MINES STATEMENT.

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SESSION II.
1921.

NEW ZEALAND

MINES STATEMENT

BY THE HON. G. J. ANDERSON, MINISTER OF MINES

MR. SPEAKER,—

I have the honour to present to Parliament the Mines Statement for the year ended the 31st December, 1920.

It was anticipated that after the termination of the war renewed efforts would be made to increase the production of minerals in the Dominion, but since the Armistice considerable difficulty has been experienced by those interested in mines in obtaining sufficient capital to develop and extend their mining ventures. As a consequence the results which were anticipated have not yet been obtained.

During the year under notice the Government has given considerable assistance in several forms :—

(1.) By making geological surveys and publishing bulletins ;
(2.) By granting subsidies to no less than eighteen approved parties for prospecting ;
(3.) By loaning Government drills upon most reasonable terms ;
(4.) By granting loans for carrying on mining and for purchasing equipment and plant ;
(5.) By making liberal contributions to the several schools of mines throughout the Dominion ;
(6.) By granting subsidies to local bodies to enable them to construct and maintain roads within mining districts ;
(7.) By maintaining at heavy expense Government water-races in the Westland and Otago Mining Districts, and selling the water at prices which are really not remunerative.

It will thus be seen that the mining industry in New Zealand has received great assistance from the Government. The Government of no other country has devoted more money to assist its people to develop mining. It is hoped that the efforts of the Department will result most favourably to prospectors and miners generally. At one period of the history of New Zealand mining held the most prominent place in our industries. The discovery of new goldfields will do much to rehabilitate it in importance, and with that object in view prospectors will be assisted as far as the financial position will allow. New discoveries will do much to alleviate our present difficulties, especially in regard to unemployment, and put fresh vigour into the trade of the Dominion.

The following statement shows the value of metalliferous minerals produced, the quantity and value of kauri-gum exported, and the quantity of coal produced during 1920 and 1919 :—

	1920.		1919.	
	Quantity.	Value.	Quantity.	Value.
		£		£
Gold and silver bullion produced ..	474,650 oz.	528,317	588,662 oz.	702,131
Quicksilver produced	..	1,378	..	2,794
Tungsten concentrate produced	39 tons	1,956	..	21,771
Manganese produced	..	10	..	..
Copper produced	..	..	..	12
Asbestos produced	..	105	..	..
Kauri-gum exported	6,481 tons	556,756	4,128 tons	255,812
Coal produced	1,843,705 tons	1,843,705	1,847,848 tons	1,847,848

The value of minerals exported and of the coal used in the Dominion, which is shown in table No. 1 accompanying this Statement, amounted to £3,431,391, as against £4,424,689 during the previous year.

It is gratifying to report that there has been a marked advance in the stone-quarrying industry, the number of such operations under the Stone-quarries Act being 241 during the year, as compared with 219 during 1919. The value of material quarried during 1920 was £314,470. The value of the 1919 output was not furnished by quarry-owners.

GOLD AND SILVER MINING.

The following statement shows the quantity and value of bullion-production, the dividends paid by registered companies, and the number of productive claims and gold-dredges during 1920 and 1919 :—

Class of Gold-mining.	Production of Bullion.				Dividends paid by Registered Companies.		Number of Productive Claims and Dredges.	
	1920.		1919.		1920.	1919.	1920.	1919.
	Oz.	£	Oz.	£	£	£		
Quartz	451,122	415,868	555,666	574,020	100,981	118,831	23	37
Alluvial ..	16,576	77,777	20,620	80,273	4,445	2,068	122	131
Dredging ..	6,952	34,672	12,376	47,838	..	2,845	12	19
Totals ..	474,650	528,317	588,662	702,131	105,426	123,744	157	187

As depth has been attained at many of the gold-quartz mines the value per ton of ore treated has declined, such value during 1920 being £1 15s. 10d., as compared with £2 0s. 1d. during the previous year. This, taken in conjunction with the increased cost of production at all mines, has seriously affected the industry in this Dominion and elsewhere.

MINERALS OTHER THAN GOLD AND SILVER.

Six parties, five of whom operated in Otago and Southland and one in Marlborough, were engaged in scheelite-mining, two of which also produced gold. From 1,883 tons of quartz crushed 39 tons 2 cwt. of tungsten concentrates was obtained, some of which is held for an improved market.

Three parties were employed at cinnabar-mining operations near Puhipuhi, North Auckland, one of which, the New Zealand Quicksilver-mines (Limited), produced 3,675 lb. of quicksilver, valued at £1,378. The other parties were employed

at prospecting or development work. One party produced 1¾ tons of asbestos, valued at £105, from its claim in Takaka County.

PETROLEUM.

No development of commercial value occurred at any of the five oil-boring operations in the Dominion. The Blenheim bore at Moturoa attained a depth of 5,726 ft., being the deepest borehole in Australasia. The bore at Chertsey, Canterbury, attained a depth of 2,178 ft. Gas-emanations were given off at both bores.

PHOSPHATE ROCK.

The production of phosphate rock at Clarendon and Milburn, Otago, amounted to 5,341 tons, valued at £5,341, as compared with 4,000 tons, valued at £4,000, during the previous year.

COAL-MINING.

The output of coal during 1920 amounted to 1,843,705 tons, as compared with 1,847,848 tons during 1919, being a decrease of 4,143 tons.

The following is a comparative statement of the coal and lignite raised during the years 1918, 1919, and 1920:—

Inspection District.	Output for 1919.	Output for 1920.	Increase or Decrease, 1920.	Output for 1918.	Increase or Decrease between Years 1919 and 1918.
	Tons.	Tons.	Tons.	Tons.	Tons.
Northern (North Island) ..	511,451	483,492	27,959*	549.778	38,327*
West Coast (of South Island)	845,826	821,507	24,319*	997,089	151,263*
Southern (Canterbury, Otago, and Southland)	490,571	538,706	48,135†	487,383	3,188†
Totals	1,847,848	1,843,705	4,143*	2,034,250	186,402*

* Decrease. † Increase.

Notwithstanding an increase of 134 in the number of persons employed in or about coal-mines, the output declined 4,143 tons. The average production per person employed below ground declined from 648 tons during 1919 to 630 tons during 1920. It is gratifying to find that the Inangahua, Otago, and Southland coalfields produced record outputs.

During the year no new collieries attained the output stage. The James State Colliery, near Runanga, and the State colliery near Waikokowai are being developed, and surface buildings, tramways, and equipment are being installed. Production of coal from the oldest and most profitable State colliery—viz., Point Elizabeth—ceased, owing to exhaustion as a large colliery, after a total output of 2,401,610 tons, an area of about 250 acres being worked out.

The comparative tonnage of the various classes of coal raised for the years 1919 and 1920 is summarized as follows:—

Class.	Output for 1920.	Output for 1919.	Increase or Decrease for 1920.
	Tons.	Tons.	Tons.
Bituminous and semi-bituminous ..	923,575	961,107	*Decrease* 37,532
Brown coal	715,709	684,331	*Increase* 31,378
Lignite	204,421	202,410	*Increase* 2,011
Totals	1,843,705	1,847,848	*Decrease* 4,143

The increase in brown-coal and lignite output is due to the greater production from Otago and Southland, which more than compensates for the Waikato coalfield decline.

The quantity of coal imported into the Dominion constituted a record, being 476,343 tons, as against 391,434 tons during 1919. The quantity of coal exported amounted to 80,088 tons, as against 150,293 tons during the previous year.

PERSONS EMPLOYED IN OR ABOUT MINES AND STONE-QUARRIES.

The following table shows the number of persons employed in each inspection district during 1919 and 1920 :—

Classification.	Inspection District.			Totals.		
	Northern.	West Coast.	Southern.	1920.	1919.	Increase or Decrease.
Gold, silver, and tungsten ore ..	1,058	484	372	1,914	2,185	*Dec.* 271
Cinnabar and asbestos	15	1	..	16	16	..
Coal	990	1,894	1,194	4,078	3,944	*Inc.* 134
Stone-quarries	972	144	352	1,468	1,409	*Inc.* 59
Totals	3,035	2,523	1,918	7,476	7,554	*Dec.* 78

The shortage of coal-miners which has been experienced during and since the war is now much less acute, the deficiency being made up by gold-miners and by new arrivals.

MINING AND QUARRY ACCIDENTS.

The year 1920 has been the most immune from mining and quarry accidents since such industries were established in the Dominion, only two fatal accidents having occurred in connection with coal and metalliferous mining, and none at stone-quarries.

Upon those industries 7,476 persons were ordinarily employed during the year. The proportion of fatal accidents per 1,000 persons employed was 0·26.

At metalliferous mines one serious accident occurred, resulting in the loss of one life; at such mines the proportion of fatal accidents per 1,000 persons employed was 0·51.

At stone-quarries, at which 1,468 persons were employed, the only serious accident consisted of a broken arm.

In or about coal-mines only one fatal accident occurred, such being due to the neglect of the sufferer, a co-operative miner, to erect timber support to the roof under which he was working. The proportion of fatal accidents per 1,000 persons employed at collieries was 0·24, and per 1,000,000 tons raised 0·54, being the lowest fatal-accident rate in the Dominion for thirty-four years, and but one-third of the lowest proportion ever attained at the collieries of the United Kingdom, which are among the most immune from colliery accidents in proportion to the number of persons employed.

STATE AID TO MINING.

Extensive use continues to be made of the Government prospecting-drills, which are lent to hirers free of charge. During the year six parties employed these drills, an aggregate of 6,822 ft. being bored in search of coal, alluvial gold, and cinnabar lodes. A workable area of coal was thus proved in Canterbury, and the continuation of a cinnabar lode was proved in North Auckland.

During the year ended 31st March, 1921, eighteen approved prospecting parties were granted subsidies amounting to £6,545, of which £1,456 was expended during the year; in addition to which £697 granted during previous years was expended during the past financial year. Upon these operations 122 persons were intermittently employed during the year, practically the whole of the prospecting operations in the Dominion being now subsidized by the Government.

A discovery of interest was made during the early part of the current year on Block XV, Waitahu Survey District, an outlying portion of the Inangahua Goldfield, by two Government-subsidized prospectors, Messrs. James Hurley and

L. McVicar. These prospectors went out in September last under the ægis of the Blackwater Miners' Association, which it is interesting to note also sent out the Government-subsidized prospectors of the Blackwater goldfield in 1905, the most recently discovered quartz-mining field prior to that now referred to.

