PART G

ANNUAL REPORT

OF THE

MINISTER OF MINES

OF THE PROVINCE OF

BRITISH COLUMBIA

FOR THE

YEAR ENDED 31ST DECEMBER

1938

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

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1939.

BRITISH COLUMBIA DEPARTMENT OF MINES.

VICTORIA, B.C.

Hon. W. J. ASSELSTINE, *Minister.*

JOHN F. WALKER, *Deputy Minister.*

JAMES DICKSON, *Chief Inspector of Mines.*

D. E. WHITTAKER, *Chief Analyst and Assayer.*

P. B. FREELAND, *Chief Mining Engineer.*

R. J. STEENSON, *Chief Gold Commissioner.*

PART G.

INSPECTION OF MINES.

BY

JAMES DICKSON.

The Province is divided into six Inspection Districts, as follows:—

Inspection District.	Mining Divisions in District.
Coast	Quatsino, Clayoquot, Alberni, Victoria, Vancouver, New Westminster, Yale, and Nanaimo.
Northern Interior	Lillooet, Ashcroft, Clinton, Quesnel, Cariboo, Peace River, and that portion of the Omineca east of the 123rd degree of longitude.
Interior	Similkameen, Osoyoos, Nicola, Vernon, and Kamloops.
East Kootenay and Boundary	Greenwood, Grand Forks, Trail Creek, Nelson, Slocan City, Slocan, Arrow Lake, Ainsworth, Lardeau, Revelstoke, Fort Steele, Windermere, and Golden.
Northern	Queen Charlotte Islands, Bella Coola, Stikine, Portland Canal, Skeena, Atlin, and that portion of Omineca west of the 124th degree of longitude.

The Inspectors inspect the coal mines, metalliferous mines, and quarries in their respective districts.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

James Dickson	Chairman, Victoria.
James Strang	Secretary, Victoria.
H. E. Miard	Member, Fernie.

Messrs. Strang and Miard and the Inspector of Mines of the district in which an examination is being held form the Board for granting certificates of competency to coal-miners.

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

INSTRUCTORS, MINE-RESCUE STATIONS.

Richard Nichol	Nanaimo Station.
James L. Brown	Cumberland Station.
Alfred Gould	Princeton Station.
John T. Puckey	Fernie Station.

The District Inspectors of Mines have their headquarters in the different mining areas as follows: H. E. Miard, Fernie; Hamilton C. Hughes, Nelson; John G. Biggs, Merritt; Charles Graham, Prince Rupert; Edward R. Hughes, Cumberland; John MacDonald, Nanaimo; James Strang, Victoria. During the year Inspector Thomas R. Jackson retired and was succeeded by Inspector James Mitchell, with headquarters at Lillooet.

During 1938 the "Coal-mines Regulation Act" was amended as follows:—

AN ACT TO AMEND THE "COAL-MINES REGULATION ACT."

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of British Columbia, enacts as follows:—

1. This Act may be cited as the "Coal-mines Regulation Act Amendment Act, 1938."

2. Section 71 of the "Coal-mines Regulation Act," being chapter 188 of the "Revised Statutes of British Columbia, 1936," is amended by adding the following as subsection (3):—

"(3.) Without limiting or otherwise affecting the rights of the persons employed in the mine, as otherwise provided for in this Act, in all cases where an inspection is made by the mine management or the Inspector, following an unusual occurrence or fatal accident, as defined in subsections (1) and (2), the persons employed in the mine may select one of their number to accompany the mine manager or the Inspector when making such inspection."

PRODUCTION.

The total tonnage produced by the coal mines of the Province for the year ended December, 1938, was 1,309,428 tons, being a decrease of 135,259 tons or 9.4 per cent. from production of 1937.

The Coast District, which includes Vancouver Island, Nicola-Princeton District, and the Northern District, produced 875,360 tons, a decrease of 10,191 tons or 1.03 per cent. from 1937.

Vancouver Island Collieries produced 684,398 tons, a decrease of 134,049 tons or 16.37 per cent. from 1937.

The Northern District produced 3,990 tons, a decrease of 527 tons from 1937.

The Nicola-Princeton District produced 186,972 tons, an increase of 24,385 tons or 14.9 per cent. over 1937.

The East Kootenay District produced 434,068 tons, a decrease of 25,068 tons or 5.46 per cent. from 1937.

The following table shows the output and *per capita* production daily and for the year of the various mines:—

Colliery and Mine.	Gross Tons of Coal mined during Year.	Days worked.	Total No. of Employees.	Tons of Coal mined per Employee daily.	Tons of Coal mined per Employee for Year.	No. of Employees Underground.	Tons of Coal mined per Underground Employee daily.	Tons of Coal mined per Underground Employee for Year.
Comox Colliery, No. 5 mine	203,338	204	575	1.73	353	454	2.19	447
Comox Colliery, No. 8 mine	62,295	176	134	2.63	464	115	3.07	541
Northfield Colliery	117,550	205	331	1.73	355	284	2.02	414
South Wellington, No. 10 mine	19,465	123	64	2.47	304	54	2.92	360
Western Fuel Colliery, Nanaimo	146,176	194	419	1.80	349	180	4.18	812
Reserve mine	114,934	204	227	2.48	506	177	3.18	649
Lantzville Colliery	5,237	271	19	1.01	275	14	1.38	374
Fiddick mine	14	24	4	.....	3	4	.....	3
Chambers' mine	4,492	190	9	2.62	499	8	2.95	561
Beban's mine	8,195	96	38	2.24	215	31	2.75	264
Loudon's mine	140	24	3	1.91	46	2	2.91	70
Cassidy mine	1,610	223	5	1.44	322	4	1.89	402
Biggs' mine	228	170	2	0.67	114	2	0.67	114
Lewis' mine	715	265	3	0.89	238	3	0.89	238
Berkley Creek mine	9	41	2	.....	4	2	.....	4
Clifford mine	.....	.....	6	.....	.....	4	.....	.....
Coalmont Collieries, Ltd.	79,816	162	191	2.58	418	113	4.35	706
Middlesboro Collieries, Ltd.	25,696	171	100	1.50	257	66	2.22	389
Granby Consolidated M.S. & P. Co., Ltd.	62,914	303	97	2.13	648	72	2.88	873
Princeton Tulameen Coal Co.	17,377	259	23	2.93	755	18	3.74	965
Black mine (Glover Trust)	426	.....	2	.....	213	2	.....	213
Hat Creek Colliery	743	107	2	3.46	371	2	3.46	371
Bulkley Valley Colliery	3,889	171	11	2.06	353	8	2.84	486
Aveling Colliery	101	38	2	1.31	50	2	1.31	50
Coal Creek Colliery	105,736	171	170	3.63	622	128	4.83	826
Michel Colliery	328,332	230	523	2.72	627	339	4.21	968

COLLIERIES OF VANCOUVER ISLAND INSPECTION DISTRICT.

The output of Vancouver Island Collieries was 684,398 tons. Of this amount, 74,325 tons or 10.8 per cent. was lost in preparation for the market; 58,292 tons of 8.5 per cent. was consumed by producing companies as fuel; 559,707 tons was sold in the competitive market, of which 7,926 tons was taken from stock; thus 80.7 per cent. of the output was sold.

Of this amount sold in the competitive market, 515,662 tons or 92.1 per cent. was sold in Canada and 44,045 or 7.9 per cent. was sold in the United States.

Collieries of the Nicola-Princeton District.

Of the gross output of 186,972 tons produced by the collieries of the Nicola-Princeton District, 15,429 tons or 8.2 per cent. was consumed by the producing companies as fuel and 171,543 tons or 91.8 per cent. was sold in the competitive markets in Canada.

Collieries of the East Kootenay Inspection District.

The output of the collieries in the East Kootenay District was 434,068 tons. Of this amount, 3,338 tons or 0.76 per cent. was lost in preparation for the market, 12,678 tons or 2.9 per cent. was consumed as fuel by the producing companies, 77,335 tons or 17.8 per cent. was used in making coke, and 340,764 tons was sold in the competitive market. Of this amount, 293,364 tons or 86.1 per cent. was sold in Canada and 47,000 tons or 23.9 per cent. was sold in the United States.

The following table shows the *per capita* production of the various districts for the past five years. Similar figures for the years prior to 1932 are shown in previous Annual Reports.

Output and Per Capita Production in Various Districts.

Year.	District.	Gross Tons of Coal mined during Year.	Total No. of Employees at Producing Collieries.	Tons of Coal mined per Employee for Year.	No. of Men employed Underground in Producing Collieries.	Tons of Coal mined per Underground Employee for Year.
1934	East Kootenay District	627,619	754	832	551	1,139
	Coast District	719,471	2,139	336	1,499	480
	Whole Province	1,347,090	2,893	465	2,050	657
1935	East Kootenay District	407,110	819	497	614	663
	Coast District	780,858	2,152	363	1,531	510
	Whole Province	1,187,968	2,971	399	2,145	554
1936	East Kootenay District	470,606	606	776	459	1,025
	Coast District	875,865	2,208	396	1,556	563
	Whole Province	1,346,741	2,814	478	2,015	668
1937	East Kootenay District	459,136	628	731	462	972
	Coast District	985,551	2,525	390	1,824	540
	Whole Province	1,444,687	3,153	458	2,286	632
1938	East Kootenay District	434,068	693	626	467	972
	Coast District	875,360	2,269	386	1,621	540
	Whole Province	1,309,428	2,962	442	2,088	675

The following table shows the production and distribution of coal by the various collieries and districts compiled from returns furnished by the owners:—

COLLIERIES OF BRITISH COLUMBIA—PRODUCTION, 1938.

Mine.	Sold.			Total Sales.	Lost in Washing.	Used in making Coke.	Used under Companies' Boilers, etc.	Total for Colliery Use.	Stock.		Difference.		Output for the Year 1938.
	In Canada.	In U.S.A.	Elsewhere.						First of Year.	Last of Year.	Added to.	Taken from.	
Vancouver Island District.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Canadian Collieries (D.), Ltd.—													
Comox Colliery (No. 5 mine)	167,611	7,266	.....	174,877	16,770	.....	6,504	23,274	7,077	12,264	5,187	.....	203,338
Comox Colliery (No. 8 mine)	56,751	2,295	.....	59,046	3,249	.....	.....	3,249	.....	.....	.....	.....	62,295
Northfield Colliery	84,924	21,443	.....	106,367	10,448	.....	498	10,946	12,535	12,772	237	.....	117,550
South Wellington (No. 10 mine)	10,701	.....	.....	10,701	6,171	.....	44	6,215	33	2,582	2,549	.....	19,465
Western Fuel Corp. of Canada, Ltd.—													
No. 1 mine	126,125	9,129	.....	135,254	22,305	.....	26,320	48,625	37,703	.....	.....	37,703	146,176
Reserve mine	51,923	3,912	.....	55,835	13,924	.....	23,481	37,405	.....	21,694	21,694	.....	114,934
Lantzville Colliery	4,697	.....	.....	4,697	.....	.....	540	540	.....	.....	.....	.....	5,237
Fiddick mine	14	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	14
Chambers' mine	4,492	.....	.....	4,492	.....	.....	.....	.....	.....	.....	.....	.....	4,492
Beban's mine	5,832	.....	.....	5,832	1,458	.....	905	2,363	.....	.....	.....	.....	8,195
Loudon's mine	120	.....	.....	120	.....	.....	.....	.....	120	140	20	.....	140
Cassidy mine	1,520	.....	.....	1,520	.....	.....	.....	.....	.....	90	90	.....	1,610
Biggs' mine	228	.....	.....	228	.....	.....	.....	.....	.....	.....	.....	.....	228
Lewis' mine	715	.....	.....	715	.....	.....	.....	.....	.....	.....	.....	.....	715
Berkley Creek mine	9	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	9
Totals, Vancouver Island District	515,662	44,045	.....	559,707	74,325	.....	58,292	132,617	57,468	49,542	29,777	37,703	684,398
Nicola-Princeton District.													
Coalmont Collieries, Ltd.	70,435	.....	.....	70,435	.....	.....	9,381	9,381	.....	.....	.....	.....	79,816
Middlesboro Collieries, Ltd.	21,737	.....	.....	21,737	.....	.....	3,959	3,959	.....	.....	.....	.....	25,696
Granby Consolidated M.S. & P. Co., Ltd.	60,875	.....	.....	60,875	.....	.....	2,039	2,039	.....	.....	.....	.....	62,914
Princeton Tulameen Coal Company	17,377	.....	.....	17,377	.....	.....	.....	.....	.....	.....	.....	.....	17,377
Black mine (Glover Trust)	426	.....	.....	426	.....	.....	.....	.....	.....	.....	.....	.....	426
Hat Creek Colliery	693	.....	.....	693	.....	.....	50	50	.....	.....	.....	.....	743
Totals, Nicola-Princeton District	171,543	.....	.....	171,543	.....	.....	15,429	15,429	.....	.....	.....	.....	186,972
Northern District.													
Bulkley Valley Colliery	3,769	.....	.....	3,769	.....	.....	120	120	.....	.....	.....	.....	3,889
Aveling Colliery	101	.....	.....	101	.....	.....	.....	.....	.....	.....	.....	.....	101
Totals, Northern District	3,870	.....	.....	3,870	.....	.....	120	120	.....	.....	.....	.....	3,990
East Kootenay District.													
Coal Creek Colliery	68,163	34,500	.....	102,663	.....	.....	3,181	3,181	354	246	.....	108	105,736
Michel Colliery	225,201	12,900	.....	238,101	3,338	77,335	9,497	90,170	200	261	61	.....	328,332
Totals, East Kootenay District	293,364	47,400	.....	340,764	3,338	77,335	12,678	93,351	554	507	61	108	434,068
Coal.													
Grand totals for Province	984,439	91,445	.....	1,075,884	77,663	77,335	86,519	241,517	58,022	50,049	29,838	37,811	1,309,428
Coke.													
Crow's Nest Pass Coal Co., Ltd.—													
Michell Colliery	25,283	23,531	.....	48,814	.....	.....	.....	.....	464	401	.....	63	48,751
Total Coke for Province	25,283	23,531	.....	48,814	.....	.....	.....	.....	464	401	.....	63	48,751

Collieries of British Columbia—Men employed, 1938.

Mine.	White Men.																		Indians.			Japanese and Chinese.									Total Men employed.		
	Supervision and Clerical.			Miners.			Helpers.			Labourers.			Mechanics and Skilled Labour.			Boys.			Labourers.			Miners.			Helpers.			Labourers.					
	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.	U.	A.	T.
Vancouver Island District.																																	
Canadian Collieries (D.), Ltd.—																																	
Comox Colliery (No. 5 mine)	24	10	34	165	—	165	17	—	17	129	34	163	92	51	143	27	7	34	—	—	—	—	—	—	—	—	—	—	19	19	454	121	575
Comox Colliery (No. 8 mine)	8	1	9	30	—	30	—	—	—	39	6	45	32	9	41	6	3	9	—	—	—	—	—	—	—	—	—	—	—	—	115	19	134
Northfield Colliery	11	2	13	111	—	111	—	—	—	101	13	114	32	12	44	29	20	49	—	—	—	—	—	—	—	—	—	—	—	—	284	47	331
South Wellington (No. 10 mine)	4	1	5	31	—	31	—	—	—	11	7	18	4	2	6	4	—	4	—	—	—	—	—	—	—	—	—	—	—	—	54	10	64
Western Fuel Corp. of Canada, Ltd.—																																	
No. 1 mine	10	22	32	95	—	95	—	—	—	49	98	147	17	59	76	9	9	18	—	—	—	—	—	—	—	—	—	—	51	51	180	239	419
Reserve mine	12	6	18	97	—	97	—	—	—	43	13	56	13	10	23	12	10	22	—	—	—	—	—	—	—	—	—	—	11	11	177	50	227
Lantzville Colliery	1	—	1	11	—	11	2	—	2	—	1	1	—	1	1	—	2	2	—	—	—	—	—	—	—	—	—	—	1	1	14	5	19
Fiddick mine	—	—	—	2	—	2	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	4
Chambers' mine	—	—	—	6	—	6	2	—	2	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	1	9
Beban's mine	2	1	3	17	—	17	—	—	—	7	2	9	5	1	6	—	—	—	—	—	—	—	—	—	—	—	—	—	3	3	31	7	38
Loudon's mine	—	—	—	2	—	2	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	3
Cassidy mine	1	—	1	2	—	2	1	—	1	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	1	5
Biggs' mine	—	—	—	1	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Lewis' mine	1	—	1	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	3
Berkley Creek mine	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Clifford's mine	1	1	2	1	—	1	1	—	1	1	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	2	6
Totals, Vancouver Island District	76	44	120	574	—	574	24	—	24	382	178	560	195	145	340	87	51	138	—	—	—	—	—	—	—	—	—	—	85	85	1338	503	1841
Nicola-Princeton District.																																	
Coalmont Collieries, Ltd.	9	10	19	72	—	72	—	—	—	2	13	15	27	49	76	3	5	8	—	—	—	—	—	—	—	—	—	—	1	1	113	78	191
Middlesboro Collieries, Ltd.	5	1	6	33	—	33	12	—	12	16	13	29	—	12	12	—	8	8	—	—	—	—	—	—	—	—	—	—	—	—	66	34	100
Granby Consolidated M.S. & P. Co., Ltd.	4	1	5	30	—	30	26	—	26	8	18	26	4	6	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	72	25	97
Princeton Tulameen Coal Co., Ltd.	1	1	2	11	—	11	6	—	6	—	3	3	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18	5	23
Black mine (Glover Trust)	—	—	—	1	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Hat Creek Colliery	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Totals, Nicola-Princeton District	19	13	32	149	—	149	45	—	45	26	47	73	31	68	99	3	13	16	—	—	—	—	—	—	—	—	—	—	1	1	273	142	415
Northern District.																																	
Bulkley Valley Colliery	1	1	2	3	—	3	3	—	3	1	—	1	—	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	3	11
Aveling Colliery	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Totals, Northern District	1	1	2	5	—	5	3	—	3	1	—	1	—	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	3	13
East Kootenay District.																																	
Coal Creek Colliery	5	2	7	62	—	62	—	—	—	35	17	52	25	18	43	1	5	6	—	—	—	—	—	—	—	—	—	—	—	—	128	42	170
Michel Colliery	15	10	25	174	—	174	—	—	—	36	53	89	112	118	230	2	3	5	—	—	—	—	—	—	—	—	—	—	—	—	339	184	523
Totals, East Kootenay District	20	12	32	236	—	236	—	—	—	71	70	141	137	136	273	3	8	11	—	—	—	—	—	—	—	—	—	—	—	—	467	226	693
Grand totals for Province	116	70	186	964	—	964	72	—	72	480	295	775	363	351	714	93	72	165	—	—	—	—	—	—	—	—	—	—	86	86	2088	874	2962

NOTE.—U.=Underground; A.=Above ground; T.=Total.

