with a monitor when the slide took place. Sikora heard the slide a few seconds before it reached them. Although struck by flying debris, he was able to get out of the way. Iverson was on the other side of the sluice-box and apparently had no time to move to safety. As both men's lantern and flashlight were put out, a search had to be postponed until next morning, when no trace of Iverson could be found. His body was found in Lorne Creek some days later.

An inquest was held in Terrace on November 16th, and the jury returned the following verdict:—

"On October 27th, 1953, on the west side of Lorne Creek about three miles up said creek from the Canadian National Railway, Anton Iverson was caught in a rock slide and carried into Lorne Creek where he met his death by drowning."

Iverson was an experienced placer-miner.

George Beaulieu, French-Canadian, aged 43, married, with five children, and employed as a miner by Yankee Dundee Mines Limited, was almost instantly killed when his partner drilled into a hole containing explosives in the face of the Wildhorse adit of the Yankee Dundee Mines Limited near Ymir on October 30th, 1953.

His partner, Lloyd Johnson, suffered minor arm and face cuts which resulted in badly impaired vision in his left eye.

The Wildhorse adit is a crosscut which is being driven to explore the Yankee Girl and Dundee orebodies at depth. It is 6½ by 7 feet in cross-section and had been advanced 4,250 feet from the portal at the time of the accident.

Beaulieu and Johnson, assisted by motorman O. Gowing, were on the day-shift crew. By noon the previous round had been mucked out and Beaulieu had drilled two right lifters, one centre back hole, and had started a breast hole. (Both men were using Copco jack-leg machines.) Johnson started to collar a centre lifter and had Beaulieu hold the steel when the explosion occurred, Beaulieu taking the full force of it.

The previous shift had drilled and blasted an 8-foot thirty-two-hole round with an eight-hole burnt cut to the right of the centre. Three holes were blasted in the cut, making a total blast of twenty-seven holes. Primer cartridges were placed in the bottom of the holes, which were loaded with about nine sticks of 40 per cent Forcite each.

Johnson reported that there were no bootlegs to be seen at the lower left side of the face, although he should have been suspicious as the cut had not broken as deep as it should and other holes showed bootlegs up to 20 inches long. When the explosion occurred, a slab of rock 2 feet by 3 feet by 10 inches and smooth on both sides came off the face at the lower left side. Thus it would appear that a knee hole had been cut off here by the previous blast, leaving one cartridge at the bottom. This hole may have been collared too low or powder from it may have been forced into a crack.

In view of the fact that bootlegs existed, the lower part of the face, which was obscured by water and fine muck, should have been examined more carefully. Both men were experienced miners.

An inquest was held in Ymir on November 9th and completed on November 19th. The jury returned the following verdict:—

George Beaulieu came to accidental death at the Ymir Dundee Mine at Ymir, B.C., at approximately 12.15 noon October 30th, 1953, by holding steel for a miner to help collar a hole which drilled into unseen explosive, of which no blame can be attached to anyone."

John Detterbeck, German, aged 31 years, single, and employed as a scraperman by the Granby Consolidated Mining Smelting and Power Company Limited, at the Copper Mountain mine, was killed by a run of rock from a scraper draw-point in 38 No. 4 scraper drift, No. 5 level, at about 8.15 p.m. on November 18th, 1953.

The 38 No. 4 scraper drift on No. 5 level is a standard scraper drift with eight draw-points, four on each side. The grizzly and slusher hoist are at the north-east end of the drift.

There were no actual witnesses to the accident. Detterbeck had been talking to a miner, Leo Reimche, about seventeen minutes before he was found under the muck by mucker boss W. J. Melnychenko. Reimche said Detterbeck told him he was going to No. 17 scraper drift on the same level and that everything was going all right. It would take about ten minutes to go to No. 17 scraper drift and return to 38 No. 4 scraper drift, where Detterbeck had been working. This leaves only about seven minutes elapsed time after he was assumed to have returned to the time when he was found by the mucker boss while the latter was making his rounds.

Melnychenko obtained help, and first aid was given promptly. The doctor arrived about 9.30 p.m. and pronounced Detterbeck dead.

There is no explanation as to why Detterbeck returned to 38 No. 4 scraper drift. The grizzly was almost full and the ropes had been tied up, indicating that, for the time being, scraping had been discontinued.

Detterbeck had been employed at Copper Mountain for four years and as a scraperman for two years and was regarded as a good and experienced workman.

An inquest was held in Princeton on November 23rd, 1953. The Coroner's jury returned the following verdict:—

"John Detterbeck came to his death at the Copper Mountain mine at about 8.05 p.m. on November 18th, 1953, as the result of an accident in which he died of suffocation. No blame attached to anyone."

Joseph Henry Simmons, Sr., American, aged 61 years, married, with eight children (four dependents), and employed as a mill operator's helper at the Western Exploration

Company's mill at Silverton, was found dead at the bottom of the fine-ore bin on November 25th, 1953, at about 9 p.m.

The fine-ore bin is 19 feet long, 15½ feet wide, and 19 feet deep. Sloping sides, running lengthwise, extend from the bottom to about halfway up the bin. A small steel hopper is set in the floor at one end. This allows the muck to flow out at that end and remain at the angle of repose at the other. This remaining muck is scraped into the hopper with a rake after the flow has stopped. A safety rope and belt are provided at the top of the bin, but these are not used as there appears to be no hazard when the muck has reached the angle of repose.

At about 9 p.m. on November 25th, 1953, Simmons spoke to acting mill superintendent C. E. Towgood and mill operator R. N. Hambly. He then left them, and shortly afterwards Hambly noticed by ear that the ball mill was running without load. He investigated the hopper which feeds on to a belt supplying the ball mill, and through a slit in the hopper saw the hair of a head. He and Towgood found Simmons head down in the hopper. He was lifted out and the doctor summoned. He was found to have two broken vertebræ in the neck.

Apparently Simmons had gone into the fine-ore bin to rake the ore into the hopper when he tripped and fell head first into the hopper, a slope distance of about 9 feet. The rake was found across the hopper.

An inquest was held in New Denver on November 30th, 1953. The jury returned the following verdict:—

"Joseph Henry Simmons came to his death on the 25th of November, 1953, at approximately 9.00 p.m., in the Western Exploration Limited mill at Silverton, B.C., from injuries received apparently as a result of accidentally falling head first into the hopper of the fine ore bin, with no blame attached to anyone."

Paul Solecki, aged 37, Canadian, married, with two dependent children, and employed as a skip-tender by The Consolidated Mining and Smelting Company of Canada, Limited, at the Bluebell mine at Riondel, was instantly killed on December 24th, 1953, at 7.45 p.m., when, while loading from the 800 raise chute, a large rock struck his bar and forced it against his head.

The 800 raise connects the 525 level with No. 1 shaft, and the chute is about 45 feet below the level station. The raise is about 20 feet long and is equipped with an air-operated chute gate. There is a level control platform about 2½ feet below the lip of the chute.

There were no actual witnesses to the accident. Solecki was loading a skip at the chute gate and was evidently having difficulty in getting the chute to run. Two men, Aage Anderson and Frank McWhinnie, were working in the shaft about 35 feet below the 800 raise chute. At about 7.55 p.m. they went to the 525 level. When they reached the 800 chute, Anderson noticed the skip was half full and that Solecki was not in sight. Upon investigation they found him pinned by a bar above the chute. Apparently he had climbed up on the timber above the control platform and had tried to loosen the muck above the sand board when a large rock about 280 pounds in weight struck his bar, forcing it against his head and pinning him to the hangingwall of the shaft.

Solecki was an experienced workman, and it is hard to explain why he tried to use the bar from on top of the shaft timbers.

An inquest was held on December 28th, 1953, and the Coroner's jury returned the following verdict:—

"On December 24th, 1953, between the hours of 7.30 and 8.00 p.m. at Bluebell Mine, Riondel, B.C., in No. 1 Shaft 45 feet below 525 level at 800 Raise the deceased, Paul Solecki, while working as a chute loader in the above mentioned place was in the act of barring down the chute which was hung up and in doing so a large rock weighing about 280 pounds came down on his bar and the opposite end which he held struck him under the jaw pinning him to the wall. It is our opinion that this blow caused his accidental death."

FATAL ACCIDENTS AND ACCIDENTS INVOLVING LOSS OF TIME

Nine fatal accidents and 361 accidents involving a loss of time of seven days or more were reported to the Department. These accidents were investigated and reported on by the Inspectors of Mines.

The following three tables classify these 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	10	2.7
Breaking of staging or ladders	2	0.6
Falls of ground	61	16.6
Falling or flying material	33	8.9
Falls from ladders, staging, etc.	10	2.7
Slipping and falling	59	15.9
Lifting and handling material or equipment	128	34.7
Machinery, tools, etc.	47	12.7
Run of ore or waste	4	1.1
Burns or shock	1	-------
Miscellaneous	15	4.1
Totals	370	100.0

Accidents Causing Death or Injuries Classified as to the Occupation of Those Injured

Occupation	Number of Accidents	Percentage of Total
Underground—		
Barmen	6	1.6
Chutemen	8	2.2
Haulagemen	30	8.1
Miners	136	36.8
Truckers	46	12.4
Timbermen	24	6.5
Repairmen	4	1.1
Trackmen and pipe-fitters	5	1.3
Skip-tenders	9	2.4
Miscellaneous	21	5.7
Supervisors and staff	9	2.4
Surface—		
Shops	24	6.5
Mill	21	5.7
Surface, general	23	6.2
Quarries	4	1.1
Totals	370	100.0

ACCIDENTS CAUSING INJURIES CLASSIFIED AS TO PARTS OF THE BODY INJURED

Location	Number of Accidents	Percentage of Total
Head and neck	21	5.7
Eyes	16	4.3
Trunk	22	5.9
Back	79	21.4
Arms	30	8.1
Hands and fingers	60	16.2
Legs	81	22.0
Feet	41	11.1
Toes	9	2.4
Multiple	2	0.5
Fatal	9	2.4
Totals	370	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 8th, 1953, during muck hoisting in the No. 1 shaft at the Cariboo Gold Quartz, a loaded skip ran through both overwinds into the dump while travelling at full speed. The bucket rollers came off the guides and the bucket inverted. The rollers were retracked and, on inspection, it was found that no damage had been done to the equipment. The hoistman was unable to explain the cause of the occurrence and was discharged.

On January 11th, 1953, the mill dry at the Consolidated Mining and Smelting Company operation at Tulsequah was completely destroyed by fire. The fire was thought to have started at the front of the oil furnace or under the hot-water-heating furnace, which was situated near the oil furnace. As there was a 2-inch concrete base over the wooden floor, the fire may have been burning undetected below this base for some time. The cause of the fire was not definitely determined.

On January 15th, 1953, a fire occurred in the plank floor of the Red Rose upper tram terminal. This was set by a workman thawing a pipe-line with a torch made of a rag dipped in oil.

The fire was quickly put out with fire-extinguishers. Three thawing transformers were placed on the water-lines to prevent freezing in future.

On January 23rd, 1953, in the 21-27 drift of the Pioneer mine, a miner's helper was instructed to remove a slab from the side of the drift. Without permission or instruction he proceeded to bulldoze the slab instead of breaking it with a rock hammer. The blast from the bulldoze detonated one and a half cases of dynamite in a local stope powder magazine about 8 feet from the blast. No one was injured but several sets of timber were blown out. The employee was discharged.

On February 14th, 1953, one of the running line guides on a tower of the Red Rose aerial tram broke. The running line caught on the tower and stalled the tram-line. No one was injured.

On February 16th, 1953, in the 23-29 drift of the Pioneer mine a mucking-machine operator, a miner's helper, and a motorman were mucking at the face of the drift when it was found necessary to reblast a missed lifter. The reblast failed to explode, and it was again primed and fired. Approximately fifteen minutes after the blast the crew returned to the face, where the mucking-machine operator commenced to scale loose rock from the back. At this point an explosion occurred which seriously injured him and slightly injured the helper, while the motorman escaped without injury. It is thought that the rock being scaled struck and detonated loose powder lying in the muck pile.

On February 16th, 1953, the running line of the Canadian Exploration tram-line failed 1,000 feet from the upper terminal, allowing the buckets to run back into the terminal. The operating crew was able to leave the danger area quickly and no one was injured. The rope had only been in use about nine months. The probability is that a bucket fouled a tower and then released after causing a kink in the cable.

On February 18th, 1953, the recreation-hall at the Polaris-Taku (Consolidated Mining and Smelting Company) mill-site and most of its furnishings were destroyed by a fire originating in the furnace-room. Owing to a partly closed valve in the water-line the fire-fighting crew was not able to quench the fire, but did prevent it from spreading to an adjoining bunkhouse. No one was able to give a satisfactory explanation for the valve in the water-line being partly closed.

On February 20th, 1953, in the 39282 sublevel No. 3 draw-hole, W. H. Childress and E. Olson, miners in the Sullivan mine, were drilling a pillar slash when the muck they were standing on suddenly gave way. Apparently there was an unknown hang-up below them and water from their drilling caused the muck to move. Olson disappeared with the muck, but Childress caught hold of the air-hose and pulled himself clear. He shouted to Olson, who replied. Childress realized that he could not get his partner up the raise. He went down to the level 45 feet below, met G. Eliuk, and the two men went to the chute controlling the raise down which Olson had been drawn. They succeeded in digging a small hole through the muck, entered the raise, and found Olson buried to the waist. The muck had hung up again, thus saving Olson from being completely buried. Disregarding their own safety, the two men freed Olson and brought him through the small escape hole to the chute platform. Olson suffered a fractured right forearm and fractured ribs.

Childress and Eliuk were awarded the Canadian Institute of Mining and Metallurgy's medal for bravery for their heroic act.

On February 25th, 1953, the Ottawa mine compressor-house, which also contained the mine fan, was completely destroyed by fire. No one was on shift and the fire was not observed. The cause of the fire was believed to be a defective oil stove used for heating. Mine fans should be placed in fireproof structures to lessen the danger from fire and eliminate the possibility of filling the mine with noxious gases.

On March 4th, 1953, on the concentrate loading-dock at the Bluebell mine, the stiff-leg derrick used to load concentrate from the dock onto gondola cars collapsed without warning. None of the men on the dock or barge was injured. Investigation of the wreckage revealed the cause of the collapse to be the failure of the 4½-inch-diameter pin which pins the stiff legs to the mast. This pin had a hole 1½ inches in diameter drilled through its length to take the bucket-tripping line. The position of the pin was such that close inspection was difficult. It apparently had crystallized and cracked, causing a complete break.

On March 19th, 1953, a fire started in the chimney of the assay laboratory at the Polaris-Taku mill-site. It was quickly extinguished by the fire-fighting crew and little damage was done.

In view of this fire and several others which occurred in December, 1952, and January and February of 1953, it was thought that perhaps some or all of them were started by a pyromaniac. Investigations were made, but proof was not definitely established that the fires had been deliberately set.

On April 23rd, 1953, the boom on a Banta crane in the surface yard at the Sullivan concentrator fell about 6 feet, striking a workman a glancing blow. The crane was being used to load a ball-mill loader from a small push car on to a truck. As the crane operator was an experienced man, and the crane was found to be in good mechanical condition, no reason for the boom to suddenly fall could be found.

On May 7th, 1953, in the steel-sharpening shop at the Polaris-Taku mill-site, the steel-sharpener, on attempting to clean out the screen in the ½-inch oil-line feeding the steel-tempering furnace, neglected to close the valve in the oil-line, allowing oil to splash on the hot furnace. The oil ignited and flames rapidly spread to the framework of the building, resulting in considerable damage to the building and equipment.

On May 11th, 1953, the grips on a bucket on the Red Rose aerial tram failed. The bucket crashed into the one ahead and partly knocked it off before falling to the ground. The partly suspended bucket caught on a tower and stalled the running line.

About two weeks previously, about 40 feet of the ⅝-inch running line was replaced by ¾-inch line because no ⅝-inch cable was available at the time. This piece was painted yellow and operators were instructed not to attach buckets to it. In spite of this, a bucket was attached, with the result mentioned. The entire running line was replaced, and no further trouble of this nature was experienced.

On June 22nd, 1953, the cable on the east side of the Victoria shaft at Britannia mine was kinked near the capel, and 31 feet, including the kinked portion, was cut off. The hoistman was testing the overspeed control below the 3900 level, which was found to be in order. New and more efficient dogs had been installed on June 19th, and, as a result of the action of the overspeed control, the dogs caught on the guides. The cage was not hoisted to release the dogs, the practice being to lower the cage to the 4100 level, and sufficient rope was unreeled to allow a kink to form in the cable.

On July 25th, 1953, the Red Rose power-house, about 6 miles from the mine, was completely destroyed by fire, and the equipment—a 1,600-horsepower Fairbanks-Morse diesel, two 1,250-kva. generators, and a Pelton wheel—was reported to be a total loss. The ignition of carbon deposit in the exhaust-pipe and consequent overheating was thought to have been the cause of the fire.

On July 29th, 1953, during stripping operations near the shaft dump of the Mastodon mine, a bulldozer uncovered nine cases of explosives. These were dated 1946, and fortunately the powder had deteriorated to such an extent that it did not explode. The burying of explosives is an improper method of disposal, and this fact was pointed out to the company.

On August 14th, 1953, the following incident occurred at the Copper Mountain mine. The afternoon-shift blasting crew set off a fairly large blast in the 13-E block when coming off shift. Knowing that the foul air would escape by No. 1 shaft and via the 5-90 drift through 16 stope, the mine foreman instructed men going on night shift to travel by the surface skip and enter the mine by the No. 6 portal, a main fresh-air route into the mine. Similar blasts had been set off in the same part of the mine without any trouble, but in this instance some of the gas found its way down to the 6-40 drift and the No. 6 level main drift. Seven of the men entering these headings suffered from gas and returned to No. 6 level and proceeded to the surface through No. 6 level portal. They were given first-aid treatment in the shiftboss's office. Most of the affected workmen wanted to return to work, but all were taken home. All returned to work on their next shift. It was not definitely determined why some of the smoke travelled to Nos. 6 and 8 levels, although it is possible that the force of the blast opened some doors and thus caused a short-circuiting of the ventilation. To prevent a recurrence of incidents of a similar nature, the shifts following such blasts are laid off so that ample time will be allowed for the smoke to be cleared from the mine.

On September 5th, 1953, on the 6100 level of the Tulsequah Chief mine, two experienced miners received severe lacerations on their backs and heads from explosions from a drift round and slash. Altogether there were twenty-seven holes to spit, twenty-four in the round and three in the slash. Although the face of the drift was dry, the drift about 3 feet back from the face was wet.

From reports given by the miners and evidence obtained from an examination of the drift face and broken rock, it appears that, due to the wet condition, the miners had difficulty in lighting their fuses and finally, after succeeding in lighting eighteen holes, they decided to leave the face. They had retreated about 100 feet when the holes started to explode, the blast knocking off their hats, extinguishing their lamps, and severely lacerating their backs, arms, and heads. They were able to crawl along the rails to within 80 feet of the shaft station when the cage-tender arrived.

As a result of the investigation, the blasting certificate of the lead miner was suspended for six months and that of his partner for three months.

On September 8th, 1953, while slowly hoisting a mucking-machine in the east compartment of the Victoria shaft at Britannia mine, and using the west cage as a counterbalance, the west cage stuck in the shaft about 80 feet below the 2800 level. Enough hoisting rope was unreeled to allow a kink to form in the hoisting cable. When the shaft was checked, there was found to be insufficient clearance between the guides thirteen sets below the 2800 level. A length of 28 feet was cut off the west side cable, and the west compartment was used only above the 2800 level until the tight place in the guides was repaired and adequate clearance provided.

On September 11th, 1953, in the 23-33 stope of the Pioneer mine, two miners were redrilling a cut in a subdrift after the previous blast failed to break the ground. When attempting to collar a new hole, the drill steel slipped across the drift face and into a bootleg hole of the previous round. The drill apparently struck some unexploded powder which detonated, causing moderate injury to the two miners exposed to the blast.

On September 12th, 1953, the combined garage and machine-shop and contents at the Red Rose mine was completely destroyed by fire. The fire was started by a broken light bulb on an extension cord falling into a bucket of gasoline. The clothing of an employee caught fire when he attempted to carry the flaming gasoline bucket from the building. He extinguished the fire in his clothing by rolling on the dirt floor and escaped with minor burns on his hands and face.

On September 14th, 1953, on the 1800 level of Bralorne mine a miner was redrilling a subdrift round that had failed to break when it was blasted on the previous shift. About 6 feet of bootleg was left in each hole, and he decided to deepen the holes about 18 inches before reblasting. This was a direct violation of General Rule 85 of the "*Metalliferous* Mines Regulation Act." He had deepened four holes and immediately had started to drill in the fifth when there was an explosion which plastered his hands, face, eyes, and arms with fragments of quartz. Some unexploded powder must have remained in the bottom of the hole. His blasting certificate was suspended for a period of six months as a disciplinary measure.

On September 25th, 1953, on the surface haulage of the Nickel Plate mine a train of seventeen loaded cars of ore broke away from the locomotive between the mine and the ore-bin at the head of the gravity tramway. Failure of the locomotive draw-bar was the cause of the accident. All the cars stayed on the rails for about half a mile and crashed into the car-dumping mechanism at the ore-bin. The mechanism and six ore-cars were completely destroyed, and several other cars and the bin structure were extensively damaged. No one was injured. The draw-bar pin that failed was of a type discarded some years ago, and it is not known how or when this pin was put in service. Orders were issued that locomotive draw-bar pins must be checked daily and that no substitutions be permitted without proper authority.

On October 9th, 1953, the Highland-Bell office at Beaverdell was completely destroyed by fire. The building contained the office and company staff-house. The company's records were destroyed. There had been no fire in the stove at the office since the previous afternoon. On October 19th a fire was discovered in one of the company houses at the Beaverdell camp. Because of the nature of these fires, an investigation was conducted by the Fire Marshal's department.

On October 20th, 1953, on the 4200 level of the Jersey mine, a Le Tourneau loader entered the portal with the box raised, and cut the 2,300-volt armoured cable suspended from the back of the tunnel. The circuit-breaker cut off the current before any further damage was done.

On December 11th, 1953, in the N-6 slusher drift at the Sullivan mine two timbermen were blasting a pop hole for a hitch and neglected to guard both entrances to the working place. Two miners were entering the area via the second entrance, but the shot went off before they came into line with the blast and no one was injured. The timbermen responsible for not properly guarding the blast had their blasting certificates suspended for a period of three months.

On December 28th, 1953, a small fire occurred in the No. 2 underground hoistroom at the Copper Mountain mine. The hoistman was hoisting a model 20 Eimco mucking-machine which weighed 2½ to 3 tons. The machine was slung underneath the skip and a very slow hoisting speed was used. This heated the grids above normal, and it is possible that the increased temperature was sufficient to cause some pitch to run from the wooden planks above the grids. This may have dripped through cracks in the asbestos-board covering on to the grids, causing a flash of flame which could have ignited the hot planks. The fire was quickly brought under control, and no damage was done to the equipment, and no persons were injured. By removing the remaining planks over the grid and raising the suction-fan hood, it is not expected that such an incident will recur.

PROSECUTIONS

There were no prosecutions in metalliferous mines and quarries in 1953.

Several violations of the "Metalliferous Mines Regulation Act" in regard to explosives and blasting procedure resulted in the offenders having their blasting certificates suspended for periods of from three to six months according to the seriousness of the offence.