The prospectors found the outcrop of a quartz lode showing some gold on a ridge above the Alexander Stream, a tributary flowing from the north-east into the Big Grey River. They also found two other outcrops of lodes of apparently lower grade in the valley of the Alexander Stream about one mile to the northward and at 800 ft. lower level than the lode on the ridge.

The discovery has been inspected by Mr. P. G. Morgan, Director of Geological Survey, who has furnished a report thereon. Considerable local excitement followed the report of the discovery, and a mild rush shortly ensued, much country being pegged out in prospecting-areas. The locality is bush-clad and hilly, and until development is carried out it is premature to express an opinion as to the future prospects of the field.

The Waimea–Kumara and Mount Ida Government Water-races, which greatly aid alluvial gold-mining in the Kumara and Naseby districts, have, during the year ended 31st March, 1921, supplied claims employing thirty-one miners with water for sluicing, by which gold to the approximate value of £4,188 was obtained. The cash received for water sold amounted to £1,182, the expenditure on the upkeep of the races being £4,576. It is therefore doubtful if the upkeep of these races for alluvial gold-mining is now justified.

The expenditure on roads and tracks by subsidies and direct grants out of the Public Works Fund vote, "Roads on goldfields," during the year amounted to £11,050.

The expenditure by the Mines Department on schools of mines for the year amounted to £4,427 9s. 6d.

It will thus be seen that the mining industry has, in regard to its relative position among the industries of the Dominion, received liberal State aid and encouragement.

GEOLOGICAL SURVEY.

During the past year geological surveys have been conducted in the Whangarei, Tokomaru (north of Gisborne), Kawhia, and Tangarakau districts. The total area surveyed amounted to about 2,400 square miles. In the course of field-work, as in previous years, special attention was given to the collection of data bearing directly on the mineral and other natural resources of each district, and consequently the work had to be done with greater detail than would be required if the surveys had been of a purely geological nature.

Mainly on account of the cost of printing, the only publications issued by the Geological Survey during the year were its annual report and Bulletin No. 21, entitled "The Geology of the Gisborne and Whatatutu Subdivisions." This bulletin deals fully with the geological relations of the possible petroleum-bearing rocks of the Gisborne district. A number of reports are in course of or are ready for publication, and others are under way.

In addition to the ordinary bulletins prepared by members of the staff, several valuable memoirs on the fossil collections of the Survey have been written by specialists in other countries. When published they will be of assistance not only to the Geological Survey itself, but to all teachers and students of geology both in this country and elsewhere.

WORKING OF THE MINER'S PHTHISIS ACT.

Provision is made in this Act for a pension of £1 15s. per week being paid to a married man or a widower with children under the age of fourteen years, and £1 5s. per week to a single man who is or becomes totally incapacitated for work owing to miner's phthisis contracted while working as a miner in New Zealand. In

addition to this the widow of any pensioner under the Act who dies from that disease is entitled to a pension of 12s. 6d. per week during widowhood. The aggregate receipts by a widow and her children from all sources (including any other pension or allowance) shall not, however, exceed £1 5s. a week, together with 10s. a week in respect of any child.

The following is a statement by the Commissioner of Pensions showing the amount of pensions payable, in force, and granted to the 31st March, 1921 :—

Amount of Pensions Payable.	£	s.	d.
Six months from 1st October, 1918, to 31st March, 1919 ..	6,340	19	2
Year ended 31st March, 1920	16,652	1	2
Year ended 31st March, 1921	26,971	18	6
	£49,964	18	10

Pensions in Force and Granted.	£	s.	d.
Annual value of pensions in force	29,685	10	0
Average pension payable per annum	62	12	7

Number of pensions in force	474
Number of pensions granted to unmarried miners	133
Number of pensions granted to married miners	266
Number of pensions granted to widows of miners	391

As an additional precaution against miner's phthisis, provision was made in the Mining Amendment Acts of 1919 and 1920 that no rock-drills, other than those having an axial water-feed, shall be used in any metalliferous mine after the 31st December, 1920.

DEPARTMENTAL.

The duties of Inspecting Engineer of Mines appertaining to metalliferous mines and quarries were again taken over by Mr. Frank Reed in April, 1921. These duties have since that time been carried out by that officer in conjunction with his duties as Chief Inspector of Coal-mines.

STATE COLLIERIES.

The operations of the State coal-mines and State coal-depots for the year ended 31st March, 1921, are briefly reviewed hereunder.

Output and Sales.

The gross output of the mines for the year was 153,722 tons, as compared with 156,228 for last year, a decrease of 2,506 tons. A comparative statement for the two years is shown below :—

Mine.	Output in Tons, 1920–21.		Output in Tons, 1919–20.	
	Gross.	Net.	Gross.	Net.
Point Elizabeth ..	..	..	35,816	33,553
Liverpool	153,722	149,054	120,412	115,650
Totals ..	153,722	149,054	156,228	149,203

Notes.—(*a.*) The difference between the gross and net output is the allowance made for mine consumption and waste. (*b.*) The Point Elizabeth Colliery was finally closed on the 20th March, 1920.

The Liverpool Colliery produced 149,054 tons of marketable coal, an increase of 33,404 tons on the previous year's production. The output from this colliery constituted a record, being 20,710 tons in excess of the output for the year ended

31st March, 1917, during which the highest previous output was obtained. The disposal, allowing for stock on hand at beginning of year, was as follows:—

Supplied to	Screened.	Unscreened.	Small.	Totals.
	Tons.	Tons.	Tons.	Tons.
Depots	7,927	30,245	...	38,172
Railways	307	9,667	...	9,974
Other Government Departments	9	188	...	197
Shipping companies	33	28,968	2,218	31,219
Gas companies	170	39,207	460	39,837
Other consumers	3,667	18,678	6,499	28,844
Totals	12,113	126,953	9,177	148,243

The total sales of State coal from the mines for the year amounted to 148,335 tons, value £222,127, as compared with 149,850 tons, value £192,958, for last year, a decrease of 1,515 tons, but an increase in value of £29,169.

For the purpose of easy comparison the figures are restated below in tabulated form:—

Comparative Statement of Sales from Collieries.

Mine.	Total Sales, 1920–21.		Total Sales, 1919–20.	
	Quantity.	Value.	Quantity.	Value.
	Tons cwt. qr.	£ s. d.	Tons cwt. qr.	£ s. d.
Point Elizabeth ..	91 8 0	59 8 2	34,676 3 3	33,750 14 3
Liverpool	148,243 11 0	222,067 19 8	115,174 3 1	159,207 15 8
Totals ..	148,334 19 0	222,127 7 10	149,850 7 0	192,958 9 11

The average price per ton realized by the mines on the total sales for the year was £1 9s. 11·4d., an increase of 4s. 2·36d. on last year's average.

The sales of coal, &c., through the medium of the depots totalled 60,912 tons, value £137,910, as against 40,157 tons, value £80,083, for last year.

There was an increase of sales from the Liverpool Colliery of 33,069 tons, with a value of £62,860.

The total profit at the mines was £17,681, and after deducting losses at the depots, &c., there remained a balance of £13,962, out of which £6,828 was applied to Sinking Fund Account and £222 to Bad Debts Reserve, leaving £6,912 to be carried forward.

During the year a tennis-court at Runanga was completed, and a large number of miners and others have made full use thereof for recreation purposes. A bowling-green is also in course of preparation, and it is expected that it will be available for use this coming summer. The ground which has been set aside for a recreation-ground has also been drained, and the surface covered with ashes, which have been ploughed in. Arrangements have been made for harrowing the ground and sowing grass-seed therein.

In carrying out these works a number of the employees at the State colliery voluntarily, and without payment, undertook the work of clearing the sites and of assisting in other directions.

James Colliery.

Further development works, including the re-erection of a portion of the coal-storage bins which were shifted from the Point Elizabeth Colliery, and the installation of the requisite equipment, have been carried out. The development of this colliery has to some extent been governed by the progress made in constructing the railway-line giving access thereto. It is expected that the railway will be sufficiently completed for the haulage of coal within a few months.

Trial samples of the coal from this colliery have upon test shown that it is a first-class household coal. When supplies are available it will greatly stimulate the activities at the several State coal-depots.

Macdonald Mine.

With a view to improving the access to this colliery arrangements were made to construct a road, two miles in length, from Rotowaro Station to Waikokowai. During the year a number of buildings to accommodate the workmen and machinery, including repairs to two cottages, were erected and carried out respectively.

A further part of the property was also drilled for the purpose of proving the coal thereunder, and the results obtained are considered to be satisfactory.

ITEMS FROM BALANCE-SHEET.

The following items taken from the balance-sheet will prove of interest as indicating the more important items of expenditure, and for reference in respect to the position of Capital Account, reserve funds, and other accounts shown therein :—

	£
The amount written off for depreciation for the year was	15,815
The payments for interest totalled	9,102
The payments for sea carriage of coal amounted to	68,891
The cost of railway haulage amounted to	22,117
The total wages paid for coal-winning was	84,382
The amount paid for management and office salaries (Head Office and mines) totalled	4,531
The gross capital expenditure on the whole undertaking to 31st March last was	480,109
The total depreciation written off to date (equal to 51·47 per cent. on the gross capital expenditure) amounts to	247,156
The debenture and loan capital stands at	227,601
The net profits of the State Coal-mines Account from inception to 31st March, 1921	71,995
The net profit for the year ended 31st March, 1921, was	13,962
The sinking fund is in credit	20,028
The depreciation fund stands at	5,884
The amount at credit of Profit and Loss is (last year £38,670)	45,582
The cash in hand and in the Public Account at 31st March last was (last year £18,000)	18,293
The present net book value of permanent or fixed assets is	225,143

TABLES AND REPORTS.

The usual statistical tables and departmental reports are appended.

TABLES TO ACCOMPANY MINES STATEMENT.

No. 1.

TABLE SHOWING THE QUANTITY AND VALUE OF GOLD AND OTHER MINERALS EXPORTED DURING THE YEARS ENDED THE 31ST DECEMBER, 1919 AND 1920, AND THE TOTAL VALUE SINCE THE 1ST JANUARY, 1853. THE COAL-OUTPUT IS ALSO INCLUDED.