LABOUR AND EMPLOYMENT.

During 1938, 2,962 persons were employed in and about the coal mines of the Province, a decrease of 191 persons from that of 1937.

Taking the average of all the mines in Vancouver Island District, about 36 per cent. of the working-days was lost through lack of trade. In the Nicola-Princeton District the different collieries worked on an average of 74 per cent. of the working-days. In the East Kootenay District the average for the year was about 66 per cent.

The table on page 7 shows the number of persons ordinarily employed in and about the mines, distinguishing the persons and different classes employed underground and above ground, compiled from the returns furnished by the owners.

FUEL-OIL COMPETITION.

During 1938 imports of crude oil for refining in British Columbia totalled 189,917,000 gallons; in addition to which 5,789,000 gallons of fuel-oil was imported for use in the Province and 31,169,000 gallons of fuel-oil was brought in duty free for use in ships' bunkers.

COMPETITION OF COAL PRODUCED OUTSIDE BRITISH COLUMBIA.

During 1938 the importation of coal into British Columbia from the United States consisted of 280 tons of anthracite, 2,201 tons of bituminous, and 2,617 tons of lignite.

Imports from Great Britain consisted of 57 tons of bituminous coal, and from Japan 417 tons of bituminous coal.

Alberta coal sold in British Columbia amounted to 238,435 tons. In addition to this, 68,640 tons of Alberta coke and 3,817 tons of Alberta briquettes were sold in this Province.

The following table shows the amount of Alberta coal brought into British Columbia during past years:—

Year.	Short Tons.	Year.	Short Tons.
1925	117,037	1932	136,188
1926	127,858	1933	119,026
1927	187,028	1934	123,968
1928	262,198	1935	221,758
1929	247,060	1936	244,928
1930	227,385	1937	269,023
1931	193,060	1938	238,435

Of the 1,075,884 tons of British Columbia coal marketed 175,233 tons were sold in the Provinces of Alberta, Saskatchewan, Manitoba, and Ontario, 153,267 tons was sold for ships' bunkers, and 91,445 tons was exported to the United States; the total sales in the Province being 655,939 tons of British Columbia coal, 310,882 tons of Alberta coal, coke, and briquettes, and 5,292 tons of imported coal; so that approximately one-third of all the coal used in British Columbia was produced outside the Province.

ACCIDENTS IN AND AROUND COAL MINES.

During 1938, 2,962 persons were employed in and around the coal mines. Ten fatal accidents occurred during the year as compared with ten for 1937.

The ratio of fatal accidents per 1,000 persons employed was 3.37 as compared with 3.17 in 1937. In 1936 the ratio was 2.84; in 1935, 1.67; in 1934, 2.07; in 1933, 0.97; in 1932, 2.21; in 1931, 1.22; in 1930, 11.62; and in 1929, 2.38. The average for the ten-year period being 3.43.

The number of fatal accidents per 1,000,000 tons produced during 1938 was 7.63; during 1937 the figure was 6.92; in 1936, 5.94; in 1935, 4.21; in 1934, 4.45; in 1933, 2.37; in 1932, 5.21; in 1931, 2.81; in 1930, 28.64; and in 1929, 5.33. The average for the ten-year period being 8.40 per 1,000,000 tons of coal mined.

The following table shows the collieries at which the fatal accidents occurred during 1938 and comparative figures for 1937:—

Name of Company.	Name of Colliery.	1938.	1937.
Canadian Collieries (D.), Ltd.	Comox No. 5	----	1
Canadian Collieries (D.), Ltd.	Northfield	----	1
Western Fuel Corporation, Ltd.	No. 1 mine	1	----
Western Fuel Corporation, Ltd.	Reserve mine	----	2
Beban's Colliery	Beban mine	----	4
Coalmont Collieries, Ltd.	No. 4 mine	1	----
Crow's Nest Pass Coal Co., Ltd.	Coal Creek	3	1
Crow's Nest Pass Coal Co., Ltd.	Michel	5	1
Totals		10	10

The following table shows the various causes of fatal accidents in 1938 and their percentage of the whole, with corresponding figures for 1937:—

Cause.	1938.		1937.	
	No.	Per Cent.	No.	Per Cent.
By falls of roof and coal	3	30.00	4	40.00
By mine-cars and haulage	----	----	2	20.00
By inrush of water from old workings	----	----	3	30.00
By mine explosion	3	30.00	----	----
By bumps	3	30.00	----	----
Miscellaneous	1	10.00	1	10.00
Totals	10	100.00	10	100.00

The following table shows the number of tons of coal mined for each fatal accident in their respective classes in the years 1938 and 1937:—

Cause.	1938.		1937.	
	No. of Fatal Accidents.	No. of Tons of Coal mined per Fatal Accident.	No. of Fatal Accidents.	No. of Tons of Coal mined per Fatal Accident.
By falls of roof and coal	3	436,476	4	361,171
By mine-cars and haulage	----	----	2	722,343
By inrush of water from old workings	----	----	3	481,562
By mine explosion	3	436,476	----	----
By bumps	3	436,476	----	----
Miscellaneous	1	1,309,428	1	1,444,687
Totals	10	130,942	10	144,468

The number of tons mined per fatal accident during 1938 was 130,942 tons compared with 144,468 tons in 1937. The average for the ten-year period was 118,027 tons.

The following table shows the fatalities from various causes in coal mines during the year 1938 compared with 1937, according to Inspection Districts:—

District.	Number of Deaths from Accidents.						Total.	
	Falls of Roof and Coal.	Mine-cars and Haulage.	Inrush of Water from Old Workings.	Mine Explosion.	Miscellaneous.	Bumps.	1938.	1937.
Vancouver Island	----	----	----	----	1	----	1	8
Nicola-Princeton	1	----	----	----	----	----	1	----
East Kootenay	2	----	----	3	----	3	8	2
Northern	----	----	----	----	----	----	----	----
Province (1938)	3	----	----	3	1	3	10	10
Province (1937)	----	----	----	----	----	----	----	10

RATIO OF ACCIDENTS.

District.	Accident Death-rate.			
	Per 1,000 Persons employed.		Per 1,000,000 Tons of Coal mined.	
	1938.	1937.	1938.	1937.
Vancouver Island	0.54	3.96	1.46	9.77
Nicola-Princeton	2.41	.....	5.34	.....
East Kootenay	11.54	3.18	18.43	4.35
Northern	.....	.....	.....	.....
Totals (1938)	3.37	.....	7.63	.....
Totals (1937)	.....	3.17	.....	6.92

The details regarding the occurrences of the fatal accidents in coal mines during 1938 are as follows:—

The fatal accident which occurred to Asbjorn Hagen, miner, No. 4 mine, Coalmont Collieries, Ltd., on February 8th was due to a fall of coal at the face of a new skip which deceased was starting; a bridge timber had been put up and preparations being made for the first set of timber when some coal from the face struck Hagen and dislocated his neck; he died from his injuries on February 14th.

The fatal accident which occurred to Robert McFegan, overman, No. 3 mine, Michel Colliery, on March 12th was due to a fall of coal and roof while deceased and others under his supervision were uncovering a buried compressed-air line that had been laid in along a roadway which had been abandoned; temporary timber support had been set by this crew immediately before the accident, but it proved insufficient as a body of coal rolled from the rib and was followed by a fall of roof that completely buried deceased, who was dead when extracted from the cave.

The fatal accident which occurred to Andro Laskodi, miner, No. 1 mine, Michel Colliery, on April 5th was due to fall of coal and roof at the face where deceased and his partner were at work; the place was closely timbered, but a sudden weighting of the roof at the face broke the last two stringers and a large mass of rock came down; deceased was killed instantly.

The fatal accident to Edward Morrison, fireboss; William H. Cartwright, fireboss; and John Phillips, mechanic "B" mine, Michel Colliery, on July 5th was due to an explosion; details of this are given in another part of this report.

The fatal accident to William Green, driver boss; Thomas Manning, miner; and William A. Brown in No. 1 East mine, Coal Creek Colliery, on September 20th was due to a bump; details of this are given in another part of this report.

The fatal accident to Robert Forrester, carpenter, No. 1 mine, Western Fuel Corporation of Canada, Ltd., on October 25th occurred at the tipple on the surface; deceased was engaged in reriffling a coal-washing table and was using an extension electric-light cord. The light cord came in contact with a revolving shaft and deceased was entangled in the coils of the cord and drawn around the shaft. He died from his injuries a few hours later. Deceased had done this same work on numerous occasions during the previous fifteen years.

NOTE.—In addition to above fatalities during 1938, Eskel Eskelson, construction-man, who was injured on the surface at Michel Colliery, November 15th, 1936, died on January 7th, 1938.

EXPLOSION IN "B" MINE, MICHEL COLLIERY.

On July 5th an explosion occurred in "B" Mine, Michel Colliery, and caused the death of Edward Morrison, fireboss; Wm. H. Cartwright, fireboss; and John Phillips, mechanic. At this colliery four seams are worked and, in descending order, are known as "B" seam, "A" seam, No. 1 seam, and No. 3 seam; there is approximately 120 feet of strata between "B" and "A" seams; 180 feet between "A" and No. 1 seam; and 220 feet between Nos. 1 and 3 seams.

These seams outcrop on the northern side of the Crowsnest Pass and dip into the mountain; the mine has been developed by main cross-measure adit-tunnels which intersect the seams in descending order; the workings in each seam have been driven to the surface at the

outcrop, so that practically the workings in each seam can be considered as separate mines with individual intakes and a common return airway, with the main tunnel serving as the main haulage system for the different mines. The pillar-and-stall system is followed in "A," No. 1, and No. 3 seams, while in "B" seam retreating long-wall with machine-cutting and face conveyers is carried on.

On July 5th the mine was "idle" and only a small maintenance crew was underground, and of these the three deceased and two surveyors were in "B" mine; the latter were surveying on the return side from where the others were killed by the explosion, and several thousand feet distant from them.

At the time of the explosion a severe lightning-storm was experienced on the surface in the vicinity of the mine, and some men employed on the surface reported that a discharge of lightning appeared to strike near the intake portal of "B" mine, while others working near the portal of the main tunnel were at the same time temporarily affected by lightning. These two points are approximately 2,000 feet apart.

The alarm occasioned by above caused a search-party to investigate whether any damage had been done underground. On reaching the point where No. 1 mine branched off the main tunnel the search-party met the few men who had been working in No. 1 mine on their way out, as they had been alarmed by several manifestations of lightning in that mine. Shortly after this all the men were accounted for except the men in "B" mine, and immediate steps were taken to examine these workings. When it was discovered that an explosion had occurred there, and after penetrating the workings of "B" seam for 1,000 feet, the search-party encountered a concentration of after-damp that compelled retreat, trained crews using the oxygen rescue apparatus were called into service to explore "B" mine and find the missing men.

The bodies of the three men were found about 300 feet beyond the point reached by the original search-party, and the indications were that they had been instantly killed by the explosion. These men had been engaged in moving equipment to a new position and nothing they had been doing had been a factor in the explosion. The bodies were recovered about four hours after the explosion.

The two flame safety-lamps belonging to deceased firebosses were found to be undamaged, but two of the electric safety-lamps were damaged by the explosion.

The two surveyors who were at work surveying in another part of "B" seam on the return side of the explosion area did not hear or feel the explosion and continued their work until 3 p.m., and it was only when on their way out that they discovered evidence of the explosion.

The physical damage done by the explosion was comparatively slight and consisted of the displacement of a number of set timbers and props, the disarrangement of conveyer-pans, and damage to a number of mine-cars. Several stoppings were blown out but there was no extensive caving, and although the small amount of ventilating brattice and curtains in use was displaced the main general course of the ventilation was not materially affected in the explosion area. There were very few places in the explosion area that were driven in the solid, and these places were bratticed close to the face, and although the curtains and brattices were disarranged by the explosion it was several days before any indications of explosive gas were found at any of these solid faces. The replacement of the brattice and curtains was postponed to establish this point.

This seam produces a considerable amount of coal-dust and the workings were constantly treated with lime-dust to counteract the explosibility of the coal-dust. There can be no doubt that the lime-dust treatment limited the violence and area of this explosion, but from an examination of this mine following the explosion the writer is of the opinion that had the regular mine crew been at work the death toll would have been high. The general indications were that this was a coal-dust explosion. The three men who were killed were on the outer fringe of the area traversed by the flame of the explosion. This area was 600 by 1,400 feet, and there were indications of violence outside of this area which covered practically all the producing long-walls in this mine.

The available evidence points to lightning as being the ignition factor in this explosion, which apparently occurred immediately following the lightning discharge mentioned above,

and at the same time that lightning phenomena were seen and experienced in No. 1 and 3 mines below " B " mine, these lightning manifestations being as follows:—

Thomas Branch, mechanic, was on No. 6 Incline, No. 1 mine, about 1.30 p.m., and saw a flash of light travel up one of the track-rails for a distance of 250 feet and pass him for a distance of 15 feet, at which point the light disappeared.

Peter Mussio, tracklayer, No. 1 mine, was laying track in a room of No. 6 Incline about 1.30 p.m., when a flash of light came along the track on which he was working and travelled inby towards the face; he stated that this light gave off a cracking noise when it passed over the rail-joints, and that the light appeared to be 2 to 3 inches high.

Frank Jarolyn, who was switching cars on No. 6 Incline, saw flashes of light from the track to a signal-bell wire, after which the bell would not operate. It was later found that the relay coil had been ruptured.

The above matters all occurred in the one district, and the men who noted them were alarmed and reported the occurrences to the fireboss in charge, who immediately ordered the men to retire from the mine and accompanied them outby to the point where they met the search-party from outside. At this time none of the men in No. 1 mine had any knowledge of the fact that an explosion had occurred in " B " seam above them.

At the same time in No. 3 mine, Steve Letassy, timberman, saw flashes of light between the track-rails and a pipe-line that were from 14 to 18 inches apart, and stated that the light made noises like " fire-crackers "; John McInnes, machineman at this time, was repairing an air-line and sustained a severe shock from the pipe. These men did not learn of the explosion until 3 p.m.

With the exception of the telephone system and several local electric-bell systems there is no electrical installation of any kind underground at Michel Colliery.

The possibility of lightning being the ignition factor has been raised in connection with several previous mine explosions in British Columbia and elsewhere, and probably did not get the attention such theory deserved, as at least two previous disastrous mine explosions in British Columbia occurred at the height of local electrical storms.

In the case of this explosion in " B " mine, the writer is of the opinion that lightning was the ignition factor, and that the lightning discharge at some point stirred up and ignited the dust.

The fact that of the few men underground at this time, five of them saw and reported separate manifestations of lightning in the seams below " B " mine at the time of the explosion would indicate that there were probably many more such manifestations throughout the mines that were unobserved. Whether " B " mine, being the uppermost working, would be affected more intensely by this lightning discharge than the mines below is not clear, but the indications would seem to point to this as possible.

At the intake portal of " B " mine and for several hundred feet inby there are no rails, pipe-lines, or anything of a metallic nature that could serve as an electrical conductor, and the only conductors of this nature entering the colliery are the track-rails and compressed-air lines entering the main portals of the colliery; these pipe-lines and tracks being continuous to and into all the mines.

Following this explosion and with a view to preventing a recurrence of lightning entering the mines, a protective system to arrest and ground possible lightning discharges has been installed at the main portal of the colliery.

This installation consists of two rows of 3-inch-diameter steels pipes 26 feet long set vertically in the ground to a depth of 6 feet; these pipes are 50 feet apart, and there is 50 feet between the two rows of pipes, which are installed so that the main intake and return portals are between the two rows of pipes.

Each pipe is grounded individually to a copper mat at the bottom of the pipe and the whole system is connected by heavy copper cable from each pipe; and two separate cables lead from the system to ground plates installed below the bed of Michel Creek. All possible conductors of electricity, such as track-rails, compressed-air lines, and water-lines entering the portals, are grounded to this system. Several of the research departments of leading electrical manufacturing companies were contacted in regard to the problem of protecting mines against lightning, and much helpful information was obtained.

BUMPS IN No. 1 EAST MINE, COAL CREEK COLLIERY, CROW'S NEST PASS COAL CO., LTD.