EXPLOSIVES USED IN MINES

The table below shows the quantities of explosives and blasting accessories used in metal mines and quarries in British Columbia in 1949, 1950, 1951, 1952, and 1953:—

	1949 Total	1950 Total	1951 Total	1952 Total	1953 Total	1953	
						Mines	Quarries
High explosives (lb.)	7,022,000	7,318,962	9,162,179	9,935,946	9,237,700	8,895,700	342,000
Blasting-caps	2,082,400	2,518,200	2,570,600	3,159,900	1,890,000	1,628,000	262,000
Electric blasting-caps	146,760	65,725	163,920	166,740	141,000	134,000	7,000
Delay electric blasting-caps (short period)	....	....	232,375	250,649	182,771	173,811	8,960
Delay electric blasting-caps (sure fire)	36,170	110,269	105,950	205,140	138,055	137,455	600
Primacord (ft.)	421,000	460,000	283,000	522,000	647,000	631,000	16,000
Safety fuse (ft.)	16,838,400	19,934,700	19,832,300	22,754,200	17,679,000	16,701,000	978,000
Ignitercord (ft.)	....	....	151,700	146,600	142,000	142,000	....
Ignitercord connectors	....	....	100,900	114,100	114,000	114,000	....

A decrease of about 7 per cent in the total quantity of high explosives used is a direct indication of the decreased activity in the industry. The fact that there was not a corresponding decrease in the use of ignitercord and ignitercord connectors indicates a trend toward safer blasting methods.

UNDERGROUND DIESEL EQUIPMENT

Four diesel locomotives were in use underground in metal mines at the end of 1953, at smaller mines and development operations. Substantial advance was made in the use of trackless underground diesel equipment at the lead-zinc operations of the Canadian Exploration Company near Salmo, where a large flat-lying orebody is being mined entirely by trackless methods above the 4200 level. Drilling is done from a jumbo carrying three leyner-type machines and mounted on a diesel-driven caterpillar tractor. The machines can all be operated by remote control. The ore is loaded on to Euclid or Dart trucks or Koehring dumptors by Eimco overhead loaders. All this equipment is diesel-driven and is provided with scrubbers. The layout is designed and equipped to mine about 1,200 tons per day. Ventilation to working places is through 30-inch-diameter fan pipe. The equipment is serviced in an underground repair-shop. The whole operation has been most satisfactory, both from the standpoint of good working conditions and low mining cost.

The exhaust gases of all diesel engines used underground and the mine air in which they are working is periodically sampled and analysed for noxious ingredients, and ventilation requirements are periodically checked. Experience to date has shown that diesel 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 to check determinations made by methane detectors, carbon-monoxide detectors, and mine safety lamps. In total, sixty samples were taken and analysed for oxygen, nitrogen, carbon dioxide, carbon monoxide, methane, and hydrogen as circumstances and conditions indicated. This was twelve less than in 1952. Of the sixty samples, eighteen were taken to test diesel exhaust gases, and a substantial proportion of the remainder were taken to test the air in which the diesels were operating. The problem of sampling and analysing diesel exhaust gases for aldehydes and oxides of nitrogen was studied by the Department of Mines analytical laboratory, and facilities for undertaking this work will be available in 1954.

At the Sullivan mine, in connection with special problems resulting from the formation of sulphur dioxide from the oxidation of sulphides in ore and in the tailings used as backfill, complete facilities have been set up by the company for the sampling and analysis of the mine gases.

DUST CONTROL 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 seventy-six of the more important mines by the Silicosis Branch of the Workmen's Compensation Board, and fifty-two surveys of dust conditions were made in crushing plants and assay offices of operating mills. In addition, some of the larger mines employed ventilating engineers and trained personnel to make dust counts.

The Silicosis Branch of the Workmen's Compensation Board also carried out tests to determine comparative dust counts resulting from drilling with the conventional drills now in common use and a recently developed type of dry web drill that operates on the vacuum principle of exhausting the dust as it is formed from the bottom of the hole and conducting it to a container through the hollow drill steel and machine itself. The dust counts obtained in the vicinity of the new type of drill were remarkably low, and it would appear that the use of this equipment would do much to reduce dust from drilling operations. A machine of the new type was successfully used in one of the coal mines for drilling holes for roof-bolts in an area where a supply of drilling-water was not available.

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, 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 1953 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 was on duty at each station. Each station is equipped with several sets of McCaa two-hour self-contained oxygen breathing apparatus, one set of Chemox one-hour self-contained oxygen breathing apparatus, all-service gas masks, self-rescuers, methane and carbon-monoxide detectors of the latest type, one or more H.H. inhalators, 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 in Nelson in 1950, continued to be of great assistance in promoting and giving instructions in mine-rescue and first aid at the mines tributary to that centre. First-aid classes were held at the H.B. and Canadian Exploration mines near Salmo, the Jack Pot mine near Ymir, the Sunshine Lardeau at Camborne, the Violamac mine near Sandon, the Columbia Lead and Zinc mine near Revelstoke, and at Slocan City, New Denver, and Sandon. In the senior classes fifty men were successful in obtaining St. John Ambulance certificates or higher awards, and twenty-three junior awards were earned. In addition, forty-seven took all or part of a course, but were not examined because no doctor was available to conduct the tests. Classes at Slocan City, New Denver, Sandon, and the Violamac mine were still in progress at the end of the year, with fifty-five seniors and forty-one juniors enrolled.

Classes in mine-rescue were held at the Canadian Exploration and Sunshine Lardeau mines and at Riondel and Sandon. Of the twenty-six who took the course, nineteen were examined and awarded certificates.

In addition to the mine-rescue equipment maintained at the Government mine-rescue stations, there are several complete sets of McCaa and Chemox apparatus at the Sullivan mine at Kimberley, a set of McCaa at Copper Mountain, and complete sets of Chemox at Wells, Hedley, the Bridge River camp, and Britannia. Minor amounts of mine-rescue equipment are kept at the operations at Tulsequah, the Torbrit mine at Alice Arm, and the Giant Mascot mine at Spillimacheen. This equipment is checked periodically by one of the mine-rescue instructors.

The Princeton station was made available to the St. John Ambulance Association for lectures and instruction in first aid, and the Similkameen Branch of the Canadian Institute of Mining and Metallurgy made use of the lecture-room for their meetings throughout the year. The building was also used by the Motor-vehicle Branch for two weeks for the purpose of giving drivers' 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 1953, in addition to the regular teams in training, seventy-nine men took the full training course and were granted certificates as follows:—

Certificate No.	Name	Where Trained	Certificate No.	Name	Where Trained
2694	Kenneth Joseph MacKay	Kimberley.	2734	Silvio Strussi	Cumberland.
2695	Harry Orme Howey	Kimberley.	2735	Joseph Pavlich	Cumberland.
2696	William Lindsay Foulds	Kimberley.	2736	George Stockand	Cumberland.
2697	Barry Scott	Kimberley.	2737	Donald Morrison	Cumberland.
2698	Henry George Bryant	Kimberley.	2738	Renato Strussi	Cumberland.
2699	Roderick Peter Douglas	Kimberley.	2739	Charles Hamilton	Cumberland.
2700	David Grant Adam	Kimberley.	2740	Charles Cosorzo, Jr.	Cumberland.
2701	Francis Cornelius Lowes	Kimberley.	2741	Kenneth Gordon Livingstone	Wells.
2702	Eric Moore Thompson	Kimberley.	2742	Donald Richardson Burton	Wells.
2703	John Arthur Journeay	Kimberley.	2743	Alfred Walter Baker	Salmo.
2704	Roy Harold Paddon	Kimberley.	2744	John Richard Nuss	Salmo.
2705	Gordon Russell Edmonds	Kimberley.	2745	Thomas Pfliger	Salmo.
2706	Roy Robertson McMichael	Chapman Camp.	2746	Peter William Watson	Salmo.
2707	Franklin Lionel Goodwin	Kimberley.	2747	Donald H. Weddell	Salmo.
2708	John Soden	Kimberley.	2748	William Zawadski	Salmo.
2709	Carl Hjamaas Olson	Kimberley.	2749	Robert Gordon P. Colthorp	Riondel.
2710	Lloyd Edward Barrett	Chapman Camp.	2750	Charles Stanley Comfort	Riondel.
2711	John Albert Hume	Kimberley.	2751	Edward Roy Hanson	Riondel.
2712	Frederick Raynes	Kimberley.	2752	Frank Leslie McWhinnie	Riondel.
2713	Harry Foster	Kimberley.	2753	Norman Joseph Paulhus	Riondel.
2714	David Meredith Williams	Kimberley.	2754	Francis Philip E. Rowan	Riondel.
2715	Sebastian Flegel	Kimberley.	2755	Stanley Herbert Zillman	Camborne.
2716	Stewart Alexander Ferguson	Kimberley.	2756	Maxwell John Hocking	Sandon.
2717	Czeslaw Plonka	Fernie.	2757	Donald Marston Edwards	Sandon.
2718	Harry Miller	Fernie.	2758	Wallace Harold Holmes	Sandon.
2719	Herbert Henry Parsons	Fernie.	2759	Frank Stephen Kohar	Sandon.
2720	James B. McKnight	Pioneer.	2760	Anthony Maxinuk	Sandon.
2721	Malcolm Kieth Lorimer	Pioneer.	2761	Thomas Bailey	Nickel Plate.
2722	Heinz Otto Hellmin	Pioneer.	2762	Robert M. Campbell	Nickel Plate.
2723	Hans Gerdes	Pioneer.	2763	John Fritz	Nickel Plate.
2724	Joachim Fricks	Pioneer.	2764	Frank Grundig	Nickel Plate.
2725	Willy Brueckel	Pioneer.	2765	Andrew Jackson	Nickel Plate.
2726	Douglas F. Beasley	Pioneer.	2766	P. J. F. McLaughlin	Nickel Plate.
2727	Anton Bognar, Jr.	Copper Mountain.	2767	Gerhard Rempel	Nickel Plate.
2728	J. Allen Byer	Copper Mountain.	2768	Ernest Timms	Nickel Plate.
2729	Victor Fritz	Copper Mountain.	2769	Ralph Urban	Nickel Plate.
2730	Joseph Klein	Copper Mountain.	2770	Clifford C. Wheeler	Nickel Plate.
2731	John Mohoruk	Copper Mountain.	2771	Bruce Hawkins	Wells.
2732	James P. MacCulloch	Copper Mountain.	2772	Henry Lewis Bertrand	Camborne.
2733	H. E. Woodhouse	Copper Mountain.			

The Mine Safety Associations in the different centres of 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, first-aid, and safety education in their respective districts.

First-aid and mine-rescue competitions were held in Wells, New Denver, Fernie, Princeton. and Cumberland. 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.

The Central British Columbia Mine Rescue Association held its annual competition at Wells on May 30th, 1953. Teams competing were from the Bralorne, Pioneer, Island Mountain, Cariboo Gold Quartz, and Britannia mines. The Bralorne team, captained by A. Mracek, was the winner.

The West Kootenay Mine Safety Association held its annual competition at New Denver on June 6th, 1953. Five teams took part in this competition—two from the Canadian Exploration mines at Salmo, two from the Bluebell mine at Riondel, and one from Sandon. First place was given to the Canadian Exploration team No. 2, captained by R. Chenoweth. A novel feature was introduced in this competition. A 50-foot section of the "mine" was completely enclosed by transparent plastic and filled with smoke and noxious gas. The teams were required to conduct "patients" equipped with suitable respirators through the smoke-filled section. This realistic part of the competition was successfully performed by all competing teams.

The East Kootenay Mine Safety Association held its annual mine-rescue competition in Fernie on June 13th, 1953. Six teams competed—two from Kimberley, two from

Michel, and one each from Coal Creek and Fernie. The competition was won by the Michel No. 1 team, captained by Mario Pettoello. The teams from Kimberley were chosen by holding a local elimination competition before the meet.

The Similkameen Valley Mine Safety Association held its annual competition in Princeton on June 30th, 1953. Four teams competed—two from the Nickel Plate mine and two from Copper Mountain. The winning team was from Copper Mountain and was captained by E. H. Pickard.

The Vancouver Island Mine Safety Association held its annual competition in Cumberland on June 27th, 1953. Three teams competed—two from Tsable River and a visiting team, winner of the Similkameen Valley competition, from Copper Mountain. The Tsable River No. 1 team, captained by John Thomson, was the winner.

At all meets, except the one staged at Wells, competitions were held in first-aid as well as mine-rescue work. In all these competitions, events were held for women and juniors, and representatives of other industries and organizations not necessarily directly connected with mining also participated.

A local first-aid competition was held at Britannia and a local mine-rescue and first-aid competition in Kimberley, in which teams from the Bluebell mine participated. A Kimberley first-aid team also took part in the Similkameen Valley competition at Princeton, and the Princeton mine-rescue team visiting Cumberland entered the first-aid competition at that centre.

In all local first-aid competitions, events were held for women and juniors. This, in addition to the fact that teams from other industries are encouraged to compete, 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 1952 was won by the Consolidated Mining and Smelting Company's Sullivan mine at Kimberley and concentrator at Chapman Camp for the third successive year. The company's safety organization and officials and employees are highly commended for the effort which brought about this fine result. 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 Fernie on June 13th, 1953.

The 1952 regional safety award for coal mines was won by the Michel Colliery of The Crow's Nest Pass Coal Company Limited and was presented at the annual mine-rescue and first-aid competition of the East Kootenay Mine Safety Association that was held in Fernie on June 13th, 1953.

WEST KOOTENAY MINE SAFETY ASSOCIATION TROPHY

Because the West Kootenay districts contain many small mines not eligible for the John T. Ryan Safety Awards, and in order to encourage and promote safety in these operations, the West Kootenay Mine Safety Association in 1951 put up a safety trophy for annual competition.

The award is made to the mine having the lowest accident rate and working a total of from 2,500 to 30,000 shifts per year, one-third of these having been worked underground. An accident is taken as one which involves more than four days' loss of time.

In 1951 the award was won by the H.B. mine, near Salmo, and in 1952 and 1953 by the Violamac mine near Sandon. The 1953 award was presented at a joint meeting of the West Kootenay Mine Safety Association and the Nelson branch of the Canadian Institute of Mining and Metallurgy, held in Nelson on January 30th, 1954.

CANADIAN INSTITUTE OF MINING AND METALLURGY MEDAL FOR BRAVERY

The Canadian Institute of Mining and Metallurgy Medal for Bravery was awarded William Howard Childress and Gus Kust Eliuk for an outstanding act in freeing a fellow workman from a cave-in in a raise at the Sullivan mine on February 20th, 1953. The award is to be presented at the annual meeting of the Institute in Montreal, in April, 1954.

A complete account of this occurrence is given on page 213 under "Dangerous Occurrences."

Coal

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 1953 was 1,576,105 tons, a decrease of 74,514 tons or 4.5 per cent from 1952; 404,173 tons of the total output came from strip mines at Michel and Tent Mountain.

Vancouver Island collieries produced 265,427 tons, a decrease of 138,296 tons or 34.2 per cent from 1952.

The Northern District production was 46,971 tons, an increase of 5,813 tons or 14.1 per cent over 1952.

The Nicola-Princeton District production was 8,085 tons, an increase of 642 tons or 8.6 per cent over 1952.

The East Kootenay District production was 1,255,620 tons, an increase of 57,327 tons or 4.7 per cent over 1952.

OUTPUT AND PER CAPITA PRODUCTION, 1953

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[1]	17,178	......	......	......	......	......	......	......
Tsable River Colliery	166,990	234	218	3.27	766	202	3.53	826
Bright mine[2]	76,006	205	75	4.94	1,013	64	5.79	1,187
Chambers mine (strip)	875	172	2	2.54	437	......	......	......
Loudon mine	804	188	4	1.07	201	4	1.07	201
Lewis mine (Timberlands)	670	181	3	1.23	223	3	1.23	223
Wellington mine (Carruthers)	558	186	2	1.50	279	2	1.50	279
Stronach mine	1,419	226	5	1.25	283	5	1.25	284
Cassidy No. 7 mine[3]	445	76	3	1.95	148	3	1.95	148
Wellington Blue Flame mine	282	125	2	1.13	141	2	1.13	141
Wende mine[4]	66	60	3	0.37	22	2	0.55	33
Riverside mine (Biggs)[5]	134	30	1	4.46	134	1	4.46	134
Taylor Burson mine (Blue Flame)	7,047	255	12	2.30	587	11	2.50	640
Coldwater Coal mine	1,040	240	3	1.44	347	3	1.44	347
Bulkley Valley Colliery	42,136	271	53	2.92	795	36	4.30	1,170
Reschke mine	2,371	160	6	2.47	395	5	2.96	474
Gething mine No. 3	2,464	160	11	1.40	224	11	1.40	224
Elk River Colliery	306,462	210	363	4.01	841	281	5.20	1,090
Michel Colliery (underground)	545,860[6]	219	736	3.38	741	519	4.80	1,051
Michel Colliery (strip)	271,216[6]	219	25	......	......	......	......	......
Coleman Collieries (strip)	132,082	157[6]	23[6]	......	......	......	......	......

[1] Comox No. 8 mine closed February 6th, 1953.
[2] Bright mine closed November 27th, 1953.
[3] Cassidy No. 7 mine closed in May, 1953.
[4] Wende mine closed in April, 1953.
[5] Biggs mine closed in April, 1953.
[6] Estimated.

Collieries of Vancouver Island Inspection District

The output of Vancouver Island collieries was 265,427 tons. Of this amount, 51,704 tons or 19.4 per cent was lost in preparation for market and 1,798 tons or 0.6 per cent was used by the operating companies as fuel under boilers, etc. The total sales amounted to 204,931 tons, and 6,994 tons was put on stocks. Of the amount sold in competitive market, 192,432 tons was sold in Canada and 12,499 tons sold in the United States.

Collieries of the Nicola-Princeton District

The gross total of 8,087 tons produced in the collieries of the Nicola-Princeton District was sold in Canada.

Collieries of the Northern District

A total of 46,894 tons was sold in Canada from the Northern District; 57 tons was added to stocks, the gross output for 1953 being 46,971 tons.

Collieries of the East Kootenay District

The gross output of the collieries in the East Kootenay District was 1,255,620 tons. Of this amount, 131,476 tons or 10.4 per cent was lost in preparation for the market, 12,729 tons or 1.0 per cent was used as fuel under company boilers, etc., and 230,814 tons was used in making coke. Of the amount sold in competitive market, 816,696 tons was sold in Canada and 62,169 tons sold in the United States.

Output and per Capita Production in the Various Districts, 1953

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	264,552	316	837	288	918
Nicola-Princeton District	8,087	15	539	14	578
Northern District	46,971	70	671	52	903
East Kootenay District	852,322	1,099	775	800	1,065
Whole Province	1,171,932	1,500	781	1,154	1,015

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, 1943–53

Year	Man-shifts[1]	Tonnage	Average per Man-shift (Tons)
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
1953	333,922	1,171,932	3.51

[1] Includes both surface and underground workers.

Collieries of British Columbia, 1953—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				Sales				Total Coal Sold and Used[2]
						On Hand First of Year	On Hand Last of Year	Added To	Taken From	In Canada	In U.S.A.	Else-where	Total Sales	
Vancouver Island District	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Canadian Collieries (D.) Ltd.—														
Comox Colliery (No. 8 mine)	17,178	5,441	11,737	430	....	14,272	....	....	14,272	25,579	....	....	25,579	26,009
Tsable River Colliery	166,990	22,814	144,176	962	....	10,533	31,355	20,822	....	109,893	12,499	....	122,392	123,354
Bright mine	*76,006*	*23,449*	*52,557*	*406*	....	*4,583*	*5,027*	*444*	....	*51,707*	....	....	*51,707*	*52,113*
Chambers mine (strip)	875	....	875	....	....	....	....	....	....	875	....	....	875	875
Loudon mine	804	....	804	....	....	....	....	....	....	804	....	....	804	804
Lewis mine (Timberlands)	670	....	670	....	....	....	....	....	....	670	....	....	670	670
Wellington mine (Carruthers)	558	....	558	....	....	....	....	....	....	558	....	....	558	558
Stronach mine	1,419	....	1,419	....	....	....	....	....	....	1,419	....	....	1,419	1,419
Cassidy No. 7 mine	445	....	445	....	....	350	350	....	....	445	....	....	445	445
Wellington Blue Flame mine	282	....	282	....	....	....	....	....	....	282	....	....	282	282
Wende mine	66	....	66	....	....	....	....	....	....	66	....	....	66	66
Riverside mine (Biggs)	134	....	134	....	....	....	....	....	....	134	....	....	134	134
Totals, Vancouver Island District	265,427	51,704	213,723	1,798	....	29,738	36,732	21,266	14,272	192,432	12,499	....	204,931	206,729
Nicola-Princeton District														
Taylor Burson mine (Blue Flame)	7,047	....	7,047	....	....	....	....	....	....	7,047	....	....	7,047	7,047
Coldwater Coal mine	1,040	....	1,040	....	....	....	....	....	....	1,040	....	....	1,040	1,040
Totals, Nicola-Princeton District	8,087[1]	....	8,087	....	....	....	....	....	....	8,087	....	....	8,087	8,087
Northern District														
Bulkley Valley Collieries	42,136	....	42,136	....	....	134	191	57	....	42,079	....	....	42,079	42,079
Reschke mine	2,371	....	2,371	....	....	....	....	....	....	2,371	....	....	2,371	2,371
Gething No. 3 mine	2,464	....	2,464	20	....	....	....	....	....	2,444	....	....	2,444	2,464
Totals, Northern District	46,971	....	46,971	20	....	134	191	57	....	46,894	....	....	46,894	46,914
East Kootenay District														
Elk River Colliery	306,462	28,431	278,031	3,884	....	....	1,894	1,894	....	241,656	30,597	....	272,253	276,137
Michel Colliery (underground and strip)	817,076	84,422	732,654	8,845	230,814	2,004	1,846	....	158	461,581	31,572	....	493,153	732,812
Coleman Collieries (strip)	132,082	18,623[1]	113,459	....	....	....	....	....	....	113,459	....	....	113,459	113,459
Totals, East Kootenay District	1,255,620	131,476	1,124,144	12,729	230,814	2,004	3,740	1,894	158	816,696	62,169	....	878,865	1,122,408
Coal														
Grand totals for Province	1,576,105	183,180	1,392,925	14,547	230,814	31,876	40,663	23,217	14,430	1,064,109	74,668	....	1,138,777	1,384,138
Coke														
Crow's Nest Pass Coal Co. Ltd.—Michel Colliery	177,790	....	....	....	....	15,207	26,418	11,211	....	99,757	66,822	....	166,579	....

[1] Estimated.
[2] Includes coal used in making coke and coal used under company stationary and locomotive boilers, etc.