Name of Metal or Mineral.	For Year ended the 31st December, 1920.		For Year ended the 31st December, 1919.		Total from the 1st January, 1853, to the 31st December, 1920.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Precious metals—	Oz.	£	Oz.	£	Oz.	£
Gold*	212,973	883,748	320,210	1,334,405	22,591,505	89,012,107
Silver	369,400	87,665	453,567	103,037	22,616,879	2,648,950
Total gold and silver ..	582,373	971,413	773,777	1,437,442	45,208,384	91,661,057
Mineral produce, including kauri-gum—	Tons.	£	Tons.	£	Tons.	£
Copper-ore	..	..	..	12	1,504	19,390
Chrome-ore	..	..	..	..	5,869	38,002
Antimony-ore	..	..	..	..	3,781	55,045
Manganese-ore	2	10	..	..	19,366	61,915
Hæmatite ore	..	..	..	..	77	469
Tungsten-ore	$10\frac{1}{10}$	1,378	$130\frac{9}{10}$	29,489	$2,304\frac{13}{20}$	299,311
Quicksilver	$1\frac{13}{20}$	900	$8\frac{6}{10}$	4,619	$14\frac{3}{4}$	7,641
Sulphur (crude)	..	..	..	..	4,927	13,241
Mixed minerals†	$2,895\frac{3}{5}$	8,745	$1,089\frac{14}{20}$	4,039	$59,945\frac{1}{20}$	250,112
Coal (New Zealand) exported	80,088	128,509	138,174	201,383	5,113,105	4,986,562
Coke exported	20	63	45	113	16,818	25,688
Coal, output of mines in Dominion (less exports)‡	1,763,617	1,763,617	1,709,674	2,491,780	46,771,288	27,190,210
Oil-shale	..	..	..	..	14,444	7,236
Kauri-gum	6,481	556,756	4,128	255,812	366,901	19,137,820
Total quantity and value of minerals	$1,853,115\frac{7}{20}$	2,459,978	$1,853,250\frac{4}{20}$	2,987,247	$52,380,344\frac{9}{20}$	52,092,642
Value of gold and silver, as above	..	971,413	..	1,437,442	..	91,661,057
Total value of minerals produced, including gold and silver	..	3,431,391	..	4,424,689	..	143,753,699

* In respect of gold, ounces of the fineness of 20 carats and upwards. † Including lime, 15 tons; greenstone, $\frac{3}{5}$ ton; building-stone, 37 tons; pumicestone, 104 tons; pumice sand, 2,739 tons; also marble and dressed stone of weight unspecified by the Customs Department. ‡ For a number of years prior to 1918 the value of the output of coal-mines consumed in the Dominion was estimated at 10s. per ton, being pit's-mouth cost. During 1918 and 1919 the estimated value was increased to that of exported coal f.o.b., which is excessive for all classes and grades of coal at the pit's mouth. The estimated value for 1920, as given above, is on the basis of £1 per ton at the pit's mouth.

No 2.

TABLE SHOWING THE QUANTITY AND VALUE OF GOLD EXPORTED FROM NEW ZEALAND FOR THE YEARS ENDED THE 31ST DECEMBER, 1919 AND 1920, AND THE TOTAL QUANTITY AND VALUE FROM 1857 TO THE 31ST DECEMBER, 1920.

District and County or Borough.	Year ended 31st December, 1919.		Year ended 31st December, 1920.		Total Quantity and Value from January, 1857, to 31st December, 1920.	
	Quantity.	Value.	Quantity.	Value.		
AUCKLAND—	Oz.	£	Oz.	£	Oz.	£
County of Tauranga	..	..	2,849	12,071		
County of Coromandel	283	1,195	157	625		
County of Thames	3,651	15,347	295	1,264		
County of Ohinemuri	53,742	227,124	9,285	38,555		
County of Piako	50	214	..	..		
Borough of Thames	873	3,552	452	1,924		
Great Barrier Island	..	..	..	..		
Borough of Waihi	187,507	792,005	85,959	362,156		
	246,106	1,039,437	98,997	416,595	6,823,616	26,344,549
WELLINGTON	..	..	..	..	188	706
MARLBOROUGH—						
County of Marlborough	2,194	8,437	1,833	7,362	104,487	406,948
NELSON—						
County of Waimea	8	32	..	..		
County of Collingwood	143	577	10	38		
County of Takaka	3	12	..	..		
County of Murchison	2,559	10,390	403	1,579		
	2,713	11,011	413	1,617	1,739,515	6,897,025
WEST COAST—						
County of Buller	993	3,890	1,260	5,185		
County of Inangahua	36,123	139,647	42,912	172,627		
County of Grey	542	2,200	2,852	11,721		
County of Westland	3,371	13,676	8,183	33,437		
Hokitika Borough	..	..	537	2,199		
Ross Borough	503	2,010	572	2,288		
Kumara Borough	..	..	993	3,972		
	41,532	161,423	57,309	231,429	6,246,818	24,797,663
CANTERBURY—						
County of Selwyn	..	..	2	6	120	473
OTAGO—						
County of Taieri	43	166	85	350		
County of Tuapeka	4,056	16,635	10,870	45,358		
County of Vincent	9,610	39,518	14,972	62,235		
County of Maniototo	1,754	7,184	4,834	20,289		
County of Waihemo	27	103	201	814		
County of Waitaki	425	1,783	409	1,724		
County of Bruce	20	110	236	999		
County of Lake	703	2,847	2,667	11,142		
County of Wallace	2,922	12,265	2,739	11,227		
County of Fiord	3	12	..	..		
County of Southland	7,821	32,375	16,524	67,767		
County of Clutha	..	..	361	1,566		
	27,384	112,998	53,698	223,471	7,671,232	30,543,262
Unknown	281	1,099	721	3,268	5,529	21,481
Totals	320,210	1,334,405	212,973	883,748	22,591,505	89,012,107

No. 3.

TABLE SHOWING THE OUTPUT OF COAL FROM THE VARIOUS COALFIELDS, AND THE COMPARATIVE INCREASE AND DECREASE, FOR THE YEARS 1919 AND 1920, TOGETHER WITH THE TOTAL APPROXIMATE QUANTITY OF COAL PRODUCED SINCE THE MINES WERE OPENED.

Name of Coalfield.	Output.		Increase.	Decrease.	Approximate Total Output up to 31st December, 1920.
	1920.	1919.			
	Tons.	Tons.	Tons.	Tons.	Tons.
North Auckland	102,801	115,390	..	12,589	3,957,494
Waikato (including Mokau)	380,691	396,061	..	15,370	6,131,164
Nelson	15,344	12,037	3,307	..	369,622
Buller	488,546	506,314	..	17,768	16,628,910
Inangahua	56,452	20,006	36,446	..	371,970
Grey	261,165	307,469	..	46,304	10,125,407
Canterbury	32,457	36,004	..	3,547	825,596
Otago	307,807	285,040	22,767	..	10,036,739
Southland	198,442	169,527	28,915	..	3,437,491
Totals	1,843,705	1,847,848	..	4,143	51,884,393

No. 4.

TABLE SHOWING THE OUTPUT OF DIFFERENT CLASSES OF COAL.

Class of Coal.	Output.		Increase.	Decrease.	Approximate Total Output to the 31st December, 1920.
	1920.	1919.			
	Tons.	Tons.	Tons.	Tons.	Tons.
Bituminous and semi-bituminous	923,575	961,107	..	37,532	33,055,687
Brown	715,709	684,331	31,378	..	15,880,197
Lignite	204,421	202,410	2,011	..	2,948,509
Totals	1,843,705	1,847,848	..	4,143	51,884,393

No. 5.

TABLE SHOWING THE INCREASE OR DECREASE IN THE ANNUAL PRODUCTION OF COAL AND OIL-SHALE IN THE DOMINION, AND THE QUANTITY OF COAL IMPORTED SINCE 1878.

Year.	Coal and Shale raised in the Dominion.		Coal imported.		
	Tons.	Yearly Increase or Decrease.	Tons.	Increase over Preceding Year.	Decrease below Preceding Year.
Prior to 1878	709,931	..	..	..	..
1878	162,218	..	174,148	..	..
1879	231,218	*Inc.* 69,000	158,076	..	16,072
1880	299,923	„ 68,705	123,298	..	33,778
1881	337,262	„ 37,339	129,962	6,664	..
1882	378,272	„ 41,010	129,582	..	380
1883	421,764	„ 43,492	123,540	..	6,042
1884	480,831	„ 59,069	148,444	24,904	..
1885	511,063	„ 30,232	130,202	..	18,242
1886	534,353	„ 23,290	119,873	..	10,329
1887	558,620	„ 24,267	107,230	..	12,643
1888	613,895	„ 55,275	101,341	..	5,889
1889	586,445	*Dec.* 27,450	128,063	26,722	..
1890	637,397	*Inc.* 50,952	110,939	..	17,124
1891	668,794	„ 31,397	125,318	14,379	..
1892	673,315	„ 4,521	125,453	135	..
1893	691,548	„ 18,233	117,444	..	8,009
1894	719,546	„ 27,998	112,961	..	4,483
1895	726,654	„ 7,108	108,198	..	4,763
1896	792,851	„ 66,197	101,756	..	6,442
1897	840,713	„ 47,862	110,907	9,151	..
1898	907,033	„ 66,320	115,427	4,520	..
1899	975,234	„ 68,201	99,655	..	15,772
1900	1,093,990	„ 118,756	124,033	24,378	..
1901	1,239,686	„ 145,696	149,764	25,371	..
1902	1,365,040	„ 125,354	127,853	..	21,911
1903	1,420,229	„ 55,189	163,923	36,070	..
1904	1,537,838	„ 117,609	147,196	..	16,727
1905	1,585,756	„ 47,918	169,046	21,850	..
1906	1,729,536	„ 143,780	207,567	38,521	..
1907	1,831,009	„ 101,473	220,749	13,182	..
1908	1,860,975	„ 29,966	287,808	67,059	..
1909	1,911,247	„ 50,272	258,185	..	29,623
1910	2,197,362	„ 286,115	232,378	..	25,807
1911	2,066,073	*Dec.* 131,289	188,068	..	44,310
1912	2,177,615	*Inc.* 111,542	364,359	176,291	..
1913	1,888,005	*Dec.* 289,610	468,940	104,581	..
1914	2,275,614	*Inc.* 387,609	518,070	49,130	..
1915	2,208,624	*Dec.* 66,990	353,471	..	164,599
1916	2,257,135	*Inc.* 48,511	293,956	..	59,515
1917	2,068,419	*Dec* 188,716	291,597	..	2,359
1918	2,034,250	„ 34,169	255,332	..	36,265
1919	1,847,848	„ 186,402	391,434	136,102	..
1920	1,843,705	„ 4,143	476,343	84,909	..

No. 6.