There were two bumps reported in No. 1 East mine during 1938; one of these was on No. 26 Incline and immediately adjacent areas and caused considerable damage, but no one was injured.

On September 20th at about 3.30 p.m., while the afternoon shift was travelling to work along the main haulage and intake roadway of the mine, a disastrous bump occurred which killed three men, injured three others, and wrecked over 1,000 lineal feet of the main tunnel and adjacent roadways.

This bump occurred on the main adit-tunnel at a point approximately 1½ miles from the portal and where the cover is 2,500 feet thick. This area was developed during years 1924–26 and no other work of any kind has been done in this area since that time. The development of the mine has since that time been extended several thousand feet past this area.

Some twelve men of the shift had passed through this area before the bump occurred and the others had not reached this point; and it was due to a fortunate chance that there were not more men in the affected area at the time of the bump, as for a considerable distance the floor of the roadways was forced up to the roof and most of the timbering in the area was thrown out of position.

Prior to the bump the main tunnel and the adjacent counter-tunnel had over 7 feet clearance between the floor and roof timbers and had ample width for the double-track system in use; but the bump not only forced the floor up to the roof, but narrowed the width by forcing the pillars, particularly the one on the low side, into the roadway. The main roof was not broken and only a comparatively small amount of loose roof material was dislodged. There was little, if any, gas produced or released by this bump.

Bumps have been experienced in this area of the Coal Creek field since 1904, and in No. 1 East mine especially large pillars were designed as a precaution against bumps and to reduce the violence of any that did occur; but the magnitude and violence of the bump suffered on September 20th indicates that large pillars do not prevent bumps, and that the violence is concentrated owing to the resistance provided by large pillars. With a view to reducing this concentration of violence in the event of further bumps inby from the location of the one that occurred on September 20th, roadways are being driven through the large pillars along the main tunnel, and these roadways are paralleling the main tunnel; when completed they are expected to absorb a large part of the shock that may be produced by any bump in this area and will not be used for haulage or travel.

It may be mentioned that only some 15 per cent. of the coal is removed in the development-work and that with the exception of a small area, the nearest point of which was 1,500 feet from this bump, no pillar-extraction has been attempted in this mine.

It is fairly certain that the bumps are largely due to some of the strata, overlying the seam at some distance, being abnormally strong and thick to the extent that such strata can bridge over a large area in which the intervening strata have sagged slightly due to the fluidity of the seam and pillars; and that the blow given when the strong stratum ultimately breaks throws a sudden load on the seam and pillars and to the strata below the seam. The mine roadways offered the only means of relief of the sudden pressure produced so that the floor, roof, and pillars are forced towards the mine openings in the inverse ratio of their respective resistances. There is the possibility that a strong stratum underlying the seam may also produce bumps.

Bumps have occurred in coal mines in Nova Scotia, United States, Great Britain, France, and other coal-mining countries, and considerable research has been carried on in regard to them, but so far no efficient means or methods of working have been devised that will eliminate bumps in areas susceptible to this phenomenon; but all available information from the different countries in which bumps are experienced in coal mines is closely watched for any points which may be applicable to conditions existing at Coal Creek Colliery.

Most of the practical work done along research or precautionary lines has been in the direction of identifying areas likely to develop bumps and leaving such areas unworked, but where practically the whole area of a large developed mine, such as No. 1 East, is susceptible to bumps the problem becomes much aggravated; and particularly so when the bumps may

occur many years after the development-work has passed that point and no further work has been done in the area.

The work of identifying areas likely to produce bumps has generally been by diamond-drilling the roof and floor strata to locate and determine the presence of thick or strong beds of sandstones or conglomerate, but where the cover over the seam is thick the cost of such drilling is prohibitive if done from the surface; and if such drilling is done from the mine-workings, then such workings may already be in a danger zone before the hazard is recognized.

Some work has also been done to determine whether small ground movements, imperceptible to the ordinary senses, may precede and indicate impending bumps; but no definite results have so far been established.

It is hoped that the pillar-extraction mentioned above, now in operation in No. 1 East mine, will provide a means of fracturing the overlying strata gradually and before they can be subjected to any built-up load, and will reduce the hazard of bumps in the vicinity of the working-faces.

The results of this pillar-extraction will be closely watched.

EXPLOSIVES.

The following table shows the quantity of explosives used in coal mines during 1938, together with the number of shots fired, tons of coal produced per pound of explosive used, and the average pounds of explosive per shot fired (these quantities include all explosives used for breaking coal and for rock-work in coal mines):—

Vancouver Island District.

Colliery.	Quantity of Explosive used in Pounds.	Tonnage for Mine.	Total No. of Shots fired.	Tons of Coal per Pound of Explosive used.	Average Pounds of Explosive per Shot fired.
Comox Colliery No. 5 mine	65,295	203,338	88,494	3.11	0.73
Comox Colliery, No. 8 mine	24,060	62,295	44,000	2.58	0.54
Northfield Colliery	49,721	117,550	55,300	2.36	0.90
South Wellington, No. 10 mine	17,300	19,465	21,000	1.12	0.84
Western Fuel Colliery, No. 1 mine	33,065	146,176	45,004	4.42	0.73
Western Fuel Colliery, Reserve mine	37,288	114,934	59,553	3.08	0.62
Lantzville Colliery	6,000	5,237	8,000	0.87	0.75
Fiddick mine	50	14	100	0.28	0.50
Chambers' mine	1,200	4,492	2,500	3.74	0.48
Beban's mine	3,400	8,195	9,600	2.41	0.35
Loudon's mine	60	140	108	2.33	0.57
Cassidy mine	800	1,610	1,600	2.01	0.50
Biggs' mine	200	228	300	1.14	0.66
Lewis' mine	1,300	715	1,500	0.55	0.86
Berkley Creek mine	75	9	150	0.12	0.50
Clifford mine	500	.....	750	.....	0.66
Totals for district	240,314	684,398	337,959	2.84	0.71

Nicola-Princeton District.

Coalmont Collieries	23,580	79,816	39,000	3.38	6.04
Middlesboro Collieries	7,050	25,696	10,100	3.64	0.69
Granby Consolidated M.S. & P. Co., Ltd.	12,500	62,914	14,100	5.03	0.88
Princeton Tulameen Coal Co.	2,950	17,377	6,000	5.89	0.49
Black mine (Glover Trust)	160	426	200	2.66	0.80
Hat Creek Colliery	250	743	700	2.97	0.35
Totals for district	46,490	186,972	70,100	4.02	0.66

Northern District.

Colliery.	Quantity of Explosive used in Pounds.	Tonnage for Mine.	Total No. of Shots fired.	Tons of Coal per Pound of Explosive used.	Average Pounds of Explosive per Shot fired.
Bulkley Valley Colliery	1,350	3,889	2,500	2.88	0.54
Aveling Colliery	65	101	54	1.55	1.20
Totals for district	1,415	3,990	2,554	2.82	0.55

East Kootenay District.

Coal Creek Collieries	58	105,736	72	1,823.03	0.80
Michel Colliery	97,114	328,332	79,900	3.38	1.21
Totals for district	97,172	434,068	79,972	4.46	1.21
Totals for Province	385,391	1,309,428	490,585	3.65	0.78

Quantities of Different Explosives used.

	Lb.
Monobel of different grades	261,092
Permissible rock-powder	124,299
Total	385,391

The following is a list of explosives permitted for use in coal mines by the Honourable the Minister of Mines under the provisions of section 101, General Rule 11, clause (*i*), "Coal-mines Regulation Act":—

Polar Monobel No. 4.
Polar Monobel No. 6.
Polar Monobel No. 7.
Polar Monobel No. 14.
Polar CXL-ite No. 2.

MACHINE-MINED COAL.

During the year 1938 mining-machines produced approximately 696,656 tons or 53.2 per cent. of the total.

The following table gives the district, number of machines, how driven, and type of machine used:—

District.	Number driven by		Type of Machine used.					
	Electricity.	Compressed Air.	Mavor and Coulson.	Anderson Boyes.	Hardy.	Siskol.	Ingersoll-Rand.	Pneumatic Pick.
Vancouver Island	----	25	4	17	4	----	----	----
Nicola-Princeton	----	22	----	----	----	11	11	----
East Kootenay	----	33	----	3	30	----	----	----
Totals	----	80	4	20	34	11	11	----

SAFETY-LAMPS.

There were 2,622 safety-lamps in use in the coal mines of the Province. Of this number, 233 were flame safety-lamps of the Wolf type and 2,389 were electric lamps of various makes, as follows: Edison, 2,329; Wolf electric, 60.

The following table shows the distribution of lamps by district, method of locking, and illuminant used:—

Vancouver Island District.

Colliery and Mine.	Method of Locking.		Illuminant used.	
	Magnetic Lock.	Screw or Automatic Clip.	Naphtha Gasoline.	Electricity.
Comox Colliery, No. 5 mine	40	483	40	483
Comox Colliery, No. 8 mine	12	156	12	156
Northfield Colliery	25	307	25	307
South Wellington, No. 10 mine	17	160	17	160
Western Fuel Colliery, No. 1 mine	20	160	20	160
Western Fuel Colliery, Reserve mine	14	198	14	198
Lantzville Colliery	2	12	2	12
Fiddick mine	1	3	1	3
Chambers' mine	2	10	2	10
Beban's mine	6	70	6	70
Loudon's mine	2	4	2	4
Cassidy mine	2	8	2	8
Biggs' mine	1	3	1	3
Lewis' mine	1	3	1	3
Berkley Creek mine	2	-----	2	-----
Clifford's mine	2	10	2	10
Totals for district	149	1,587	149	1,587

Nicola-Princeton District.

Coalmont Colliery	6	109	6	109
Middlesboro Colliery	8	65	8	65
Granby Consolidated M.S. & P. Co., Ltd.	5	83	5	83
Princeton Tulameen Coal Co.	1	34	1	34
Black mine (Glover Trust)	1	3	1	3
Hat Creek Colliery	2	6	2	6
Totals for district	23	300	23	300

Northern District.

Bulkley Valley Colliery	1	8	1	8
Aveling Colliery	2	-----	2	-----
Totals for district	3	8	3	8

East Kootenay District.

Coal Creek Colliery	12	130	12	130
Michel Colliery	46	364	46	364
Totals for district	58	494	58	494
Totals for Province	233	2,389	233	2,389

Approved Safety-lamps, Electric and Flame.

A list of the approved safety-lamps, both electric and flame, was published in the 1930 Annual Report. The following lamps, all electric, are now also approved:—

No. 8.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 18 of the United States Bureau of Mines. The only bulb approved for use in this lamp carries the symbol BM-18, and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

No. 9.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 18F of the United States Bureau of Mines. This model of Edison lamp in reality represents an extension of the lamp approval given under Approval No. 18. The only bulb approved for use with this lamp carries the symbol BM-18F and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

No. 10.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 18H of the United States Bureau of Mines. This lamp represents an extension of the No. 18 approval of the United States Bureau of Mines. The only bulb approved for use with this lamp carries the symbol BM-18H and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio.

No. 11.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 24 of the United States Bureau of Mines. The only bulb approved for use with this lamp carries the symbol BM-24 and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio. This lamp is known as the Edison Model J lamp.

No. 12.—The electric lamp manufactured by the Edison Storage Battery Company, Orange, New Jersey, U.S.A., under Approval No. 25 of the United States Bureau of Mines. The only bulb approved for use with this lamp carries the symbol BM-25 and is manufactured by the National Lamp Works of the General Electric Company, Cleveland, Ohio. This lamp is known as the Edison Model K lamp.

No. 13.—The electric lamp manufactured by the Koehler Manufacturing Company, and known as the Super-Wheat Model " W " electric safety cap-lamp under Approval No. 20 of the United States Bureau of Mines.

(Unless otherwise specified, all lamps are cap-lamps.)

NOTE.—*While the use of flame safety-lamps is permitted, it is the policy of the Department of Mines to encourage the use of approved electric safety-lamps for all persons underground in the coal mines, except such flame-lamps as may be required by the officials of the mines in the carrying-out of their duty and in such cases as it is considered advisable to provide flame safety-lamps in addition to the electric safety-lamps.*

ELECTRICITY.

Electricity is used for various purposes on the surface at eleven mines and underground at five mines.

The purpose for which it was used, together with the amount of horse-power in each instance, is shown in the following table:—

Nature of its Use.	Aggregate H.P.
Above ground—	
Winding or hoisting	2,303
Ventilation	1,305
Haulage	201
Coal-washing	1,716
Miscellaneous	5,368
Total horse-power	10,893
Underground—	
Haulage	1,300
Pumping	1,421
Coal-cutting	.....
Miscellaneous	1,038
Total horse-power	3,759
Total horse-power above and under ground	14,652

Of the above amount approximately 376 horse-power was operated as direct current and 14,276 as alternating current.

VENTILATION.

The reports of the District Inspectors give detailed information regarding the ventilation in the main airways and splits of the different mines. In a number of instances it was found necessary to order an increased quantity of air at working-faces, particularly on the machine-cut long-wall faces at No. 5 mine, Comox Colliery, where a continued abnormal methane outflow required augmented ventilation to dilute and carry off the gas.

The outflow of gas from each wall rises rapidly towards the end of the cutting cycle and shotfiring is prohibited until at least one hour after cutting is completed.

Methane Detection.

The Burrell Methane Detector was used during the year to detect the presence of methane in percentages less than could be detected by the flame safety-lamp.

The M.S.A. Methane Recorder was tried during the year, and although found efficient is not very suitable for use in very thin seams worked on the long-wall system such as is now practically standard on Vancouver Island; in many cases it is difficult to travel along the long-wall faces and crawling has to be resorted to, which limits the amount and weight of equipment that can be carried and kept in efficient service.

Mine-air Samples.

Mine-air sampling was carried out in the various mines, and 318 samples were taken during the year; of this number, thirty-four were spoiled in transit. The air of the mines at Comox Colliery and in the Crowsnest Pass District where the gas outflow is greatest is sampled most frequently. In addition to samples of the normal ventilation, a number of samples were taken in abandoned workings and from areas sealed off on account of fire. The analyses of the above samples are filed in the office of the Chief Inspector of Mines.

INSPECTION COMMITTEES.

At practically all the mines throughout the Province, inspection committees appointed by the workmen under General Rule 37, section 101, "Coal-mines Regulation Act," were in operation throughout the year.

COAL-DUST.

Sampling of dust as per the Regulation for Precautions against Coal-dust was well maintained during the year and a total of 1,104 samples were taken and analysed at the different mines, and where the analyses showed less than 50 per cent. incombustible matter immediate steps were taken to see that the mine or part of the mine was re-rock dusted.

DANGEROUS OCCURRENCES.

During the year the following dangerous occurrences, in addition to those causing injuries, were reported:—

On January 13th a shot fired by a fireboss in Northfield mine, Nanaimo, was immediately followed by a flash which was apparently due to a small feeder of gas being ignited by the shot. The fireboss was positive that he had made a careful examination of the place and found no indication of gas before firing the shot, and no gas was found on later examinations. No damage was done and no persons were injured.

On February 19th the haulage-rope on the main slope of No. 5 Mine, Comox Colliery, broke while a loaded trip of sixteen cars was being hoisted, but the safety-car which is used with each trip held the trip and no further damage resulted. The men were hoisting on this slope at the end of each shift, but this practice was prohibited pending the installation of a new rope.

On April 27th, at Michel Colliery, while several railroad-cars were being lowered to the tipple loading-point they were allowed to come into collision with a stationary box car in which the Ottumwa loader was in position. No one was injured, but a man who was repairing the loader at the time had a narrow escape.

On June 26th a 150-horse-power synchronous motor driving a compressor in an underground power-house in No. 5 mine, Comox Colliery, overheated and caught fire; the fire was extinguished by the use of the new Lux fire-extinguishers. It was later discovered that the fire was due to a short circuit. No damage was done except to the motor.

On August 22nd a bump was experienced on No. 26 Incline, No. 1 East mine, Coal Creek Colliery, which did fairly extensive damage but did not injure any person.

On August 26th a small fire was discovered at a haulage-roller on 26 Incline, No. 1 East mine, Coal Creek Colliery. This was due to friction from a defective roller. The fire was discovered in its early stage and no damage was done.

On September 20th a severe bump occurred on the main intake and haulage-level, No. 1 East mine, and caused the death of three men and serious injury to three others. This is dealt with in another part of this report.

On October 5th a large cave occurred on the only road providing communication between No. 1 shaft and the Protection shaft of the Western Fuel Corporation of Nanaimo. All men were withdrawn from the mine except those required to deal with the cave. This mine was being rapidly exhausted at this time and was finally abandoned during the following month.

PROSECUTIONS.

During 1938 there were seven prosecutions made for infractions of the "Coal-mines Regulation Act," as follows:—

Date.	Colliery.	Occupation of Defendant.	Offence charged.	Judgment.
Jan. 31	Western Fuel Corporation of Canada, Ltd., No. 1 mine	Miner	Failed to sprag overhanging coal	Fined $20 and costs.
Jan. 31	Western Fuel Corporation of Canada, Ltd., No. 1 mine	Miner	Assaulted the manager of the mine when the manager ordered him to properly sprag overhanging coal in the working-place	Fined $20 and costs.
April 7	Canadian Collieries (D.), Ltd., No. 5 mine, Comox Colliery	Miner	Being underground for more than eight hours	Fined $5 and costs.
April 7	Canadian Collieries (D.), Ltd., No. 5 mine, Comox Colliery	Manager	Permitting workman to be underground more than eight hours	Fined $10 and costs.
June 11	Canadian Collieries (D.), Ltd., No. 5 mine, Comox Colliery	Fireboss	Failed to cause sufficient timber to be distributed for safe and proper working	Fined $10 and costs.
Dec. 15	Canadian Collieries (D.), Ltd., No. 5 mine, Comox Colliery	Miner	Had a lucffer match in his possession underground	Fined $10 and costs.
Dec. 21	Canadian Collieries (D.), Ltd., No. 5 mine, Comox Colliery	Miner	Failed to properly guard a place where a shot was being fired, after being specifically instructed by the fireboss to do so	Fined $5 and costs.