Collieries of British Columbia, 1953—Men Employed, Distribution by Collieries and by Districts

Mine	Supervision and Clerical			Miners			Helpers			Labourers			Mechanics and Skilled Labour			Boys			Total Men Employed		
Vancouver Island District	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.
Canadian Collieries (D.) Ltd.—																					
Comox Colliery (No. 8 mine[1])	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Tsable River Colliery	12	1	13	130	......	130	......	......	......	36	10	46	24	5	29	......	......	......	202	16	218
Bright mine	5	......	5	35	......	35	......	......	......	20	10	30	4	1	5	......	......	......	64	11	75
Chambers mine (strip)	......	......	......	......	2	2	......	......	......	......	......	......	......	......	......	......	......	......	......	2	2
Loudon mine	1	......	1	2	......	2	1	......	1	......	......	......	......	......	......	......	......	......	4	......	4
Lewis mine (Timberlands)	......	......	......	3	......	3	......	......	......	......	......	......	......	......	......	......	......	......	3	......	3
Wellington mine (Carruthers)	......	......	......	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Stronach mine	1	......	1	3	......	3	......	......	......	1	......	1	......	......	......	......	......	......	5	......	5
Cassidy No. 7 mine	1	......	1	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	3	......	3
Wellington Blue Flame mine	......	......	......	2	......	2	......	......	......	......	......	......	......	......	......	......	......	......	2	......	2
Wende mine	......	......	......	2	......	2	......	......	......	......	1	1	......	......	......	......	......	......	2	1	3
Riverside mine (Biggs)	......	......	......	1	......	1	......	......	......	......	......	......	......	......	......	......	......	......	1	......	1
Totals, Vancouver Island District	20	1	21	182	2	184	1	......	1	57	21	78	28	6	34	......	......	......	288	30	318
Nicola-Princeton District																					
Taylor Burson mine (Blue Flame)	1	......	1	9	......	9	1	......	1	......	......	......	......	1	1	......	......	......	11	1	12
Coldwater Coal mine	......	......	......	3	......	3	......	......	......	......	......	......	......	......	......	......	......	......	3	......	3
Totals, Nicola-Princeton District	1	......	1	12	......	12	1	......	1	......	......	......	......	1	1	......	......	......	14	1	15
Northern District																					
Bulkley Valley Colliery	3	2	5	20	1	21	13	......	13	......	4	4	......	7	7	......	3	3	36	17	53
Reschke mine	1	......	1	4	......	4	......	......	......	......	1	1	......	......	......	......	......	......	5	1	6
Gething No. 3 mine	1	......	1	6	......	6	4	......	4	......	......	......	......	......	......	......	......	......	11	......	11
Totals, Northern District	5	2	7	30	1	31	17	......	17	......	5	5	......	7	7	......	3	3	52	18	70
East Kootenay District																					
Crow's Nest Pass Coal Co. Ltd.—																					
Elk River Colliery	19	18	37	161	......	161	40	......	40	25	33	58	36	27	63	......	4	4	281	82	363
Michel Colliery (underground)	32	27	59	246	......	246	135	......	135	87	71	158	19	113	132	......	6	6	519	217	736
Michel Colliery (strip)	......	6	6	......	......	......	......	......	......	......	12	12	......	7	7	......	......	......	......	25	25
Coleman Collieries (strip)	......	2	2	......	......	......	......	......	......	......	9	9	......	12	12	......	......	......	......	23	23
Totals, East Kootenay District	51	53	104	407	......	407	175	......	175	112	125	237	55	159	214	......	10	10	800	347	1,147
Grand totals for Province	77	56	133	631	3	634	194	......	194	169	151	320	83	173	256	......	13	13	1,154	396	1,550

[1] Closed February 6th, 1953.

NOTE.—U.=Underground; A.=Above ground; T.=Totals.

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 minus 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 dewatering 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 plus 6-inch, 1¼- to 3/16-inch, and minus 3/16-inch. All sizes above 3/16-inch are treated by two Vissac jigs for the removal of rock, and the minus 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 minus 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 into railway cars.

Coke-making

The earliest record of 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 at its Michel and Morrissey Collieries in 1902 and 1904 respectively, also in bee-hive ovens. In December, 1908, Hosmer Mines Limited commenced 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.

Batteries Nos. 1 and 2 each consists of ten ovens, each 30 feet long and 8½ feet wide; batteries Nos. 3 and 4 each consists of sixteen ovens, each 40 by 8½ feet. The coal charge per oven in batteries Nos. 1 and 2 is 5½ tons, and in batteries Nos. 3 and 4, 7½ tons. From a total of approximately 775 tons of coal per day charged into the fifty-two ovens, the coke yield is about 580 tons, of which 540 tons is sized coke, plus ¼-inch, and about 40 tons is breeze, minus ¼-inch. With a charge depth of 10½ to 11 inches of coal, the coking time is ten and a half hours at temperatures of 2,500 to 2,600 degrees Fahrenheit.

By-products amount to about 6 gallons of tar and 8,000 to 10,000 cubic feet of gas 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 coal charges therein to the required coking temperatures. The excess gas not used for this purpose 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 from the ovens by use of a ram operated by an engine using by-product gas.

The plant is operated continuously on a three-shift basis. To ensure continuous operation, slack coal is stored in bins having a total capacity of 3,200 tons. This bank of coal allows the plant to operate throughout week-ends, statutory holidays, etc. The total number of men employed at the plant is sixty.

Briquetting

In the third week of February, 1954, the first successful briquetting plant in the Province was brought into production on a twenty-four-hour basis at the Michel Colliery of The Crow's Nest Pass Coal Company Limited.

An earlier attempt at briquetting in the Province had been made at the Union Bay preparation plant of Canadian Collieries (Dunsmuir) Limited but had proved unsuccessful.

Construction of the Michel plant was started in June, 1953, and was completed early in February, 1954. The plant is housed in an insulated steel structure. Slack coal from both the Michel and Elk River Collieries will be utilized for the making of briquettes. The plant consists of two units, each designed to produce 25 tons of briquettes per hour.

A brief description of the process is as follows. The coal, minus ¼-inch slack, on leaving the bin at the colliery tipple is mixed with low-grade flour (approximately 1 per cent of flour for binding) then conveyed by an inclined belt-conveyor to coal surge bins at the briquette plant. From the surge bins it is distributed to the two units by a forked coal-feeder to the pre-heaters which, in conjunction with steam injectors, are used to raise the temperature of the coal. From the pre-heaters the coal is carried along paddle mixers, sprayed with asphalt, and then conveyed to vertical fluxers. During transit to the fluxers the temperature of the coal is raised to approximately 250 degrees Fahrenheit, the temperature necessary for the proper blending of the coal and asphalt. On leaving the fluxers the mixture is conveyed to the presses by tempering conveyors on which the temperature of the mix is lowered to 120 degrees Fahrenheit.

After formation in the presses, the briquettes are conveyed by chute on to a bar screen for screening. After being screened, the briquettes are transported by conveyor out of the building, where they are cooled by the outside atmosphere on their way to the plant surge bin, from which they are loaded directly into railway cars.

The screenings from the briquettes are returned to the plant for recirculation.

The asphalt is stored in two 20,000-gallon-capacity tanks situated behind the plant.

LABOUR AND EMPLOYMENT

In 1953, 1,550 persons were employed in and about the coal mines of the Province, a decrease of 131 from 1952.

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 7.8 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 15.3 per cent, owing mainly to the progressive increase of diesel-powered engines on the railways. In the Northern and Nicola-Princeton Districts the average loss of working-days was 22.4 and 2.7 per cent respectively, owing mainly to the lack of coal orders.

COMPETITION FROM COAL PRODUCED OUTSIDE OF BRITISH COLUMBIA

In 1953 the shipment of Alberta coal and briquettes to British Columbia totalled 859,385 and 30,373 tons respectively. The following table shows the amount of Alberta coal brought into British Columbia during the past ten years:—

Year	Short Tons	Year	Short Tons
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
1948	945,700	1953	859,385

Of the 1,138,777 tons of British Columbia coal marketed, 217,323 tons was sold for domestic and industrial use in Alberta, Saskatchewan, Manitoba, Ontario, and Yukon Territory; 455,751 tons was sold for railroad use in Canada; 74,668 tons was exported to the United States; and 5,692 tons was sold for ships' bunkers.

The amount sold for domestic and industrial use in the Province was 385,343 tons.

ACCIDENTS IN AND AROUND COAL MINES

During 1953, 1,550 persons were empolyed in and around coal mines, including strip-mining operations. Five fatal accidents occurred in the year, as compared with three in 1952. The number of fatal accidents per 1,000 persons employed was 3.22, compared with 1.78 in 1952, 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, and 1.06 in 1944. The average for the ten-year period was 1.75.

The number of fatal accidents per 1,000 tons of coal produced in 1953 was 4.26, compared with 1.81 in 1952.

The following table shows the collieries at which fatal accidents occurred in 1953, with comparative figures for 1952.

Name of Company	Name of Colliery	1953	1952
Crow's Nest Pass Coal Co. Ltd.	Michel Colliery	2	1
Crow's Nest Pass Coal Co. Ltd.	Elk River Colliery	3	1
Canadian Collieries (D.) Ltd.	No. 10, South Wellington	....	1
Totals		5	3

The following three tables classify the fatal accidents in coal mines in 1953 as to cause, quantity of coal per accident, and inspection districts.

Fatal Accidents Classified as to Cause

Cause	1953		1952	
	Number	Per Cent	Number	Per Cent
By falls of roof and coal	3	60.00	1	33.33
By mine cars and haulage (underground)	1	20.00	....	....
Asphyxiated by methane gas	1	20.00	....	....
Asphyxiated by being covered with coal from blowout	....	....	....	....
By falling power-line pole	....	....	1	33.33
By runaway stone-boat	....	....	1	33.33
Totals	5	100.00	3	100.00

Fatal Accidents Classified as to Quantity of Coal Mined

Cause	1953		1952	
	Number of Fatal Accidents	Coal Mined per Fatal Accident[1]	Number of Fatal Accidents	Coal Mined per Fatal Accident[1]
		Tons		Tons
By falls of roof and coal	3	390,644	1	1,388,732
By mine cars and haulage underground	1	1,171,932	....	....
Asphyxiated by methane gas	1	1,171,932	....	....
By falling power-line pole	....	....	1	1,388,732
By runaway stone-boat	....	....	1	1,388,732
Average	5	234,386	3	462,910

[1] Excludes coal from strip mines.

NOTE.—There were no fatal accidents in strip-mining operations in the years 1953 and 1952.

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	Falling Power-line Pole	Runaway Stone-boat	1953	1952
Vancouver Island	....	....	....	....	....	....	1
Nicola-Princeton	....	....	....	....	....	....	....
East Kootenay	3	1	1	....	....	5	2
Northern	....	....	....	....	....	....	....
Province, 1953	3	1	1	....	....	5	....
Province, 1952	1	....	....	1	1	....	3

Ratio of Fatal Accidents

District	Accident Death Rate			
	Per 1,000 Persons Employed		Per 1,000,000 Tons of Coal Mined	
	1953	1952	1953	1952
Vancouver Island	....	1.80	....	2.47
Nicola-Princeton	....	....	....	....
East Kootenay	4.55	1.91	5.86	1.66
Northern	....	....	....	....
Province, 1953	3.33	....	4.26	....
Province, 1952	....	1.78	....	1.81

In 1953 there were five fatal accidents at the coal mines in the Province—all underground.

On March 24th, 1953, John Singleton, a rope-rider employed at the Elk River Colliery, was fatally injured when he was crushed between two trips of cars.

It appears that Singleton had signalled to the slope hoistman to lower an empty trip of four cars into a parting. Singleton had preceded the trip into the parting and was apparently standing on the high side track in front of the loaded trip. He was crushed between the loaded trip and the entering empty trip when the latter trip either split the switch points or turned on to the loaded track because the switch had not been set for the empty track.

On June 9th, 1953, Peter Gyorgy, a miner employed at Michel Colliery, was fatally injured when he was struck on the back by a fall of rock.

Gyorgy was standing on a coal bench engaged in removing coal from a face to make room for a post when several pieces of rock fell from the roof and struck him on the back, inflicting internal injuries. The presence of a small fault in the roof contributed to the accident.

On August 31st, 1953, Nicholas Suttnas, a miner employed at Elk River Colliery, was asphyxiated by methane gas when, for some unknown reason, he went about 75 feet into a gob behind an idle face in a pillar-extraction area.

On September 2nd, 1953, Edmond T. Lowe, a miner employed at Michel Colliery, was fatally injured when he was struck on the head by a fall of rock.

Lowe was removing coal from a face preparatory to erecting two posts when the fall of rock from the roof occurred. The roof at the site of the accident was rather broken due to the proximity to old workings, and this fact, together with the presence *of a small fault in the roof, contributed largely to the accident.*

On September 10th, 1953, Andrew Guizdy, a miner employed at the Elk River Colliery, was seriously injured when struck by a large piece of overhanging caprock at his working place.

Guizdy was standing beneath the rock and engaged in measuring for a post when the rock fell. He suffered a severe fracture of the pelvic bone; he was apparently recovering, but had a relapse and died on November 6th, 1953. An autopsy indicated the cause of death to be congested lungs brought about by blood clots in the two main arteries connecting the lungs.

Including the foregoing fatal accidents, 408 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 Inspectors of Mines.

The following three tables classify the accidents in coal mines in 1953 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	226	55.4
Drillers and facemen	......	......
Conveyormen and muckers	10	2.5
Haulagemen	68	16.7
Trackmen and mechanics	15	3.7
Supervisors	13	3.2
Timbermen	13	3.2
Coal-cutters	5	1.2
Miscellaneous	11	2.7
Surface—		
Shops	16	3.9
Surface	17	4.2
Preparation and coke-ovens	13	3.1
Miscellaneous	1	0.2
Totals	408	100.0

Accidents Classified as to Cause

Cause	Number of Accidents	Percentage of Accidents
Fall of ground	109	26.7
Fall of material and flying material	28	6.9
Lifting and handling equipment and material	142	34.8
Machinery and tools	56	13.7
Slipped and tripped	47	11.5
Falling off staging and platforms	6	1.5
Miscellaneous	20	4.9
Totals	408	100.0

Accidents Classified as to Injury

Injury	Number of Accidents	Percentage of Accidents
Head and neck	39	9.6
Eyes	10	2.5
Trunk	62	15.2
Back	71	17.4
Arms	27	6.6
Hands and fingers	70	17.1
Legs	91	22.3
Feet	25	6.1
Toes	13	3.2
Totals	408	100.0

EXPLOSIVES

The following table shows the quantity of explosives used in coal mines in 1953, 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)	2,700	17,178	2,700	6.36	1.00
Tsable River Colliery	87,300	166,990	122,250	1.91	0.78
Bright mine	20,775	76,006	26,450	3.66	0.78
Chambers mine (strip)	......	......	......	......	......
Loudon mine	900	804	900	0.89	1.00
Lewis mine (Timberlands)	1,150	670	1,100	0.58	1.04
Wellington mine (Carruthers)	630	558	830	0.88	0.76
Stronach mine	1,400	1,419	1,200	1.01	1.16
Cassidy mine No. 7	500	445	1,050	0.89	0.48
Wellington Blue Flame mine	150	282	450	1.88	0.33
Wende mine	240	66	248	0.27	0.97
Riverside mine (Biggs)	50	134	100	2.68	0.50
Totals for district	115,795	264,552	147,278	2.28	0.78

Nicola-Princeton 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
Taylor Burson mine (Blue Flame)	3,709	7,047	3,700	1.90	1.00
Coldwater Coal mine	550	1,040	650	1.89	0.85
Totals for district	4,259	8,087	4,350	1.90	0.98

Northern 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
Bulkley Valley Colliery	22,100	42,136	22,000	1.90	1.00
Reschke mine	1,000	2,371	1,000	2.37	1.00
Gething No. 3 mine	1,200	2,464	1,600	2.05	0.75
Totals for district	24,300	46,971	24,600	1.93	0.98

East Kootenay 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
Elk River Colliery	41,600	306,462	44,161	7.36	0.94
Michel Colliery (underground)	125,551	545,860	96,612	4.35	1.30
Coleman Collieries (strip)	-				
Totals for district	167,151	852,322	140,773	5.09	1.18
Totals for Province	311,505	1,171,932	317,001	3.76	0.98

Quantity of Different Explosives Used

	Lb.
Monobel of different grades	295,410
Permissible rock powder	16,095
Total	311,505

MACHINE-MINED COAL

In 1953, mining-machines produced approximately 515,734 tons or 44.0 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	....	8	8	....
Nicola-Princeton	....	6	....	6
Northern District	1	1	1	1
East Kootenay	....	36	13	23
Totals	1	51	22	30

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 1,925 safety lamps in use in the mines of the Province. Of this number, 159 were flame safety lamps and 1,766 were approved electric lamps, mostly of the Edison type.

Appoved 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 nine coal mines and underground at nine. A total of 18,644 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 firebosses 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.

AIR-SAMPLING

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.

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.

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 1953, 1,493 dust samples from the various mines were analysed, and in all these samples the incombustible content was well over the 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.

MILLISECOND 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 millisecond 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 millisecond delay detonators were conducted at the Tsable River mine, 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 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 millisecond 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; that, although more powder was being detonated at one time than in 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

Early Sunday morning, March 15th, 1953, at the Tsable River mine, an unauthorized person attempted to operate the main slope hoist. This person lost control of the hoist and allowed an empty trip of eight cars to run down the slope, out of control, for a distance of about 2,000 feet. At this point slack rope locked around the drum shaft and broke. The trip was derailed and knocked out eighteen sets of timber before piling up, and the cars were severely damaged. The broken section of rope was also damaged in several places. Only one man, a fireboss, was on duty at the time on the surface. He was later dismissed from employment.

On August 20th, 1953, at the Tsable River mine, the coupling link on the rope car broke, allowing the rest of the trip of seven loaded cars and one empty car to run back down the main slope for about 700 feet. Thirty sets of timber were dislodged and production was lost for one shift. A defective weld was the cause of the incident.

At 5.30 p.m. on September 12th, 1953, a surface fire of unknown origin was discovered on the endless-rope incline near the portal of No. 1 East mine, Elk River Colliery. Although the fire was extinguished before it reached the mine portal, 150 feet of snowsheds and three power-line poles were burned. Considerable damage was done to 300 feet of double track as well as to victaulic joints of the 10-inch compressed-air line.

On November 16th, 1953, a piece of cast iron, 2 feet square in area, was blown off the water-jacket of a steam-driven compressor in the compressor-house at Michel Colliery. No one was injured. Subsequent investigation disclosed that a tube had ruptured in the intercooler and that the safety valve installed on the water-jacket had not functioned.

On December 8th, 1953, at the Lewis mine, Timberlands, the coal-bunker containing 10 tons of coal was wrecked. Stay ropes attached to tree stumps to prevent forward movement of the bunker gave way and allowed the structure to move downhill and collapse. One man, a trucker, sustained a bruised back.

On December 14th, 1953, at No. 1 East mine, Elk River Colliery, a loaded trip of six cars being lowered on the surface endless rope uncoupled from the bogey car and crashed into the loaded trip ahead. The impact was severe enough to break the rope and damage four cars.

On December 21st, 1953, at the Tsable River mine the main slope hoistman observed that the hoist was not performing normally while hoisting a trip of eight loaded cars. He promptly stopped the hoist, and subsequent inspection of the hoist disclosed that the 10-inch drum shaft had fractured inside the drum bearing on the side nearest the coupling. It is thought that the dangerous occurrence involving the same hoist on March 15th, 1953, had contributed to this incident.

On December 29th, 1953, at the Baldy Mountain strip mine, Michel Colliery, an empty coal-truck ascending the road to the mine was driven too close to the outside edge while passing a descending truck and rolled down the mountainside for about 115 feet. The truck sustained extensive damage, and although the driver remained in the cab, he was not seriously injured.

BUMPS AND BLOWOUTS

On March 19th, 1953, in " B " south slope district, Michel Colliery, explosive gas was found to be issuing from an old roadway in the gob area of No. 1 slope section. Due to the caved condition of the roadway, it was not possible to trace the origin of the gas, but it was assumed that a minor blowout had occurred in a small pillar of coal left in the gob area. The gas issued directly into the No. 1 return airway and did not affect the active workings. Within three days the outflow of gas stopped.

On December 29th, 1953, a minor outburst of gas occurred at the face of a crosscut off No. 9 room, No. 3 slope section, "A" East mine, Michel Colliery. The customary warnings of an impending outburst were given and allowed the two miners employed at the face to retreat to safety. Considerable gas, together with about 25 tons of coal, was expelled from the face. Two legs of timber sets were broken and a large rock fell from the roof.

PROSECUTIONS

There were no prosecutions during 1953 in and about the coal mines of the Province.

SUPERVISION OF COAL MINES

During 1953 seventeen companies operated thirty-three mines, employing 1,154 men underground. In the supervision of underground employees there were 6 managers, 16 overmen, 3 shiftbosses, and 70 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.
Bowron River Coal	Bowron River mine (Prince George)	Central Industries Ltd.
Comac	Tsable River Colliery (Cumberland) and McLeod River Colliery (Alberta)	Canadian Collieries (D.) Ltd.

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 1953 on the following dates: May 13th, 14th, and 15th at the Fernie and Cumberland centres, and on August 18th at the Fort St. John centre.

The total number of candidates at these examinations was as follows: For first-class certificates, 5 (1 passed, supplemental); for second-class certificates, 2 (none passed); for third-class certificates, 6 (4 passed); for mine surveyors' certificates, 1 (none passed).

The following is a list of the candidates who were successful in the various classes:—

First class: Alfred J. Garroway.

Third class: Czeslaw Jan Plonka, Andrew Davey, Ronald Saad, and Louis Sclippa.

All officials, before engaging in multiple blasting with millisecond 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 1953 there were 130 candidates for coal-miners' certificates, six 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 gross output of coal from the Vancouver Island Inspection District was 265,427 tons, a decrease of 34.2 per cent from the 1952 output. Two important producing mines were closed in 1953: the No. 8 mine at Cumberland ceased production on February 6th due to high operating costs, and the Bright mine at Cassidy was closed on November 27th, this mine being worked out. Both mines were operated by Canadian Collieries (Dunsmuir) Limited. By the end of 1953 only one large mine was operating, the Tsable River mine of Canadian Collieries (Dunsmuir) Limited. Production at this mine in 1953 increased by almost 37 per cent from the 1952 output to 166,990 tons.

The decline of the Island coal-mining industry is particularly striking when the 1953 production is compared with that of ten years ago. Present output is little more than one-third that of 1943, and production in 1954 may be still lower. Since the closure of the Bright mine, the only mines left in this field are very small ones operating in outcrops, pillars, and barriers left during earlier operations. The exhaustion of the once highly productive Nanaimo coalfield is an important factor in this decline. Other factors contributing to decline are lack of markets due to competition from other fuels, relatively high operating costs, and the depletion of the more easily worked seams in the Comox coalfield.

It is pleasing to report that 1953 has been a year free from fatal accidents in the Vancouver Island coal mines. There were three accidents classified as serious, one of which occurred during the dismantling of No. 8 mine, one at Bright mine, and one at Tsable River. One of these accidents resulted from a man falling on to the drum of a small tugger hoist, another occurred when a trip jumped a switch, and the third was due to a car becoming derailed while being lowered by hand down a crosscut. Two of the accidents involved fractures of the right tibia, one simple and the other compound-comminuted, and the third resulted in a fracture of the right humerus.

In addition to the above, 163 minor accidents have been reported and investigated, representing a 35-per-cent decrease from the 1952 figure.

Five dangerous occurrences were reported and investigated; all but one occurred at the Tsable River mine. Two involved runaway trips on the main slope: the first was due to interference with the hoist by an unauthorized person on a Sunday morning, and the second was caused by a broken coupling link. Another dangerous occurrence was a sudden fall of roof and displacement of timber sets without warning at the face of a working-place in the Diagonal section of the mine. The fourth occurrence was the fracture of the main shaft on the main hoist. The fifth dangerous occurrence took place at the No. 8 Timberlands mine, when a small coal-chute on the surface collapsed. In all cases, steps have been taken to avoid 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 June 30th. Two teams from Tsable River mine and a visiting team from Copper Mountain mine participated in the mine-rescue competition, and a high standard of performance was maintained. The winning team was the Tsable River No. 1 team, captained by J. Thomson.