TABLE SHOWING THE TOTAL QUANTITY AND VALUE OF COAL IMPORTED INTO AND EXPORTED FROM NEW ZEALAND FROM AND TO EACH COUNTRY DURING THE YEAR ENDED 31ST DECEMBER, 1920.

Country.	Imports.		Exports.*	
	Quantity.	Value.†	Quantity.	Value.
	Tons.	£	Tons.	£
United Kingdom	..	..	28,036	58,497
Canada	..	..	412	783
Australia	461,986	493,401	38,266	46,993
Fiji	..	..	91	123
Chile	..	..	150	337
United States of America	2,327	3,849	8,821	15,085
New Caledonia	..	..	1,709	2,563
Society Islands	..	..	6	29
Tonga	..	..	2	6
Tuamotu Archipelago	..	..	300	300
Tutuila	..	..	1,494	2,030
Western Samoa	..	..	801	1,763
South African Union	12,030	16,999	..	..
Totals	476,343	514 249	80,088	128.509

* New Zealand produce. † The values are the fair market values in the countries of export plus 10 per cent.

No. 7.

NUMBER OF PERSONS ORDINARILY EMPLOYED AT OR ABOUT MINES OTHER THAN COAL-MINES DURING THE YEAR ENDED 31ST DECEMBER, 1920.

County or Borough.	Number of Persons ordinarily employed at				Total.	
	Gold-quartz Mines.	Gold Alluvial Mines.	Gold-dredges.	Mines other than Gold and Coal.	1920.	1919.
NORTHERN INSPECTION DISTRICT.						
County and Borough of Thames ..	55	..	..	..	55	59
County of Ohinemuri	99	..	..	..	99	147
,, Coromandel	39	..	..	..	39	25
,, Piako	9	..	..	..	9	6
Borough of Waihi	827	..	..	..	827	866
Tauranga district	29	..	..	..	29	50
Puhipuhi district	..	..	..	15	15	14
WEST COAST INSPECTION DISTRICT.						
County of Marlborough	29	5	..	..	34	42
,, Waimea	4	..	..	..	4	7
,, Takaka	..	..	..	1	1	..
,, Collingwood	..	..	..	..	..	3
,, Murchison	..	19	..	..	19	14
,, Buller	9	22	..	..	31	38
,, Inangahua	255	9	..	..	264	330
,, Grey	4	34	..	..	38	42
,, Westland	7	55	32	..	94	115
Borough of Ross	..	..	..	..	..	..
SOUTHERN INSPECTION DISTRICT.						
County of Taieri	..	..	..	3	3	2
,, Tuapeka	..	74	..	..	74	85
,, Vincent	8	44	62	..	114	113
,, Maniototo	..	37	..	..	37	51
,, Waihemo	6	..	..	2	8	23
,, Waitaki	..	10	..	..	10	13
,, Lake	2	22	..	6	30	45
,, Wallace	..	26	..	..	26	28
,, Bruce	..	1	..	..	1	1
,, Southland	..	51	18	..	69	82
Totals	1,382	409	112	27	1,930	2,201

Summary of Persons ordinarily employed in or about New Zealand Mines during 1920 and 1919.

	1920.	1919.	Increase or Decrease.
Gold, silver, and gold-scheelite mines	1,903	2,143	*Dec.* 240
Other metalliferous mines, including those worked for scheelite alone	27	58	,, 31
Coal-mines	4,078	3,944	*Inc.* 134
Totals	6,008	6,145	*Dec.* 137

APPENDICES TO THE MINES STATEMENT.

APPENDIX A.

REPORTS RELATING TO METALLIFEROUS MINES AND STONE-QUARRIES.

The INSPECTING ENGINEER OF MINES to the UNDER-SECRETARY OF MINES.

SIR,— Wellington, 11th May, 1921.

I have the honour to present my fourteenth annual report on metalliferous mines and stone-quarries, together with annexures and statistical information, for the year ended 31st December, 1920.

In accordance with the usual practice, the tables showing expenditure on roads, bridges, tracks, prospecting operations, &c., are for the period covered by the financial year—viz., from the 1st April, 1920, to the 31st March, 1921.

The reports, &c., are divided into the following sections: -

I. Minerals produced and exported.

II. Persons employed.

III. Accidents.

IV. Gold-mining.
- (1.) Quartz-mining.
- (2.) Dredge Mining.
- (3.) Alluvial Mining.

V. Minerals other than Gold.

VI. Stone-quarry Inspection and Statistics.

VII. State Aid to Mining.
- (1.) Subsidized Prospecting.
- (2.) Government Prospecting-drills.
- (3.) Subsidized Roads on Goldfields.
- (4.) Government Water-races.
- (5.) Schools of Mines.

Annexures:—
- (A.) Summary of Reports by Inspectors of Mines.
- (B.) (1.) Report on a Konimeter Test of Mine-dust at Waihi, by A. H. V. Morgan, M.A.
- (2.) Notes on the Katathermometer, by Frank Reed, M.I.M.M.
- (C.) Summary of Reports by Water-race Managers.
- (D.) Summary of Report by the Inspector of Stone-quarries for the North Island.
- (E.) Mining Statistics.

I. MINERALS PRODUCED AND EXPORTED.

The following statement shows the value of minerals (other than kauri-gum and coal) produced during 1920 and 1919:—

	1920. £	1919. £
Gold and silver	528,317	702,131
Quicksilver	1,378	2,794
Tungsten-ore	1,956*	21,771
Manganese	10	..
Copper	..	12
Asbestos	105	..

* Estimated.

The following statement shows the value of New Zealand minerals exported from metal-mines, quarries, and kauri-gum fields from the 1st January, 1853 to the 31st December, 1920:—

—	1919.	1920.	Increase or Decrease.	Total from the 1st January, 1853, to the 31st December, 1920.
	£	£	£	£
Gold	1,334,405	883,748	*Dec.* 450,657	89,012,107
Silver	103,037	87,665	„ 15,372	2,648,950
Quicksilver	4,619	900	„ 3,719	7,641
Tungsten-ore	29,489	1,378	„ 28,111	299,311
Kauri-gum	255,812	556,756	*Inc.* 300,944	19,137,820
Manganese	...	10	„ 10	61,915
Copper	12	...	*Dec.* 12	19,390
Other minerals	4,039	8,745	*Inc.* 4,706	356,869

Total value for 1919 ... ... £1,731,413
Total value for 1920 ... ... £1,539,202

II. PERSONS EMPLOYED.

The following statement shows the number of persons ordinarily employed in or about the metalliferous mines of the Dominion during the year:—

Classification.	Inspection District.			Total, 1920.
	Northern.	West Coast.	Southern.	
Gold, silver, and tungsten	1,058	484	372	1,914
Cinnabar	15	...	...	15
Asbestos	...	1	...	1
Totals for 1920	1,073	485	372	1,930
Totals for 1919	1,167	591	443	2,201

III. ACCIDENTS.

Only one serious accident occurred at any metalliferous mine during 1920, which constitutes a record for such mines since the industry has been established in the Dominion.

The accident referred to resulted in the death of the sufferer, Thomas Liddell, a miner, forty-eight years of age, who was killed by a blasting accident in the Rising Sun Gold-mining Company's mine at Owharoa, in the Northern Inspection District, on the 9th August, the following being a description of the sad occurrence:—

Owing to the timber at the top of the main rise collapsing and blocking the ventilation, a drive was being put in the footwall to connect with the top adit level, clear of the broken country. Two shifts were employed, driving from both sides. On the morning of the accident, deceased, in the presence of the mine-manager, bored a hole through and was able to converse with M. Brean, who was working on the other side. Deceased had bored five holes, and Brean on the other side two holes, the latter having been charged ready to fire. Before commencing to charge the holes drilled in the face where deceased was working he suggested to Brean

that it would be advisable to plug the hole which had been bored through, and which when measured showed only 20 in. of solid ground between the two faces. Brean plugged the hole as suggested, and knew that deceased was charging this and the other four holes, and was waiting for the signal agreed upon to fire. This signal, which is always given, consists of the miners' knocks followed by distinct knocks denoting the number of holes to be fired. Brean in his evidence at the inquest stated positively that before he spit the holes bored on his side he received the signal as arranged with deceased that morning before commencing work that he was ready to fire. Brean spit both holes and walked out of the drive to a place of safety. It appears from the evidence given that deceased, after charging the holes on his side, had one of nature's calls and walked out of the drive, being absent a few minutes. On his return he went into the face, leaving his mate Dean to attend to the lights so that he could see to reach a place of safety after spitting the holes. Shortly after, Dean heard the miners' signal given, a short pause, and whoever was knocking seemed to be in the act of repeating the signal when the first hole went off; he could not swear whether the knocks were given by deceased or Brean. After the first hole went off Dean rushed to within 14 ft. of the face and saw deceased lying on the floor of the drive. He called out but got no reply, and then ran for assistance.

Dean, accompanied by the manager and others, went to the top level and found that the holes fired had made a connection sufficiently large to enable them to enter the face where deceased was lying. It was found that deceased had received the full force of the explosion on the head and that he was dead. Subsequent examination of the place by Mr. M. Paul, Inspector of Mines, showed that no attempt had been made by deceased to fire the holes charged, and that he was killed by the hole bored through being fired by the concussion of one of the holes fired by Brean immediately under it on the other side.

In the Inspector's opinion this accident should never have occurred, as the men were able to talk to each other and arrange for firing, and it is quite evident that there was a grave misunderstanding, but no evidence to prove who was to blame.

The following verdict was returned by the Coroner: "That the deceased, Thomas Liddell, was killed by an explosion in the Rising Sun Mine at Owharoa on Monday, the 9th day of August, 1920. There is no evidence to show clearly how this accident occurred, but it is quite apparent that some grave misunderstanding as to the signals given by Brean existed in the mind of deceased, hence his remaining in the face until the fatal explosion occurred. I am satisfied that the mine-manager has taken every precaution against accident, and has warned the men accordingly." Rider: "In view of this fatality I would strongly recommend that, where approaching faces are closely nearing each other, both faces be fired separately and not simultaneously."

As the result of subsequent litigation the widow and children of deceased were awarded, by consent of the Rising Sun Gold-mining Company, the sum of £1,250 as compensation for their loss.