GOVERNMENT RESCUE-STATIONS.

The Department of Mines has four mine-rescue stations in different parts of the Province and centrally located in the mining districts—namely, at Nanaimo, Cumberland, Princeton, and Fernie. During the year many requests were received from medical men for oxygen and the inhalators for use in emergencies, and immediate service was rendered in every case. In the larger coal-mining districts of Crowsnest, Cumberland, and Nanaimo experienced teams maintain a regular schedule of training throughout the year and so keep ready for any emergency calls.

The preliminary training course consists of twelve two-hour lessons in the actual use of oxygen apparatus and Burrell all-service gas-masks in an irrespirable atmosphere and instruction on the approved method of dealing with mine fires and recovery-work. The training itself is strenuous work, and all candidates have to undergo a special physical examination before starting training and must be under thirty-four years of age.

During the year, in addition to the regular teams in training, sixty-four new men took the full training and were granted certificates of competency:—

Cert. No.	Name.	Where trained.	Cert. No.	Name.	Where trained.
982	Andrew Bates	Cumberland.	1015	William Carson	Nanaimo.
983	Thos. Henry Conrod	Cumberland.	1016	Clarence William Rowa	Nanaimo.
984	Andrew Easton	Cumberland.	1017	William K. Gordon	Nanaimo.
985	Dorino Galeazzi	Cumberland.	1018	Henry Nygard	Copper Mountain.
986	James Patterson	Cumberland.	1019	Thomas W. Walker	Copper Mountain.
987	Alex. John Ponn	Cumberland.	1020	John Givens, Jr.	Copper Mountain.
988	George Stewart	Cumberland.	1021	Wm. J. Cartwright	Princeton.
989	Arthur Williams	Cumberland.	1022	Kenneth L. M. Dodd	Princeton.
990	Martin Frobisher	Nanaimo.	1023	Chas. W. Davis	Princeton.
991	Norman Wallace	Nanaimo.	1024	Gordon J. McGillivray	Princeton.
992	Orla Christoffersen	Copper Mountain.	1025	Frederick H. Pope	Princeton.
993	Thomas M. Clarke	Copper Mountain.	1026	Frederick H. Robins	Princeton.
994	James Clarkson	Copper Mountain.	1027	Joseph Chester	Fernie.
995	Edwin Foy	Copper Mountain.	1028	Thor Backe	Cumberland.
996	Samson A. Gould	Copper Mountain.	1029	David McCallum	Bevan.
997	Hector Herniman	Copper Mountain.	1030	Thomas M. Wynne	Bevan.
998	Albert B. Holm	Copper Mountain.	1031	James Kelly	Bevan.
999	J. Robert McKinnon	Copper Mountain.	1032	William Wear Johnstone	Bevan.
1000	George Mooney	Copper Mountain.	1033	James Simister	Michel.
1001	Lloyd Monroe	Copper Mountain.	1034	David Kerr McKenzie	Michel.
1002	Wm. H. Montgomery	Copper Mountain.	1035	Lloyd Sterling	Bevan.
1003	Steele C. Murdoch	Copper Mountain.	1036	Roger Albert Pasiand	Michel.
1004	Harry D. Peterson	Copper Mountain.	1037	Fred Brewer	Michel.
1005	Charley E. Riley	Copper Mountain.	1038	John Krall	Michel.
1006	Matthew Sandeson	Copper Mountain.	1039	Peter Lazaruk	Natal.
1007	Wm. J. Tough	Copper Mountain.	1040	Charles Tupper Courtney	Nanaimo.
1008	Michael Ubell	Copper Mountain.	1041	Wm. Vlandamere Midan	South Wellington.
1009	Archie H. Walker	Copper Mountain.	1042	Isaac Edward Aitken	Nanaimo.
1010	David Westaway	Copper Mountain.	1043	James Davidson Fearon, Jr.	Nanaimo.
1011	Stanley H. C. Wooster	Copper Mountain.	1044	Norman Louis Maughan	Nanaimo.
1012	Stephen McGlenen	Nanaimo.	1045	John Unsworth	Nanaimo.
1013	Thomas Nicholson	Nanaimo.	1046	John Samuel Raffle	Nanaimo.
1014	Arnold Wm. Malpass	Nanaimo.			

MINE-RESCUE AND FIRST-AID WORK.

Mine-rescue teams carried on training at the Department of Mines Rescue Stations at Nanaimo, Cumberland, Princeton, and Fernie, and the Mine Safety Associations at these mining centres all carried on safety and first-aid work during the year.

Competitions in mine-rescue and first-aid work were held at Fernie, Princeton, and Nanaimo, and in addition to demonstrating the efficiency of the crews trained in this work these competitions do much to attract new men to this valuable service to the men engaged in the mining industry.

It may be mentioned that this work has spread beyond mining to the extent that at Nanaimo competitions during the past few years teams from the logging industry, Victoria military units, and several Vancouver industries have taken part. In addition to male teams there are a large number of ladies', girls', and boys' teams taking part, showing very efficient work.

SUPERVISION OF COAL MINES.

During the year twenty-two coal companies operated thirty mines, employing 2,088 men underground. In the supervision of underground employees there were eleven managers, nineteen overmen, ninety-seven firebosses and shotlighters, a total of 127, or one official for every sixteen persons employed underground.

"COAL SALES ACT."

During the year a considerable number of inspections were made under the "Coal Sales Act" and several complaints were investigated. The majority of the complaints were in the Vancouver District and most of these were due to small dealers accused of substituting an

inferior grade of coal for a superior grade. Valuable assistance was rendered in this district by the Weights and Measures Inspector for the City of Vancouver, who keeps a close check on the sale of coal in the city. Generally speaking, the regular coal-dealers try to conduct their business in accordance with the "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 District.	Producing Company.
Comox	Nos. 5 and 8 mines, Comox Colliery (Cumberland)	Canadian Collieries (D.), Ltd.
Old Wellington	No. 9 mine (Wellington)	Canadian Collieries (D.), Ltd.
Ladysmith-Wellington	No. 10 mine (South Wellington)	Canadian Collieries (D.), Ltd.
Ladysmith-Extension	No. 8 mine (Extension)	Canadian Collieries (D.), Ltd.
Hi-Carbon	Mixture of Canadian Collieries' coal and B.C. Electric coke	Canadian Collieries (D.), Ltd.
Nanaimo Reserve	Reserve mine (Nanaimo)	Western Fuel Corporation of Canada, Ltd.
Mabury-Northfield	(Recovered from surface dump) (Wellington)	Mabury Engineering Corporation, Ltd.
Lantzville Wellington	Lantzville (Lantzville)	Lantzville Colliery.
Fiddick-Douglas	Fiddick mine (South Wellington)	Fiddick mine.
Chambers-Extension	Chambers (Extension)	R. H. Chambers.
Wellington South, Ida Clara	Ida Clara No. 1 (South Wellington)	Richardson Bros., Ltd.
Biggs-Wellington	Biggs' mine (Wellington)	Biggs' mine.
Berkley Creek-Little Wellington	Berkley Creek Colliery (Extension)	Hugh McLean Davidson.
Nanaimo Jingle Pot	Old East Wellington (Nanaimo)	Thos. Lewis.
Cassidy-Wellington	Cassidy mine (Cassidy)	A. H. Carroll.
Middlesboro	Middlesboro (Merritt)	Middlesboro Collieries, Ltd.
Coalmont	Coalmont (Coalmont)	Coalmont Collieries, Ltd.
Tulameen Coal, Princeton	Tulameen (Princeton)	Tulameen Collieries, Ltd.
Tulameen Valley Coal, Princeton	Tulameen (Princeton)	Princeton Tulameen Coal Co.
Granby Tulameen	Granby (Princeton)	Granby Consolidated M.S. & P. Co., Ltd.
Hat Creek	Hat Creek (Lillooet)	Canada Coal & Development Co., Ltd.
Bulkley Valley	Bulkley Valley (Telkwa)	Bulkley Valley Colliery, Ltd.
Aveling	Aveling (Telkwa)	Aveling Colliery.
Crow's Nest, Coal Creek	Coal Creek (Coal Creek)	Crow's Nest Pass Coal Co., Ltd.
Crow's Nest, Michel	Michel (Michel)	Crow's Nest Pass Coal Co., Ltd.
Corbin Washed	Corbin (Corbin)	Corbin Collieries, Ltd.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

FIRST, SECOND, AND THIRD-CLASS CERTIFICATES AND MINE-SURVEYORS' CERTIFICATES.

BY

JAMES STRANG.

The Board of Examiners, which was formed on July 10th, 1919, now consists of James Dickson, Chief Inspector of Mines, Chairman; H. E. Miard, member; and James Strang, member and Secretary to the Board.

The meetings of the Board are held in the office of the Department of Mines in Victoria. Examinations are held in accordance with the amended rules of the Board of Examiners and approved by the Minister of Mines on September 28th, 1929. Two examinations were held in 1938, the first on June 1st, 2nd, and 3rd, and the second on November 16th, 17th, and 18th.

The total number of candidates at the examinations were as follows: For First-class Certificates, 2 (1 passed and 1 failed); for Second-class Certificates, 8 (3 passed, 5 failed); for Third-class Certificates, 31 (13 passed, 18 failed); for Mine-surveyors' Certificate, 2 (1 passed, 1 failed).

The following is a list of the candidates who successfully passed in the various classes:—

First-class Certificate.—William Chapman.

Second-class Certificates.—John Christie, Irving Morgan, and Peter Lancaster.

Third-class Certificates.—John Whittaker, Christopher Mills, Andrew B. Easton, William W. Bennie, William W. Johnstone, Hugh M. Gilmour, Roger A. Pasiaud, Robert Littler (Jr.), Harry Corrigan, Joseph R. Wilson, Thomas H. Cunliffe, Arthur H. Dockrill, and Arthur Williams.

Mine-surveyors' Certificate.—Morton H. Graham.

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. By miner is meant any person employed underground in any coal mine to cut, sheer, break, or loosen coal from the solid, whether by hand or machinery.

Examinations are held regularly in all the coal-mining districts.

No certificate has been granted in any case 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 1938 there were 123 candidates for coal-miner's certificates, of these 113 passed and 10 failed to qualify.

In addition to the certificates granted above, substitute certificates were granted to those who had lost their original certificates.

The Board of Examiners desire to thank the different coal-mining companies for the use of their premises for holding the examinations when necessary.

The Inspector of Mines in each district has authority under the "Coal-mines Regulation Act" to grant, after a satisfactory examination, a provisional certificate as a coal-miner to applicants, which entitles the holder to follow the occupation of a coal-miner for a period not exceeding sixty days or until the date of the next examination before the Board.

GOVERNMENT MINE-RESCUE STATIONS.

NANAIMO.

BY

RICHARD NICHOL.

There was no change in rescue apparatus maintained at this station during the year, except in the necessary replacement of parts. The apparatus in service consists of six sets of the Gibbs two-hour oxygen machines; six sets of the McCaa two-hour oxygen machines; twelve sets of Burrell all-service gas-masks; two H.H. inhalators; one Sparklet resuscitator; and thirty-five self-rescuers; with the necessary supplies to maintain above apparatus in service for a considerable time.

An 85-horse-power panel truck with half of above equipment on board is kept ready for any emergency calls.

Thirteen new men took the full training course during the year and received Certificates of Competency in this work; and several trained teams carried out training practice during the year.

There were no emergency calls for the rescue apparatus during the year, but twenty-three calls for oxygen supplies and the inhalator were received from local medical practitioners and the Nanaimo and Ladysmith Hospitals. These calls were responded to at once.

CUMBERLAND.

BY

JAMES L. BROWN.

The equipment of this station consists of eleven sets of McCaa two-hour oxygen breathing apparatus; twelve sets of the Burrell all-service gas-masks, with speaking diaphragm; six Edison Model K electric cap-lamps; one H.H. inhalator with dual face-mask; one Sparklet resuscitator; and twenty self-rescuers, with adequate supplies to maintain same in service.

During the year 800 cubic feet of oxygen was supplied from this station for emergency purposes at the request of local medical practitioners and the Cumberland Hospital. Four fully-trained teams from Canadian Collieries carried out regular practice during the year, being paid by the company for the time spent in training. Fourteen men took the full training course and received certificates of competency in this work.

PRINCETON.

BY

ALFRED GOULD.

There was no change in the rescue apparatus maintained at this station during the year. The equipment consists of eleven sets of the McCaa two-hour apparatus; eleven Burrell all-service gas-masks; seventeen self-rescuers; one H.H. inhalator; with sufficient supplies to maintain service for a considerable time.

Two calls for the use of the H.H. inhalator from the Princeton Hospital were given immediate attention. There were no emergency calls for the rescue apparatus.

During the year the Instructor made visits of instruction in mine-rescue work and first-aid work to *Copper Mountain* mine and *Hedley Mascot* mine. Twenty-nine men at these mines took the full training course and received certificates of competency in mine-rescue work.

FERNIE.

BY

J. T. PUCKEY.

No additions were made to the equipment at this station during the year except in the matter of replacement of parts of the apparatus.

The rescue apparatus at this station consists of eleven sets of the McCaa two-hour oxygen apparatus; twelve sets of the Gibbs two-hour oxygen apparatus; twelve sets of the Burrell all-service gas-masks; twelve self-rescuers; and one inhalator, with sufficient supplies to maintain the above in service for a considerable time.

At the explosion at Michel Colliery on July 5th, a call was received to stand by with the rescue apparatus, but the rescue machines at Michel Colliery were found adequate for the needs of that emergency. A number of emergency calls for oxygen treatment at the local hospital were responded to without delay.

A number of previously trained men underwent practice training during the year, and seven new men took the full training course and received certificates of competency in mine-rescue work.

INSPECTION OF COAL MINES.

VANCOUVER ISLAND INSPECTION DISTRICT.

BY

JOHN MACDONALD.

Western Fuel Corporation of Canada, Ltd. J. A. Boyd, President, Montreal, Que.; H. R. Plommer, Vice-President, Nanaimo, B.C.; P. S. Fagan, Secretary-Treasurer, Nanaimo, B.C.; John Hunt, General Manager, Nanaimo, B.C. This company operated the No. 1 and Reserve mines in the Nanaimo area during the year.

No. 1 Mine, Nanaimo.—W. Frew, Manager; T. Wood and G. Frater, Overmen. This mine is situated on the southerly end of the Esplanade in the City of Nanaimo and close to the shore-line of the Strait of Georgia. Until the early part of October it had the distinction of being the oldest operating coal mine in British Columbia, with the underground workings connected with four shaft openings, as follows: No. 1 and No. 2 shafts on the Esplanade; Protection shaft on Protection Island; and Newcastle shaft on Newcastle Island.

No additions were made to the plant during the year; the reverse being the case, inasmuch as various units were dismantled and transported to other company mines as the available coal remaining in many districts was being extracted and the pillars drawn back to the immediate vicinity of the main motor-level.

From the beginning of the year until the afternoon of October 5th this mine worked 194 days with an average production of 715 tons per day. This shows a decrease of 160 tons per day as compared with the output for 1937, and was not entirely unexpected, as it was generally known that the end was in sight for this mine as an active producer.

The ventilation was provided by two fans; one located at Protection shaft and operated as a blower-fan, and one at No. 2 shaft on the Esplanade which was operated as an exhaust-fan, the distance between these two units being approximately 1¾ miles. The ventilation was generally satisfactory throughout the year, no explosive gas being found in the live workings at any of our inspections, while the methane content in the various return air-currents was always well under 0.5 per cent. Thirty-five samples of air were taken between the returns from each split and in old workings to check on any heating in these abandoned areas, the resultant analyses showing that the ventilation in general was fairly good considering existing circumstances. Every precaution was taken to offset the dangers to be apprehended from the presence of coal-dust by frequent applications of limestone-dust where this treatment was deemed necessary; thirty-five samples of dust were collected during the year and all but five of these were well above the standard set by the Coal-dust Regulations as regards non-combustible content. The miners' "gas committee" inspected the mine regularly and promptly forwarded copies of their reports for our information. All report-books required to be kept at the mine were examined frequently and found in order.

Though no serious or fatal accidents occurred underground in this mine, I regret to report a fatality at the cleaning plant on the surface when a carpenter, while engaged in repairing one of the tables, was caught by a revolving shaft, sustaining injuries from which he died a few hours after the accident. This was the only fatality that occurred in or around the mines in the Vancouver Island Inspection District during the year. Sixty minor accidents of a compensatable nature that happened in this mine during the year were investigated and reported on in detail.

In passing, it may be permitted to mention a few interesting facts concerning the early history of "Old No. 1," as it is now known. Sinking operations were commenced on September 14th, 1881, the Douglas seam being tapped at a depth of 635 feet on October 26th, 1883, the sinking operations being finally completed on November 15th, 1883. The driving of the main levels began in December of the same year and on the 24th of this month 50 tons a day were being hoisted. The first fatal accident to be reported from this mine occurred on August 30th, 1884, and on May 3rd, 1887, the first major disaster happened when the staggering toll of 148 lives were lost in the "big" explosion.