Canadian Collieries (Dunsmuir) Limited Company office, Union Bay. 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. In 1953 this company operated the

Bright mine at Cassidy (closed on November 27th), and the No. 8 mine (closed on February 6th) and Tsable River mine 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.)

Bright Mine, Cassidy.—W. Frew, manager; J. Wilson, overman; M. Brodrick, A. Dunn, F. Johnston, and J. Unsworth, firebosses. This mine is in Sections 1 and 2, Range 7, in the Cranberry district, near Cassidy, approximately 9 miles south of Nanaimo. The workings are in the Douglas seam, in an area immediately to the south of the old Granby No. 2 workings. Operations in 1953 were confined to the extraction of pillars. This work was completed and the mine was closed on November 27th, after being in production for three years. Total production from the mine was 199,558 tons. Production in 1953 was 76,006 tons over a working period of 205 days with a crew of sixty-four men underground and eleven on the surface. A detailed description of the equipment and method of working this mine was contained in the Annual Report for 1952.

Working conditions were usually found satisfactory in the course of inspections. One serious accident and thirteen minor accidents were reported and investigated.

Chambers Strip Mine, Extension

R. H. Chambers and associates, operators; R. H. Chambers, manager. This small strip pit is in Section 14, Range 7, in the Douglas district, near Extension. The area at present being mined was opened up during the latter part of 1952 and comprises a small section of the Wellington seam lying close to the surface in the vicinity of the old Vancouver slope workings. The seam dips gently in a westerly direction, and the thickness of overburden varies from 8 to 15 feet. The following seam section is typical, though in part of the property the top coal has been eroded: Top coal, 4 feet 5 inches; carbonaceous shale, 1 foot 6 inches; coal, 1 foot 5 inches; rock, 4 inches; coal, 1 foot 8 inches.

By the end of 1953 the seam had been mined out over an area of about 100 feet square (producing 1,165 tons) and enough overburden had been removed to allow mining to continue throughout the winter. The coal is hand-loaded into cars which are hauled up to the tipple by a gasoline-driven hoist. A small shaker screen sorts the coal into over 2-inch, 1- to 2-inch, and under 1-inch sizes.

Total production in 1953 was 875 tons over a working period of 172 days with a crew of two men. Working conditions were found satisfactory in the course of inspections, and no accidents were reported.

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. The mine was closed in May, 1953, due to high operating costs after producing 5,918 tons since the start of mining in 1949. The seam worked is a purely local deposit and lies 50 to 60 feet stratigraphically above the Douglas seam. From the mine portal it dips 20 degrees in a southerly direction. The trough of a fold is reached at a point 300 feet south of the outcrop and the seam then rises again. 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. The immediate roof of the seam is a strong grey shale which is overlain by conglomerate.

A main slope has been driven southwest down the dip of the seam for 340 feet; four levels have been driven to the right off the slope, the longest being 240 feet, and four levels and a diagonal have been driven to the left off the slope. The diagonal was driven 330 feet, and five short levels have been driven from it. A substantial amount of coal, probably at least 8,000 tons, remains blocked out in pillars in the mine. Development drivage in 1953 up to the time of closing amounted to 150 feet. Production was 445 tons over a working period of eighty-four days with a crew of three men. General working conditions were found to be satisfactory in the course of inspections, and no accidents were reported.

No. 8 Mine, Timberlands

J. R. Wilson and G. Lewis, operators; G. Lewis, 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 to and immediately 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 periods during the winter months 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 an attempt to drain part of the old workings, the operators drilled a 4-inch inclined hole in 1952 from a point on the hillside 80 feet below the mine portal. Drainage has not proved as satisfactory as had been hoped, but with the aid of a small electrically driven pump it has been possible to render accessible all the coal reserves in the new mine except during periods of heavy rainfall. In 1954 it is hoped to further improve the drainage of the old mine.

In 1953 the main slope of the new mine was advanced in a direction approximately south 20 degrees west to a distance of 300 feet from the portal. Work at the old mine was confined to the extraction of pillars to the east of the slope.

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 fine sizes. Total production in 1953 was 670 tons over a working period of 181 days with a crew of two men.

Blue Flame, Wellington (Timberlands) Mine

F. Vlasich and A. Barrows, operators; F. Vlasich, fireboss. This 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 the faults are steeply tilted, and the seam dips at 45 degrees or more to the northeast. All the outcrop coal immediately to the northwest of the mine was worked from the old Timberlands No. 8 mine from 1926 to 1928. The coal ranges from 2 to 3 feet thick, and is overlain by a bed of soft mudstone ranging from 10 inches to 2 feet 6 inches thick. In places there is as much as 10 inches of top coal above the mudstone. The roof is a massive conglomerate.

In 1951 and 1952 a slope 210 feet long was driven from the outcrop due east across the dip, and from the bottom of the slope a level was driven 130 feet northwest to connect with a level in the old workings. In 1953 another level, started from a point 30 feet from the bottom of the slope, was driven southeast 150 feet. Total production in 1953 was 275 tons over a working period of 125 days with a crew of two men.

At the end of 1953 a single-stage centrifugal pump powered by an English Electric 10-horsepower electric motor was installed near the bottom of the slope.

Conditions were found fairly satisfactory in the course of inspections. No accidents were reported.

Riverside Mine

J. Biggs, operator and fireboss. This prospect was operated for a few months at the beginning of the year in an outcrop on the north bank of Nanaimo River near the old White Rapids mine in Section 3, Range 1, of the Cranberry district. The outcrop contains 3 feet of clean coal, and is probably the Wellington seam. A heading was driven a short distance into the seam but encountered faulted conditions. The heading caved to the portal and was then abandoned. A total of 134 tons of coal was produced over a working period of thirty days with a crew of one man.

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 is in a small area of coal near the outcrop in the No. 2 or Upper Wellington seam. Production in 1953 was 804 tons over a working period of 188 days with a crew of four men.

During the summer a short prospect slope was driven from the surface to the main Wellington seam (25 feet vertically below the surface) in the hope of finding some unworked pillars of coal, but none was found.

Working conditions were usually found satisfactory in the course of inspections. No accidents were reported during the year.

Carruthers and Wakelam 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 1953 amounted to 558 tons over a working period of 186 days with a crew of two men. Difficulties were experienced during the winter months due to the flooding of the main entry, and a small electrically driven centrifugal pump was installed at the end of 1952 to deal with this water. Working conditions were found satisfactory in the course of inspections, and 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 in 1953 amounted to 1,419 tons over a working period of 226 days with a crew of four 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 was operated from the outcrop of the No. 2 or Upper Wellington seam. Operations at this mine ceased at the beginning of April and have not been resumed. A description of the mine was given in the 1952 Annual Report. Production in 1953 was 66 tons over a working period of sixty 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

Tsable River Mine.—S. J. Lawrence, manager; T. Ecclestone, overman; L. Cooper and J. Weir, shiftbosses; A. Somerville, J. Cochrane, A. Cullen, W. Bennie, M. Frobisher, W. High, L. Hutchinson, C. Lewis, and J. Thomson, firebosses. This mine is on the left bank of Tsable River, approximately 5 miles west of Buckley Bay. It is 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 being worked, the No. 2 seam, ranges in thickness from 6 to 10½ feet and in places contains several bands of shale of varying thickness. The roof strata consist of sandy shales and sandstones. The general dip of the measures is from 6 to 9 degrees in a northerly direction.

The mine is developed by a main slope and three counter slopes driven for 3,000 feet on the full dip of the seam, and by a main diagonal and counter diagonals driven northeast from a point near the bottom of the main slope for a distance of 2,100 feet. The diagonals have penetrated a zone of faults striking northwest across the property, and have opened up a considerable area of coal lying in a wide shallow syncline beyond the faults. The main diagonal was advanced 600 feet in 1953 and the face is now 1,400 feet beyond the fault belt. The diagonal has now encountered another major fault striking west across the property.

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 are driven to the boundary of the property or the limits of workable coal. The coal between the pairs of levels is 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 millisecond delay detonators is used throughout the mine. A total of 84,900 pounds of Monobel No. 4 explosive and 2,400 pounds of C.X.L.-ite was used during the year, together with 112,250 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 1953 amounted to 23,050 feet of drivage in the seam, including slopes, counter slopes, diagonals, levels, counter levels, and crosscuts. Development work has been pressed vigorously in the Diagonal section of the mine, where four pairs of levels have been advanced to the right off the main diagonal and three pairs of levels to the left. The longest of these, No. 6 right level, has been advanced 1,750 feet from the main diagonal.

In addition to development work, the extraction of coal between Nos. 2 and 3 right levels was completed in 1953, the extraction of pillars between Nos. 3 and 4 right levels was continued, and extraction was commenced between Nos. 4 and 5 right levels. It is estimated that 90 per cent of the coal is recovered in these operations.

A new rock raise for ventilation purposes was completed between the prospect level and the surface, the raise being 430 feet long and inclined at about 40 degrees. The raise is approximately 7 by 12 feet in cross-section and is mainly in sandstone. A new fan installation was completed at the top of this raise on December 30th. The new fan is a La-Del Troller high-pressure exhausting fan, driven by a 150-horsepower General Electric induction motor. The fan at present circulates 130,000 cubic feet of air per minute at a 3½-inch water-gauge. The old fan is no longer being used, and the old fan drift has been opened to form an additional intake airway.

Total production in 1953 amounted to 166,990 tons over a working period of 234 days with a crew of 202 men employed underground and 16 on the surface. The number of men employed increased by 23 per cent during the year, and the average daily output by 21.5 per cent.

Conditions at 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.

Although parts of the workings are naturally damp, 112 tons of limestone dust was used during the year for tamping the shots and dusting the coal faces, and 115 tons was used for treating the roadways. Sixty-four dust samples were taken from the various roadways during the year; all these, on analysis, showed results in compliance with the coal-dust regulations.

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 available in readiness for emergencies. Four qualified industrial first-aid attendants are employed to cover the three working shifts, and twenty-two other employees hold first-aid certificates.

A mine-rescue team of six men is maintained, which attends periodic practices at the Cumberland mine-rescue station.

One hundred and twenty accidents were reported and investigated, one of which was classed as serious and the remainder as minor. Four dangerous occurrences were reported and investigated; these are described elsewhere in this Report.

Fourteen minor accidents were reported from the various surface departments of the Company in the Cumberland area and were investigated.

Regular inspections of the mine were made each month by the inspection committee appointed by the workmen, and copies of their reports were forwarded to the office of the District Inspector through the courtesy of this committee.

Suquash (50° 127° N.E.)

Suquash Collieries Limited

Company office, 1016 Stock Exchange Building, 475 Howe Street, Vancouver. This company was incorporated on November 26th, 1951, and acquired licences to develop and produce coal in an area of 7,201.80 acres of partially developed coal lands at Suquash on the northeast coast of Vancouver Island. A description of this property and of the work done by the company was given in the 1952 Annual Report. Operations ceased on November 15th, 1952, and since that time there has been no activity.

NICOLA-PRINCETON INSPECTION DISTRICT

By E. R. Hughes

Coal-mining in this district continued on a small scale. The total production in 1953 amounted to 8,087 short tons, a slight increase over the 7,445 tons produced in 1952. There were no producing mines in the Coalmont or Hat Creek coal areas in 1953, nor was any exploratory or development work done toward bringing in any new properties. A coal licence was granted to Edward W. Pechr, Enderby, to develop and produce coal from an area of 80.90 acres situated 2 miles southeast of Grindrod, but no coal was found on the property and work was discontinued. The licence under the "Coal Act" granted to Arthur Hewitt in April, 1951, to mine coal from a portion of Lot 1133, Yale Division of Yale District, was assigned to Robert Evans, Princeton, in July, 1953, but no coal was produced from this property. 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 completed the extraction of pillars left by former operators between the old main level and the surface in the vicinity of the old Blue Flame No. 1 mine portal and commenced production from a new opening known as the Blue Flame No. 2 mine.

One compensable accident was reported, but this was not of a serious nature. 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 20th. The mine-rescue competition was held in the forenoon at 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 Copper Mountain mine team, captained by E. Pickard.

PRINCETON (49° 120° S.W.)

Taylor Burson Coal Company Limited

Blue Flame No. 1 Mine.—James Fairley, overman; Arthur Hilton and Thomas Bryden, firebosses; William T. Forsythe, fireboss on permit. 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 1953 consisted solely of the removal of pillars left by the former operators between the old Main East level and the surface in the vicinity of the main slope at the old Blue Flame No. 1 mine. The old workings were penetrated to a maximum distance of 620 feet in a northeasterly direction from the portal. The removal of available pillar coal in this area was completed, and the mine was closed in November.

Blue Flame No. 2 Mine.—James Fairley, overman; Arthur Hilton and Thomas Bryden, firebosses; William T. Forsythe, fireboss on permit. After several attempts had been made to locate the continuation of the Blue Flame coal zone east of the old mine on Lots 962 and 148, it was finally decided that the most favourable approach to the seam would be on the hillside 1,750 feet north 78 degrees east from the old No. 1 mine portal. The portal of the new mine was started in June at an elevation 274 feet higher than the No. 1 mine portal. The adit was advanced northwesterly on a level course for 80 feet, crosscutting the measures. On reaching the seam a slope was driven to the full dip, which here averages approximately 14 degrees. At the end of the year the slope face had been advanced 280 feet from the knuckle at the top, and was 380 feet from the abandoned workings that are to the rise of the main east level in the old No. 1 mine. Three levels have been turned off to the right from the slope. From No. 1 right level a raise was driven toward the surface to provide a second exit and return airway. This ventilation raise had not quite reached the surface at the end of 1953.

The part of the seam being worked is approximately 7 feet thick and has several thin rock and clay bands. The coal is sold locally, with a few carloads going to Vancouver and Copper Mountain. The coal is cut with post-type punching machines and is hand-loaded into 1-ton cars which are then hauled up the slope by a small compressed-air hoist. A tipple was built and a 20-ton Gurney scale was installed at the mine to weigh loaded coal-trucks. The total production of coal for 1953 was 7,047 short tons from the No. 1 and No. 2 mines. In December 808 tons was produced, and fourteen men were employed.

MERRITT (50° 120° S.W.)

Coldwater Coal Mines

This property, formerly owned by the Middlesboro Collieries Limited, is about 1 mile south of Merritt. During 1953 the property was operated by the owners, S. Gerrard and partners; F. Kelly, fireboss. Activities were confined to the Coldwater No. 5 mine and consisted of splitting pillars and extracting remnants of coal left between the abandoned Middlesboro No. 5 mine and the surface in the area adjacent to and west of the old water-tank, and about 250 feet west of the portal of the old Middlesboro No. 4 mine. The seam here is about 5 feet thick, dips southwestward at 12 degrees, and the coal is of good quality.

The coal is blasted off the solid and is hand-loaded into 1-ton cars which are hauled up the 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 been detected in the mine workings. The total production of coal in 1953 was 1,040 short tons. In December 158 tons was produced, and five men were employed.

ENDERBY (50° 119° N.E.)

Cliffview Colliery Limited

Edward W. Pechr, president; S. A. Lundman, secretary; N. S. Johnson, director, all of Enderby. Coal Licence No. 59, dated February 13th, 1953, was granted under the provisions of the "Coal Act" to Edward W. Pechr to develop and produce coal in an amount not exceeding 10,000 tons from Legal Subdivision 13 of Section 8, and Legal Subdivision 4 of Section 17, Township 19, Range 8, west of the 6th meridian, containing 80.90 acres, situated 2 miles southeast of Grindrod and about 5 miles by road northeast of Enderby. In March an open-cut had been made on the south side of Lambert Creek, exposing some dark-grey shale banded with light-brown shale. No coal was found, and prospecting was discontinued.

Late in December a licence was granted to develop and produce coal on the South Half of Section 20, Township 19, Range 8, containing 320 acres. This licence covers part of the area acquired in 1905 by Enderby Coal Mines Limited, who did some tunnelling, drilling, and surface work on the east side of Shuswap River about 5 miles northeast of Enderby. This company's operations were discontinued in 1908, and no further work has since been done on the showings. The present licence to mine coal was obtained too late in the year to permit development work to be started in 1953.

EAST KOOTENAY INSPECTION DISTRICT

By D. R. Morgan

The production of coal from East Kootenay District during 1953 was 1,255,620 tons, an increase of 57,327 tons from the corresponding figure in 1952. There were two companies operating mines in the district, and the major operation, carried out by The Crow's Nest Pass Coal Company Limited at Michel and Fernie, produced 1,123,538 tons. This was a decline of 68,553 tons from the 1952 output. Coleman Collieries Limited produced 132,082 tons of coal from the British Columbia side of its stripping operation on the interprovincial boundary at Tent Mountain, which is 125,880 tons more than was obtained in 1952.

The operations were confined to the Crowsnest Pass area and comprised underground and open-cast mining, the greater quantity of coal being obtained from the underground mines. All the mines were in operation throughout the year, but the production of both companies was curtailed by the loss of a considerable number of working-days owing to the present state of the coal market.

Three fatal accidents occurred at Elk River Colliery and two at Michel Colliery, all of which were underground. In addition, 13 serious and 330 minor accidents were reported and investigated, 301 of which were underground and 42 on the surface. This was a slight improvement in the accident rate for the district, but the fatal accidents were three more than in 1952. The serious accidents were classified as follows: Ten caused by falls of rock and coal (including three fatal); seven involving haulage and machinery (including one fatal); and one by entering an irrespirable atmosphere (fatal). No accidents were reported from the British Columbia side of the strip mine at Tent Mountain.

A successful mine-rescue and first-aid competition was held under the direction of the East Kootenay Mine Safety Association at Fernie on June 13th. Six teams from

Fernie, Michel, and Kimberley entered the mine-rescue competition, and the British Columbia Department of Mines shield was won by Michel No. 1 team, captained by Mario Pettoello. In the first-aid competition there were 115 competitors, and the men's first-aid cup and shield were won by the Sullivan mill team from Kimberley, captained by R. I. Ralph. Presentation of the regional Ryan Trophy was made by the Chief Inspector of Mines to Michel Colliery for the best safety record in 1952 for the coal mines of British Columbia.

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 strip mines, and a by-product plant in the East Kootenay District. Construction was started in 1953 of a briquetting plant adjacent to the preparation plant, at Michel Colliery. A brief description of the operations follows.

Michel Colliery.—(49° 114° N.W.) William Chapman, manager; Irving Morgan, senior overman; Walter McKay, safety inspector; John Whittaker, afternoon 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 different seams known as the "A," "B," and No. 3 seams. Four of the mines are developed off a pair of rock tunnels driven into the synclinal structure of the coal measures on the south side of Michel valley, and the fifth, the "A" North mine, is being developed on the north side of the valley. One of the pair of rock tunnels was advanced to the Lower No. 3 and No. 4 seams in 1953, but up to the present no development has been done in either seam. The chief motive power used underground is compressed air, which is supplied by three electric and two steam-driven compressors on the surface; two other compressors supply high-pressure air for use in the compressed-air locomotives. Electricity was introduced into "A" West and No. 3 mines in 1953, and preparations are being made for electrification of the "A" North mine. Haulage on all the main levels in the mines is by compressed-air locomotives, which haul the output from the four main mines along one of the rock tunnels to a modern preparation plant. A description of the preparation plant is included in another part of this Report.

The combined underground operations of the colliery are under the direct supervision of six overmen, one shiftboss, and twenty-four firebosses.

"A" East Mine.—William Gregory, overman; Frank McVeigh, Harry Saunders, Frederick Nash, David Thewlis, Sr., and Robert Doratty, firebosses.

This mine, 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 worked on the room-and-pillar method, and the pillars are extracted on the retreat.

An average of 600 tons of coal per day was produced; a crew of 128 men was employed at the end of the year. There are two slope sections, and most of the output was obtained from No. 3 slope section, formerly known as No. 1 slope. Pillar extraction in this section is nearing completion. Another slope is being developed from the main level, outby the No. 3 slope. A small amount of pillar extraction above the inner end of the main level was completed in the latter part of the year.

The coal in the rooms is generally cut by compressed-air coal-cutters or blasted off the solid with millisecond delay detonators, and is 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 the 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 main level at the tops of the slopes, and from there by compressed-air locomotives.

The mine is ventilated by an electrically driven aerodyne fan which delivers 116,000 cubic feet of air per minute at a 4.5-inch water-gauge. In general the ventilation was found to be satisfactory during the course of inspections. Small quantities of methane found on a few occasions near the roof at some of the working-places were usually present due to defective bratticing. Difficulties were experienced at times in coursing sufficient ventilation to the faces of the small pillar extractions on No. 7 room, due to leakages of air through extensive gobs. As reported under " Dangerous Occurrences," a minor outburst of methane occurred in December at the face of a crosscut off No. 9 room.

"A" West Mine.—Harry Corrigan, overman; James Walsh, Reginald Taylor, Robert Taylor, Thomas Krall, Stanley Menduk, and John McInnis, firebosses.

This mine, similar to the "A" East mine, is operated in the "A" seam and on the eastern limb and trough of the Michel syncline. It is entered on the right side of the rock tunnels, and all workings are toward the outcrop. The coal is of good quality and is 10 to 28 feet thick; the seam dips from 20 to 35 degrees to the west. Because it is closer to the surface, the coal is not as gassy as in the "A" East mine.

This mine is the largest producer at the colliery and has an average daily production of 750 tons with 145 men. It is worked on the room-and-pillar method, and the pillars are extracted on the retreat. The coal in the rooms is mined by shortwall coal-cutters and then blasted with millisecond delay detonators. The broken coal is loaded by duckbill loaders on to shaker- and chain-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. Following approval from the Chief Inspector of Mines, six compressed-air motors driving the conveyors on the main-belt incline were replaced by electric motors in 1953. Each motor is 20 horsepower and of the flame-proof permissible type.

Most of the production in 1953 was obtained by extracting pillars from two sections of the mine known as No. 4 and No. 7 belt-road sections. In No. 7 belt-road section the seam is 28 feet thick and the pillars are extracted by the " caving " system. All the roadways in this section from which pillars are to be extracted are driven on the footwall of the seam, and the top coal in these roadways is supported by timber sets. During retreat the sets are withdrawn and the coal is allowed to fall or is blasted with millisecond detonators into the roadway, from where it is loaded by duckbill conveyors. The seam in No. 4 belt-road section is of normal thickness, and the pillars are extracted in the ordinary manner.

The mine is ventilated by a Sirocco double-inlet fan, driven by a 100-horsepower electric motor. The fan delivers 65,000 cubic feet of air per minute at a 1.5-inch water-gauge. This quantity was found to be sufficient throughout 1953.

"A" North Mine.—Thomas Slee, fireboss. This is a new mine being developed in the "A" seam on the north side of Michel valley, approximately half a mile east of the preparation plant. Development of the mine commenced in 1951 but stopped in April, 1952, due to lack of motive power. An electrically driven portable air compressor was placed outside the portal of the mine in January, 1953, and work was then resumed on a single-shift basis.

The mine is worked by a crew of eleven men, and the average daily output is 40 tons of coal. At present, operations are confined to the advancement of two main levels, which are now 800 feet from the mine portal. A rock raise was driven from the counter level to the surface for ventilation purposes, and a Joy axivane fan was put into operation in December. The fan delivers 30,000 cubic feet of air to the mine at a 0.7-inch water-gauge.