IV. GOLD-MINING.

The following statement shows the value of the bullion-production, also the dividends declared, number of persons employed, and the number of gold-mines and dredges:—

—	Production of Bullion, 1920.* (All Mines.)	Dividends paid, 1920. (By Registered Companies only.)†	Number of Persons ordinarily employed at Productive and Unproductive Mines.	Number of Productive Quartz-mines, Alluvial Mines, and Dredges, 1920.
	£	£		
Quartz-mining	415,868	100,981	1,382	23
Dredge mining	34,672	...	112	12
Alluvial mining‡ ...	77,777	4,445	409	122
Totals, 1920 ...	528,317	105,426	1,903	157
Totals, 1919 ...	702,131	123,744	2,143	187

* In addition to the gold produced from the gold-mines, silver was obtained from them, hence the word "bullion" used in preference to "gold."

† The profits of privately owned dredges and mines are unobtainable, which renders this statement incomplete.

‡ The bullion-production is from 122 alluvial claims, but the dividends are only ascertainable from those few that are the property of registered companies.

(1.) Quartz-mining.

At the productive quartz-mines no development of importance occurred during the year, at several of them mining being discontinued owing to exhaustion of the known ore-bodies. These include the Talisman and New Zealand Crown Mines at Karangahake, the Progress, and Keep-it-Dark Mines near Reefton.

The average value obtained per ton of ore treated declined from £2 0s. 1d. during 1919 to £1 15s. 10d. during 1920.

At Coromandel the Hauraki Mines (Limited) has proved the continuation of the shoot of ore in Legge's Reef below the 260 ft. level, where it was faulted. The bonanza above that level

between the years 1895 and 1899 yielded bullion to the value of £240,000. A step-fault system has been recently penetrated to the 300 ft. level, and the lode, although showing blotches of gold in places, is thin and as yet not payable. The prospecting operations are very interesting.

At the Waihi Mine sinking operations in No. 4 shaft attained a depth of 1,600 ft. The deepest mining was carried on at No. 12 (1,447 ft.) level, east of No. 4 shaft on the Dreadnought lode, for a distance of 391 ft. The ore-values were payable. East of the Dreadnought lode the Empire lode was intersected by a crosscut; the lode was split up and variable in value, although generally low. In the west crosscut to No. 2 shaft the Edward lode was intersected, having very low value. In the annual report of the Waihi Gold-mining Company it is estimated that at the end of 1920 the ore reserve amounted to 523,830 tons (short), of an average value of £1 11s., which ore could be worked in the ordinary course of mining. There was also a further reserve of 254,740 tons of ore in pillars and arches, of an average value of £1 18s. per ton. The average value of ore treated declined from £1 17s. 9d. during 1919 to £1 12s. 10d. during 1920.

At the Waihi Grand Junction Mine the pumping compartment of the main shaft has attained a depth of 1,473 ft., the water-temperature at the bottom being 95° F. The deepest mining was carried on at No. 8 (1,320 ft.) level on the Empire lode, the values being moderate. The average value of ore treated declined from £1 15s. 3d. during 1919 to £1 13s. 11d. during 1920.

At Muir's Gold Reefs, Te Puke, development in levels and by winze above the water-level has proved encouraging. Early in the year the mill was destroyed by fire, but a 20-head mill was forthwith purchased, which it is proposed to operate by electric power.

At the Blackwater Mine the main shaft was continued to a depth of 1,690 ft., the deepest mining operations being at No. 9 level, both north and south. The most favourable development occurred in the southern section.

At the New Big River Mine development was practically confined to winzing below the bottom No. 11 (1,775 ft.) level. The results were satisfactory.

In Otago only one small gold-quartz mine was productive, but a small quantity of gold was obtained from a gold-scheelite mine at Macrae's.

During the early part of the current year James Hurley, a Government subsidized prospector, found an outcrop of a quartz lode on a ridge near the Alexander Stream, a tributary of the Big Grey River. Considerable attention was drawn to this discovery by grossly exaggerated reports in the local Press. Subsequent examination by Mr. P. G. Morgan, Director of Geological Survey, proved that the lode, as exposed in trenches for a length of less than 100 ft., averaged 5 ft. 1½ in. in width, and contained an average assay value of £1 7s. 2d. per ton. No other prospecting-work than the trenching referred to had been done, and the lode remains a mere prospect.

The following is a statement showing the tons of ore treated, the value of bullion produced, and the amount of dividends paid by quartz-mining companies in each of the inspection districts during the years 1920 and 1919:—

Inspection District.	Statute Tons of Ore treated.		Value of Bullion.		Dividends paid (by Registered Companies only).	
	1920.	1919.	1920.	1919.	1920.	1919.
	£	£	£	£	£	£
Northern	194,316	226,614	325,854	475,999	99,181	116,431
West Coast	37,592	58,937	89,333	97,712	1,800	2,400
Southern	145	506	681	310	..	..
Totals	232,053	286,057	415,868	574,021	100,981	118,831

The average value per ton of ore treated during 1920 amounted to £1 15s. 10d.

The following is a statement of the production, dividends declared, and the number of persons employed by the principal gold-quartz mining companies during 1920:—

Name of Company.	During 1920.			Dividends paid.		Number of Persons ordinarily employed during 1920.
	Quantity of Quartz treated.	Value of Bullion.	Average Value per Ton.	1920.	Total to End of December, 1920.	
	Statute Tons.	£	£ s. d.	£	£	
Northern District—						
Waihi Gold-mining Company (Limited) ..	142,239	233,466	1 12 10	99,181	5,437,238	531
Waihi Grand Junction Gold-mining Company (Limited)	51,294	86,960	1 13 11	..	267,064	296
West Coast District—						
Blackwater Mines (Limited)	24,468	58,887	2 8 1	..	174,994	108
New Big River Gold-mining Company (Limited)	2,970	14,333	4 16 6	1,800	105,000	31
Progress Mines of New Zealand (Limited) ..	8,102	13,571	1 13 6	..	326,562	43
Other quartz-mines throughout New Zealand ..	2,980	8,651	2 18 0	..	..	373
Totals	232,053	415,868	1 15 10	100,981	..	1,382

(2.) Dredge Mining.

This system of gold-mining, which originated in New Zealand, has greatly declined in importance owing to increased cost of labour and material, the number of productive dredges having decreased from 167 during 1906 to twelve during 1920, the number of persons employed thereon having decreased from over 1,000 to 112 during that period.

The following dredges were put out of commission during 1919: Rise and Shine No. 2, Ngapara, Otakau, Kapitea, Pactolus, and Hessey-Cameron; and during 1920, the Ferry, Lower Nevis, and McGeorge's No. 2.

The only interesting feature worthy of record in connection with this branch of the gold-mining industry is the near completion of the powerful dredge "Rimu," built after the American design at Rimu Flat, near Hokitika, where an ancient and buried branch of the Hokitika River has been favourably and systematically proved by Government Keystone drills.

The following is a statement showing the capacity, production, and profits of bucket gold-dredges during 1920. (Note.—The profits made by privately owned dredges are not obtainable for publication.)

Name of Dredge.	Locality.	Capacity of Dredge-buckets, in Cubic Feet.	Number of Buckets discharged per Minute.	Nominal Horse-power of Engines.	S = Steam. H = Hydraulic. E = Electrical. SG = Suction Gas.	Average Depth of Ground dredged.	Value of Bullion obtained during 1920.	Dividends declared. During 1920.	Dividends declared. Total.
Otago and Southland.						Ft.	£	£	£
Rise and Shine No. 1 ..	Cromwell	5½	10	20	S	40	2,601	..	53,100
Rising Sun	„	7	10	25	S	45	2,173	..	24,000
Ferry (private)	„	4½	11½	16	S	40	215	..	..
Electric No. 1 (private) ..	„	5	10	16	S	35	3,320	..	..
Earnscleugh No. 3 ..	Alexandra	7	12	150	E	50	4,348	} ..	30,250
Earnscleugh No. 5 ..	„	6	13	150	E	35	2,750	}	
Lower Nevis	Nevis	4	11	12	S	10	526	..	2,970
Nevis Crossing (private) ..	„	3½	10	12	S	10	716	..	..
McGeorge's Freehold No. 2 (private)	Waikaka Valley ..	6½	9	16	S	14	5,400	..	..
McGeorge's Freehold No. 3 (private)	„ ..	6½	9	20	S	35	1,330	..	..
Kura (private)	Waikaia	3½	9	16	S	30	7,983	1,400	7,747
West Coast.									
Chambers Reward	Arahura Valley ..	8	15	20	S	15	3,319	..	..
Rimu*	Rimu	10	20	550	E	..	..	..	..
Totals 1920 ..	..	..	..	..	..	..	34,672	1,400	Unknown.
Totals, 1919 ..	..	..	..	..	..	..	47,838	2,845	Unknown.

* This dredge, the property of the Rimu Gold-dredging Company, is being equipped with machinery preparatory to being put into commission.

(3.) Alluvial Mining.

Upon alluvial gold-mining operations, which formerly employed many thousands of prosperous diggers, only 409 persons were engaged during the past year; and some of these must have failed to earn a living-wage, the average gold-production per person employed being £190, from which all costs for rent, water, plant, tools, and other material should be deducted.

The following is a table showing the value of production of alluvial gold-mines, and dividends paid by those few which are owned by registered companies, during 1920. (The profits of privately owned mines are unobtainable.)

Name of Company.	Value of Gold produced.	Dividends declared. During 1920.	Dividends declared. Total to End of 1920.
	£	£	£
Gabriel's Gully Sluicing Company	3,692	1,320	15,615
Golden Crescent Sluicing Company	2,754	525	12,425
Havelock Sluicing Company	2,146	200	11,000
Nokomai Hydraulic Sluicing Company ..	8,547	2,400	53,483
Other claims (118)	60,638	..	..
Totals, 1920	77,777	4,445	Unknown.
Totals, 1919	80,273	2,068	Unknown.

V. MINERALS OTHER THAN GOLD.

Tungsten-ore.

There has been a considerable collapse in the tungsten-ore (scheelite) mining industry owing to the great decline in price, there being little or no demand for tungsten-ore at the Home market owing to accumulated stocks, due to greatly increased production during the war. For several years prior to the war the price of concentrates per unit (on a 65-per-cent. WO_3 basis per ton) did not exceed £1 10s., but during the war the Empire's production was commandeered for Imperial requirements, the price being eventually increased to £3 8s. per unit. After the armistice, upon the commandeer being removed, the price declined until at the time of writing it is nominally 14s. per unit.