On January 12th, 1887, 800 tons of coal were being hoisted daily and on November 6th, 1907, this output had been boosted to 1,600 tons. On May 20th, 1892, the first electric-trolley motor to operate underground in a coal mine in British Columbia was put into service on the main haulage; this, in addition to others installed later, performed wonderful work on the long haul between Protection workings and No. 1 shaft, where all coal was hoisted to the surface. From December, 1883, until active production ceased in the early part of October of the present year, approximately 18,000,000 tons of coal were hoisted from No. 1 mine, constituting a record for any one producing mine in the Province.

Reserve Mine, Nanaimo.—W. Roper, Manager; A. W. Courtney and T. Wood, Overmen; R. Houston, Shiftboss. This mine is situated in the Cranberry District, 5 miles south of Nanaimo, and operates in the Douglas seam, this being reached by two shafts at a depth of 1,000 feet. This mine worked 204 days during the year with an average output of 600 tons per day, a fair proportion of this output coming from pillar-extraction in "Baird's Heading section." New development-work has progressed favourably in the "Rock Slope section," but operations in this area were curtailed toward the end of the year owing to faulted and troubled ground being encountered. The ventilation has been generally satisfactory throughout the year, the quantities passing in the various splits at the last inspection measured as follows: Rock Slope return—11,200 cubic feet of air a minute for the use of forty men and four horses; Baird's return—5,700 cubic feet of air a minute for the use of nine men and one horse; Main return—45,000 cubic feet of air a minute for the use of sixty men and five horses. Safety-lamp readings taken regularly in the above return airways never exceeded 0.6 per cent. methane. Thirty-six samples of air were taken in this mine, five of which were lost in transit. As a safety precaution to offset the danger from coal-dust, 52,500 lb. of limestone-dust were used to treat 17,500 feet of roadways. Eighty-three samples of dust were collected from these roadways, all but seven of these samples being well above the standard set by the Coal-dust Regulations. Regular inspections were made each month by the miners' "gas committee," who kindly furnished copies of their reports. All report-books required to be kept at the mine were examined at each visit of inspection and found in order.

Two serious accidents were reported from this mine; one of these was caused by a miner being jammed by an empty car that ran back from the face, while the other was caused by a piece of rock falling out from between the lagging and striking a miner on the back while he was engaged in cutting a timbêr; thirty-nine minor accidents of a compensatable nature were also investigated and reported on. Inquiry into these occurrences show that a very large proportion can be avoided by the exercise of reasonable care and good judgment on the part of the men directly involved.

Canadian Collieries (Dunsmuir), Ltd.*

J. A. Boyd, President, Montreal, Que.; H. R. Plommer, Vice-President, Vancouver, B.C.; P. S. Fagan, Secretary, Nanaimo, B.C.; John Hunt, General Superintendent, Nanaimo, B.C. The mines operated by this company during the year were Nos. 5 and 8, Comox Colliery, Cumberland; Northfield mine at Northfield; and the No. 10 mine at South Wellington. Comóx Colliery is situated near Cumberland and is connected to Union Bay by the colliery railway, 12 miles in length, over which the whole of the output is transported. The Northfield Colliery is situated about 4 miles north of Nanaimo and has railway connections over the Esquimalt & Nanaimo Railway and the Western Fuel Corporation's private lines with the loading-wharves at Nanaimo where all coal is shipped. No. 10 mine is situated at South Wellington, which is approximately 7 miles south of Nanaimo. This latter property was brought into production during the year.

*No. 5 Mine, Comox Colliery.**—E. H. Devlin, Manager; John Christie and Irving Morgan, Overmen. This mine operates the No. 2 seam, which is reached by a shaft 280 feet in depth. All the workings lie to the dip of the shaft and are accessible by four slopes which are driven from the level of the No. 1 seam. All of the output is produced from long-wall faces and their accompanying development places; at the end of the year there were ten active long-wall faces, having a total length of 2,700 feet of actively exposed face-line. The long-wall advance method of working as employed at this mine causes a considerable amount of crushing and squeezing, which consequently necessitates a considerable amount of repair-work being done. The long-wall faces are equipped with Meco-type conveyers which carry the coal

* By E. R. Hughes.

from the faces to the loading-points on the levels. All mining is done in the rock-bands, either in the centre of the seam or underneath, by means of Anderson-Boyes coal-cutting machines which mine the coal to a depth of 6 feet. In the development places the cutting is also done in the rock-bands by means of Hardiax post-type punching machines, compressed air being used to operate the coal-cutters and conveyers.

A 500-horse-power electric hoist situated at the top of the main slope carrying 5,300 feet of 1⅛-inch rope hauls all the coal from the various districts of the mine to the top of the slope. The slope is laid with heavy steel as a precaution against derailing of the trips, which of necessity must travel at a high speed on such a long slope. Each trip is made up of eighteen cars with a safety-car behind as a safeguard against accident to the hoisting equipment. A man-trip is run on this slope to bring the workmen out at the end of each shift; the speed of the trip when men are thus being hauled is between 6 and 7 miles per hour.

Six compressors, located underground at approximately 1 mile from the shaft-bottom, supply the compressed air required for the operation of the coal-cutting machines, conveyers, air-hoists, and air-pumps. During the year two electric hoists, each of 75 horse-power, 440 volts, were added to the electrical equipment underground.

The heavy outflow of methane from the workings of this mine demands a continual improving, extension, and enlarging of existing airways, coupled with the driving of new and more direct roadways to carry the large volumes of air necessary to dilute and render harmless the gases given off. The outstanding improvement to the ventilating system during the year was the completion of the new intake air-shaft and its connection to the new air-drift from the Main Slope section. The new air-drift, which was driven for a distance of 912 feet at an angle of 58 degrees, "holed through" to the new air-shaft on June 5th; the new air-shaft having been previously sunk and completed to a depth of 150 feet. Although this new drift has not been instrumental in actually increasing the volume of air passing through the mine, yet it has directly decreased the amount of leakage from the intake to the return airways, thus increasing the efficiency of the ventilation; also a potentially large volume of fresh intake air is available for use in the Main Slope section, which at present cannot be utilized because of regulators placed on each side of this section; these at present being necessary because of constricted air-passages in other parts of the mine. However, arrangements are being made to take advantage of this condition by driving new roadways and by the erection of overcasts to lead a portion of this fresh-air current directly to some of the working faces of the No. 5 East Slope section and to the No. 2 West section. Other improvements to the return airways were the driving of a roadway 350 feet long, 7 by 10 feet, from No. 1 Right in the No. 2 West section to the main return on the right side of No. 2 West; this providing a return airway for the No. 1 Right wall. A roadway 7 by 10 feet was also driven through solid rock and gob and an overcast erected to connect the east side of the No. 5 East Slope section with the return airway on the right side of the main slope. In connection with this airway, 1,000 feet of old No. 6 level was enlarged and retimbered.

The application of rock-dust to the roadways and long-wall faces of this mine is being constantly maintained. Roadways to the extent of approximately 45,000 feet in length and face-lines totalling 210,000 feet in length were so treated during the year, using a total amount of 432,800 lb. of rock-dust. The dust is applied on all main roadways by means of specially constructed dust-cars; while small boxes, or sacks, in conjunction with air-nozzles are used in all other places. Water-sprays are constantly in use at the discharge end of all conveyers, and all main partings are equipped with water-sprinklers which are used to thoroughly wet down all loaded cars before they are taken out of the main haulage. Samples of mine-dust were collected each month from the different roadways as required and a total of 231 samples of this dust were analysed; of these, only three samples failed to be in keeping with the standard set by the Coal-dust Regulations.

Samples of mine-air were taken regularly from all splits and return airways. A total of sixty-three regular samples and fifty-two special samples of mine-air were taken and sent to Bureau of Mines, Ottawa, for analyses. The resultant analyses providing a fund of useful information in checking on the quantities of methane given off from the faces and passing along the various returns; in addition to this, the analyses provide a record indicative of the possible future trend of methane emission for either the whole mine or for each separate split.

Special air samples were taken on every active long-wall face in the mine with a view to ascertaining to what extent the operation of coal-cutting machines affected the outflow of methane. It was proved that the methane emission continued to increase for a considerable period after coal-cutting operations had actually ceased; the peak outflow being reached from one to three hours after cutting had been completed. The outflow of methane is also influenced by the cleaning of the cuttings from the undercut coal and by the breaking off and further fracturing of the coal in position.

Monthly inspections were made by the miners' "gas committee" and copies of all these reports of inspection were received through the courtesy of the committee members. All report-books required to be kept at the mine were examined regularly and were found to be in order.

Four serious accidents occurred in this mine during the year, two of which were due to mine cars and haulage and the other two due to falls of coal and rock. There were also 135 minor accidents, which caused a loss of time varying from a few days to several weeks. The quantity of air passing in the main return, at the bottom of the fan-drift, at the last inspection measured 155,000 cubic feet per minute; the air-sample analysis showed this air to contain 1.22 per cent. methane. The total methane outflow from this main return being 2,723,000 cubic feet during the 24-hour period.

This mine operated on 204 days during the year and produced 205,756 tons of coal, with 450 men employed underground and fifty-one men on the surface.

*No. 8 Mine, Comox Colliery.**—James A. Quinn, Manager; John S. Williams, Overman. This mine is situated in the vicinity of the Lake Trail road and 2 miles east of the mine camp at Bevan. The seams are reached by two shafts each 1,000 feet in depth; these were dewatered and repaired to the 700-foot level in the latter part of 1936 after having been closed down for over twenty years. Prospecting-work had only been done when the shafts originally tapped the coal-measures and it was necessary to make new roadways and sidings to facilitate the new development in the seam to be worked. Although it had hitherto been supposed that this seam was the No. 1 seam and, in fact, is still so named, yet it has many characteristics common to the No. 2 seam at present being worked at the Comox No. 5 mine. When further correlation data have been obtained it will be possible to definitely establish the identity of this seam. Before opening out on the long-wall advance method of work, a shaft pillar 1,000 feet in diameter was marked off and the narrow openings driven to beyond this limit.

All development-work during the year has been done on the south side of the shaft. The Main south level has been driven out 1,600 feet from the shaft. An incline off this level, starting from a point 450 feet from the shaft, has been driven 900 feet in a westerly direction. Airways have been maintained to keep pace with this development. Six long-wall faces have been developed in this seam which is approximately 33 inches thick with a band of bone and shale in the centre which ranges from a thin lens to about 10 inches in thickness; the cutting is done in this centre band by means of Anderson-Boyes long-wall machines; Hardiax post-type punching machines are used to cut the development places. Meco-type conveyers are used on the walls; compressed air being used to operate the coal-cutters and conveyers. The roof conditions are not of the best and require close attention on account of the numerous slips encountered, together with cap-rock or false roof from 4 to 6 inches in thickness which usually comes down with the coal.

The ventilation is produced by a Keith fan which is capable of passing 100,000 cubic feet of air per minute under a water-gauge of 2.5 inches.

At the 116-foot level in the main shaft a rock drift has been driven from the main shaft to the air-shaft. This drift is 6 by 10 feet, 200 feet long. It is sealed on the air-shaft end and a 6-foot wall placed in the main shaft end forming a dam or sump. The surface water from both shafts is collected in rings in the shafts and piped into this sump. From this sump the water is pumped to the surface by a 5-inch single-stage centrifugal pump driven by a 50-horse-power 2,200-volt 3-phase motor and having a capacity of 700 gallons per minute. This unit is fully duplicated for use in case of emergency. Both pumps are set below the sump-level and are automatically primed. The discharge is also controlled by a float in the dam connected to a valve on the discharge-line, this controlling the discharge and preventing

* By E. R. Hughes.

the pump from running out of water. The amount of surface water thus collected and pumped out of the mine varies from about 300 gallons per minute in the summer to 600 gallons per minute in the winter. All the water that accumulates below the 700-foot level is hoisted with a 600-gallon-capacity bucket up the No. 2 shaft, the water-level being kept down to a point 200 feet below the present shaft-bottom.

During the year 170,000 lb. of rock-dust were used in treating the roadways and face-lines of the mine; 65,000 lb. of this being used to treat 6,500 feet length of roadway and 105,000 lb. being used to treat the face-lines; 600 feet of face-line being treated daily for 176 days. As an additional precaution against the coal-dust hazard, water sprays were installed at the discharge end of the conveyers. One hundred and twelve samples of mine-dust were analysed during the year, all of which exceeded the minimum standard as set by the dust regulations. Thirty-two samples of mine-air were collected during the year and sent to the Bureau of Mines, Ottawa, for analyses. The last mine-air sample taken in the Main return—during December—showed the air to contain 0.54 per cent. methane, the quantity of air passing at this time being 103,000 cubic feet per minute, this being for the use of sixty-four men and five horses. At the time of the December inspection the output was 320 tons per day with 114 men employed underground and fifteen men on the surface. The workings were inspected frequently by the miners' "gas committee" who kindly furnished copies of all reports of inspection. All report-books were examined periodically and found to be in accordance with the regulations.

Two serious accidents occurred in this mine during the year, both of which were the results of falls of rock. In addition to the above there were fifty-seven minor accidents in and around the mine, involving a loss of time varying from a few days to a few weeks.

Compressed air is supplied to the mine by a large Ingersoll-Rand compressor located on the surface. This machine is driven by a 750-horse-power motor and has a displacement of 2,100 cubic feet of air per minute. The only addition to surface equipment during the year was in the nature of fire-protection. The water from the underground pumps is discharged into a large tank on the surface. From this source a 4-stage, 5-inch centrifugal pump is coupled. This water is pumped to one 4-inch hydrant in the middle of the yard, one 2-inch hydrant on the picking-table, and one 2-inch hydrant on the top landing. This pump develops approximately 100 lb. pressure per square inch; 500 feet of 2-inch hose is on hand to be used when required.

After working irregularly for several weeks this mine closed down on December 12th for an indefinite period; however, the manager and the overman, also the main shaft hoistmen have been retained for the purpose of repairs and pumping.

Northfield Mine.—A. Newbury, Manager; J. Sutherland, Overman. This mine is situated about 4 miles north of Nanaimo and has railway connections over the Esquimalt & Nanaimo Railway and the Western Fuel Corporation's private lines with the loading-wharves at Nanaimo where the coal is shipped to the various markets. A general description of the surface plant and method of working in force at this mine appeared in the 1937 Annual Report of the Minister of Mines. An important addition to the underground equipment was the installation of a new hoist to cope with the increased output from the main slope. This is a product of the Ottumwa Iron Works and consists of a single-keyed drum, 54 inches in diameter, 42-inch face, with 72-inch-diameter flanges, equipped with a post-type brake operating on a 72-inch diameter, 11-inch face brake-ring. The motive power is provided by a General Electric 150-horse-power, 2,200-volt, 3-phase, 60-cycle, 435-r.p.m. slip-ring motor. The controls are also General Electric and consist of a 2,200-volt primary reversing panel and a secondary accelerating panel. The hoist-room is located 75 feet from the shaft and fully fire-proof throughout, being built of reinforced concrete with steel girders for roof supports. The controls are installed in a separate room, also built of concrete.

This mine is operating in the Wellington seam and was reopened in the latter part of 1936 after having been closed for over forty years. During the present year it worked 205 days with an average daily production of 574 tons, all of which being produced from long-wall faces where the coal is undercut by Anderson-Boyes coal-cutting machines, then loaded on to Meco conveyers which transport the coal along the various face-lines to the loading-points on the haulage. No. 5 Incline has been extended a distance of 1,400 feet, being driven in the strata above the seam, and will ultimately make connection with the old Wellington

No. 5 mine workings and provide a means of access to a considerable area of pillars left in by former operators. It is anticipated that the upper Wellington seam will be tapped from this roadway; this seam averages from 24 to 30 inches in thickness in this area and has never been worked in this portion of the field.

In all roadways and face-lines approaching in the general direction of submerged abandoned workings interlacing diamond-drill holes were kept ahead at angles sufficient to fully protect all advance operations. A high standard of ventilation has been maintained in this mine and working conditions have generally been found satisfactory at all our inspections. Twenty-three samples of air were taken, the resultant analyses, together with the safety-lamp readings, showed the methane content to be well under 1 per cent. in the various returns. The miners' "gas committee" inspected the workings frequently and kindly furnished us with copies of their reports. All report-books required to be kept at the mine were examined regularly and found in order.

Six serious accidents were reported from this mine during the year, all of these occurred in connection with the haulage; seventy-one minor accidents of a compensatable nature were also investigated and reported on in detail. Again I must repeat that a large proportion of these accidents should never happen if ordinary common sense and good judgment was exercised by the workmen in general while performing their various duties.

No. 10 Mine, South Wellington.—W. Frew, Manager. This mine is situated in the Cranberry District about ½ mile south of the old South Wellington No. 5 mine. Operations were begun in May, 1937, when a slope was driven from the surface through more or less faulted and barren ground for a distance of 1,700 feet before reaching the Douglas seam. From this point onward the mine is being opened out on the pillar-and-stall method of working with a fair measure of success, and was included in the list of producing mines in August of this year with an output of 2,692 tons for the month. It has since operated 123 days on production with an average daily output of 158 tons. All operations at the present time are confined strictly to development, with the main and counter slopes being driven ahead as rapidly as possible, while a diagonal slope and counter is being driven to the left of the main slope in the general direction of the abandoned workings of old No. 5 mine. Immediately the above roadways reached the 500-foot barrier-line established around these abandoned workings, diamond-drill holes were kept at least 50 feet ahead of the faces while flank holes not less than 20 feet in length were drilled at an angle of 30 degrees with the line of the roadway, these flank holes being drilled for every 6 feet of advance.