Physical conditions so far encountered seem favourable, and it is anticipated that the mine will develop into a large operation. The seam is 12 feet thick, and the dip ranges from 15 to 20 degrees. It is the intention to introduce electricity into the mine in the future, and an underground diesel locomotive has been purchased for the haulage system. The entire production from the mine is being trucked at present to the preparation plant along the old Erickson strip-mine road.

No. 3 Mine.—Stirling Baudoux, overman; Roger Pasiaud, Mario Pettoello, and Benjamin Volpatti, firebosses.

This mine in the No. 3 seam is being operated 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 dip ranges from 35 to 40 degrees.

The mine is being developed by levels and rooms driven to the south off four inclines which are driven on the full pitch of the seam. The rooms are driven on the strike, and in the present stage of development make provision for two longwall faces between the levels. The coal at one of the faces is being extracted during the advance of the rooms; at the other face it will be extracted on the retreat. The coal is mined by shortwall and longwall coal-cutters and radial-punching machines, or is blasted off the solid with millisecond delay detonators. Steel bolting was commenced as a form of roof support in 1953, and up to the present over 800 feet of No. 2 level is supported in this manner. Surveys are being carried out to check the roof movement.

The average daily production from the mine is 250 tons of coal, with fifty-six men employed. All the production is loaded on the main south level, and the coal is conveyed to this loading point by shaker-conveyors and angle chutes. The coal and rock from the face of the main south level are loaded by a mobile loader.

Conditions were found to be generally satisfactory in the course of inspections. The mine is ventilated by a Joy axivane fan delivering 36,000 cubic feet of air per minute at a 1.75-inch water-gauge. The fan was installed after completion of a rock raise from the face of No. 2 raise to the surface, and was put into operation in October, 1953. The fan is driven by a 100-horsepower electric motor, and at present is forcing the air into the mine. Prior to the installation of the fan the mine was ventilated as a separate split by the "A" West mine fan. Electricity was introduced into the mine in 1953, and the circuit was energized in October. At present one Anderson-Boyes electric longwall coal-cutter is operating in the longwall face.

" B " South Mine (South Level District).—Vans Hulbert, overman; Henry Eberts, Sidney Hughes, Paul Kusnir, Ronald Saad, Thomas Taylor, and Glyn Parry, 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 dips at 30 degrees.

The major operations in " B " South mine are in the South Level district, which is developed toward the outcrop from the main level. Most of the production is obtained from No. 3 raise section, a panel of workings 1,500 feet wide, at the inner end of the main level. The panel is split by three raises, driven on the full pitch of the seam for a distance of 2,290 feet, and rooms are driven on the strike at both sides of each raise to the full width of the panel. The pillars are withdrawn on the retreat. Other operations in the district include advancement of the face of the main level and two raises, Nos. 5 and 6, which have been started to develop another panel of workings, inby No. 3 raise section. Extraction of a small pillar area between No. 3 incline and No. 1 raise sections is also proceeding.

The coal at the faces is mined by shortwall and longwall coal-cutters and radial-punching machines, or is blasted off the solid with millisecond delay detonators. It is conveyed to loading points on the main level by angle chutes, shaker-, chain-, and belt-conveyors. The average daily production at the end of 1953 was 500 tons, with ninety-eight men employed.

The district is ventilated by a Joy axivane fan which delivers 65,000 cubic feet of air per minute at a 3.6-inch water-gauge.

" B " South Mine (Slope District). — William Davey, overman; Henry Batchelor, Steven Lazaruk, and John Krall, firebosses.

This district is worked to the dip of the main south level and is divided into two sections known as Nos. 1 and 3 slope sections. Due to depletion of coal, the No. 1 slope section, from which a considerable tonnage was produced for many years, was abandoned in December and the workings were sealed off. No. 3 slope is further inby on the level and is at present in a stage of development. Rooms are driven in pairs off the slope, making provision between each pair of rooms for a longwall face, from which the coal will be extracted later on the retreat.

The coal is mined by radial-punching machines and pneumatic picks, and is loaded on to shaker-, chain-, and belt-conveyors. From the loading points it is hauled in trips to the main level by compressed-air hoists. The average daily production at the end of 1953 was 350 tons, with seventy-five men employed.

The district is now ventilated by the same fan as the South Level district, and prior to the closing of No. 1 slope section was partly ventilated by the "A" East fan as well. In general, the ventilation was fairly good throughout the year, but on a few occasions difficulties were experienced in No. 1 slope section due to gas escaping from the goaves.

In 1953, 116,331 pounds of Monobel No. 4, 9,220 pounds of C.X.L.-ite, and 96,612 electric detonators were used at the colliery in coal and rock blasting. Five misfired shots were reported.

Five hundred and ten tons of limestone dust was applied to the roadways at the various mines to minimize the coal-dust hazard and for the tamping of shots. Monthly mine-dust samples were collected at all mines and analysed. All the samples were above the minimum requirements of incombustible content.

Monthly examinations were made by the miners' inspection committees at all the mines, and a regular meeting was held at the colliery office 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—Nos. 2 and 4A—on Baldy Mountain near Michel. Both operations are carried out by Mannix Ltd., of Calgary, on a contract basis.

The coal ranges from 60 to 100 feet thick. It is of fairly good quality, although some sections have inferior coking qualities. No. 2 mine, which has operated during the past four years, is at an elevation of 4,500 feet on the mountainside, and No. 4A mine is half a mile farther north and 500 feet higher in elevation. Stripping operations commenced at No. 4A mine in November, 1952, and were confined to removal of overburden until July, 1953, since which date most of the strip coal has been obtained from this mine.

The average daily production is over 1,000 tons; the coal is loaded into trucks by power-shovels and hauled along a private road to the preparation plant at Michel, a distance of 5 miles. The number of men employed varied considerably, depending on the amount of rock work necessary; accommodation was provided at a camp near the workings for most of the year. The camp was closed when rock work was abandoned for the winter months.

By-product Plant.—George Lancaster, superintendent. The by-product plant is on the colliery-site at Michel, and a description of it is included in the 1952 Annual Report. The plant was in constant production during 1953, and general conditions were found to be satisfactory.

ELK RIVER COLLIERY.—(49° 114° S.W.) James Littler, manager. This colliery is at Coal Creek, 4 miles from Fernie. It comprises four mines, which are driven from the outcrops of their respective seams and are all on the south side of the valley. Diamond drilling 1 mile east of the preparation plant commenced in 1953 to prove the No. 10 seam, with a view to opening a slope mine in the future. The coal from the mines is treated on the site in a modern preparation plant and, following preparation, is transported to Fernie by the Morrissey, Fernie and Michel Railway for distribution. No alterations were made on the surface in 1953, and a description of the preparation plant is given elsewhere in this Report.

The combined underground operations are under the direct supervision of three overmen, one assistant overman, and fifteen firebosses. A brief description of the mine follows in descending order of the seams worked as they are now numbered.

No. 1 East Mine.—Arnold Webster, overman; Leonard Brett and John Cairns, firebosses.

This mine is in the No. 10 seam and is the oldest producing mine at the colliery. It is half a mile east of the present preparation plant, and formerly was part of the old Coal Creek Colliery. The mine is still an important producer, averaging 330 tons of coal per day with seventy men employed. The present workings are divided into two operations—one extracting the remaining pillars in the old section of the mine, and the other developing a small area of coal on the south side of No. 1 West roadway. The latter area is restricted by the presence of abandoned workings on each side, but it should prolong the life of the mine as a whole for a few years. Most of the production in 1953 was obtained in developing the No. 1 West section, and extraction of the pillars on the retreating system has nearly been completed in the old section of the mine.

The coal ranges from 12 to 25 feet thick, 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, no shot-firing being necessary. The coal is loaded directly into cars by hand and hauled by horses to partings. From No. 1 West section the coal is hauled in six-car trips via a separate portal by a 100-horsepower electric hoist and lowered on a surface incline to No. 4 landing. Trips from the old section of the mine are lowered to this point by an endless-rope haulage, which extends 450 feet from the portal into the old mine.

The underground conditions, in general, were found to be fairly good during inspections, although difficulty was experienced in maintaining 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 126,000 cubic feet of air per minute at a 2-inch water-gauge. Of this quantity, 90,000 cubic feet is supplied to the active workings and the remainder is circulated through abandoned workings.

No. 9 Mine.—Daniel Chester, overman; Ralph Larner, Albert Littler, James Corrigan, William Waller, Archibald Allen, Henry O'Neil, and Henry Miller, 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 at 15 degrees and is overlain by a hard sandstone roof. It is a large mine, worked on the pillar-and-stall system, but due to geological disturbances the operations are very restricted and scattered. The coal seam at the faces of the main levels, although of good quality, is thin and contains a thick rock band. Adverse conditions were encountered in several panels of workings driven to the rise of the main levels and in a slope driven inby the abandoned No. 2 workings. Because of these conditions no advancement was made at the inside section of the mine in 1953, and it was decided to extract the pillars alongside the main levels and then abandon the section. The electrical equipment in use in this section has been withdrawn and transferred to Michel Colliery.

Despite these difficulties the mine continues to be one of the larger producers at the colliery, and at the end of 1953 averaged 420 tons of coal per day with 105 men employed. Most of the production came from the extraction of pillars in the Nos. 1 and 5 slope sections; production also came from the No. 4 incline section until July, when the reserves of the latter area were exhausted. In order to maintain the present output, the No. 1 slope, entrance to which is outside the mine portal, is being advanced, and a restricted amount of development should be possible for the next few years.

Throughout the mine the coal is cut by pneumatic picks and radial-punching machines, or is blasted off the solid with millisecond delay detonators. The coal is conveyed from the faces by conveyors and loaded into cars at the various 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. On the No. 1 slope the coal is loaded into 10-ton bottom-dumping cars which are hauled up the slope by a 300-horsepower electric hoist installed on the surface. The cars 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 1953 were found to be fairly good at the time of inspections. The mine is ventilated by a Joy axivane fan delivering 104,000 cubic feet of air per minute at a 5.3-inch water-gauge. Another Joy axivane fan has been installed preparatory to the development of No. 1 slope section but up to the present has not been put into operation.

No. 4 Mine.—James Brown, assistant overman; William Verkerk, fireboss.

This mine, which operates in the No. 4 seam, is worked on the pillar-and-stall system. The coal is 8 feet thick and of good quality, but the erratic distribution of ash and frequent occurrence of thin rock bands complicate its preparation for market. The variable condition of the shale roof necessitates systematic close timbering. The mine is operated on the room-and-pillar system, the pillars being extracted on the retreat. Rooms are driven 12 feet wide on a slight inclination in favour of the load, and are connected by " splits " 12 feet wide driven on the full pitch of the seam, which is 15 degrees. The coal is mined by pneumatic picks and radial-punching machines, or is blasted off the solid with millisecond delay detonators. It is loaded on to conveyors or directly into cars, and trips of cars are taken from partings near the faces by compressed-air hoists and by horses.

Most of the production in 1953 was obtained by extracting the pillars in a panel of workings off an incline inby the old No. 3 incline. The reserves of coal in this section were depleted in the latter part of the year, and operations since have been in the slope section which is being developed from the main level. The average daily production was 120 tons with twenty men employed.

Conditions in general were found to be satisfactory throughout 1953. The mine is ventilated by an electrically driven Sirocco double-inlet fan which delivers 35,000 cubic feet of air per minute at a 0.5-inch water-gauge. In the winter months the fan is reversed to act as a blower to prevent formation of ice in the main entry. Emission of gas from the coal is slight, due to the proximity of the surface.

No. 3 Mine.—James Anderson, overman; Roger Girou, David Brown, Brindley Morris, Kenneth Kniert, and Michael Tymchuk, firebosses.

This mine is operated in No. 3 seam, which is the lowest being worked 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 is mined by pneumatic picks, only occasional shots being necessary. It is very gassy, and a large volume of air is required to dilute the gases effectively.

The mine comprises slope and incline workings and is worked on the pillar-and-stall system in a manner similar to the other mines. The average daily output is 430 tons of coal with seventy-five men employed. Most of the production in 1953 was obtained by extracting pillars in No. 1 slope and No. 4 incline sections. Prevailing conditions in No. 1 slope section are very favourable, and a considerable amount of pillar extraction was carried out on the left side of the slope. The right side of the slope is being developed preparatory to the exhaustion of coal on the other side. In No. 4 incline section, difficulties are being experienced due to faulty ground, and because the roof is weak very close attention must be given to its support. Most of the work carried out in this region at present is confined to extraction of the incline pillars. The remaining pillars off the top belt-road were extracted early in the year and another belt-road section was developed. Due to difficulties arising from faults, further development of the area was stopped for the time being.

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. There is a large area of virgin coal available in the locality, but before any large-scale development can be carried out a permanent system of ventilation must be established. The two inclines are being driven toward the outcrop of the seam, and the faces at present are 1,350 feet from the main level, having advanced 650 feet in 1953.

The mine is ventilated by an electrically driven aerodyne fan which delivers 101,250 cubic feet of air per minute in the mine at a 2.3-inch water-gauge. In general, conditions were found to be fairly good during inspections. On a few occasions small quantities of methane were found near the roof at some of the working-places, usually due to defective bratticing.

During 1953, 37,400 pounds of Polar Monobel No. 4, 4,200 pounds of C.X.L.-ite, and 44,161 electric detonators were used at all mines at the colliery in coal and rock blasting. Six misfired shots were reported.

To neutralize the coal dust, 210 tons of limestone dust was applied to the underground roadways of the mines. Monthly mine-dust samples were collected from all the mines and analysed. All the samples were above the minimum requirements of incombustible content.

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

(49° 114° N.W.) Henry Miller, general superintendent, Bellevue, Alta.; Ivon Donkin, mine superintendent. The coal-mining activities of this company in the East Kootenay District are confined to stripping operations on Tent Mountain, near Corbin. Most of the operations are on the Alberta side of the interprovincial boundary, but, as the seams extend into British Columbia, the company operates on both sides of the boundary.

Two coal seams are being worked on the British Columbia side at present, and most of the production in 1953 was obtained from the seam which extends into Crow's Nest Pass Coal Company property. This seam is 60 feet thick, dips at 65 degrees, and crosses the boundary for a short distance before outcropping on the mountainside. Stripping operations on the other seam were commenced in August and coal production started in October. These operations are carried out on Crown-granted portions of Lots 7215 and 7002, but will later extend back into Alberta. The seam ranges from 30 to 60 feet thick and dips at 65 degrees.

The coal is loaded by power-shovels and transported in trucks to the company's preparation plant at Coleman.

NORTHERN INSPECTION DISTRICT

By A. R. C. James

The coal mines of the Northern Inspection District produced a total of 46,971 tons of coal in 1953, this being a 14.1-per-cent increase over the 1952 output, and the largest annual production to date in spite of declining activity in the Peace River area.

Production of coal in the Northern District began in the Telkwa coalfield in 1918. By 1939 the annual production was a little more than 5,000 tons, but during the war years it expanded rapidly to a peak of 38,233 tons in 1944. Most of this production was from two mines in the Telkwa field, the Bulkley Valley and the Telkoal Collieries, but a substantial amount was also mined in the Peace River Mining Division. In 1945 production was 33,043 tons, but in 1946, with the cessation of war-time demand, production fell sharply to 13,009 tons. Since that time it has been increasing steadily each year. At the present time, most of the production comes from the mines of Bulkley Valley Collieries Limited, and about 90 per cent is used at the Columbia Cellulose Company's Prince Rupert plant.

Production in the Peace River coalfield began on a very small scale near Hudson Hope in 1939. From 1943 onward it expanded steadily due to war-time demand from military camps and installations along the newly constructed Alaska Highway, as well as from the increasing populations of such communities as Fort St. John and Dawson Creek. In 1950 the three small mines in the Hudson Hope coalfield produced 12,558 tons. In 1951 the Peace River mine closed down, and since that time the output from this area has declined to less than 4,000 tons a year. The recent discoveries of natural gas in the Peace River District and the fact that gas is now available to domestic consumers in Dawson Creek, Pouce Coupe, and Fort St. John make it unlikely that the considerable coal deposits of the Peace River will be exploited on any significant scale within the foreseeable future; indeed, the small coal-mining industry which exists at present seems to be in a very precarious position. The two operating mines are remotely situated at the ends of poor roads, and face difficult problems due to lack of capital and of skilled and experienced miners. In spite of excellent and virgin seams of coal, operating profits have so far been negligible. At the present time a large military camp at Fort Nelson and the Fort St. John airport provide a demand for several thousand tons of coal a year, but if these markets are lost the outlook will be bad.

No accidents to workmen were reported from the coal mines in this district during 1953, nor were there any dangerous occurrences.

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, Nos. 388 to 392 and 401. The property is on Goat Creek, a tributary of the Telkwa River, and is about 7 miles southwest of Telkwa. Three mines were in operation in 1953. The No. 2 mine was worked during the autumn and winter months to meet local demand for domestic coal in the district between Hazelton and Burns Lake. The No. 3 mine was worked continuously throughout the year, the entire production being supplied to the Columbia Cellulose plant at Prince Rupert. At the beginning of October a new strip mine commenced production on Lot 401 on the west bank of Goat Creek. All the coal from this strip mine was also supplied to the Columbia Cellulose plant. All three mines are connected by a good road with the Canadian National Railway and the Northern Trans-Provincial Highway at Telkwa.

The total production in 1953 was 42,136 tons. This represents a 13-per-cent increase from the 1952 output, and is the largest annual production yet attained in the Telkwa coalfield. Ninety per cent of this production was 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, in the southwest corner of Lot 401. 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 the extraction of pillars near the outcrop south of the portal. The mine was closed during the summer months. During the latter part of the year a crew of eight men was employed, producing 500 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 at the mine have been found generally satisfactory in the course of inspections, and no accidents were reported.

No. 3 Mine.—H. Bankhead and G. Mack, firebosses. This mine is on the east side of Goat Creek on Lot 391, about 7 miles from Telkwa. The main slope portal is on a steep hillside on the east bank of the creek 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 average dip of the seam is 13 degrees in a northeasterly direction.

The mine has been developed from a main slope driven on the full dip of the seam. When the slope had been driven 550 feet, a fault of considerable displacement was encountered. This fault has since been found to cross the whole property, striking in a general direction of north 20 degrees west, approximately parallel to the outcrop of the seam, and is believed to have an upward throw of 75 to 100 feet to the east. The operators do not now intend to drive through the fault, and the mineable area is thus limited to a distance of 1,100 feet along the strike of the seam, with the main slope in the centre extending 550 feet to the dip. To the northwest the workings are limited by another fault, and to the southeast by steeply dipping and broken strata.

Most of the production in 1953 came from the extraction of pillars blocked out in 1951 and 1952. Development work was restricted mainly to the southeast side of the mine. The No. 1 south level and counter were advanced 200 feet, and a pair of diagonals were driven southeast from this level for 200 feet. At the face of each of these development headings, the seam rises steeply upward toward the surface, and the roof strata are weak and broken. The total amount of development work completed in 1953 amounted to 2,000 feet. The principal reserve of coal in the mine now lies in an area extending along the strike 500 feet northwest from the main slope and 150 to 200 feet down the dip from the outcrop. Preparations were being made in November to begin development work in this area.

The mine is worked by a mechanized room-and-pillar system, which has been described in previous Annual Reports. In February, 1953, the company adopted the use of millisecond delay detonators for blasting. The results have proved satisfactory, especially in the saving of time in blasting rounds. A total of 21,800 pounds of Monobel No. 4 explosive was used in the mine in 1953. Transportation of coal from the face to the 300-ton storage bin on the surface is done entirely by electrically driven conveyors. The run-of-mine coal is shipped by truck and train to the Prince Rupert plant of the Columbia Cellulose Company. Average daily production in 1953 was from 130 to 150 tons with a crew of thirty men employed underground and three on the surface.

Conditions in the mine were usually found satisfactory in the course of inspections, and no methane was detected. The mine is ventilated by a 50-inch Sirocco axial-flow fan which circulates approximately 10,000 cubic feet of air per minute. This is operated as a forcing fan to keep the main slope free from cold intake air in winter.

First-aid arrangements consist of a No. 2 first-aid kit and carrying stretcher. Five employees hold first-aid certificates. No accidents were reported during 1953.

Strip Mine.—A. H. Dockrill, supervisor. This mine is on Lot 401 on the west bank of Goat Creek about 700 yards north of No. 2 mine. A seam of coal 7 feet thick, which appears to be stratigraphically below the Betty seam, outcrops on the west bank of the creek. The coal-bearing sediments strike in a northerly direction and dip east at about 20 degrees to form a small shallow syncline underlying the bed of the creek. From the outcrop the seam rises at 10 degrees to the west under the sloping sides of the creek valley, and is probably under 30 to 50 feet of cover for a considerable distance. Two samples of the seam taken by the operators showed an average calorific value of 13,475 B.t.u. per pound.

During the summer and autumn of 1953 the seam was uncovered for 700 feet along the outcrop (parallel to the creek), and the overburden was stripped for a distance of 25 feet up the pitch. Production started at the beginning of October and in November had reached 65 tons a day with a crew of three men. The seam is fairly regular, except for two small igneous intrusions and two small normal faults. The average thickness of overburden is 20 feet, and comprises 18 feet of grey shale and 2 feet of gravel and soil. The overburden is blasted by means of 10-foot vertical holes placed 6 to 8 feet from the edge of the face and spaced 10 to 12 feet apart. The coal is mined and loaded into trucks by a Finning D-6 caterpillar with a Hyster ½-cubic-yard shovel. The run-of-mine coal is delivered to the Canadian National Railway for shipment to Prince Rupert.

Working conditions were found to be satisfactory in the course of inspections, and no accidents were reported.

[Reference: *Minister of Mines, B.C.,* Ann. Rept., 1951, pp. 291–297.]

Cariboo

Bowron River (53° 121° N.W.)

Central Industries Ltd. Company office, 409, 713 Columbia Street, New Westminster. Earl N. Lehna, managing director; J. Lupton, engineer. This is a private company, formed at the end of 1952 to continue development of the coal lands held under licence by Bowron Coal Company Limited; these coal lands comprise part of Lots 9592 and 9596 on the Bowron River, about 30 miles due east of Prince George.

The Bowron River coalfield was examined by Holland in 1948, and his detailed report is contained in the Annual Report for that year. The distribution of outcrops of coal formation suggests that the formation underlies the bottom of the Bowron River valley, forming a belt 1½ to 2 miles wide and about 7 miles long. It comprises grey and buff sandstones interbedded with light to dark soft shales and sandy shales, some of which are carbonaceous, some coal seams, and several beds of conglomerate. The age of the formation is considered to be Tertiary. The surrounding rocks are largely volcanic. The coal-bearing formation generally strikes about north 40 degrees west, and the beds dip east at 20 to 60 degrees. The river valley is covered with a mantle of gravel so that most outcrops are restricted to the river banks.

From 1946 to 1950 the Bowron Coal Company explored coal seams exposed on the west bank of the river on Lot 9593. Seven drill-holes were put down, and an adit level was driven for a distance of 50 feet along the strike of the formation with the intention of crosscutting into a promising seam which outcrops at river level under the gravel overburden. All underground work ceased in the summer of 1950, but was resumed by the present company in December, 1952, and was continued until May 21st, 1953. According to information received from the company, the prospect level was advanced to a point 193 feet from the portal, and three crosscuts were driven northeast across the dip. Two of these struck gravel after being driven 40 feet. The third crosscut, started from a point on the level 60 feet from the portal, crossed two thick seams of coal after being driven 40 feet. All development work was then suspended, and efforts were concentrated on improving the 31-mile access road from Buckhorn Lake, which by March had become impassable due to mud. The remainder of the year was spent on this work, and by December 31st 25 miles of year-round motor-road had been constructed. This included the construction of seventeen culverts, one minor bridge, and the repair and strengthening of Willow River bridge. Most of the road has been completely relocated, and about 6 more miles remain to be completed. Three men were employed on underground work at the mine, and two men, together with two tractor operators, were employed on the road work. No accidents were reported.