The following statement shows the quantity and value of ore exported:—

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Tons.	£		Tons.	£
1899	32	2,788	1911	138	11,853
1900	54	2,635	1912	135	13,347
1901	2	83	1913	221	22,933
1902	39	1,200	1914	204	21,498
1903	42	1,439	1915	194	27,784
1904	17	791	1916	266	49,070
1905	28	1,848	1917	161	28,972
1906	55	3,407	1918	169½	37,922
1907	137	15,486	1919	131	29,489
1908	68	6,055	1920	10 1/10	1,378
1909	58	4,263			
1910	143	15,070	Totals ..	2,304⅜	299,311

The following is a table showing the quantity of quartz crushed and scheelite concentrates obtained during 1920:—

Name of Mine or Company.	Locality.	Quartz crushed.	Scheelite Concentrates obtained.	Value.
		Tons.	T. cwt. qr. lb.	£ s. d.
Callery and Bickerton	Macrae's, Waihemo County	35	6 17 0 0	Still held.
A. C. Buckland	The Reefs, Taieri County	4	0 17 0 0	125 0 0
Sutherland and Hodd	Glenorchy, Lake County	15	2 10 0 0	130 0 0
Black and McPherson	,, ,,	30	4 0 0 0	684 0 0
			4 6 0 0	Still held.
Glenorchy Scheelite Company ..	,, ,,	150	12 2 0 0	,,
Dominion Consolidated Mining and Development Company	Wakamarina, Marlborough	1,649	8 10 0 0	850 0 0
Totals	..	1,883	39 2 0 0	..

In addition to scheelite, gold was also obtained from the quartz crushed as follows: Callery and Bickerton, £41; Dominion Consolidated, £2,291 3s. 2d.

Cinnabar.

Three parties were employed at cinnabar-mining operations near Puhipuhi, North Auckland. One of these, the New Zealand Quicksilver-mines (Limited), produced 3,675 lb. of quicksilver, valued at £1,378. The other two parties are employed upon prospecting or development work, and have not yet attained the productive stage.

Asbestos.

Messrs. H. F. Chaffey and party from their mine in Takaka County produced 1¾ tons of asbestos, valued at £105. The mine is not now worked, being, it is understood, under option for sale.

Petroleum.

No developments of commercial value occurred at any of five oil-boring operations in the Dominion.

The Blenheim bore at Moturoa attained a depth of 5,726 ft., being the deepest borehole in Australasia. The bottom of the hole was in claystone. Gas-emanation occurs.

During the year the Taranaki Oil-wells (Limited) went into liquidation.

The borehole of the Canterbury Petroleum Company at Chertsey reached a depth of 2,170 ft. Emanations of gas and traces of oil were given off below 1,368 ft.

Kauri-gum.

The quantity and value of kauri-gum exported during 1920 amounted to 6,481 tons, valued at £556,756, as compared with 4,128 tons, valued at £255,812, during the previous year.

Phosphate Rock.

The production of phosphate rock by the Ewing Phosphate Company, of Clarendon and Milburn, Otago, amounted to 5,341 tons, valued at £5,341, as compared with 4,000 tons, valued at £4,000, during 1919.

VI. STONE-QUARRY INSPECTION AND STATISTICS.

By section 2 of the Stone-quarries Amendment Act, 1920, the application of the Act was extended to include every place, not being a mine, in which persons work in quarrying stone and any part of which has a face more than 15 ft. deep, and also in any tunnel in the construction of which explosives are used. The Act, however, does not apply to any Government operations, or any road or railway-cutting, or excavations for buildings.

The stone-quarrying industry continues to advance in importance, during 1920 the value of stone, &c., produced being £314,470.

The following is a table showing the number of quarries under the Stone-quarries Act, 1910, also the number of persons ordinarily employed thereat, and the annual output and value of crude stone during 1920:—

Provincial District.	Name and Address of Government Inspector of Stone-quarries.	Number of Working Quarries under the Act.	Number of Persons ordinarily employed.	Output of Crude Stone.								
				Stone or Gravel for Macadamizing or Ballast.	Stone for Harbour-works.	Building-stone.	Limestone for Agriculture.	Limestone for Cement or Mortar.	Phosphate for Agriculture.	Fireclay for Bricks or Tiles.	Sand for Building or Asphalting.	Value at Quarry.
				Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	£
Auckland ..	James Newton, Mines Dept., Auckland	105	532	271,316	79,661	13,712	33,867	102,626	..	1,600	..	105,764
	M. Paul, Mines Dept., Waihi (Hauraki Mining District only)	11	75	15,734	..	295	..	..	..	..	..	8,997
Hawke's Bay	James Newton, Mines Dept., Auckland	20	69	14,500	74,323	..	18,720	..	..	..	..	13,806
Taranaki ..	Ditto	11	80	17,404	136,870	..	..	..	..	..	..	18,453
Wellington ..	„	43	216	71,270	10,802	..	11,916	..	..	..	..	26,333
Canterbury ..	„	11	78	88,517	4,993	1,201	..	6,000	..	..	..	21,627
Nelson, Westland	J. F. Downey, Mines Dept., Reefton	13	144	3,824	772	1,286	1,654	29,716	..	..	..	15,587
Otago, Southland	A. Whitley, Mines Dept., Dunedin	27	274	95,697	10,040	2,529	76,095	31,611	5,341	..	..	103,903
Totals 1920	..	241	1,468	578,262	317,461	19,023	142,252	169,953	5,341	1,600	..	314,470
Totals 1919	..	219	1,409	587,901	183,000	27,051	102,010	143,182	4,000	2,500	6,685	*

* Unknown.

At the 241 stone-quarries under the Act, at which 1,468 persons were ordinarily employed, the only serious accident which occurred during the year consisted of a broken arm.

A considerable number of quarries, &c., producing valuable stone do not come under the operations of the Act by reason that the face is not 15 ft. deep: these include some of the Oamaru limestone and pumice quarries.

Further particulars regarding the inspection of stone-quarries in the North Island and Canterbury are contained in the annual report by Mr. James Newton, appearing in Annexure C accompanying this report.

VII. STATE AID TO MINING.

(1.) Subsidized Prospecting.

During the year ended 31st March, 1921, eighteen approved prospecting parties were granted subsidies amounting to £6,545, of which £1,456 was expended during the year. In addition to this, £697 granted during previous years was expended.

Upon subsidized prospecting operations 122 persons were intermittently employed during the year; the results attained were moderate.

The following is a statement showing the number of subsidized prospectors, the amount of subsidy granted and paid, also the character and result of such prospecting operations from the 1st April, 1920, to the 31st March, 1921:—

Name of Prospecting Party.	Number of Prospectors.	Locality of Operations.	Amount of Subsidy granted.	Amount of Subsidy expended.	Distance driven.	Nature of Claim.	Character of Operations.	Remarks.
Northern Inspection District.				£ s. d.	Ft.			
Hauraki Prospecting Association (Tierney and Regan)	2	Mahakirau ..	£1,000 (£2 subsidy for £1 subscribed)	373 0 0	360	Quartz ..	Surface prospecting	No work done during the year.
Waitangi Gold-mining Company	7	Thames ..	£166 13s. 4d., at 6s. 8d. per foot	£100 in 1919, £66 13s. 4d. in 1920–21	500	„ ..	Driving ..	Gold seen in ore, but nothing payable discovered.
C. Wells and G. Blythe ..	2	Cabbage Bay ..	£39, at £1 10s. a week each for three months	6 0 0	..	„ ..	Surface prospecting	Operations suspended.
John McCombie and mates ..	3	„ ..	£63, at £1 10s. a week each for three months	..	..	„ ..	„	No work done.
John Bremner and mate ..	2	Coromandel ..	£100 for 300 ft. driving, at 6s. 8d.	..	..	„ ..	Driving ..	Company formed. No application made for subsidy.
J. McClair and mate	2	Thames ..	£66 13s. 4d. on 200 ft. driving, at 6s. 8d.	13 6 8	40	„ ..	„ ..	Operations suspended.
C. and J. Carroll	2	Kuaotunu ..	£39, at £1 10s. a week for three months	12 0 0	..	„ ..	Surface prospecting	Nothing further done during the year.
Lindsay and Strongman ..	2	Matawai ..	£33 6s. 8d., 100 ft. driving at 6s. 8d.	20 0 0	60	„ ..	Driving ..	Driving in hard country. Work temporarily suspended.
Glass and Caulder	2	Taupo	£51, £1 10s. a week each for four months	38 10 0	..	„ ..	Surface prospecting	Owing to illness Caulder forced to abandon prospecting operations.
A. and H. McNeil	2	Coromandel ..	£66 13s. 4d., 200 ft. driving at 6s. 8d.	66 13 4	200	„ ..	Driving ..	Strong colours gold seen, but nothing payable discovered.
Regan and Sullivan	2	Tokatea ..	£50, 150 ft. driving at 6s. 8d.	50 0 0	150	„ ..	„ ..	6 in. lode intersected. Ore low grade.
Madell and Andrews	2	Mahakirau ..	£39, £1 10s. a week for three months	39 0 0	..	„ ..	„ ..	Good dish prospects in loose quartz. Unable to locate source.
Campbell Bros.	2	Puru	£39, at £1 10s. a week each for three months	39 0 0	..	„ ..	Surface prospecting	Prospects encouraging.
Wilson and Sadgrove	2	Waitaia ..	£39, £1 10s. a week each for three months	39 0 0	..	„ ..	„	Nothing payable discovered.
Kuranui Gold-mining Company ..	4	Tararu	£100, 300 ft. driving at 6s. 8d.	100 0 0	300	„ ..	Driving ..	Driving on 2 ft. lode. Gold seen, but ore low-grade.
Rising Sun Gold-mining Company	12	Owharoa ..	£100, 300 ft. driving at 6s. 8d.	56 13 4	170	„ ..	„ ..	Work suspended.
United Gold-mines	..	..	5s. for every £1 expended on pioneer mining	..	..	..	..	Mine under protection.
Campbell Bros.	3	Puru	£58 10s., £1 10s. each, three men for three months	58 10 0	..	Quartz ..	Surface prospecting	Trenching on course of 12 ft. reef.
St. Hippo Gold-mining Company	..	Thames ..	£83 6s. 8d., 250 ft. driving at 6s. 8d.	83 6 8	250	„ ..	Driving ..	Lode intersected; width unknown. Strong colours gold seen in hanging-wall portion.
Caledonian–Kuranui–Moanataiari	..	„ ..	£2,000, £1 for £1 ..	..	..	„ ..	„ ..	Work in progress, to prove reefs behind main slide.
Ohinemuri Gold and Silver Mines	..	Maratoto ..	£433 6s. 8d., 1,000 ft. driving at 8s. 8d. per foot	..	..	„ ..	„ ..	Work in progress to intersect Camoola lode.