Surface plant: The main slope hoist, located on the surface, is an Ottumwa self-contained, single-drum, independent band friction clutch and band brake, second reduction electric hoist, driven by a 100-horse-power 2,300-volt motor. A larger hoist has been ordered to replace the above and will be installed in the early part of 1939. The new hoist is a Lidgerwood, similar to the above, the motive power for which will be provided by a 200-horse-power, 2,300-volt, 3-phase, 60-cycle motor. The compressed air for pumping and haulage underground at the present time is supplied by three small Canadian Ingersoll-Rand single-cylinder, belt-driven units with a total piston displacement of 660 cubic feet of air a minute. To replace the above machines and cope with the rapidly growing requirements of this mine, plans have been prepared for the installation of a modern Canadian Ingersoll-Rand compressor of the angle-compound type with a piston displacement of 1,880 cubic feet of air a minute. This unit will be installed early in 1939. The ventilation is provided by a Keith type of fan which was installed in the latter part of the year; this is a single-inlet unit 72 inches in diameter, 32 inches in width, with a 56-inch-diameter inlet. It is operated at a speed of 200 r.p.m. by a 35-horse-power, 440-volt, 3-phase, 60-cycle motor, and was circulating a quantity of 30,000 cubic feet of air a minute at the last inspection in December for the use of thirty men. A spare 54- by 24-inch Sturtevant fan is kept in readiness in case of emergency. Five air samples were taken in the main return airway and the resultant analyses of these, together with frequent safety-lamp tests, showed the methane content in the air to be slightly under 1 per cent. This mine has all the characteristics of a potential gas-producer and, for this reason, the ventilating arrangements must be given careful and strict attention at all times.

System of haulage: The loaded cars are gathered from the working-faces to the main sidings by small compressed-air hoists and then hauled to the surface by the electrically

driven hoist described above. The cars are then transported a distance of fully ½ mile to the tipple by a small steam-locomotive where they are dumped by a Phillips crossover dump, the coal being elevated to the bunkers by a link-belt scraper conveyer which is powered by a 15-horse-power, 440-volt, 3-phase, 60-cycle motor. The coal is then loaded from the bunkers into trucks and hauled a distance of 6 miles to the shipping wharves at Nanaimo. Cooling water for the compressors and water for the locomotive is pumped from Beck's Lake, a distance of approximately 1,400 feet, by an Allis-Chalmers single-stage centrifugal pump with a capacity of 210 gallons per minute.

Roadways and timbering have been kept in good shape throughout the year and working conditions have been found generally satisfactory at all inspections. All report-books required to be kept at the mine were examined frequently and found in order.

Beban's Mine. F. W. Beban, Operator; G. Frater, Overman. This mine is situated in the vicinity of the old Extension No. 1 mine and is operated in an isolated area of coal left in by former operators. Additions to the plant during the year consist of a new lamp-room and a waiting-room to provide shelter for the employees when changing shifts. Owing to a serious falling-off in the demand for coal, this mine operated only on ninety-six days during the year with an average daily production of 70 tons, this working-time being equally divided between the first two and last two months of the year. The ventilation is provided by a Keith fan which was passing a quantity of 14,000 cubic feet of air a minute at the last inspection in December for the use of twenty-eight men and two horses. Six samples of air were taken in the return airway and old workings, the resultant analyses of these, together with safety-lamp readings, showed only a trace of methane travelling in the return air-current. This mine has been inspected regularly by the miners' "gas committee" who kindly furnished us with copies of their reports of inspection. No serious accidents were reported from this mine, but one minor accident was investigated and reported on.

Chambers' Mine. R. H. Chambers, Operator; Chas. Webber, Fireboss. This mine is also situated in the Extension area in the vicinity of the old Extension No. 1 mine, all operations being confined to the extraction of a few pillars and some outcrop coal that had been left by former operators. A considerable tonnage of the surface outcropping was recovered by stripping, the surface overburden being removed by a large bulldozer. This mine worked a total of 190 days with an average production of 26.5 tons per day. The ventilation is produced by natural means and was found generally good at all inspections. No serious accidents were reported, but one minor accident occurred and was investigated. All report-books kept at the mine were examined regularly and found in order.

Lantzville Colliery. *No. 1 Mine, Lantzville.*—J. A. Challoner, Overman. This mine is situated on the shore-line of the Strait of Georgia, 9 miles north of Nanaimo, and operates the Wellington seam which is reached at a distance of 270 feet from the surface by a slope dipping 30 degrees. The seam in this locality varies from 24 to 30 inches in thickness and is mined by hand on a modified long-wall method of working. This property is worked on a co-operative basis with seventeen men engaged underground and five on the surface. The mine worked 271 days during the year with an average daily production of 19.3 tons. The ventilation has been good at all inspections, a quantity of 17,400 cubic feet of air a minute being measured in the main return at the last inspection in December for the use of seventeen men. Nine samples of air were taken in the main return, the analysis of which showed only a trace of methane travelling in the air-current. Working conditions have been found generally satisfactory at all our inspections.

A small washing unit was added to the surface plant at the end of the year and is apparently giving satisfactory results in the preparation of a better product for the market. No serious or minor accidents were reported from this mine.

Biggs' Mine. J. Biggs, Operator and Fireboss. This mine is situated in the Wellington area and consists of a slope driven down in the lower portion of the Wellington seam for a distance of 110 feet from the surface for the purpose of extracting some outcrop coal left in this part of the field by former operators. This mine worked 170 days and produced 240 tons of coal with two men engaged. The ventilation is produced by natural means and sufficient air was circulating at all times to meet the mine

requirements. Working conditions were found generally satisfactory at all inspections. No accidents were reported from this mine.

Loudon's Mine. W. D. Loudon, Operator; G. Stewart, Fireboss. This mine is situated in the Wellington area and, as in the case of Biggs' mine, all operations were confined to the extraction of a few small surface pillars and outcrop coal that had been left by earlier operators. Some prospecting and repair work was carried on at the beginning of the year but this was suspended on January 27th, the mine remaining closed until November when work was resumed to supply a local demand for coal. Eight days were worked in November and sixteen in December with an average production of 6 tons per day. The ventilation was produced by natural means and was sufficient for all requirements. Working conditions were found generally satisfactory at all inspections. No accidents were reported from this mine during the year.

Lewis' Mine. Thos. Lewis and Son, Operators; A. McLaughlin, Fireboss. Operations at this mine are confined to the extraction of a small area of outcrop coal lying adjacent to the old Jingle Pot slope. This property was operated 265 days during the year and produced 714 tons of coal with a crew of three men engaged on a co-operative basis. The ventilation is produced by natural means and was always found sufficient for the mine requirements; working conditions have been found generally satisfactory at all our inspections. No accidents were reported from this mine.

Berkley Creek Prospect. H. McLean Davidson and associates, Operators; H. M. Davidson, Overman. This property is situated in the old Extension area in the vicinity of Berkley Creek, and consists of two short slopes driven approximately 35 feet from the surface, together with a crosscut being driven to connect these slopes for a second outlet and ventilating purposes. Owing to weather conditions, operations have been carried on only at intervals during the year with two men engaged. This mine is ventilated naturally and working conditions were found to be generally good at all inspections.

Fiddick Mine. P. Phillips and associates, Operators; P. Carr, Fireboss. This mine is situated in the South Wellington area and had not been operated from May, 1936, until the latter part of 1938, when Messrs. Phillips, Carr, and J. Fiddick, Jr., decided to resume operations on a co-operative basis. These men repaired the main tunnel, sank a small air-shaft to serve as a second outlet, and installed a small fan to ventilate the workings. While extending the prospecting and development, a total of 14 tons of coal was produced and disposed of locally. No accidents were reported from this mine during the year.

Clifford Coal Co. W. Clifford, Operator; H. N. Freeman, Manager. This mine is situated on the "Richardson Estate" in the Extension area and was originally prospected by the Richardson Bros., who were unsuccessful in their venture. In the latter half of the year this property was leased to Mr. W. Clifford, who extended the prospect tunnel and located coal. A new haulage tunnel was then driven from the surface and contacted the seam at a distance of 120 feet from the portal. From this roadway a connection was driven through to the original tunnel, thus providing a second outlet from the mine; a small exhaust fan was installed at the portal of the latter tunnel and this served as a return airway from the mine. A coal-chute was built to convey the coal from the mine portal to bunkers built adjacent to the roadway built to serve the mine and it was anticipated active production would commence at the beginning of 1939.

Godfrey Estate.—P. Carr and associates sank a small shaft while prospecting for the Wellington seam on the farm belonging to Mr. Frank Dix, but this operation was subsequently abandoned when water and running sand was encountered at 35 feet from the surface.

Port Alberni Colliery.—R. B. St. Clair and associates. This property is situated within the city limits of Port Alberni and consists of a prospect tunnel which has been driven a distance of 30 feet from the surface in search of a coal-seam said to be in this area.

Cassidy Mine. J. McKellar and associates, Operators; T. Bullen and D. Caldwell, Firebosses. This mine was opened in the latter part of 1937 on the old Granby property at Cassidy to recover some surface pillars left in by the former operators. The seam in this area is reached by a short slope from the surface, from which a level was set off and driven to the extreme limit of this part of the field; skips were taken

off the pillars on either side of this level as the coal was extracted toward the slope. A high percentage of recovery has resulted from the careful manner in which this work has been carried out. During the slack period when there was very little demand for coal, a considerable amount of repair-work was done on the old Granby No. 1 slope for a distance of 120 feet from the surface. It was intended to drive a roadway to the right of this old slope to tap some coal said to be left intact in this section of the field. This venture, however, proved disappointing as an old gob was encountered before the above roadway had travelled far from the side of the old main slope. Consequently, the tonnage available for extraction in this area will be much less than that anticipated. The above mines worked 223 days and produced 1,827 tons of coal. The ventilation and working conditions in general have been found satisfactory at all inspections. No accidents were reported from these mines during the year.

NICOLA-PRINCETON INSPECTION DISTRICT.

BY

JOHN G. BIGGS.

The following coal companies operated in this district during 1938: The Coalmont Collieries, Limited; Middlesboro Collieries, Limited; Princeton Tulameen Coal Company, Limited; Granby Consolidated Mining, Smelting and Power Company, Limited; and the Francis Glover Trust Company.

Coalmont Collieries, Ltd. Blake M. Wilson, President, Vancouver, B.C.; W. H. Malkin, Vice-President, Vancouver, B.C.; R. A. C. Douglas, Secretary, Vancouver, B.C.; D. McLeod, Treasurer, Vancouver, B.C.; George Murray, Superintendent, Blakeburn, B.C. The mining operations of this company are conducted at Blakeburn, B.C., on the North Fork of Granite Creek, at an elevation of 1,600 feet above and 4 miles by road from Coalmont, where the mine-tipple, screening plant, and power plant are located on a spur off the main line of the Kettle Valley Railway. The coal is transported from the mine over the mountain to the mine-tipple at Coalmont by means of an aerial tramway. (The surface plant has been described in previous reports.)

No. 4 Mine.—James Littler, Overman; Robert Murray, Frank Bond, Archie McWhirter, and Thomas Bryden, Firebosses. This mine has been described in previous reports. This year's production of coal has been from the extraction of pillars on each side of the main slope between No. 2 main haulage drift and No. 7 West level and from the pillars between Nos. 1 and 2 drifts.

Ventilation is by an electrically driven double-inlet Sirocco fan and at the last inspection there was 15,000 cubic feet of air passing for the use of thirty-two men. The ventilation has been generally good at all inspections and the air found to be free of noxious gases. Analyses of dust samples showed them to be in accordance with the "Coal-mines Regulation Act."

One fatal and one serious accident occurred during the year. Both of these were investigated. The fatality was caused by a fall of roof coal. One man received serious head injuries when caught between a moving car and roof timbers.

No. 5 Mine.—James Littler, Overman; William Brown, Wilfred Valentine, and Frank McVeigh, Firebosses. This mine is 2,800 feet north of No. 4 mine and 250 feet higher in elevation. It is connected to No. 4 mine yard by a surface incline. The main slope extends 2,100 feet underground at a pitch of 20 degrees. The output of this mine is obtained from the extraction of pillars on the east side of the main slope.

Ventilation was found to be generally good and is maintained by an electrically driven fan producing 10,000 cubic feet of air per minute for the use of twenty-one men.

Middlesboro Collieries, Ltd. His Honour E. W. Hamber, President, Vancouver, B.C.; E. McDonald, Secretary, Vancouver, B.C.; Robert Fairfoull, Manager, Merritt, B.C. This colliery is situated on a branch of the Kettle Valley Railway about 1 mile from Merritt and consists of No. 2 South and No. 3 North mines. Plant and equipment have been described in previous reports and there have been no changes during the year. One hundred and two men are employed.

No. 3 North.—A. E. Allen, Overman; Garnet S. Corbett, Fireboss. The seam of coal is about 6 feet thick and is developed by means of a slope from the surface for a distance of 450 feet and a level from this point 500 feet inby. Headings are driven through to the surface for ventilation purposes. Ventilation and timbering were found to be good. Sixteen men are employed at this mine.

No. 2 South.—James Fairfoull, Overman; William Ewart, Thomas Rowbottom, and Richard Dunnigan, Firebosses. The seam of coal is 6 to 8 feet thick and is developed from a main adit-level which follows the strike of the seam for a distance of 4,500 feet, and owing to the basin-like formation of the measures this level reaches the surface again just south of the main portal. Headings, about 450 feet in length, are driven from the main level to the surface outcroppings for ventilation and pillars are being extracted between the level and the surface. Ventilation is generally good, about 15,000 feet of air passing through the mine for the use of forty-five men.

Compressed air is the only power used underground the coal being mined by machines of the post-puncher type operated by compressed air.

Granby Consolidated Mining, Smelting & Power Co., Ltd.

N. L. Amster, President, New York; A. S. Baillie, Vice-President, Copper Mountain, B.C.; B. E. Perks, Secretary, Vancouver, B.C.; A. W. Seaton, Treasurer, Vancouver, B.C.; W. R. Lindsay, Superintendent, Allenby, B.C.; Thomas M. Wilson, Manager, Princeton, B.C. This mine is in the Bromley Creek section of the Princeton coalfield and is operated by the company principally to supply coal for their steam-electric power plant at Princeton. This plant supplies power for the Granby Company's mine at Copper Mountain and for their concentrator at Allenby. Owing to the increased production of coal at the mine it became necessary to install a new 2-stage Ingersoll-Rand air-compressor with a capacity of 1,400 cubic feet of air per minute.

The coal being developed is the No. 2 seam, 6 feet in thickness with a shale roof, and pitching 20 to 25 degrees. It is worked by the pillar-and-stall method, the levels and headings being driven 12 feet wide, the coal being brought from the face of the headings to the levels by chutes. Mining machines of the post-puncher type are used exclusively. An electrically driven Sheldon single-inlet fan producing 15,000 cubic feet of air per minute keeps the mine generally well ventilated, supplying fresh air for the use of forty men. The total number of men employed at this mine on surface and underground averages around ninety-seven.

Princeton Tulameen Coal Co., Ltd.

Guy F. Atkinson, President, San Francisco, California; Geo. H. Atkinson, Vice-President, San Francisco, California; W. D. Seaman, Secretary-Treasurer, Princeton, B.C.; James Taylor, Manager, Princeton, B.C. This mine, formerly the Lind mine, operates the No. 1 seam of the Princeton District and is developed from a main slope driven from the outcrop on a pitch of 16 degrees for a distance of 450 feet. Levels have been broken off this slope to the east and west, the usual pillar-and-stall method being followed in developing the field.

At the last inspection 14,000 cubic feet of air per minute was passing through the workings, giving ample ventilation for the number of men employed. A Diesel electric power plant has been installed on the surface, supplying power for the air-compressors, screening plant, etc. Compressed-air mining machines of the post-puncher type are used underground. During the winter season fifty-seven men are employed at this mine.

Black Mine.—Operated by the Glover Trust Syndicate; Francis Glover, Manager, Princeton, B.C. This property is in the Finlay Creek District, 6 miles west of the town of Princeton. It has been developed by two levels driven from the surface croppings in the side of the mountain. The main level is in a distance of 500 feet and raises driven to the surface for ventilation. Only two men are employed.

Golden Glow Mine.—This small mine is situated on Lot 406 in the Bromley Creek area and only worked during the month of January; four men were employed.

Hat Creek Colliery.—L. D. Leonard, Superintendent, Ashcroft, B.C.; Andrew Dean, Fireboss. This small mine is in the Hat Creek Coal District, about 30 miles west of Ashcroft. Only two men are employed underground during the winter season; the coal being taken by truck to Ashcroft, Lillooet, and Kamloops for domestic purposes.

NORTHERN INSPECTION DISTRICT.

BY

CHARLES GRAHAM.

Bulkley Valley Colliery.

F. M. Dockrill, Lessee and Fireboss. This mine is situated on Goat Creek, a tributary of Telkwa River, about 7 miles from Telkwa, to which point coal is hauled by truck and shipped via Canadian National Railway to the various consumers between and including Prince Rupert and McBride. The Canadian National Railway have extended the use of this coal for station heating one division farther east this year, now reaching McBride.