[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 following section is typical of the seam being worked: Coal, 1 foot 7 inches; inferior coal, 9 inches; coal, 4 feet 3 inches; clay ironstone, 8 inches; bottom coal, 1 foot 6 inches. The clay ironstone and the bottom coal are not mined. The immediate roof is a strong sandrock. A sample of the seam, exclusive of the 9 inches of inferior coal, was taken at the face on November 5th and gave the following analysis, on an as received basis: Moisture, 0.9 per cent; volatile matter, 17.3 per cent; fixed carbon, 70.6 per cent; ash, 11.2 per cent; sulphur, 0.5 per cent; B.t.u. per pound, 13,370. The A.S.T.M. (American Society for Testing Materials) classification of the coal is low volatile bituminous. The sample produced a soft coke with no swelling.

The seam occurs in the lower part of the Gething formation (Lower Cretaceous), which dips at 16 degrees in an easterly direction and forms part of the eastern limb of the Bullhead anticline.

The mine has been developed by means of two adit levels driven due north along the strike of the seam from the 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 the distance between levels was later increased to 100 feet. The levels have been connected by a series of raises driven at 50- to 70-foot intervals.

The main level has been driven 610 feet from the portal and the upper level 440 feet. The levels are now connected by eight raises. The raises have been extended beyond the upper level for distances ranging from 30 to 60 feet. The pillars left between the first two raises have been split by a sublevel which has been driven 100 feet. A total of about 280 feet of development drivage was done in 1953.

The coal is blasted from the solid and hand-loaded into cars which are hand-trammed out of the mine to the tipple. It is then screened by a small gasoline-driven shaker screen into lump, nut, and stoker sizes and stored in three 30-ton bunkers. In 1953 a new 600-ton storage bunker was built to receive coal from the upper level, but it has not yet been used.

Some strip-mining was done in a small area immediately to the dip side of the mine portal where the thickness of overburden ranges from 4 to 30 feet. The operation has not proved very successful owing to the difficulty in removing the sandstone (8 to 14 feet thick) which overlies the seam and which had to be blasted. Early in November only about 200 tons of coal had been mined from this strip pit. The coal is mined by a ½-cubic-yard slusher bucket operated by a gasoline-driven winch. The slusher delivers the coal on to an 18-inch chain-conveyor, which elevates it to a crusher where it is crushed to stoker size.

In 1953 the principal market for this coal was the Fort St. John airport, a military camp at Fort Nelson, and local domestic consumers. The mine worked very intermittently during the summer, but the average monthly production during the winter was 300 tons. In November nine 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; A. J. Garraway, fireboss. This property is situated at about 2,600 feet elevation on the steep southern end of a south-trending spur of Butler Ridge, 1 mile north of the Peace River. It is 23 miles by road from Hudson Hope and 83 miles from Fort St. John. The following is a typical section of the seam worked: Bone and clay, 5 inches; coal, 3 inches; bone, one-quarter inch; blacksmith's coal, 5¾ inches; hard coal, 2 feet 3 inches; blacksmith's coal, 8 inches. Both roof and floor are a silty shale. The seam dips 46 degrees due west. A sample of the seam taken at the face on November 5th gave the following values, on an as received basis: Moisture, 1.1 per cent; volatile matter, 21.8 per cent; fixed carbon, 69.3 per cent; ash, 7.8 per cent; sulphur, 0.7 per cent; B.t.u. per pound, 13,880. The A.S.T.M. (American Society for Testing Materials) classification of this coal is medium volatile bituminous. The sample produced a soft coke with no swelling.

The mine has been developed from two parallel adit levels driven due north along the strike of the seam from the outcrop. The lower level forms the main haulage level and intake airway, and the upper level, 330 feet up the pitch, provides a return airway and alternate exit. The lower level has been driven for a total distance of 1,050 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 up the full pitch of the seam to connect with the upper level. Eighteen rooms have been worked out, and Nos. 19, 20, and 21 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. During the latter part of 1953 a Huwood rotary coal drill and air pick were obtained, with the idea of blasting the coal from the solid and dispensing with the punching-machines, which are difficult to handle in a steeply inclined seam. 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 run-of-mine coal is screened on the surface into lump, nut, and stoker sizes and stored in bunkers with a total capacity of 120 tons.

The mine was closed from the end of March to the beginning of November. The average monthly production during the working months was 400 tons. In November a crew of five 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 1953 electrical power was used at seventy-two properties for operations including mining, concentrating, coal preparation, and quarrying. Eight properties commenced using electrical power in 1953, and fourteen properties at which electrical power was used ceased operations, leaving fifty-eight properties using electrical power at the end of 1953. The decrease in metal-mining activity is reflected in the figures given below, which are lower than those in the 1952 Annual Report.

Lode Mines

The kva. generating capacity of privately owned power plants at those mines which were being operated at the end of 1953 was as follows:—

Prime Mover	Generator Kva. Capacity
Steam turbines	23,050
Diesel engines	13,868
Water-wheels	13,390
Total	50,308

The electrical power produced by these plants was approximately 146,406,521 kilowatt-hours during 1953. These figures are approximate because many of the small plants are not equipped with recording meters and, therefore, the power produced by those plants had to be estimated. During 1953, 156,651,758 kilowatt-hours of electrical power was purchased from public utilities.

In addition to the aforementioned generating capacity, 8,253 horsepower used for direct mechanical application is produced as follows:—

Prime Mover	Horsepower
Diesel engines	6,312
Water-wheels	1,510
Gasoline engines	431
Total	8,253

The connected load at the metal mines which were in operation at the end of 1953 is approximately as follows:—

Equipment	Horsepower
Hoists	6,702
Scraper hoists	5,491
Ventilating fans	3,351
Pumps	3,223
Rectifiers and M.G. sets	7,292
Air compressors	17,107
Crushing equipment	8,935
Sink-float equipment	1,048
Milling and concentrating equipment	39,868
Conveyors	161
Workshop equipment	2,715
Miscellaneous equipment	8,304
Total	104,197

For surface and underground haulage there were in use 117 battery locomotives, 99 trolley locomotives, and 4 diesel locomotives.

Placer Mines

Electrical power was used at three placer mines. The generating capacity is as follows:—

	Kva.
Diesel-engine-driven generators	110
Hydro-electric	600
Gasoline-engine-driven generators	30
Total	740

The connected load is as follows:—

Equipment	Horsepower
Shaft hoists	40
Ventilating fan	5
Air compressors	75
Winches	18
Screens	3
Suction head	3
Pumps	7½
Total	151½

During 1953, 745,200 kilowatt-hours of electrical energy was produced at the Noland Mines Limited plant.

One battery locomotive is used for underground haulage.

Non-metallic Mines and Quarries

Electrical power was used at nine non-metallic mines and quarries for loading, crushing, separating, and conveying the materials removed.

Coal Mines

During 1953 electrical power was used at nine coal mines. Operations at two of these mines were terminated in 1953. The small underground pump at a third was removed when the autumn rains caused an increase in the inflow of water that was greater than the pump capacity. This left six mines using electrical power at the end of 1953. The use of electrical power underground at Elk River Colliery was terminated, and the permissible electrical equipment was moved to Michel Colliery, where several underground electrical installations have been made.

The distribution of electrical power is as follows:—

Surface

	Horsepower
Compressed air	7,425
Ventilation	1,375
Hoisting	2,407
Haulage	316
Coal washing and screening	3,177
Pumping	530
Coke production	1,215
Miscellaneous	650
Total	17,095

Total *Surface*		17,095
Underground		
Haulage	407	
Pumping	788	
Coal-cutters	100	
Coal-loaders	15	
Conveyors	214	
Miscellaneous	25	
Total		1,549
Total for surface and underground		18,644

Four battery locomotives and one diesel locomotive were used for underground haulage.

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

Taku River

Tulsequah Mill (Tulsequah Mines, Limited)

(58° 133° N.W.) The additions to the mill mentioned in the 1952 Annual Report were completed and put into operation. These additions increase the mill capacity from 300 to 500 tons and at the same time increase the mill load from 440 to 767 horsepower. The increase was effected without changing the crushing capacity. The machine-shop and electric shop were badly damaged by fire and had to be rewired. At the time of inspection only some maintenance work was required to bring the electrical installations up to the prescribed standards.

Big Bull (Tulsequah Mines, Limited)

(58° 133° N.W.) No major alterations were made to the electrical installations during 1953. At the time of inspection several recommendations were made for the improvement of the electrical system. The most important of these was to arrange the limit switch circuit on the hoist to trip out the motor circuit-breaker if the control handle were moved in the direction opposite to that which would apply power to back the hoist out of the limit which had been entered. The hoist-motor leads required enclosing in flexible conduit from the end of the rigid conduit to the motor terminal box. It was required that straps be used instead of nails for securing non-metallic sheathed cable in place.

Tulsequah Chief (Tulsequah Mines, Limited).—(58° 133° N.W.) A 75-kw. Palmer self-regulating generator driven by a U.D. 24 International diesel engine was installed in the power-house. A charging-station for locomotive batteries was built underground. This station consists of one 15-horsepower and two 5-horsepower motor-generator sets which were moved from the power-house.

Portland Canal

Salmon River (56° 130° N.W.)

Silbak Premier Mines Limited and Indian Mines (1946) Ltd.—Operations at these properties were terminated early in February, 1953, and consequently the hoist installation commenced in 1952 was not completed.

Alice Arm

Torbrit Silver Mines Limited.—(55° 129° N.W.) No major alterations were made to the electrical installations during 1953.

Hazelton

Silver Standard Mines Limited

(55° 127° S.W.) Electrical work consisted of preparations to move the D-13000 and U.D. 18A diesel electric stand-by sets from the mill power-house to the new power-house. Foundations were poured, but the units had not been moved by the end of 1953. The 50-horsepower hoist motor was replaced with a 60-horsepower motor. A 7½-kva. transformer has been installed in the upper camp area to take care of extra lighting load. At the time of inspection it was found that several switches required marking to designate circuits controlled, that some maintenance was required, and that a ground fault detecting device was required on the 440-volt system.

Red Rose (Western Tungsten Copper Mines Limited)

(55° 127° S.W.) After the Rocher Deboule mine closed it was uneconomical to run the 1,200-horsepower diesel plant on Juniper Creek for the Red Rose alone, so a 300-kw. 6,900-volt 3-phase 60-cycle a.c. generator driven by a Paxman diesel was installed at the Red Rose mill to supply power to the mill and mine. The power plant on Juniper Creek was kept as a stand-by and in July, 1953, burned to the ground when in operation. Following the loss of the Juniper Creek plant, a 375-kva. 440-volt 3-phase 60-cycle a.c. generator driven by a Fairbanks-Morse diesel engine was installed in the mill power-house. This unit is run constantly and the 300-kw. unit provides a stand-by.

In the interest of safety the voltage on the power-line between the Red Rose mine and the Rocher Deboule mine was reduced from 6,900 to 440 volts.

During the winter of 1952–53 considerable temporary wiring was done around the mill and mine in order to keep the property in operation. As required at the time of inspection, much of this work has been removed or replaced with permanent wiring and some new work has been done.

At the mill, the garage and welding-shop have been wired in conduit. A foreman's field office, a new residence, and a school-house have been built and wired. Two residences moved from the Rocher Deboule have been rebuilt and wired. The services to two residences and the office have been changed from two-wire to three-wire services.

In the mill some rewiring has been done, and a distribution centre for magnetic separating equipment has been installed. This centre will serve a separator conveyor, a magnetic separator, and two concentrate driers. The installation of a crusher distribution centre is in progress.

At the mine, the hoist, which is driven by a 50-horsepower 440-volt motor, was installed on the new incline shaft; the temporary wiring in the snowsheds was replaced with permanent wiring; and a new transformer station and distribution centre for 440-volt power and 110-volt lighting was built. It houses three 50-kva. 6,900–440-volt transformers which were removed from the mill substation. At the mill these transformers were replaced with three 150-kva. 6,900–440-volt transformers.

Smithers

Sil-Van (Sil-Van Consolidated Mining & Milling Company Ltd.)

(54° 127° N.E.) It was mentioned in the 1951 Annual Report that a mill and power-house had been built and much of the machinery and electrical equipment, with the exception of the electrical wiring, had been installed when it was decided to suspend operations. In the spring of 1953 the wiring was completed and the mill put into operation in June.

In the power-house a 12-cylinder 900-horsepower diesel direct-connected to a 750-kva. 440-volt 3-phase generator and a 150-horsepower diesel direct-connected to a 100-kva. 440-volt 3-phase generator were installed.

The equipment installed in the mill is as follows: A 24-inch by 7-foot coarse-ore feeder driven by a 2-horsepower motor; a 36-inch by 8-foot model D.D. 50 Dillon screen driven by a 2-horsepower motor; a 36-inch by 14-foot picking-belt driven by a 2-horsepower motor; an 18-inch by 50-foot waste conveyor driven by a 2-horsepower motor; a 10- by 21-inch Telsmith jaw crusher driven by a 20-horsepower motor; an 18-inch by 40-foot conveyor driven by a 2-horsepower motor; a 14- by 24- by 30-inch 1½-kw. Dings magnet; a 15-inch J.T.D. 1,750-cubic-feet-per-minute dust exhaust fan driven by a 1-horsepower motor; a 36-inch by 6-foot model D.D. 50 Dillon screen driven by a 2-horsepower motor; a 22-inch intermediate cone crusher driven by a 25-horsepower motor; an 18-inch by 78-foot conveyor driven by a 3-horsepower motor; an 18-inch by 21-foot 3-inch adjustable stroke fine-ore feeder driven by a 1½-horsepower motor; a 6- by 6-foot Eimco ball mill driven by a 125-horsepower motor; an Akins 48-inch by 19-foot 3-inch S.D.P.H. classifier driven by a 3-horsepower motor; a 6-cell 38- by 38-inch No. 21 Denver lead flotation machine driven by three 7½-horsepower motors; a 6- by 6-foot Denver zinc conditioner driven by a 3-horsepower motor; an 8-cell 38- by 38-inch No. 21 Denver zinc flotation machine driven by four 7½-horsepower motors; two 2-inch D.V.C.S. concentrate pumps each driven by a 5-horsepower motor; a 14- by 7-inch vacuum pump driven by a 15-horsepower motor; a ½-inch filtrate pump driven by a 3-horsepower motor; a 2-inch mill sump pump driven by a 5-horsepower motor; a 6-foot 6-disk Denver filter driven by a 2-horsepower motor; a No. 36 Victor Acme blower driven by a 1½-horsepower motor; a water-pump at the lake driven by a 10-horsepower motor; and a water-pump at the mill tank driven by a 40-horsepower motor.

The voltage is stepped up to 2,300 volts by three 25-kva. 440–2,300-volt transformers for transmission to an intermediate 40-horsepower water-pump motor approximately 3,100 feet from the power-house and a 10-horsepower river pump motor 4,600 feet from the power-house. Three 25-kva. 2,300–440-volt transformers step down the voltage for the intermediate pump motor and three 10-kva. 2,300–440-volt transformers step down the voltage for the river pump motor.

Three 100-kva. 440–2,300-volt transformers were installed to supply a 300-horsepower air-compressor motor. This equipment was not used in 1953.

At the time of inspection the following work was yet to be done. The grounding of the frames of the electrical equipment in the mill had to be completed and a ground fault detecting device was yet to be installed. At the 3800 level some temporary wiring required replacing with permanent wiring.

Cariboo

Wells-Barkerville (53° 121° S.W.)

Cariboo Gold Quartz Mining Company Limited

The No. 2 hoist, which had been idle since 1948, was returned to service again to hoist ore and materials only. At the time of inspection it was found that the frame of the hoist motor required to be effectively grounded. Other unsatisfactory conditions found were an ineffective controller latch on one of the battery locomotives and several portable electric tools were not provided with a grounding conductor. The management was advised to install grounding conductors on all portable electric tools not so equipped and to install an adequate number of three-wire polarized receptacles. Except as mentioned, the electrical equipment was found to be in satisfactory condition.

Island Mountain Mines Company Limited.—No alterations were made to the electrical equipment during 1953. With the exception of defective wiring in one locomotive battery box, no unsatisfactory conditions were observed at the time of inspection.

Bridge River

Bralorne Mines Limited.—(50° 122° N.W.) A double-drum hoist was installed on the 2500 level. It is driven by a 75-horsepower 440-volt motor.

Some maintenance work was required on the underground electrical equipment at the time of inspection, otherwise no unsatisfactory conditions were found.

Pioneer Gold Mines of B.C. Limited

(50° 122° N.W.) The new substation on No. 25 level for No. 5 shaft was completed. It contains a 150-kva. 6,600–440-volt 3-phase transformer, primary oil circuit-breaker, primary cable junction box, secondary gutter box, and secondary branch-circuit switches. To supply No. 5 shaft substation, a 6,600-volt armoured cable was run 2,100 feet along No. 25 level from the substation at No. 3 shaft to No. 5 shaft substation. The No. 5 shaft substation supplies the No. 5 shaft 100-horsepower sinking hoist motor, the lights and signal circuits, a locomotive battery charging set, and a 30-horsepower pump in No. 5 shaft. On the surface an axial-flow fan driven by a 50-horsepower motor was installed in the entrance of the ventilation adit. For backfill in the mine, a new sand-fill plant which will separate the sand from the tailing slimes is being built and will be put into operation in February, 1954. The separating and pumping equipment will be driven by three motors rated at 15 and 10 horsepower respectively. Four battery locomotives have been added to the underground haulage system.

At the time of inspection it was found that a ground fault detecting device was necessary on the secondary circuit supplied from No. 5 shaft substation, and a pile of timber which blocked ease of access to this station required removing. The overspeed controls on the hoists were out of adjustment and had to be adjusted by the electrician. Several grounding conductor connections were made with solder. To comply with code regulations, suitable clamps or pressure connectors must be used.

Wayside (L.A.P. Mining Company Limited).—(50° 122° N.W.) Operations were terminated early in 1953.

Copper Mountain

The Granby Consolidated Mining Smelting and Power Company Limited

(49° 120° S.W.) Underground electrical work consisted mainly of moving and reinstalling the electrical equipment for slusher hoists and ventilating fans. Slusher hoists were moved to 1-13, 13-E, 32-34 south, and 4-b blocks. Ventilating fans were moved to No. 3 level, No. 6 level portal, No. 5 level 90 drift, 37-A on No. 6 level, and No. 3 shaft at the surface. A new pump driven by a 150-horsepower motor was installed at the Copper Mountain river pumping-station. A hoist driven by a 30-horsepower d.c. motor was installed to service the river pumping-station.

During inspection of the mine it was found that the portable lamp receptacles for the 110-volt flood-lamps used for slusher-drift lighting required grounding, the neutral of the lighting transformer in the main switchroom at the crushing plant required grounding, and the splices in the blasting cables required wrapping with insulating tape. At the concentrator a general inspection of all electrical grounding conductors was requested so that all those not in serviceable condition would be found and repaired.

Hedley

Nickel Plate and French (Kelowna Mines Hedley Limited).—(49° 120° S.E.) The single-drum Stephens-Adamson hoist driven by a 75-horsepower motor which was installed in 1952 was taken out of service.

At the time of inspection it was found that the method of attaching bonding conductors was not satisfactory. No other unsatisfactory conditions were found.

Fairview Camp

Fairview (The Consolidated Mining and Smelting Company of Canada, Limited).—(49° 119° S.W.) No alterations were made to the electrical installations during 1953. At the time of inspection the transformer-station enclosure required modifying to guard adequately the high-tension wires entering the station.

Beaverdell

Highland-Bell Limited.—(49° 119° S.E.) A small electrically driven hoist was installed in the mill to raise the concentrates from the main floor to the upper floor. At the time of inspection, several portable tools required grounding conductors, and the use of incandescent lamps for testing was prohibited.

Greenwood

Providence

(49° 118° S.W.) The equipment at this mine consists of a 30-horsepower shaft hoist motor, a 40-horsepower air-compressor motor, and a 5-horsepower pump motor which is installed at the bottom of the shaft. Five horsepower is used for shop work. Most of the electrical equipment was installed in 1918, and since then a certain amount of deterioration has taken place to the overhead and underground wiring; also the ground was filled in around the pole-type transformer-station until the platform was easily accessible. The management was instructed to have the transformer-station fenced and to improve the condition of the overhead and underground wiring.

Lightning Peak

Waterloo, Dictator (Paycheck Mining and Development Company Limited)

(49° 118° N.W.) The mill detailed in the 1952 Annual Report was put into operation late in the year. It was found necessary to use a 15-horsepower motor on the water-pump instead of the 5-horsepower originally specified. At the time of inspection the generator switchboard required enclosing. Insulating bushings were required where the conductors left the conduit behind the generator switchboard, and the switchgear was yet to be marked to designate circuits controlled.

Rossland

I.X.L. (Kootenay Central Mines Limited).—(49° 117° S.W.) A 220-cubic-feet-per-minute air-compressor driven by a 30-horsepower electric motor was used to produce compressed air for mining during the first half of 1953.

Bluebird (Rossland Mines Limited).—(49° 117° S.W.) Operations were terminated early in 1953.

Nelson

Eagle Creek (49° 117° S.E.)

Kenville Base Metals Concentrator (Emerald Glacier Mines Limited).—This concentrator was closed down in October, 1953. No major alterations were made to the electrical equipment in the concentrator.

Salmo

Erie Creek (49° 117° S.E.)

Arlington

The following equipment has been added to the mill: A filter driven by a 3-horsepower motor; a vacuum pump driven by a 5-horsepower motor; a thickener driven by a 2-horsepower motor; a diaphragm pump driven by a ¾-horsepower motor. A ball mill driven by a diesel engine has been added to the grinding circuit. The pulp from this mill flows into the present classifier, which, in order to accommodate the greater load, is now driven by a 5-horsepower instead of a 3-horsepower motor.

At the time of inspection the management was advised to use suitable straps for making bonding and grounding conductor connections.

Iron Mountain (49° 117° S.E.)

Jersey, Emerald, Feeney, and Dodger (Canadian Exploration Limited)

Electrical work done during 1953 was as follows: A 4-conductor No. 2 B. & S. gauge 3,000-volt rubber-insulated lead-sheathed steel-wire-armoured cable was run between substation No. 407 on the 4100 level, Jersey mine, and substation No. 408 on the 4200 level, Jersey mine. This cable completes a ring circuit from the tungsten distribution centre through Jersey 4000, 4100 and 4200 mines and back to the tungsten distribution centre.

Substation No. 405 in the Jersey 4100 mine was dismantled and the equipment moved to the Jersey 4200 mine for a new substation, No. 409. The equipment consists of a 45-kva. 2,300–460-volt 3-phase askarel-filled transformer, a 200-ampere capacity oil circuit-breaker, and a 15-kva. 460–230/115-volt askarel-filled lighting transformer. Power is supplied from this station to a repair-shop and 50-horsepower fan. This substation is linked with substation 408 by 450 feet of 3-conductor 3,000-volt paper-insulated lead-sheathed double-steel-tape-armoured cable.