W. M. Wallnutt and Syn.	..	Waitekauri	£133 6s. 8d., 400 ft. driving at 6s. 8d.	..	..	Quartz	Driving	Work in progress
T. H. Glass and Paora Pierie	2	Taupo	£50 14s., two men £1 19s. a week each for three months	31 4 0	..	"	Surface prospecting	Failed to locate source of gold found by Caulder.
Waitangi Consolidated Gold-mining Company	..	Thames	£130, 300 ft. driving at 8s. 8d. per foot	..	..	"	Driving	No work done at No. 2 level since subsidy granted.
Golden Lily Syndicate	2	Cabbage Bay	£50 14s., two men at £1 19s. a week each for three months	..	..	"	Surface prospecting	Work in progress. Prospects encouraging.
W. and H. Madill	2	Coromandel	£50 14s., two men at £1 19s. a week each for three months	..	..	"	"	Work in progress.
Campbell Bros.	2	Puru	£50 14s., two men at £1 19s. a week each for three months	50 14 0	..	"	"	Tested 12 ft. lode for 400 ft. Results encouraging.
W. F. McNeil and mate	2	Coromandel	£50 14s., two men at £1 19s. a week each for three months	..	..	"	"	Work in progress.
West Coast Inspection District.			£ s. d.					
Alpine Consols (Limited)	5	Lyell	..	37 6 8	112	Quartz	Driving	Several blocks of reef struck, but values poor.
			166 13 4	128 6 8	367			
Blackwater Miners' Association	2	Waiuta	..	24 0 0	..	..	Prospecting	Rich quartz found in Alexander Stream.
Connolly and Koeti	2	South Westland	39 0 0	39 0 0	..	..	"	Nothing of any value found.
H. F. Chaffey	2	Mount Arthur	..	100 0 0	..	Asbestos	"	Number deposits showing crysolite opened up.
R. Duffy and Pennington	2	Larry's Creek	..	13 6 8	40	Quartz	Driving	Large reef driven on, but values proved unfavourable.
Fiddes and Doolan	2	Paparoa Riding	..	36 0 0	..	..	Prospecting	Small mineralized vein found carrying good gold.
Howat and Hyndman	2	Woodstock	..	57 5 0	458	Alluvial	Driving	Payable alluvial reported to have been found.
Kulsen and party	2	Kanieri	..	20 14 0	138	"	"	Payable alluvial reported.
Mount Greenland Extended Syndicate	2	Ross	..	37 6 8	112	Quartz	"	Several reefs met, but values poor and reef broken.
McCormack, Irwin, and Thorpe	3	Waiho	76 1 0	58 10 0	..	..	Prospecting	Good alluvial gold found several places, but deposits small.
H. F. Porter and party	2	Karamea	..	15 12 0	..	..	"	Nothing of value found.
F. D. Walker and H. Honey	2	Capleston	..	21 0 0	..	..	"	Small reef located, but value not known.
Thomas Waugh	2	Marsden	..	16 16 0	112	Alluvial	Driving	A little gold got, but not payable. Work not completed.
Webster and party	4	Rimu	..	23 0 0	153	"	"	Limited amount of ground found, with payable values.
"	..	"	103 6 8	75 3 6	291	"	"	Values got payable for sluicing but not for blocking out.
Southern Inspection District.								
Lafranchi Bros.	3	Cardrona	76 1 0	46 8 0	..	Alluvial	Surface prospecting	Prospecting for auriferous lead. Work in progress.
Otago Central Gold-mines	5	Bannockburn	483 6 8	477 5 10	1,280	Quartz	Driving	Prospecting reefs at low level. No payable ore found.
"	4	Bendigo	£100 and half-cost of timber	..	..	Alluvial	"	Prospecting for auriferous lead. Work in progress.
W. G. W. Barnard	4	Macetown	243 6 8	243 6 8	730	Quartz	"	Driving on reef. No payable ore found.
H. Fraser and J. McAuley	2	Nenthorn	31 4 0	31 4 0	..	Alluvial	Surface prospecting	Prospecting for auriferous lead.
Ballingall and Nicol	3	Nevis	75 0 0	..	..	"	Driving	Prospecting for auriferous lead. Work in progress.
R. Symes and party	2	Old Man Range	50 14 0	..	..	Quartz	Surface prospecting	Prospecting for reef.

(2.) Government Prospecting-drills.

The following is a table giving details of operations by Government drills during 1920 :—

Type of Drill.	Name of Drill Superintendent.	Number of Holes drilled.	To whom lent.	Mineral sought for.	Total Depth, in Feet.	Character of Country pierced.	Cost of Drilling, per Foot.*	Cost of Transport, per Foot.	Diameter of Hole.	Results.
							s. d	s. d.	Inches.	
No. 2 keystone placer	W. H. Warburton	18	Westland Prospecting Syndicate ..	Gold ..	416	River-bed gravels ..	6 10†	..	6	Very poor, unworkable (Arahura River).
C.N. diamond ..	,,	1	Scott Bros., Reefton	Coal ..	500	Gravel, sand, clays, and shales	3 6½	12 0	2	Coal-horizon not attained.
No. 3 Schram-Harker diamond percussive (oil-driven)	A. Wick ..	1	Homebush Brick and Coal Company, Glentunnel	,, ..	355	Sandstones, clays, and shales	4 0	0 3	1¾	No workable coal.
Ditto	,, ..	1	Ditto	,, ..	506	,, ,, ,,	4 1	0 3	1¾	,,
,, ...	,, ..	1	,, ...	,, ..	394	,, ,, ,,	2 11	0 3	1¾	,,
,, ...	,, ..	1	Mount Torlesse Collieries, Avoca ..	,, ..	266	Sandstones, clays, shales, conglomerates, and grey-wacke	2 1½	0 7	2⅜	2 ft. coal at 161 ft.
,, ...	,, ..	1	,, ,, ..	,, ..	153	Ditto	6 11	0 7	2⅜	No workable coal.
,, ...	,, ..	1	,, ,, ..	,, ..	574	,, ...	3 0	0 7	1¾	,,
,, ...	,, ..	1	,, ,, ..	,, ..	270	,, ...	1 7	0 7	2⅜	11 ft. 6 in. coal at 136 ft.
,, ...	W. H. Warburton	1	,, ,, ..	,, ..	475	,, ...	2 0	0 7	1¾	2 ft. 6 in. coal at 388 ft.
,, ...	,, ..	1	,, ,, ..	,, ..	280	,, ...	1 5½	0 7	2⅜	20 ft. coal at 236 ft.
,, ...	,, ..	1	,, ,, ..	,, ..	162	,, ...	1 9	0 7	2⅜	9 ft. coal at 124 ft.
,, ...	A. Wick ..	1	,, ,, ..	,, ..	266	,, ...	1 6	0 7	2⅜	3 ft. 6 in. coal at 135 ft.
,, ...	,, ..	1	,, ,, ..	,, ..	86	,, ...	4 3	0 7	2⅜	No coal.
,, ...	,, ..	1	,, ,, ..	,, ..	118	,, ...	4 6½	0 7	2⅜	,,
A. diamond ..	W. H. Warburton	1	State Mines, Rewanui	Ventilation	232	,, ...	5 8	0 7	4	Drilled to relieve gas; satisfactory.
C.N. diamond ..	R. Pengelly ..	1	N.Z. Quicksilver-mines, Whakapara ..	Cinnabar ..	323	Clays and gravels ..	6 9½	2 0	6 and 3⅝	Traces of cinnabar at 245 ft.
,, ..	,, ..	1	,, ,, ..	,, ..	200	Mudstone and quartz ..	6 9½	2 0	5 and 3⅝	18 ft. lode-matter at 142 ft.
,, ..	,, ..	1	,, ,, ..	,, ..	160	Grits	6 9½	2 0	,,	Traces of cinnabar at 84 ft.
,, ..	,, ..	1	,, ,, ..	,, ..	111	,, ...	15 9½	2 0	5, 4, 2¾	3 ft. lode-matter at 85 ft.
,, ..	,, ..	1	,, ,, ..	,, ..	125	,, ...	6 9½	2 0	4	2 ft. 6 in. lode-matter at 85 ft.; drilling still in progress.
No. 2 keystone ..	G. E. D. Seale ..	41	Westland Prospecting Syndicate ..	Gold ..	850	River-bed gravels ..	..	..	6	Unprofitable.

* Less salary and expenses of drill superintendent. † Including transport.

Considerable use has been made during the year of the Government prospecting drills, which are lent to hirers free of any charge but that of maintenance. An aggregate of 6,822 ft. was drilled in seventy-nine holes, of which the following is a summary:—

Number of Holes drilled.	Aggregate Depth attained.	Mineral searched for; or Purpose.	Type of Drill used.	Cost per Foot, including Transport of Plant.	Results.
	Ft.			s. d.	
18	416	Alluvial gold	Keystone ..	6 10	Unpayable ground.
11	850	,,	,,	..	,,
1	500	Coal ..	Diamond ..	15 6	Hole stopped before coal-horizon attained.
3	1,255	,, ..	,, ..	7 0	Negative.
1	232	Ventilation	,, ..	6 3	Attained.
5	959	Cinnabar ..	,, ..	8s 10d. to 17s. 10d.	A lode proved varying in thickness up to 18 ft.
10	2,610	Coal ..	Percussive ..	2s. 1d. to 7s. 6d.	50 acres of workable coal-seam proved.
79	6,822	..	..	..	..

(3.) Subsidized Roads on Goldfields.

The expenditure in the form of subsidies and direct grants upon roads on goldfields amounted to £11,050, as compared with £13,096 during the previous year.

(4.) Government Water-races.

The Waimea–Kumara and Mount Ida water-races, which render possible mining in the localities of Kumara (Westland) and Naseby (Central Otago), have during the year ended 31st March, 1921, supplied claims employing thirty-one alluvial miners with water for sluicing auriferous gravels, by which gold to the approximate value of £4,188 was obtained. The cash received by the Government for water sold amounted to £1,182, but the expenditure on the upkeep of the races was £4,576; thus the upkeep exceeded the receipts by £3,394. No allowance for depreciation or interest on the capital expenditure of about £250,000 was provided for. The loss to the Government on the combined races during the year amounted to £106 per miner using the water. The average earnings per miner from gold obtained was £199 after payment for water was deducted, but without deductions for rent of ground, cost of plant and tools, &c.; it will therefore be seen that a living-wage was not, on the average, attained.

(5.) Schools of Mines.