A new slope was turned off in 1937 and continued down on the full dip of the seam. Three places have been turned off which supply the production, and the upper level off this slope is to be driven through to the surface, coming out just above the valley-floor and will be used for a return airway and drainage. Methane gas was detected on two occasions, the first inflammable gas seen by the writer in the district. The roadways are damp and rock-dust is applied at intervals. Electric lamps are used and conditions generally were good.

Northwest Anthracite Syndicate.—Thomas Campbell, Superintendent. Nothing was done on the anthracite prospect during the year. Several small seams were uncovered in the south bank of the Bulkley River at Tatlow, about 4 miles east of Smithers, by the above syndicate; one of these indicated a good grade of blacksmith-coal and some prospecting was done.

Aveling Mine.—Operated by the Skeena Development Syndicate; J. M. Wilson, Fireboss. About 105 tons of coal was mined along the outcrop of the "Betty" seam which occurs in the north bank of the Telkwa River, about 5 miles from Telkwa, and about 18 tons of blacksmith-coal was mined from a small seam underlying the "Betty" at this point. The blacksmith-coal was used along the line of the Canadian National Railway between Terrace and Burns Lake.

EAST KOOTENAY INSPECTION DISTRICT.

BY

H. E. MIARD.

During 1938, activities in the Crowsnest coalfield were limited to the collieries operated by the Crow's Nest Pass Coal Company, Limited, at Coal Creek and Michel. At the latter place a large programme of development, involving the extension of the two main crosscut adits over an aggregate distance of 3,508 feet, permitted the opening of three of the four seams, in which the present operations are situated, in a section of the field heretofore penetrated only by the workings of "B" seam. A new coal-cleaning plant, replacing that destroyed by fire on October 25th, 1937, was put in operation towards the end of the year.

Accidents entailing injuries to 114 employees were investigated in the course of the year. There were four fatal occurrences, bringing about the death of eight men; twenty-four persons sustained serious and eighty-two comparatively slight injuries. All the fatalities occurred underground; three of them were due to an explosion initiated by lightning at Michel and three to a bump at Coal Creek. Eight of the serious and ten of the minor mishaps took place on the surface, but two of the men having sustained serious injuries there were employed on work having only an indirect connection with the operation of the mines.

In the compilation of these returns, only accidents involving disablement extending over a period of seven days or more are taken into consideration; those classed as serious entailing permanent injury or loss of time extending over more than a month. Of the fatal occurrences, two, resulting together in the loss of six lives, were due to combinations of circumstances which it would have been hardly possible to foresee or circumvent in the present state of our knowledge of natural forces; but a high proportion of all the other mishaps could probably have been avoided through the exercise of appropriate care. There is an ample field for the educational campaign conducted in the district under the auspices of the East Kootenay Mine Safety Association.

Crow's Nest Pass Coal Co., Ltd.

H. P. Wilson, President and General Manager; Thomas Balmer, Seattle, Wash., U.S.A., Vice-President; J. S. Irvine, Fernie, Secretary; A. A. Klauer, Fernie, Treasurer; Clement Stubbs, Mine Manager, Coal Creek; and Bernard Caufield, Mine Manager, Michel. As already stated, this company was the only one operating coal mines in East Kootenay during 1938.

Coal Creek Colliery, No. 1 East Mine.—Clement Stubbs, Manager; John Caufield, Overman; Carmichael MacNay, Shiftboss. No. 1 East mine was the only part of the colliery operated during the year, all extraction being concentrated in the 26 and 28 West districts, on the rise side of the main entries, and at an average depth from the surface of more than 1,200 feet. The method of working is a modified form of retreating long-wall, with sacrifice pillars left behind to assist in controlling the descent of the roof. In general, the part of No. 1 seam in which the present workings are situated has a total thickness of approximately 25 feet and is divided in two well-defined sections by a shale-band about 4 feet thick. The upper bench, 9 or 10 feet high, contains a shale-band displaying considerable irregularity as to thickness and found at a variable elevation above the main parting. The lower section of the seam, probably about 10 feet thick also, is left undisturbed, but its extraction might be considered with some chance of success, after a number of years, should economic conditions warrant such an undertaking, when the settlement of the roof over the worked-out ground will have progressed sufficiently to have permitted a partial reconsolidation of the disturbed measures. The immediate roof is conglomerate, sandstone, or shale; the last, where present, ranges in thickness between 1 foot and 12 feet. The main roof, over the entire area at present operated, is a conglomerate composed of elements varying considerably in size.

Rooms are driven in pairs, at a distance of 38 feet between centres, from one level to the counter of that immediately above it, a 100-foot pillar being left between each pair of rooms. Conveyers are installed as the work progresses and crosscuts are driven at intervals to assure efficient ventilation. It is important that the faces of advancing narrow places be kept abreast and that the crosscuts be fully opened in order to avoid coal bumps. Stringers are used in the narrow work when necessary; that is, under shale which constitutes a live load as it is being pushed out from over the solid coal. The long-faces are thus established, they start as the outby rib of each pair of rooms. When they have retreated over a short distance the roof requires little more support than that afforded by light props set about 4 feet apart and, under shale roof, two rows of "breakers" which are removed when they have accomplished their purpose. Three men are usually employed in each narrow place and nine or ten on one of the long-faces. The conveyers are loading directly into mine-cars on the levels.

The fact that not only the underlying sandstone, but the conglomerate itself, can be cracked and caused to cave in by the method described seems now to be established, although apparently only lenses of it, among them some of considerable dimensions, have so far been broken and brought down following the extraction of the coal. The small pillars abandoned are crushed and the shale-band is forced out from under them, thus bringing about a gradual closing of the openings. Chain-pillars between levels are generally abandoned.

No indication of heating has been observed in any of the goaves and it would seem that the possibility of this occurring constitutes only a remote contingency.

An interesting feature is the small amount of dust produced in the course of mining on the long-faces, compared to that liberated in the driving of narrow work. This is probably to be ascribed to greater facility for expansion offered to the seam in the former case and, as a corollary, the proportion of lump coal produced must be correspondingly greater.

The method of working followed at Coal Creek has been described at some length, for, when introduced a few years ago, it presented a radical departure from the principle upon which the operation of the mines had been based for a considerable period, in the course of which an unsuccessful battle had been waged against the special difficulties met in the extraction of the local coal-seams under cover of a certain thickness. Like every new idea, it took some time before it was sufficiently well understood by the minor officials and workmen to assure the full benefit of its application.

Two bumps occurred in the course of the year. On August 22nd, a shock of moderate intensity shook a short section of No. 26 Incline, but did comparatively little damage. Some of the shale roof immediately overlying the coal was brought down, debris piled along the ribs was thrown in the roadway over a length of some 200 feet, and an air-receiver was dis-

placed. The floor did not heave to any considerable extent. No one was injured and the working-faces were not affected.

It seemed evident that this phenomenon was due to stresses, incidental to mining operations, being retained owing to the resistance presented by a large entry pillar left on the south side of the incline. This feature had not escaped the attention of the management and it was intended to drive a couple of narrow places through the pillar mentioned in order to release the accumulated stresses, but the bump occurred before it had been found possible to begin the work.

On September 20th, an extremely violent bump wrecked the main and counter entries, inby the 20 East slope, over a length of some 600 feet. The two roadways were practically filled, over a considerable distance, with heaved-up floor material and debris projected from the sides. It occurred at the time at which the afternoon-shift men had reached that part of the main entries on their way to the working-places. Three men were killed and four others, seriously injured and imprisoned under fallen timber and rock, were rescued only after several hours of unremitting toil on the part of those who had escaped more or less unscathed, and others summoned from the surface.

From the resulting loss of life, severity of the bodily injuries sustained by some of the rescued men and material damage, this bump was the most disastrous occurrence of its kind since that of July 30th, 1908. The violence of the shock can be appreciated from the fact that a band of sandstone, 6 inches in thickness, overlying the coal was shattered or rather exploded, some of it being actually ground into powder. This band of stone is adjacent to the superincumbent conglomerate and is similar in texture and material to the matrix of the latter.

Manifestations of this kind have occurred repeatedly at Coal Creek since 1906; forty-seven being recorded up to the present time. They have caused the loss of thirteen lives and have been responsible for enormous expenditure, incurred either in repairing damage to the mines or in experimenting with methods of working which, it was hoped, could either prevent their occurrence or mitigate their effects. Five major factors are entering in the problem, none of which can be disregarded in any attempt to formulate a solution. They are: Thickness of cover; nature of superincumbent strata; residual tectonic stresses (this involving consideration of the probable state of the measures below, as well as above, the coal); configuration of the surface; and topography of the seam. The relative importance of each one being somewhat difficult to ascertain, the search for an effective remedy must perforce remain largely on an empirical basis.

The gaseous nature of this seam is well known. A part of the mine, subject at one time to violent outbursts and abandoned for a number of years, is still giving off methane at the rate of 12,600 cubic feet per hour, or a total weight of 5½ tons per day. In the active section of the mine, about 450 cubic feet of the gas are liberated on each minute of a working-day. An estimate of the amount of methane thus set free per ton of coal mined is difficult to establish, as the flow continues for a long period, under the influence of natural agencies, after the miners' activities have ceased.

The mine is ventilated by an 11-foot double-inlet Sirocco fan, driven by a 300-horse-power induction motor, which maintains a water-gauge of 2 inches. The main air-current is divided into two splits and the quantities measured were as follows at the time of the December inspection:—

No. 26 Incline district: 26,450 cubic feet per minute for the use of twenty-five men and five horses; methane content, 1.18 per cent.

No. 28 Incline district: 20,800 cubic feet per minute for the use of thirty men and four horses; methane content, 1.3 per cent.

Main return (at foot of fan-shaft): 73,800 cubic feet per minute.

No additions of any importance were made to the plant in the course of the year.

Michel Colliery.—Bernard Caufield, Manager. Operations at this colliery were considerably hampered during the greater part of the year through the lack of adequate cleaning facilities for the output, as the new coal preparation plant, replacing the installation destroyed by fire in the fall of 1937, was not completed until the latter part of October. This led not only to irregular but to selective operation of the mines, retarded extraction that

should have proceeded rapidly, and increased unduly the amount of repair-work entailed by the maintenance of roadways in some parts of the mines.

The new preparation plant, erected at a cost of nearly $500,000, is capable of treating a maximum of 380 tons per hour of operation. Means of assuring very close sizing are provided, this being essential to the efficiency of any coal-cleaning process. All sizes above ¼ inch are treated on three Vissac jigs, those below are diverted to a pneumatic separator. The moisture adhering to the washed coal, under the 1⅝-inch size, is removed by a stream of air delivered to four Vissac driers at a temperature of approximately 700° F. Coal-dust is removed from the building by an exhaust-fan coupled to a collector and a 4-foot sheet-iron flue, with branches of various diameters reaching the points at which the dust is produced. The coal is sprayed with hot oil immediately before its being loaded in railway-cars, with the object, very successfully attained, of preventing the liberation of dust in the course of subsequent handlings.

The coal-measures on the south side of Michel Creek are contorted in the form of a canoe-shaped fold, the sides of which form an angle of about 70 degrees. As would naturally be expected, at and near this important deflection of the line of strike, some tectonic adjustments have taken place and the seams have been faulted and displaced to a considerable extent. In the course of the year, two rock crosscuts, being extensions of the colliery's main adits, were driven through the trough of the fold over distances of 1,719 and 1,789 feet respectively, in which the parts of Nos. A, 1, and 3 seams outcropping on the Elk River escarpment were intersected. Development-work began immediately in this section of the field penetrated heretofore only by the workings of " B " seam.

The general method of working adopted at Michel is similar, in its essential features, to that already described at length as being followed at the Coal Creek colliery. Here, however, it is found possible to drive single places as " splits " or initial conveyer ways when preparing one of the 300-foot blocks for extraction. When retreating, a narrow sacrifice pillar is left at the end of every 100-foot section to control the descent of the roof and to prevent falls of rock, taking place over ground from which the coal has been extracted, from reaching the next working-face. Some modifications become necessary, occasionally, to adapt the method to the varying natural conditions encountered, among which weak roof and strong dips are the most important. The coal is undermined by long-wall or radial machines, according to local conditions and the nature of the work, and is carried from the face either by conveyers or chutes. In favourable circumstances, four separate conveyers are delivering coal to a belt which, in turn, either discharges it into a main chute or carries it to station where it is loaded in mine-cars.

In the course of the year 35,590 lb. of Polar Monobel and 61,524 lb. of Polar CXL-ite were used in 79,900 separate shots, only four of which missfired; a performance which, undoubtedly, comes very near to constituting a record.

No. 1 Mine.—Robert Taylor and Walter McKay, Overmen. This operations includes the present workings of Nos. 1, " A," and " B " seams. Operations in " A " seam were discontinued temporarily in the month of September.

The part of No. 1 seam in which the present workings are situated has a weak roof requiring elaborate timbering, interfering to some extent with the complete application of the method of working generally adopted at the colliery and precluding the use of coal-cutting machinery. However, it has been found possible to lay out the workings in such manner as to permit conveyers and a transporting-belt to deliver the coal from the faces to central loading-points.

This part of the mine is moderately damp and the problem presented by the production of coal-dust in the course of mining operations is not very serious. Here, as in the rest of the colliery, all roadways are systematically treated with limestone-dust.

At the time of the last inspection, 15,500 cubic feet of air per minute were circulating through the workings for the use of thirty-eight men and six horses. This part of the colliery has an independent intake but is ventilated by the main-fan.

Owing to the extraordinary low ash content and the high coking quality of the coal, operations in " B " seam were carried on more regularly than in any other part of the colliery during the year. The chief difficulty met in the workings of this seam lies in the presence of numerous " pot-holes " encountered in the roof. This feature demands constant attention

on the part of the men employed at the faces and particularly careful timbering. In the inner section of the mine, opened within the past two years by a pair of inclines driven to the surface, gradients reaching and even exceeding 40 degrees have been met, a feature which will again compel a readjustment of the usual method of working.

On July 5th three lives were lost in this mine through an explosion, undoubtedly initiated through an electric surge induced by a stroke of lightning. Material damage was caused at a number of points scattered over an area of approximately 50 acres in the 4 West entry section. Beyond this, nothing was disturbed and the surveyor and his helper, who were then 4,000 feet away and inby, had no inkling that anything out of the ordinary had happened until they met some after-damp on their way out. Timbermen at work in the main return airway remained also unaware of the occurrence. Short distances in which considerable damage had been done alternated with zones in which only insignificant traces of force could be observed. As was to be expected, small local explosions occurred at the lower end of conveyers where, naturally, more coal-dust could be found. One remarkable exception was presented by the loading-station at the end of the transporting-belt on No. 9 Incline, where not even the coal and rock dust, lying on the timber and the steel beam supporting the belt engine, had been dislodged. The rehabilitation of the district demanded only a few days. This part of the mine was in excellent condition before the accident, both as regards ventilation and rock-dusting. It must be noted here that in summer the air entering the mine loses a great deal of its moisture through condensation, owing to the low temperature of the workings (this never exceeds 50° F.), and the limestone applied to the roadways being highly hygroscopic absorbs a great deal of it, which tends to decrease its efficacy as a neutralizing agent.

The grounding arrangement at the portals through which track and pipe-line systems are entering the mine, until then considered as entirely adequate, received special attention after this occurrence and its capacity was vastly increased. It is also intended to tie together, electrically, tracks, pipe-lines, and coal-seams, where it is practicable to do so, in order to equalize possible differences of potential induced by outside sources between various conductors.

Owing to the configuration of the workings, the ventilation is affected to a considerable extent by differences of temperature; this action being favourable in summer but highly detrimental in the winter months. However, the new connection established with the surface late in the year will afford the possibility of separating the ventilation of the "B" seam workings entirely from that of the other mines, and the installation of a new fan serving them exclusively is to be undertaken in the course of the present year.

The volume of air circulating varied between 18,000 cubic feet per minute (with a methane content of 0.68 per cent.) in August and 12,250 cubic feet (methane, 1.19 per cent.) in December, for the use of fifty-three men and five horses.

In the Rock Tunnels section, which comprises all development-work begun in Nos. "A," 1, and 3 seams after they were reached through the extension of the two main adits and also, temporarily, a rock crosscut being driven towards the lower section of "B" seam, 10,800 cubic feet of air per minute were supplied for the use of ten men and one horse at the time of the December inspection.

No. 3 Mine.—Robert B. Bonar, Overman. The management of this part of the colliery constituted a complicated problem during the greater part of the year; the curtailment of trade, due to the lack of adequate cleaning facilities, leading to irregular operation, an unfavourable factor where an extensive roadway system has to be maintained and when a considerable part of the output comes from pillars. For both haulage and ventilation the mine is divided in two sections, known as the 9 and 12 Incline districts respectively, pillars are being extracted exclusively in the former, whereas in the latter both the long-face and the wide stall methods of workings are applied.

In the 12 Incline section, which is separated from the outer workings by an important fault, the dip and thickness of seam vary to a considerable extent and the method of working has to be modified in different parts of the district in order to adapt it to local requirements. Where the long-face method is applicable, long-wall coal-cutters, pan-conveyers or scraper-loaders, and conveyer-belts are used; where natural conditions preclude its introduction the coal is undercut with radial machines and is carried away from the face in chutes, from which it is either discharged upon a conveyer or loaded directly in mine-cars.

The ventilation of this part of the colliery presented considerable difficulty during the latter part of the year, particularly in the 9 Incline section in which the live workings were occasionally invaded by black-damp issuing from the goaves. Here, also, natural agencies exert an appreciable influence on the volume of air circulating, this being especially detrimental in cold weather. The length of airways to be maintained, partly in difficult ground, constitutes the major problem incident to the operation of the mine; another, and a very serious one, being the comparatively short life of timber, owing to the damage caused by dry-rot.