A new substation, No. 410, was built in the Jersey 4200 mine. It contains a 75-kva. Westinghouse power centre comprising a 75-kva. 2,300–460/115-volt 3-phase nitrogen-filled transformer, a 200-ampere oil circuit-breaker, three 100-ampere Westinghouse 3-phase " No Fuz " 600-volt air breakers, and one 50-ampere 2-pole breaker for lighting circuits. This station will feed two 50-horsepower fans and is linked with substation 409 by 750 feet of 3-conductor, 3,000-volt paper-insulated lead-sheathed double-steel-tape-armoured cable.

To supply water for the tungsten mill and mine camp, two pumps driven by two 200-horsepower 2,200-volt motors were installed. The motors are started by across-the-line magnetic oil-insulated contactors. A double overhead line of No. 2 A.S.C.R. cables supplies the pump motors.

An underground crushing plant was installed, which will be used to crush all ore for both the lead-zinc and tungsten mills. The equipment in this plant consists of the following: A hydrocone crusher driven by a 200-horsepower 2,300-volt motor; a jaw crusher driven by a 150-horsepower 2,300-volt motor; a pan feeder driven by a 15-horsepower motor; two belts each driven by 20-horsepower motors; a screen driven by a 15-horsepower motor; and two fans driven by a 15- and a 10-horsepower motor respectively. The aforementioned smaller motors are supplied at 440 volts from a dry-type 150-kva. 2,300–460-volt 3-phase transformer. Lighting is supplied from a 50-kva. 460–230/115-volt single-phase transformer fed from the 460-volt bus. The main feeder cable is a 3-conductor 350 M.C.M. 3,000-volt paper-insulated lead-sheathed double-steel-tape-armoured cable 800 feet long. It is fed through a 400-ampere 50-mva. oil circuit-breaker at the tungsten distribution centre.

A 48 by 36 PE-1 double-drum hoist driven by a 150-horsepower 440-volt wound rotor motor was installed on the 3800 level of the Emerald tungsten mine. Power is supplied to the hoist motor at 440 volts from the underground crushing chamber, through a 3-conductor 1/0 1,000-volt paper-insulated lead-sheathed double-steel-tape-armoured cable.

A system of conveyors was installed to carry ore from the underground crushing plant to the tungsten and lead-zinc mills. There are seven conveyors between the crushing plant and the lead-zinc mill. At the end of the second conveyor a conveyor takes off for the tungsten mill. There are four 20-horsepower, three 15-horsepower, and one 30-horsepower 440-volt motors driving these conveyors. Safety switches and magnetic or combination starters are installed at the motors. Remote starting is accomplished through a 24- and 36-volt control system and relays. To prevent remote starting, the safety switches may be locked out. A warning horn sounds for 30 seconds before any conveyor starts after the starting control is operated.

In the lead-zinc mill two banks of three 75-kva. 2,300–440-volt dry-type transformers enclosed in cabinets and a Canadian General Electric motor-control centre were installed to feed seventy-five 440-volt motors situated mainly on the concentrating floor. The transformers are fed through 3-conductor No. 2 B. & S. gauge paper-insulated lead-sheathed double-steel-tape-armoured cable protected by a 400-ampere 35-mva. oil circuit-breaker.

At the time of inspection, much of the newly installed switchgear was yet to be marked to designate circuits controlled, bonding and grounding were not completed, and two spans of the power-line to the Lost Creek pumps required raising to regulation height.

On October 20th, 1953, a Le Torneau loader entered the Jersey 4200 portal with the box raised. The box cut the 2,300-volt cable which is suspended from the back of the adit. The resulting short circuit caused the circuit-breaker in the Jersey substation to operate and isolate the cable.

Aspen Creek (49° 117° S.E.)

H.B. (The Consolidated Mining and Smelting Company of Canada, Limited).—The construction work on the concentrator was completed by March, 1953, when operation of the property was terminated.

Nelway

Reeves MacDonald Mines Limited.—(47° 117° S.E.) Operations at this property were terminated on July 15th, 1953, for an indefinite period. No major alterations were made to the electrical equipment during 1953.

North Kootenay Lake

Riondel (49° 116° N.W.)

Bluebell (The Consolidated Mining and Smelting Company of Canada, Limited)

A 10-horsepower slusher was installed in the 75 level pocket. Two electric fans were installed—one to ventilate the Comfort, and the other one for ventilating the south end of the 375 level. Preparations are being made to install, on the 525 level adjacent to the new shaft, six pumps, each driven by a 150-horsepower 550-volt motor. A bank of transformers will be installed to step the power down to 550 volts; a new locomotive was put into service; a 40-horsepower motor was installed to drive a pump on the dock for water for the mill.

At the time of inspection the following was observed: Repairs were required to the controller handles of the 75 level locomotive and the 375 level locomotive; free access to the switchgear in the 75 level charging-station was blocked by bags of sand; and in the Bluebell shaft, ventilating pipe was supported from the power cables.

Ainsworth (49° 116° N.W.)

Yale Lead & Zinc Mines Limited.—A 10-kva. transformer was installed at the Banker mine. At the time of inspection, several switches required marking to designate circuits controlled, and a span of 440-volt overhead cables over an elevated walkway required raising to give adequate clearance.

Kootenay Florence (Western Mines Limited).—Operation of this property was suspended for an indefinite period early in 1953.

Woodbury Creek (49° 116° N.W.)

Can-Amer Mining & Milling Company Ltd.

A mill with a capacity of 75 tons per day was built. The equipment in this mill is as follows: Power is produced by two 440-volt 3-phase 60-cycle generators of 75 kva. and 45 kva. respectively, each driven by a diesel engine. The 45-kva. generator supplies power to the crushing-plant equipment and the 75-kva. unit supplies power to the concentrating equipment. The diesel which drives the 45-kva. generator also drives the ball mill.

The crushing-plant equipment consists of two crushers, one driven by a 25-horsepower motor and the other by a 15-horsepower motor; two cross conveyors, each driven by a 3-horsepower motor; a long conveyor driven by a 1½-horsepower motor; a short conveyor driven by a 1-horsepower motor; and a screen driven by a 1½-horsepower motor.

The concentrating equipment consists of a classifier driven by a 5-horsepower motor; a jig driven by a 1-horsepower motor; a lead flotation machine driven by a 10-horsepower motor; a conditioner driven by a 2-horsepower motor; a zinc flotation machine driven by three 5-horsepower motors; a lead-pump and a zinc-pump, each driven by a 2-horsepower motor; a tailings-pump driven by a 3-horsepower motor; a lead-thickener and a zinc-thickener, each driven by a 1½-horsepower motor; a vacuum-pump and a filtrate-pump, each driven by a 1-horsepower motor; a filter driven by a 1-horsepower motor; a lead-pump and a zinc-pump, each driven by a 1-horsepower motor; and a lake pump driven by a 3-horsepower motor.

Keen Creek

Cork Province (Base Metals Mining Corporation Limited)

(49° 117° N.E.) A D-375 International diesel engine driving a 190-kw. 440-volt 60-cycle 3-phase a.c. generator was installed, primarily to supply power to the new 100-horsepower shaft hoist and mine pumps. Details of the hoist motor and a new underground power cable are given in the 1952 Annual Report. An electrical shaft-signal system with call and return bell signals on on all levels was installed in the No. 2 (new) shaft. Two 125-gallons-per-minute-capacity pumps driven by 40-horsepower motors were installed in the sump at the bottom of the new shaft.

At the time of inspection it was found that the new power cable required bonding at the splice boxes and grounding at the surface of the mine. The retardation and limit switch cams on the hoist Simplex controller required shaping and adjusting to give satisfactory automatic operation when the hoist is allowed to run into the retardation zone uncontrolled or inadvertently into the limits.

The electrical equipment below the main (300) level was taken out and the mine allowed to flood when operations were suspended indefinitely on November 26th, 1953.

Retallack-Three Forks

Lucky Jim (Zincton Unit, Sheep Creek Gold Mines Limited).—(50° 117° S.E.) Operations were terminated in July, 1953, and some of the electrical and mechanical equipment was moved to the Mineral King property, 26 miles from Athalmer.

SANDON

Silversmith (Carnegie Mines of British Columbia Ltd.)

(49° 117° S.E.) The new mill described in the 1952 Annual Report was operated all year. At the time of inspection the following improvements were required. A ground fault detecting device was required on the 440-volt system at the mill; the bonding and grounding of the frames of electrical equipment required completing; the transformer-station required fencing; and the telephone-line which was strung on the 2,200-volt power-pole line between the mill and power plant required isolating transformers at each end.

Cody Reco Mines Limited

(49° 117° S.E.) The new mill was not operated in 1953, but the air compressor, which is driven by a 125-horsepower electric motor, was operated to provide air for development work. One of the diesels was run to provide electric power for the air-compressor motor, shop motors, and lighting. At the time of inspection the following was required: The transformer-station adjacent to the mill required rewiring, as only a temporary wiring job had been done; an open 440-volt switch on the main switchboard required replacing with an enclosed one; grounding conductors were required on portable tools; and a generator required grounding.

Victor (Violamac Mines (B.C.) Limited)

(49° 117° S.E.) A new compressor-house was built at No. 9 level, and the compressors were moved from the old building to the new one. The 40-kva. lighting plant was also moved to the new building. A motor-generator charging set was installed on No. 9 level to charge a Mancha locomotive battery. The mill was closed in 1953.

Wonderful (Silver Ridge Mining Company Limited).—(49° 117° N.E.) The electrical plant was operated only when it was necessary to charge locomotive batteries. At the time of inspection the wiring in the locomotive battery box required attention.

SLOCAN LAKE

Western Exploration Company Limited

(49° 117° N.E.) The mill was operated mainly for milling custom ore, and development work was carried on at the Monarch mine. A reagent conditioner driven by a 5-horsepower motor was installed in the mill. At the Monarch mine a bank of three transformers step down the power from 2,000 volts to 440 volts for a locomotive battery charging motor-generator set. At the time of inspection it was found that some maintenance work was required on the electrical installations in the mill.

Bosun (New Santiago Mines Limited).—(49° 117° N.E.) The mine was operated during the first half of 1953. No electrical work was done during the period of operation.

NORTH LARDEAU

Spider (Sunshine Lardeau Mines Limited)

(50° 117° N.W.) No new electrical equipment was installed during 1953. At the time of inspection it was found that disconnecting switches had not been installed between the generator circuit-breakers and the main bus bars; the grounding blade had been removed from the attachment cap of the portable electric tools, so that they could be plugged into two-wire outlets. These unsatisfactory conditions have been given attention.

Kimberley

Sullivan (The Consolidated Mining and Smelting Company of Canada, Limited).—(49° 115° N.W.) Electrical work done during 1953 consisted of the following: Two fans driven by 125-horsepower motors were installed and put into operation at No. 26 exhaust raise near No. 1 shaft; some drift lighting was changed from d.c. trolley power to a.c. power. In the underground crushing plant a 125-horsepower wound rotor motor was installed on the jaw crusher and a 5-horsepower motor was installed on the screen; about 1,000 feet of 2,300-volt overhead power-line was relocated in the vicinity of No. 23 intake shaft, because of caving ground; a new bucking-room was built, and the equipment moved into it; a new 170,000–69,000-volt step-down substation near the concentrator was put into operation; and the tie line to the mill substation was relocated. At the time of inspection the electrical equipment about the mill and mine was generally in satisfactory condition.

Fort Steele

Kootenay King (Kootenay Base Metals Limited).—(49° 115° N.W.) Operations were suspended in December, 1952. In August, 1953, the management decided to mill the broken ore in the stopes. No alterations were made to the electrical installations during the period of operation.

Wasa

Estella (Estella Mines Limited).—(49° 115° N.W.) The mill was closed down early in the spring, and development work was terminated at the end of 1953. No major alterations were made to the electrical installations.

Windermere

Mineral King (Sheep Creek Gold Mines Limited).—(50° 116° S.E.) A power plant, concentrator, and camp buildings were built during 1953. In the power-house the following units were installed: A 450-horsepower diesel engine and a 275-horsepower diesel engine, each direct-connected to 440-volt 3-phase 60-cycle a.c. generators, and a 375-horsepower diesel engine direct-connected to a 2,200-volt 3-phase 60-cycle a.c. generator. An air compressor driven by a 150-horsepower 440-volt motor was installed in the power-house. The foundations were poured for a second air compressor driven by a 175-horsepower 2,200-volt motor, but installation of the compressor has not been completed.

At the end of 1953 a surface incline tram-line driven by a 30-horsepower motor was under construction. Crushing-plant equipment providing a connected load of 126 horsepower and mill equipment providing a connected load of 355 horsepower was being installed.

Spillimacheen

Silver Giant (Giant Mascot Mines Limited).—(50° 116° N.E.) A reconditioned double-drum Meade-Morrison hoist driven by a 50-horsepower 440-volt motor was installed on No. 6 level to operate the skips in the inclined shaft between Nos. 6 and 7 levels. A double-drum Joy slusher hoist driven by a 60-horsepower 440-volt motor was installed at the No. 7 level loading-pocket to handle the ore from No. 7 level. A Pumps & Power contrifugal pump driven by a 25-horsepower 440-volt motor was installed at the No. 7 level sump to handle any excess flow of water that cannot be handled by the air-driven pumps. To supply the above-mentioned motors with 440-volt power, two 25-kva. and one 37½-kva. 2,200–440-volt transformers were installed in a transformer-station at the back of the hoistroom. This station is fed from a bank of step-up transformers at the back of the power-house through a short overhead line to No. 6 portal and from there to the transformer bank through a 3-conductor No. 6 B. & S. gauge 2,500-volt paper-insulated lead-sheathed steel-tape-armoured cable. The cable is protected at the portal by fuses mounted on an A-frame and can be isolated by a set of pole-top disconnects. A main 440-volt distribution centre was installed at the hoistroom, and a secondary 440-volt distribution centre was installed on No. 7 level. The mill load was increased by 60 horsepower by the addition of six No. 21 and two No. 18 Denver Sub-A flotation cells, two 30-inch Fagergren cells, a 5 by 5 S.R.L. pump, and a 3 by 3 S.R.L. pump in the mill. A D-13000 Caterpillar diesel driving a 75-kva. 220/440-volt 3-phase a.c. generator was installed in the power-house as a temporary unit.

At the time of inspection, repairs were required to three locomotive controllers and a larger platform was required in front of No. 2 ball-mill distribution centre.

Revelstoke

Regal Silver, Snowflake (Columbia Lead & Zinc Mines Ltd.)

(51° 117° S.W.) The building of a mill was commenced in 1952 and completed in 1953. A 90-kva. 440-volt generator driven by a Fairbanks-Morse 100-horsepower diesel was installed to provide power for the mill. The crusher is driven by a belt-connected diesel. Later in 1953 a 2,300-volt 26-ampere a.c. generator driven by a 125-horsepower G.M.C. diesel was installed with the intention of using it to supply power for extra equipment and the crusher which would then be driven by a 30-horsepower motor. However, the 100-horsepower diesel was found to be adequate for the mill, so the change-over on the crusher was not made.

The connected load for the mill is 90 horsepower and for workshops and miscellaneous work 10 horsepower.

At the time of inspection, some maintenance work was required and some temporary wiring required removing.

Mastodon (Mastodon Zinc Mines Limited).—(51° 118° S.E.) Only development work was done until September, when operations were suspended indefinitely.

Hope

B.C. Nickel (Western Nickel Limited)

(49° 121° S.W.) In order to carry on development work, the following equipment was installed: An air compressor driven by a 200-horsepower 440-volt motor; a ventilating fan driven by a 25-horsepower motor; a 10-horsepower motor-generator set; and electrically driven shop equipment. At the time of inspection the switchgear was yet to be marked to designate circuits controlled; a ground detecting device was yet to be installed on the 440-volt circuit; and the lighting fixture in the cap and fuse house required replacing with a dust-proof fixture.

Howe Sound

Britannia (Britannia Mining and Smelting Co. Limited)

(49° 123° N.E.) Electrical work done during 1953 was as follows: In the mine, No. 5 hoist and transformer-station equipment were removed from service and dismantled. Two of the three 100-kva. transformers from this station were installed in a transformer-station built on the 4100 level in 0/57 crosscut. Two 10-kva. transformers, taken from No. 3 hoist transformer-station, were installed in a transformer-station on 1400 level for No. 9 shaft installation. From No. 1 shaft to No. 9 shaft transformer-station, 2,300 feet of 3-conductor No. 6 B. & S. gauge 7,500-volt paper-insulated lead-sheathed steel-tape-armoured cable was installed. From the No. 9 transformer-station to No. 9 hoistroom 350 feet of 3-conductor 4/0 B. & S. gauge 1,000-volt paper-insulated lead-sheathed double-steel-tape-armoured cable was installed. From

No. 9 hoistroom up No. 9 shaft to 1050 level a 3-conductor 2/0 B. & S. gauge 1,000-volt paper-insulated lead-sheathed steel-wire-armoured cable was installed. From the 41-0/57 crosscut transformer-station to the 0/57 fan-station a 3-conductor No. 2/0 B. & S. gauge 1,000-volt paper-insulated lead-covered steel-wire-armoured cable was installed. Ten scrapers, ranging from 7½ to 50 horsepower and totalling 367½ horsepower, were installed on various levels underground. Nine fans, driven by motors ranging from 2 to 75 horsepower and totalling 408 horsepower, were installed underground. On the surface the warehouse was rewired. At the mill further progress has been made with the installation of equipment in the new upper mill substation mentioned in the 1952 Annual Report. A new 40-foot addition to the ore-storage bin has been wired. A 25-horsepower fan installation has been made for dust collection at the cone crushers. The electrical equipment in the new assay office was connected, and new services were installed for the machine-shop, car-shop, foundry, and garage.

At the time of inspection the floor of one underground transformer-station was wet, the wiring in the underground crushing plant required improvement, and connectors were required on many of the slusher-motor cables. At the mill some conduit, damaged by solutions, required replacing.

Texada Island

Texada Mines Ltd. (49° 124° N.W.) A new air compressor driven by a 50-horsepower 440-volt English Electric motor has been installed in the power-house. Two 40-horsepower 440-volt motors at the third crusher were replaced with 60-horsepower motors. Four fans totalling 35 horsepower were installed for mill ventilation. At the time of inspection an isolating switch was required in the motor circuit for the new compressor and several motor and generator frames required grounding.

Vancouver Island

Upper Quinsam Lake (49° 125° N.W.)

Iron Hill (The Argonaut Co. Ltd.) No new electrical equipment was installed during 1953. Electrical work consisted mainly of removing temporary wiring and bringing the electrical equipment up to the standards laid down in the electrical regulations. A Joy rotary drill was put into service early in the year. This drill was supplied, when purchased, at 2,300 volts through a 3-conductor trailing cable. Such machines, to comply with electrical regulations, must have a shielded cable containing a grounding conductor or conductors for grounding the non-current-carrying metal parts of the machine. The machine was found to be not entirely satisfactory and so was taken out of service.

PLACER MINES

Atlin

Spruce Creek (59° 133° N.W.)

Noland Mines Limited This property was taken over by a group of lessees. The electrical equipment, with the exception of that used for running the rotary screen, was used by the lessees. A sluice-box was used in place of the rotary screen. The electrical equipment, with the exception of the locomotive controller, was found to be in satisfactory condition at the time of inspection.

Cariboo

Hixon Creek (53° 122° S.W.)

Hixon Placers Inc.—The electric lighting plant had not been used up to the date of inspection, October 7th. However, the recommendations made during a previous inspection had been put into effect.

Clinton

Big Bar Creek (51° 122° S.E.)

Alpine Dredging Enterprises Ltd. The Becker-Hopkins 8-inch suction dredge, built in 1949 by Tulameen Dredging Company Limited for use on the Tulameen River, was bought by Alpine Enterprises and put into operating condition for use on the Fraser River. The equipment on the dredge is as follows: Power is produced by a Ford V8 engine driving a 30-kva. 220-volt 3-phase 60-cycle 1,200-r.p.m. a.c. generator. The power is distributed, as required, through a central control panel, to the following motors: Two 5-horsepower, one 3-horsepower, and one 10-horsepower winch motors; one 3-horsepower head motor; one 3-horsepower screen motor; and one 7½-horsepower pump motor.

At the time of inspection several of the magnetic switches required heaters for the thermal relays, and connectors were required on several of the power cables.

NON-METALLIC MINES AND QUARRIES

McDame

Cassiar Asbestos Corporation Limited (59° 129° S.W.) The No. 2 diesel-driven alternator was installed in the power-house to bring the generating capacity to 650 kva. A drier building was built and wired, and the connected load of the mill was increased from 260 to 520 horsepower. It is the intention to rearrange the mill equipment and electrical circuits in 1954 to conform with the plans which are being prepared for a permanent plant. A chute was installed at the mine to bring the ore about 2,400 feet down the mountain to the loading-bin. The chute is in three sections, and the ore in each section is controlled by an endless cable with cross-bars. Each section is run by a 15-horsepower motor. Power is produced by a 45-kva. 3-phase diesel-electric unit for the three motors.

Blubber Bay

Pacific Lime Company Limited (49° 124° N.W.) No electrical equipment other than electrical blasting equipment is in use in the quarry. Electrical blasting is done from a 110-volt a.c. single-phase generator driven by a gasoline engine. This equipment was found to be in satisfactory condition at the time of inspection.

British Columbia Cement Company Limited The electrically powered shovel formerly used at the Blubber Bay Quarry (49° 124° N.W.) was used at the Bamberton Quarry (48° 123° N.W.) during 1953. Unsatisfactory conditions found at the Bamberton Quarry were as follows: A splice in one of the shovel trailing cables was not vulcanized; a standard disconnecting switch was in use as a blasting switch; an approved gravity-opened switch is required when blasting from power-lines. No unsatisfactory conditions were found at the time of inspection of the electrical equipment at Blubber Bay.

Indian Arm

Gilpin Construction Co., Ltd.—(49° 124° S.W.) This property was operated for only a few weeks in 1953.

Kilgard

Clayburn Company Limited.—(49° 122° S.W.) No major alterations were made to the electrical installations during 1953. At the time of inspection some maintenance work was required on the electrical equipment.

Coquitlam

Deeks-McBride Ltd.—(49° 122° S.W.) No alterations were made to the quarry electrical installations during 1953. At the time of inspection it was found that one splice in the power cable to the shovel required vulcanizing.

Fresh Water Sand & Gravel Company Limited.—(49° 122° S.W.) No major changes were made to the electrical equipment in the gravel pit during 1953. At the time of inspection several splices in the trailing cable to the electric shovel required vulcanizing.

Windermere

Columbia Gypsum Products, Inc.

(50° 115° S.W.) General Construction Company, who is doing the quarrying and trucking, has installed equipment for conveying and screening the quarried material. This equipment consists of a screen driven by a 20-horsepower motor, and four conveyors, two for stacking and two for loading, each driven by a 5-horsepower motor. Power is produced by a D-315 Caterpillar driving a 40-kw. 110/220-volt 3-phase a.c. generator.

COAL MINES

Nanaimo (49° 123° S.W.)

Bright Mine, Cassidy (Canadian Collieries (Dunsmuir) Limited).—Operations were terminated and all equipment was removed from the mine in November, 1953.

Blue Flame (Timberlands) Mine.—A pump driven by a 10-horsepower motor was installed underground to keep the mine dewatered. At the time of inspection the service to the tipple required reconstructing.

No. 8 Mine, Timberlands.—A 5-horsepower motor driving a pump was used for dewatering the mine until the heavy inflow of water in November forced its removal.

North Wellington (49° 124° N.W.)

Carruthers and Wakelam Mine.—Only a pump driven by a 3-horsepower motor is in use. At the time of inspection an improvement in the method of connecting grounding conductors was requested.

Comox (49° 124° S.E.)

Tsable River Mine (Canadian Collieries (Dunsmuir) Limited).—An additional 1,500-kva. 13,200–2,200-volt transformer was installed in the main substation and a 150-horsepower 2,200-volt induction motor was installed to drive a new fan. No unsatisfactory conditions were found at the time of inspection.

No. 8 Mine (Canadian Collieries (Dunsmuir) Limited).—Operations were terminated in February, 1953, and all equipment was removed from underground.

Union Bay Washery (Canadian Collieries (Dunsmuir) Limited).—A 10-horsepower 440-volt motor was installed on the crushed-coal elevator and a 5-horsepower motor on the small crusher. As required at the time of inspection, two switches mounted on the back of the switchboard in the washery have been moved to the front of the board.

EAST KOOTENAY (49° 114° S.W.)

Michel Colliery (The Crow's Nest Pass Coal Company Limited)

Electrification in the Michel Colliery was commenced by the installation of eight 20-horsepower 550-volt Buxton approved motors on the belts in A West seam, and one AB 50-horsepower Buxton approved longwall coal-cutter in No. 3 seam. A 10-horsepower 550-volt motor was installed to operate a small fan at A North mine. Some trouble was experienced with moisture condensing in underground switchgear. A briquette plant was built which has a connected load of 584 horsepower. Three 200-kw. 2,200–550-volt transformers supply power for this plant.

At the time of inspection the transformer-room for the by-product tipple required locking to prevent entry of unauthorized persons, and some of the wiring in the coke tipple required improving.

Elk River Colliery (The Crow's Nest Pass Coal Company Limited)

The use of electrical power underground has been discontinued, and all the underground equipment will be moved to Michel Colliery. A 550-volt power-line 1,200 feet long was installed to supply power to a new fan motor at No. 9 mine. The motor was not installed by the end of 1953. At the time of inspection some temporary wiring required removing and some wiring required enclosing.

TELKWA (54° 127° N.E.)

Bulkley Valley Collieries Limited

Trouble was again experienced with moisture condensing in the electrical equipment, and one switch and an insulating bushing were burned out. The use of bags of silica-jel in the electrical equipment was advised. To be fully effective, the silica-jel must be removed and dehydrated before it becomes saturated. Low voltage caused a pump motor to burn out. The above-mentioned burn-outs are considered as dangerous occurrences in a coal mine and are recorded as such.

At the time of inspection a number of cover-plate securing bolts were loose. To maintain permissible equipment in a flame-proof condition, all cover bolts must be tightly secured.

A strip mine was opened in July, and an electrical service was installed to supply power to a small pump motor and an electric drill.

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.

CHARGES*

A 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 or $2.50. 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.

On receipt of a request, two free publications may be supplied to an applicant without charge. If more than two nominally free publications are requested, the applicant should remit 50 cents for each such publication in excess of two.

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	50¢	—	1941	Free	1.00
1916	50¢	—	1942	Free	1.00
1917	50¢	—	1943	Free	—
1918	Free	—	1944	Free	1.00
1919	50¢	—	1945	Free	1.00
1920	50¢	—	1946	Free	1.00
1921	Free	—	1947	Free	1.00
1922	50¢	—	1948	Free	1.00
1923	50¢	—	1949	Free	1.00
1924	—	—	1950	Free	1.00
1925	—	—	1951	Free	1.00
1926	—	—	1952	$1.00	2.50
1927	Free	—	1953	Free	2.50

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.

* NOTE.—All charges for sales within British Columbia are subject to the 5-per-cent sales tax.

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. Out of print.
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, 1953.

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. Out of print.
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.)
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.)
Bulletin 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.)
Bulletin No. 34: Geology of the Yanks Peak-Roundtop Mountain Area, Cariboo District, British Columbia. (By Stuart S. Holland.)
Bulletin No. 35: Geology of the Stanford Range of the Rocky Mountains, East Kootenay District, British Columbia. (By G. G. L. Henderson.)

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 maps conform to the reference and mineral-reference maps issued by the Lands Department in size and geographical detail and correspond as to numbers.

PERMITS AND LICENCES UNDER " PETROLEUM AND NATURAL GAS ACT "

Maps showing the locations of permits and licences under the " Petroleum and Natural Gas Act " may be obtained upon application to the office of the Surveyor-General, Department of Lands, Victoria, B.C., accompanied by payment of $3* per sheet.

Regarding reports listing changes in permits, licences, and leases held, monthly reports listing additions and revision to permit-location maps and giving information listing changes in title to permits, licences, and leases and related matters are available from the office of the Controller upon application and payment of a fee of $1* per annum.

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 on payment of the proper charge. 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. The charge (including tax) in British Columbia is $2.10.

Prospectors in other Provinces and in the United States who are seriously interested in prospecting in British Columbia may be supplied with sets of specimens. The price will be $2.50, provided that the collection can be shipped parcel post by surface mail. Sales outside British Columbia are not subject to the 5-per-cent sales tax.

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.

* Charges for sales within British Columbia are subject to the 5-per-cent sales tax, which must accompany the remittance.

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 1953 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 1953:—

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																	
Big Bull	Atlin	58° 133° N.W.	1	1	1	1	1	..	2	..	..	..	..	..	..	..	81
Husselbee Uranium	Atlin	59° 133° N.W.	..	..	..	..	..	..	..	..	..	..	3	..	..	..	79
Tulsequah Chief	Atlin	58° 133° N.W.	1	1	1	1	1	..	2	..	..	..	..	..	..	..	81
Central British Columbia																	
Bear	Quesnel	52° 121° N.E.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	42
Cariboo Gold Quartz	Cariboo	53° 121° S.W.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	96
Cariboo-Hudson	Cariboo	53° 121° S.W.	..	..	..	..	..	3	..	..	..	..	..	..	..	..	96
Emerald, Tahtsa Lake	Omineca	53° 127° N.E.	2	1	..	1	1	..	..	..	..	..	..	..	..	..	42
Duthie	Omineca	54° 127° N.E.	1	2	..	1	1	..	..	..	..	..	..	..	..	..	93
Empire Valley	Clinton	51° 122° S.E.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	97
Grotto	Omineca	54° 128° N.E.	1	1	1	..	..	3	..	..	..	..	..	..	..	..	92
Harrison	Omineca	53° 127° N.E.	3	3	..	..	..	3	..	..	..	..	..	..	..	..	94
Island Mountain	Cariboo	53° 121° S.W.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	96
Jim	Quesnel	52° 121° N.E.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	97
Lustdust	Omineca	55° 126° N.E.	3	3	..	..	..	..	..	..	..	..	..	..	..	..	94
Mamie	Omineca	54° 127° N.E.	1	2	..	1	1	..	..	..	..	..	..	..	..	..	93
Nicholson Creek	Omineca	54° 128° N.E.	..	2	1	..	..	..	..	..	..	..	..	..	..	..	92
Northwestern Exploration	Omineca	56° 124° S.W.	..	..	3	3	..	..	..	..	..	..	..	..	..	..	94
Red Rose	Omineca	55° 127° S.W.	1	1	1	..	..	1	..	..	..	..	..	..	..	..	93
Rocher Deboule	Omineca	55° 127° S.W.	1	1	1	..	..	2	..	..	..	..	..	..	..	..	93
Sil-Van	Omineca	54° 127° N.E.	1	2	..	1	1	..	..	..	..	..	..	..	..	..	93
Silver Cup	Omineca	54° 126° N.E.	2	1	..	1	1	..	..	..	..	..	..	..	..	..	42
Silver Standard	Omineca	55° 127° S.W.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	92
Taylor Windfall	Clinton	51° 123° S.E.	1	..	..	..	..	..	..	..	..	..	..	..	..	..	97
Coast and Islands																	
A.M.	New Westm't'r	49° 121° S.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	157
Anyox	Skeena	55° 129° S.W.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	92
B.C. Nickel	New Westm't'r	49° 121° S.W.	..	..	..	..	..	..	..	..	..	..	..	..	..	3	158
Blue Grouse	Victoria	48° 124° N.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	170
Bornite	Victoria	48° 124° N.W.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	170
Britannia	Vancouver	49° 123° N.E.	2	2	1	2	1	..	2	..	..	..	..	..	..	..	158
Cambrian Chieftain	Vancouver	50° 123° N.W.	..	3	3	..	3	..	..	..	..	..	..	..	..	..	162
Copper Road	Nanaimo	50° 125° S.W.	..	1	1	..	..	..	..	..	..	..	..	..	..	..	165
Dodge Copper	Nanaimo	50° 125° S.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	163
East	Skeena	56° 130° S.E.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	90
Granduc	Skeena	56° 130° S.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	84
Indian	Skeena	56° 130° S.E.	1	1	..	1	1	..	..	..	..	..	..	..	..	..	89
Iron Hill	Nanaimo	49° 125° N.W.	..	..	..	..	..	..	..	1	..	..	..	..	..	..	170
Lake	Nanaimo	49° 124° N.E.	..	..	..	..	..	..	..	1	..	..	..	..	..	..	162

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 1953 Annual Report—*Continued*

Property	Mining Division	Latitude and Longitude	Gold	Silver	Copper	Lead	Zinc	Tungsten	Cadmium	Iron	Manganese	Antimony	Uranium	Cobalt	Molybdenum	Nickel	Page
Coast and Islands— Continued																	
Last Chance, King Island	Skeena	52° 127° S.W.													3		165
Lucky Four	New Westm't'r	49° 121° S.W.			3												158
McVicar	Vancouver	49° 123° N.E.		3	3	3	3										160
Neekas	Skeena	52° 128° S.E.			3		3										166
Paxton	Nanaimo	49° 124° N.E.								1							162
Premier Border	Skeena	56° 130° S.E.	1	2		1	1		2								89
Prescott	Nanaimo	49° 124° N.E.								1							162
Privateer	Alberni	50° 126° S.W.	1	2	2	2											43
Promise Well	Skeena	51° 127° N.W.						3									165
Promise Well Nos. 1 and 11	Skeena	52° 127° S.W.								3							166
Silbak Premier	Skeena	56° 130° S.E.	1	2	2	1	1		1								89
Silver Tip	Skeena	56° 130° S.E.	3	3		3	3										89
Toric	Skeena	55° 129° N.W.	2	1		2	2										90
Wolf	Skeena	55° 129° N.W.	2	1	2	2											90
Yreka	Nanaimo	50° 127° S.W.			3												167
South Central British Columbia																	
Attwood Copper	Greenwood	49° 118° S.W.			3												111
Billie Goat	Osoyoos	49° 119° S.W.			3			3									107
Bralorne	Lillooet	50° 122° N.W.	1	2													98
Copper Mountain	Similkameen	49° 120° S.W.	2	2	1												103
D.A.	Greenwood	49° 118° S.W.	3	3		3	3										110
Dynamo	Greenwood	49° 118° S.W.	3	3		3	3	3									110
Elizabeth	Lillooet	51° 122° S.W.	3														98
Emeline	Greenwood	49° 118° S.W.	3	3		3	3										109
Ex	Kamloops	50° 119° N.W.	2	1		1	1										102
Fairview	Osoyoos	49° 119° S.W.	1														108
Fife	Greenwood	49° 118° S.E.	3		3												111
French	Osoyoos	49° 120° S.E.	1	2	2												106
Gold Bug	Greenwood	49° 118° S.W.	3	3		3	3										110
Golden Contact	Lillooet	50° 122° N.E.	3														101
Golden Ledge	Lillooet	50° 122° N.W.	3														100
Gray Rock	Lillooet	50° 122° N.W.										3					100
Highland-Bell	Greenwood	49° 119° S.E.	2	1		1	1		2								108
Little Gem	Lillooet	50° 122° N.W.	3										3	3			100
Nickel Plate	Osoyoos	49° 120° S.E.	1	2	2												106
Pioneer	Lillooet	50° 122° N.W.	1	2													99
Providence	Greenwood	49° 118° S.W.	3	3		3	3										109
Rexspar Uranium	Kamloops	51° 119° N.W.												3			101
Sally	Greenwood	49° 119° S.E.		3		3	3		3								108
Shamrock	Osoyoos	49° 119° S.W.			3			3									107
Silver Hill	Similkameen	49° 121° S.E.		3		3	3										103
Stemwinder	Greenwood	49° 118° S.W.	3		3												110
Tungsten Queen	Lillooet	51° 122° S.W.						3				3					100
Twin Mountain	Kamloops	51° 119° S.W.	3	3	3	3	3										101
W.S.	Greenwood	49° 118° S.E.		3		3	3										111
Waterloo	Greenwood	49° 118° N.W.		3		3	3										109
Wellington	Greenwood	49° 119° S.E.	2	1		1	1										109
Southeastern British Columbia																	
Amazon	Ainsworth	49° 116° N.W.		3		3	3										133
Amco	Nelson	49° 117° S.E.		3		3	3										116
American Boy	Slocan	49° 117° N.E.		3		3	3										139
Arlington	Nelson	49° 117° S.E.	1	2		2	1										116
Ayesha	Ainsworth	49° 116° N.W.		3		3	3										132
Baltimore	Ainsworth	49° 117° N.E.		3		3											136
Black Diamond	Ainsworth	49° 116° N.W.		1		1	1										123
Black Rock	Nelson	49° 117° S.E.		3		3	3										117
Blue Jay	Revelstoke	50° 117° N.E.		3		3	3										144
Bluebell	Ainsworth	49° 116° N.W.		2	2	1	1		2								121
Bluebird, Sandon	Slocan	49° 117° N.E.		3		3	3										139
Bluebird, Rossland	Trail Creek	49° 117° S.W.	3	3		3	3										112
Bosun	Slocan	49° 117° N.E.		3		3	3										141
Boy Scout	Fort Steele	49° 116° N.E.	3	3	3	3	3										147
Buckeye	Ainsworth	49° 116° N.W.		2		1	1										133
Budwiser No. 2	Ainsworth	49° 116° N.W.		3		3	3										133

Lode-metal Deposits Referred to in the 1953 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																	
Caledonia	*Ainsworth*	50° 117° S.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	137
Carey Fraction	Ainsworth	49° 116° N.W.	..	2	..	1	1	..	..	..	..	..	..	..	..	..	131
Copper Chief	Revelstoke	50° 117° N.W.	..	3	..	3	..	3	..	..	..	..	..	..	..	..	144
Cork	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	141
Cork Province	Ainsworth	49° 117° N.E.	..	2	..	1	1	..	2	..	..	..	..	..	..	..	136
Creston Hill	Nelson	49° 116° S.E.	..	..	3	..	..	..	..	..	..	..	..	..	..	..	147
Cromwell	Revelstoke	50° 117° N.E.	1	..	2	..	2	2	..	..	..	..	..	..	..	..	146
Daisy Bell	Ainsworth	*49° 116° N.W.*	..	3	..	3	3	..	..	..	..	..	..	..	..	..	133
Deadman	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	139
Discovery Fraction	Slocan	49° 117° N.E.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	141
Dixie	Nelson	49° 117° S.E.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	114
Dodger	Nelson	49° 117° S.E.	..	..	..	..	..	1	..	..	..	..	..	..	..	..	117
Dundee	Nelson	49° 117° S.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	115
Ed No. 8	Nelson	49° 117° S.E.	..	2	..	1	2	..	..	..	..	..	..	..	..	..	120
Eden-Crescent	*Ainsworth*	49° 116° N.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	130
Emerald, Salmo	Nelson	49° 117° S.E.	..	..	..	..	..	1	..	..	..	..	..	..	..	..	117
Emerald Hill	Ainsworth	50° 117° S.E.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	45
Enterprise	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	141
Estella	Fort Steele	49° 115° N.W.	..	2	..	1	1	..	..	..	..	..	..	..	..	..	150
Eureka	Nelson	49° 117° S.E.	3	..	3	..	..	..	..	..	..	..	..	..	..	..	113
Feeney	Nelson	49° 117° S.E.	..	..	..	..	..	1	..	..	..	..	..	..	..	..	117
Fisher Maiden	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	142
Flint	Ainsworth	49° 117° N.E.	2	1	..	1	1	..	..	..	..	..	..	..	..	..	137
Galena Farm	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	142
Goodenough	Nelson	49° 117° S.E.	1	2	..	1	1	..	..	..	..	..	..	..	..	..	114
Granite	Nelson	49° 117° S.E.	1	1	..	1	1	..	..	..	..	..	..	..	..	..	113
H.B.	Nelson	49° 117° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	117
Hawk Creek	Golden	51° 116° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	155
Highland	Ainsworth	49° 116° N.W.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	133
Highlander	Ainsworth	49° 116° N.W.	2	2	..	1	1	..	..	..	..	..	..	..	..	..	129
I.X.L.	Trail Creek	49° 117° S.W.	1	2	..	..	..	..	..	..	..	..	..	..	..	..	113
J.G.	Ainsworth	50° 116° S.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	146
Jack Pot	Ainsworth	49° 116° N.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	131
Jack Pot	Nelson	49° 117° S.E.	..	..	..	..	3	..	..	..	..	..	..	..	..	..	115
Jersey	Nelson	49° 117° S.E.	..	2	..	1	1	..	2	..	..	..	..	..	..	..	117
Kootenay Florence	Ainsworth	49° 116° N.W.	2	2	..	1	1	..	2	..	..	..	..	..	..	..	131
Kootenay King	*Fort Steele*	*49° 115° N.W.*	..	*2*	..	*1*	*1*	..	..	..	..	..	..	..	..	..	*150*
Krao	Ainsworth	49° 116° N.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	130
Lakeshore	Ainsworth	49° 116° N.W.	..	2	..	1	1	..	..	..	..	..	..	..	..	..	132
Lakeview	Nelson	49° 116° S.W.	..	2	..	1	1	..	..	..	..	..	..	..	..	..	120
Last Chance	Nelson	49° 117° S.E.	..	..	..	..	3	..	..	..	..	..	..	..	..	..	115
Libby	Ainsworth	49° 116° N.W.	..	1	..	1	2	..	..	..	..	..	..	..	..	..	133
Little Donald	Ainsworth	49° 116° N.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	123
Little Phil	Ainsworth	49° 116° N.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	123
Lone Bachelor	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	140
Lucky Boy	Revelstoke	50° 117° N.W.	..	3	..	3	..	3	..	..	..	..	..	..	..	..	144
Lucky Jim	Slocan	50° 117° S.E.	..	2	..	2	1	..	2	..	..	..	..	..	..	..	138
Mammoth	*Slocan*	49° 117° N.E.	..	*1*	..	1	*1*	..	..	..	..	..	..	..	..	..	*141*
Mastodon	Revelstoke	51° 118° S.E.	..	3	..	3	3	..	3	..	..	..	..	..	..	..	157
Min	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	141
Mineral King	Golden	50° 116° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	151
Monarch	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	141
Moonshine	Ainsworth	50° 116° S.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	147
Noble Five	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	139
O.K.	Trail Creek	49° 117° S.W.	3	3	..	..	..	..	..	..	..	..	..	..	..	..	113
Ottawa	Slocan	49° 117° N.E.	..	1	..	2	2	..	..	..	..	..	..	..	..	..	143
Oxide	Nelson	49° 117° S.E.	..	..	..	..	3	..	..	..	..	..	..	..	..	..	115
Paradise	Golden	50° 116° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	151
Reeves MacDonald	Nelson	49° 117° S.E.	..	2	..	1	1	..	2	..	..	..	..	..	..	..	119
Regal Silver	Revelstoke	51° 117° S.W.	..	1	2	1	..	3	..	..	..	..	..	..	..	..	156
Renata	*Trail Creek*	*49° 118° S.E.*	..	3	..	3	3	3	..	..	..	..	..	..	..	..	143
Richmond-Eureka	Slocan	49° 117° N.E.	2	1	..	2	1	..	2	..	..	..	..	..	..	..	138
Right Bower	Ainsworth	50° 116° S.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	147
St. Patrick	Ainsworth	50° 116° S.W.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	147
Scranton	Ainsworth	49° 117° N.E.	1	1	..	1	1	..	2	..	..	..	..	..	..	..	134

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 1953 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																	
Silver Bear	Ainsworth	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	137
Silver Chief No. 2	Revelstoke	50° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	146
Silver Giant	Golden	50° 116° N.E.	..	2	..	1	2	..	..	..	..	..	..	..	..	..	154
Silversmith	Slocan	49° 117° N.E.	2	1	..	2	1	..	2	..	..	..	..	..	..	..	138
Snowflake	Revelstoke	51° 117° S.W.	..	1	2	1	..	3	..	..	..	..	..	..	..	..	156
Spider	Revelstoke	50° 117° N.W.	2	1	2	1	1	..	2	..	..	..	..	..	..	..	143
Spokane	Ainsworth	49° 116° N.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	130
Spokane	Nelson	49° 116° S.W.	1	1	..	1	2	..	..	..	..	..	..	..	..	..	116
Standard	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	141
Sullivan	Fort Steele	49° 115° N.W.	2	1	..	1	1	..	..	..	..	..	..	..	..	..	148
Sun Fraction	Nelson	49° 117° S.E.	3	..	..	..	..	..	..	..	..	..	..	..	..	..	114
Surprise	Ainsworth	50° 116° S.W.	..	3	..	..	..	..	..	..	..	..	..	..	..	..	147
Townsite	Ainsworth	49° 116° N.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	130
Trinket	Ainsworth	49° 116° N.W.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	130
Truman	Nelson	49° 117° S.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	119
Tungsten King	Nelson	49° 117° S.E.	..	..	..	..	..	3	..	..	..	..	..	..	..	..	119
Twin	Ainsworth	49° 116° N.W.	..	1	..	1	1	2	..	..	..	..	..	..	..	..	131
Utica	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	137
Valparaiso	Nelson	49° 116° S.W.	3	3	..	..	..	3	..	..	..	..	..	..	..	..	121
Van Roi	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	142
Velvet	Trail Creek	49° 117° S.W.	1	2	1	..	..	..	..	..	..	..	..	..	..	..	112
Victor	Slocan	49° 117° N.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	140
Victory	Nelson	49° 117° S.E.	..	..	..	..	..	3	..	..	..	..	..	..	..	..	116
Vigilant	Ainsworth	49° 116° N.W.	..	2	..	1	1	..	2	..	..	..	..	..	..	..	134
Vulture	Slocan	49° 117° N.E.	..	1	..	1	1	..	..	..	..	..	..	..	..	..	139
Whitewater	Slocan	50° 117° S.E.	2	1	..	1	1	..	2	..	..	..	..	..	..	..	138
Wonderful	Slocan	49° 117° N.E.	..	3	..	3	3	..	..	..	..	..	..	..	..	..	140
Woodbury (Nameless Fr.)	Ainsworth	49° 116° N.W.	..	2	..	1	2	..	..	..	..	..	..	..	..	..	133
Yankee Girl	Nelson	49° 117° S.E.	3	3	..	3	3	..	..	..	..	..	..	..	..	..	115

INDEX

A

B

C

D

E

F

G

H

I

J

K

L

Mc and Mac

M

N

O

P

Q

R

S

T

U

V

W

LIST OF ILLUSTRATIONS

DRAWINGS

PHOTOGRAPHS

VICTORIA, B.C.
Printed by DON MCDIARMID, Printer to the Queen's Most Excellent Majesty
1954

2,160-254-7768