At the time of the last inspection 9,300 cubic feet of air per minute were supplied to the 9 Incline section for the use of thirty-five men and ten horses, and 10,400 cubic feet per minute were circulating through the 12 Incline district for thirty-six men and three horses. The percentage of methane present in the return air of the latter section never exceeded 0.25 per cent.

No. 3 East Mine.—This section of the colliery remained idle throughout the year, the only work done was limited to repairs necessary to permit regular inspections of the stoppings surrounding the sealed-off fire area and improvements to one or two of the seals.

All the Michel mines are ventilated by a 12- by 6-foot double-inlet Sullivan fan driven by a 100-horse-power induction motor. At the time of the December inspection it was circulating 124,200 cubic feet of air per minute through the workings against a water-gauge of 3 inches. With the extension of the workings towards the south, the lengthening of the airways, and the adverse influence of natural ventilation at certain times of the year, this installation is now operated at a disadvantage and will soon have to be supplanted, in part at least, by smaller fans placed in more advantageous positions, each serving the workings of only one of the seams.

Corbin Collieries, Ltd.—Walter Almond, Acting Accountant, in charge. The operations of this firm at Corbin have been definitely abandoned and the dismantling and shipment of the machinery and other equipment was completed in the course of the year. Some of this material, however, is still stored at the McGillivray railway-yard. It is probable that the entire stock will have been disposed of before the coming autumn. Some 20 tons of slack coal, recovered from dumps, was shipped by truck to Fernie and sold locally.

INSPECTION OF METALLIFEROUS MINES.

BY

JAMES DICKSON.

PRODUCTION.

The output from the metalliferous mines for 1938 was 7,377,091 tons, an increase of 1,231,837 tons from the tonnage of 1937. This tonnage was produced from 211 mines, of which 92 produced 100 tons or more.

FATAL ACCIDENTS IN METALLIFEROUS MINES (INCLUDING UNDERGROUND PLACER-MINING).

There were twelve fatal accidents in and around the metalliferous mines and concentrators in 1938, being a decrease of eleven from the figures of 1937. There was one fatal accident in the quarries of the Province.

There were 6,115 persons under and above ground in the metalliferous mines and 919 persons in the concentrators in 1938. The ratio of fatal accidents per 1,000 persons employed was 1.73.

The tonnage mined per fatal accident during 1938 was 614,757 tons, compared with 267,185 tons during 1937. The tonnage mined per fatal accident for the last ten-year period was 381,788 tons.

The following table shows the mines at which fatal accidents occurred during 1938 and comparative figures for 1937:—

Mining Division.	Mine.	No. of Accidents.	
		1938.	1937.
Vancouver	Britannia	3	2
Lillooet	Minto	----	1
Lillooet	Bralorne	----	1
Lillooet	Pioneer	1	2
Cariboo	Williams Creek (placer)	1	----
Cariboo	Cariboo Quartz	----	1
Cariboo	Wingdam	----	3
Similkameen	Copper Mountain	1	4
Nelson	Ymir Consolidated	----	1
Nelson	Wesko	----	1
Rossland	Le Roi	1	----
Osoyoos	Hedley Mascot	2	----
Fort Steele	St. Eugene Extension	----	1
Fort Steele	Sullivan Concentrator	----	1
Fort Steele	Sullivan	1	1
Greenwood	Highland Bell	1	----
Salmo	Kootenay Belle	----	1
Spillamacheen	Golden Eagle Claim	----	2
Omineca	Harrison Creek (placer)	----	1
Atlin	Polaris Taku	1	----
Totals		12	23

The following table shows the cause, the percentage to the whole of the fatal accidents, and comparative figures for 1937:—

Cause.	1938.		1937.	
	No.	Percentage.	No.	Percentage.
By blasting	----	-------	3	13.05
By falling down chutes or shafts	4	33.33	5	21.70
Haulage	----	-------	1	4.35
By falls of ground	5	41.67	9	39.15
By carbon monoxide poisoning	----	-------	2	8.70
Shaft accidents	3	25.00	3	13.05
Totals	12	100.00	23	100.00

FATAL ACCIDENTS IN METALLIFEROUS MINES.

The fatal accident to Frank Mausser, barman, *Copper Mountain* mine, on April 29th was due to deceased being thrown from a 40-foot extension ladder from which he was barring down after blasting. The ladder was guyed by six ½-inch ropes, but a slab of rock struck the ladder and threw deceased to the floor of the stope; he died several hours later.

The fatal accident to John Smurthwaite, miner, Pioneer Gold Mines of B.C., Limited, on May 13th was due to deceased being carried down a chute with a run of muck; the muck had hung up and deceased had been engaged in trying to start the muck running, and failed to get clear when the muck started to move.

The fatal accident to Arvid Erickson, miner, *Copper Mountain* mine, on June 14th was due to a fall of ground. Deceased was engaged in barring down his working-place preparatory to setting up his drill when a large piece of ore fell on him; he died within a few minutes of being injured.

The fatal accident to John H. G. Tucker, timberman, Britannia Mining and Smelting Company, Limited, on June 24th was due to deceased falling 80 feet vertically in a cribbed raise. He had been engaged in replacing cribbing from a staging when a fall of rock struck the staging from which he was working. The rocks broke the planks of the staging and caused deceased to fall.

The fatal accident to A. Kantola, timberman's helper, Victoria No. 2 shaft, *Britannia* mine, on August 3rd was due to deceased being struck on the head by a 10-foot section of shaft guide which dropped 15 feet. The leading timberman and deceased were engaged in replacing guide timbers in the shaft in which the guides are in 10-foot and 15-inch lengths; the lag screws had been removed from a 15-inch length of old guide and the end joint at the top of this length was not noticed, with the result that the lag screws were taken out from the 10-foot section above which fell out and struck deceased. Both men were fully aware that there were no guide sections more than 15 inches long in this shaft, and this accident can be attributed to oversight or carelessness.

The fatal accident of Earl K. Christie, miner, on August 4th was due to a fall of ground of approximately 50 tons from the hanging-wall immediately over where deceased was cribbing a raise; this ground had been examined, but after the fall a number of originally concealed slips were found.

The fatal accident to William Nuttall, placer-miner, Williams Creek, Barkerville, on August 9th was due to deceased being struck by a block of wood which fell down a small shaft. This property was owned by deceased and his partner, who were the only men at work. A small shaft 5 feet square and 20 feet deep had been sunk and deceased was at work on the bottom, when a piece of timber 30 inches long and 6 inches in diameter fell from the top. This was a hand-windlass operation and the block of wood that fell down was apparently used to block the handle of the winch when the bucket was brought to the top, and was accidentally knocked down the shaft by the partner on top. Deceased died from his injuries on August 15th.

The fatal accident to August Beckman, leaser, *Le Roi* mine, Rossland, on August 18th was due to deceased being caught by a hoisting cable and dragged up a small shaft. He

suffered injuries to his right leg which necessitated amputation. He died from his injuries on August 23rd. Only deceased and his son worked at this small operation, which was recovering ore about 20 feet from the bottom of an inclined shaft in which a bucket was used. The bucket was taken to the face on a flat car without detaching the rope, and when brought back to the shaft there were some slack coils of rope; there was no signal system except by shouting up the shaft. On this occasion deceased shouted up to his son to hoist the backet and was caught by the loose coils of rope.

The fatal accident to Hans Duus, nipper, *Hedley Mascot* mine, on August 23rd was due to falling 200 feet on a slope of 50 degrees after he slipped while climbing up a 4-foot ridge to a drift above. There was a good trail to the point to which deceased was going and there was no necessity to take the route he followed. The ledge from which he fell was 6 feet wide. He died the following day.

The fatal accident to Hans A. Anderson, miner, *Sullivan* mine, Consolidated Mining and Smelting Company of Canada, Limited, on August 26th was due to his falling down a stope and into a raise from a trail. The trail was in good condition and deceased was not carrying anything to cause him to stumble. His partner heard him approach singing and then the noise of his falling down the stope. He was killed instantly.

The fatal accident to Martin Alatola, mucker, Britannia Mining and Smelting Company, Limited, on October 12th was due to deceased being carried down a raise by muck that had hung up. Alatola and a miner had been detailed to blast this hang-up from a level by driving a pipe into the muck from the level, but instead of doing so both men started to work on top of the hung-up muck. An adjacent miner warned both men that they were doing this work in a dangerous manner, but they continued until the hang-up suddenly released itself and carried both men down the raise, with fatal results to Alatola. The other man had a remarkable escape with his life. Safety-ropes were stationed a few feet from the raise at this point, but neither man used the ropes; this accident was definitely due to carelessness.

The fatal accident to Fred Cote, miner, Polaris-Taku Mining Company, on November 20th was due to a fall of ground which he had apparently been barring down at the time. There were no witnesses of this accident and deceased was not missed until the shift came out of the mine, when an immediate search was made for him. His bar was found near the body and indicated that he had been using it at the time of the accident. He was apparently killed instantly.

DANGEROUS OCCURRENCES.

On March 22nd an inrush of water, sand, and gravel occurred in the *Melvin* mine of the Consolidated Gold Alluvials of B.C., Limited, at Wingdam. The Melvin shaft is sunk in the rim-rock paralleling Lightning Creek, and the main underground developments consist of drifts driven up and down stream in the solid rock below the gravels forming the present bed of Lightning Creek and the original channel as shown by drilling.

The gravels in this immediate area are deep, and from the above-mentioned drifts 4-inch-diameter holes were drilled up to the gravel for dewatering purposes. When a zone in the vicinity of these bore-holes was dewatered a raise was put up into the gravel and ordinary underground placer-mining carried on from these points. An older operation known as No. 1 shaft had previously been operated close to the Melvin workings, and this No. 1 shaft and workings had been abandoned because of inrushes of water and sand which caused caving to the surface; and this area was marked on the company's plans as a danger zone.

In the *Melvin* mine the gravel workings from the first raise off the main rock-drift were driven directly towards this known danger zone, and when this area was too closely approached the inrush occurred as above.

It is probable that the rock-raise acted as a throttle and prevented the inrush from flooding the *Melvin* mine instantly, as this inrush produced a new caving practically in the bed of Lightning Creek. As it happened, it was several hours before the *Melvin* workings were finally flooded and the mine abandoned, except for a pumping unit which is used to keep the water-level in the Melvin shaft below the level of the workings of the *Sanderson* mine, which is connected to the Melvin by means of a raise from the latter.

The *Melvin* mine remained flooded at the end of the year.

On December 12th the skip at the Crown shaft, Bralorne Mines, Limited, was operated at an excessive speed due to a faulty setting of the automatic control, and was crashed into

the shaft timbers above the dump. The automatic brake came into operation but the speed was too great for the brake action to arrest the cage in time to prevent the crash. The speed control was overhauled and adjusted immediately. No person was injured by this occurrence.

On December 26th the hoist at No. 2 shaft of the Pioneer Gold Mines of B.C., Limited, got out of control owing to an unusual circumstance.

The mine had been idle for the Christmas holiday and work was being resumed by the afternoon shift on the 26th, and the hoistman in charge prepared to run the cages up and down the shaft, as required by the regulations, before lowering any men.

On going on shift at 2.40 p.m. the hoistman operated both brakes; then tried the two clutches, following which he made an inspection of the hoist. He then switched on the power and proceeded to hoist the east side cage, but had only raised this cage a few feet when he noticed the west side drum was turning over at high speed and the overspeed alarm rang; the Lilly automatic safety control went into operation but failed to stop the drum, with the result the cage went to the bottom of the shaft. The hoisting-rope was torn from the drum and followed the cage to the bottom of the shaft and was a total loss. It was thought that moisture from the compressed air had frozen in the pipe-lines and control cylinder, due to the holiday shut-down and the low temperature then prevailing; and four hours later when attempts were being made to thaw out the lines the east side drum started to turn over and attained a high speed, but one of the hoistmen reached the controls and was able to stop the hoist just as the cage reached the shaft-bottom, and no damage was done on this side.

Later investigation showed that the above accident was due to the fact that the said air-line that went to the Lilly controls also supplied air to an air-pressure tank used to boost water to some houses at a higher elevation. There was a valve between the hoist and this pressure-tank, and the man in charge of this water system had arrived on the 26th some time before the hoistman and opened this valve to supply air to the tank and had also started the pump. Before the hoistman had gone off duty prior to the holiday he had shut the main air-valve, this cutting off the air-supply to both hoist and tank, and when the above pump was started all air-lines between the tank and the hoist were filled with water.

When the pumpman found that no air-pressure was forthcoming he again shut the tank pressure-valve, but not until the lines were filled with water as above, and when the hoistman opened the main air-valve this water was forced into the central cylinders by the compressed air, where it froze and caused failure of the Lilly control and brakes.

This compressed-air line was changed at once to give a direct individual air-supply to the Lilly control system.

There was no person injured in this occurrence, but it demonstrates the value of General Rule 96 of the "Metalliferous Mines Regulation Act," which requires: "After any stoppage of the hoisting machinery for repairs, and after a stoppage for any other purpose which exceeds four hours' duration, no person shall be raised or lowered thereby until the cage or skip has made one complete trip up and down the working portion of the shaft."

EXPLOSIVES USED IN MINING.

During 1938 the explosives used in metalliferous mines and quarries in British Columbia consisted of 10,359,900 lb. of high explosives; 4,390,000 No. 6 and No. 8 detonators; 917 electric detonators; 93,000 delay-action detonators; 5,000 feet of Cordeau and Primacord; and 25,531,000 feet of safety fuse.

There were no fatal accidents from the use of above explosives, but eight men were injured; three due to mistaking the report of adjacent shots for their own and returning too soon; two due to approaches not being properly guarded; one where the injured man had not received warning; and two men who had spit a round in a stope and retired to a place of apparent safety, but a diamond-drill hole, 100 feet long and collared from where they were standing, intersected the area of the blast and the men were slightly injured by matter projected through the diamond-drill hole.

AIR-SAMPLING.

Air-sampling was carried on in the metalliferous mines after blasting and at the faces of long single drifts, to determine whether carbon monoxide was present and if the oxygen content of the atmosphere was sufficient.

In no instance were dangerous conditions found from above causes, but in a number of cases augmented ventilation was ordered.

DUST AND VENTILATION.

It is gratifying to note that increased attention is being given to the matter of ventilation underground by the increased use of large capacity fans for general mine or sectional ventilation, and smaller fans for long single drifts or local conditions.

In many of the mines that depend on natural conditions to produce ventilation there is a marked tendency towards better control and efficiency in directing the ventilation by means of stoppings and doors, so that the air reaches the working-faces and stopes.

This improvement in ventilation is largely due to the fact being recognized that efficient ventilation in the faces and stopes offers the only practical means of reducing the dust content of the air underground, and quickly removing the dust unavoidably produced by drilling, blasting, and handling of ore.

Some years ago the Department of Mines introduced the Zeiss Konimeter for determining the dust content of the air, and at present all the larger mining companies are keeping a careful check on the dust conditions in their mines by careful sampling of the air by trained engineers using the Zeiss Konimeter, which is practically standard for this work in the Province.

The Department has also the Bausch and Lomb Dust Counter and the Thermal Precipitator, which have been sent to different mines for sampling the dust underground, and these machines are available to any mining company on request, as it is the intention to keep in touch with any new means of dust determination and control.

The *Sullivan* mine of the Consolidated Mining and Smelting Company, Limited, is fully ventilated by constantly-running surface fans having a capacity of 200,000 cubic feet of air per minute; and at Britannia Mining and Smelting Company, Limited, underground fans having a capacity of 150,000 cubic feet of air per minute are in use. The above fans are of the Jeffrey Aero Vane type and are found to be very efficient. At the end of the year at the *Copper Mountain* mine of the Granby Consolidated Mining, Smelting and Power Company, Limited, a Canadian Blower and Forge Company fan of 64,000-cubic-feet-per-minute capacity was being installed.

In addition to pressing for fan-produced ventilation at different mines this Department made arrangements for engineers from different metalliferous mines to visit and study the fan ventilation at the above mines, and also arranged visits to different coal mines for the same purpose; and there is no doubt that this assisted very materially in the present trend towards improved ventilation in the metalliferous mines. It may be mentioned that the modern efficient high-speed fans can be installed and operated at a very low cost compared with the fans available a decade ago.

MINE-LIGHTING.

With one exception all the larger metalliferous mines in the Province have adopted the electric safety cap-lamp for use underground, and many of the smaller mines are also equipped with this modern means of underground lighting. There are approximately 2,300 lamps of the Edison Model " K " and 250 of the Super Wheat Model " W " in use. In no case where the electric cap-lamp has been tried has there been a return to the carbide-lamp formerly in standard use.

FIRST-AID AND SAFETY WORK.

First-aid training of new men and practice training of already certificated first-aid men was well maintained at the different mining centres during the year, and at all the larger mines safety committees are doing efficient work in accident-prevention; this very largely by means of their intimate knowledge of conditions obtaining at their individual mines, and in no less a degree to the fact that the members of the safety committees are constantly in

contact with their fellow-employees and so are in a position to carry on general safety education.

Most of these safety committees are on a rotating basis so that a large percentage of those employed will ultimately be brought directly into contact with this work.

Reports from the safety committees received at this office show that the committees carry out this work in a practical manner, and that their recommendations receive immediate attention from employers and employees alike. The reports of the safety committees are a decided help to the Inspection Department and a definite advance towards greater safety.

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