The six schools of mines on the goldfields of Coromandel, Thames, Karangahake, Waihi, and Reefton, if judged by the paucity of students who presented themselves for examination at the last annual Government examination in connection with such schools, have practically ceased to be mining schools, for no student from these schools presented himself for examination on the subjects of mining, mine-drainage, or haulage and winding, and only one student on the subjects of mine-ventilation and mineralogy; in metallurgy there were two students, and in geology three. As secondary or technical schools for children of both sexes who desire to acquire a knowledge of mathematics, electricity, and chemistry they are, in the North Island, fairly well attended.

The expenditure by the Mines Department on schools of mines amounted for the year ended 31st March, 1921, to £4,427 9s. 6d.

I have, &c.,

Frank Reed,

Inspecting Engineer of Mines.

ANNEXURE A.

SUMMARY OF REPORTS BY INSPECTORS OF MINES.

Northern Inspection District (Mr. M. Paul, Inspector of Mines).

Quartz-mining.

Waihi Gold-mining Company (Limited).—No. 4 shaft: Sinking was commenced in November, and up to date a total depth of 153 ft. below No. 12 level has been sunk; depth from surface, 1,600 ft.

No. 12 level (1,447½ ft. below the collar of No. 4 shaft): Mining was resumed east of No. 4 shaft on the Dreadnought lode. Distance driven, 174 ft.; average width of lode, 2 ft. 8 in.; assay value, £1 10s. 5d. per ton. Total distance driven east on this lode, 391 ft.

Bath north crosscut: This was started 273½ ft. east on the Dreadnought lode and driven north 141 ft. At 60 ft. the south section of the Empire lode was met with. It was split up into four parts, as follows: At 60 ft., lode 48 in., value 1s. 1d.; at 86 ft., lode 24 in., value 8d.; at 103 ft., lode 51 in., value 7s. 9d.; at 111½ ft., lode 38½ in., value £1 14s. 8d. This crosscut is being continued with the object of intersecting the Martha lode, approximately 60 ft. ahead of present face.

West crosscut to No. 2 shaft: Total distance driven, 680½ ft. At 652 ft. the east part of the Edward lode was encountered, and proved to be 25 ft. in width, with an average assay value of 3s. 10d. per ton.

No. 11 level (1,301 ft. below the collar of No. 4 shaft).—Martha lode (east of Bath north-west crosscut): This drive has now reached a total of 358 ft., but nothing of importance has been discovered. Empire lode, Dreadnought lode, Edward lode: Stoping operations are in progress above this level.

No. 10 level (Empire lode, north section): A total of 153 ft. has been driven on the course of this lode. At 132 ft. the full width was 18 ft., with an average assay value of £2 12s. 8d. per ton. At 153 ft. this level connected with a drive on the main Empire lode. The lodes actually junction at the 142 ft. point. At 75 ft. west, when widening out on this lode a branch reef was discovered, 8 ft. in width and with an average assay value of £1 9s. 3d. per ton. Further work will be done on this lode. East on the north section of the Empire lode the drive was widened out for a length of 70 ft., exposing a width of 16½ ft. of payable ore.

Martha lode east: A good block of sulphide ore has been developed—length 168 ft., width 12 ft. Stoping operations are now in progress on this and the following lodes: Empire, Dreadnought, and south branch Martha and Edward lodes.

No. 9 level (Empire lode, north section east): A total of 143½ ft. has now been driven upon this lode, showing the average width of 5 ft., with the values ranging from 1s. 9d. to £2 0s. 2d. per ton. Stoping operations are in progress on the following lodes: Empire, Alexandra, Edward and Martha.

No. 8 level: The only important development work done on this level was driving on the course of the north branch of the Martha lode. A total distance of 44 ft. has been driven, showing the width of the lode to be 5 ft., and the values ranging from 15s. 6d. to £2 10s. 8d. per ton. Stoping is in progress on the following lodes: Empire, Alexandra, and Welcome.

No. 7 level: Stoping operations are in progress on the following reefs: North section of the Martha, and also the Royal.

No. 6 level: Stoping is in progress on the following reefs: Martha (south section), Regina No. 2 reef, and Manganese lodes.

No. 5 level: On the north branch of the Martha lode, north of Brady's winze, 74 ft. of driving was done, showing the width of the lode to be 5 ft., with values varying from 5s. 6d. to £10 10s. 2d. Stoping operations are in progress on this lode. A considerable quantity of payable ore is still being won from the arches on the Martha lode between Nos. 3 and 6 levels.

Western Smithy level: Ore was won from the Welcome lode and branches, south branch of Martha, Bell lode, and Welcome lode. A good deal of ore has also been won from the open-cuts, which supply the filling for the various stoping-blocks. During the year 32,762 tons have been sent down to fill the depleted stoping-area.

Waihi Grand Junction Gold Company (Limited).—The pumping-compartment of the main shaft has been sunk to a depth of 1,473 ft. A distance of 105 ft. was sunk in quartz of low value. At 1,425 ft. the south dip of this lode carried it out of the shaft area. It is proposed to open out at 1,440 ft. for No. 9 level. The water-temperature at the bottom of this shaft is 95°.

No. 8 level: The drive on the Empire lode was advanced east 235 ft., with values low. This makes the total distance driven 1,243 ft.

No. 4 winze: Depth, 36½ ft.; average assay value over an average width of 41 in. was £1 8s. per ton.

No. 6 winze: Depth, 36 ft.; lode, average width, 36 in.; average value per ton, 18s. 10d.

No. 7 winze: Depth, 33 ft.; average width, 48 in.; average value per ton, £5 1s. 5d.

No. 10 winze: Depth, 55 ft.; average width, 45 in.; average value per ton, £1 9s. 6d.

No. 11 winze: Depth, 32 ft.; average width, 41 in.; average value per ton, 3s. 7d. From 32 ft. to 55 ft. down average value over an average width of 37 in. was £1 16s. 9d. In each case walls not exposed. At a depth of 40 ft. in No. 11 winze a crosscut was driven, and the lode proved to be 13½ ft. in width. The first 9 ft. on the south wall is worth £2 3s. 6d. per ton, and the next 4½ ft. 1s. 2d. per ton.

The Empire lode crosscut at 210 ft. east was advanced 47 ft., making a total of 78 ft. This will be used to transport filling from main filling-shaft to Empire lode. At 57 ft. north quartz was met with, and driven upon east for 11 ft. and west for 12 ft.; average width, 53 in.; and value, £3 6s. 6d. per ton.

Royal lode (No. 8 winze): Depth, 60½ ft. A crosscut at 25 ft. down shows the lode to be 237 in. in width; value, 11s. 7d. per ton.

Extended section (No. 6 level, Mary lode): The drive east was advanced 575 ft., making a total of 945 ft. From 370 ft. to 624 ft. is low grade. At 635 ft. east the lode was 69 in., and worth 17s. 8d. per ton; at 710 ft., width 52 in., worth £1 11s. per ton; at 795 ft., width 48 in., worth £1 9s. per ton.

No. 5 level: The drive east on the Mary lode was advanced 390 ft., making a total of 827 ft. From 426 ft. to 820 ft. for a width of 80 in. the assay values were 13s. 9d. per ton. Walls exposed.

No. 4 level: The drive east on the Mary lode was advanced 225 ft., making a total of 939 ft. From 714 ft. to 801 ft. over an average width of 33 in. the values were 17s. 4d. per ton. At 870 ft. the lode was 10½ ft. wide, worth 4s. 5d. per ton. This lode was broken out and timbered for stoping from 280 ft. east to 322 ft. east. Assays averaged £1 for width of 90 in.

No. 3 level: From 487 ft. to 845 ft. over an average width of 50 in. the values averaged £4 4s. 4d. per ton. At 809 ft. east the lode divided into two branches. The south branch from 809 ft. to 845 ft. over a width of 40 in. gave assay values of £1 16s. 2d. per ton. Walls exposed.

West area (site of B shaft): The original shaft-timbers have decayed, allowing the surface to collapse. A winze was sunk to No. 1 level—depth 160 ft.—through loose ground. It was deemed advisable to discontinue this work, as the restoration of this shaft would be an expensive undertaking, and even when ultimately completed would be liable to distortion at any time. It has therefore been decided to transfer operations to C shaft, where a suitable winding plant will be erected and the shaft put in working-order to the 500 ft. level. The lode at No. 1 level was sampled, with the following results: At 42 ft. east, width 70 in., footwall exposed; value, £1 13s. per ton. From north crosscut, 30 ft. west, width 74 in., walls not exposed; value, 3s. 2d. per ton. A crosscut at 28 ft. east exposed 17½ ft. of quartz; value, £1 13s. 9d. per ton (footwall only exposed). A crosscut 40 ft. east exposed 12 ft. of quartz; value, 6s. 6d. per ton (footwall exposed).

Rising Sun Gold-mining Company, Owharoa.—Owing to delay in obtaining a motor to provide sufficient power to work the mine and the mill no work was done in this mine until the middle of May. On resuming operations the drive on No. 1 reef at the low level was extended 110 ft.; width of lode, 12 in.; average assay value, £4 10s. per ton. A rise was also put up on No. 3 reef for 32 ft.; width of lode, 18 in., carrying high values. Work is at present confined to sinking a shaft in the country below the low level to test the reef-system at a depth of 100 ft.

Talisman Mine, Karangahake.—At the end of December, after driving 120 ft. south on main lode from the bottom of No. 16 winze with no improvement in values, it was decided to suspend mining operations. Therefore it was decided to remove the air-pipes, rails, sinking-pumps, &c. Unfortunately, one of the main rods in the Woodstock shaft broke. This was replaced, but it again carried away, and it was considered that the cost of putting in another rod and pumping out the accumulated water would exceed the selling-price of the pumps, &c. It was therefore decided to salvage all above water-level, this work being still in progress. Besides sinking a winze on this lode, three vertical and one horizontal diamond-drill holes were put down. No. 1 bore, Woodstock section (vertical), attained a depth of 424 ft., and proved the width of a vein 11 ft. The cores showed zinc, iron, sulphides, and a little black flint. Assays range from nil to 14s. per ton.

No. 2 bore, No. 15 level, Bonanza section, was started 125 ft. west of No. 6 winze, and reached the vein at 332 ft., and passed through into the footwall country at 350 ft. The core carried zinc sulphides and pyrites, but no values. Estimated width, 8 ft. Owing to soft ground this hole gave a good deal of trouble. The first 201 ft. had to be cased, and several short sections cemented.

No. 3 bore, Bonanza section, was put in horizontally from the site of No. 2 bore, and stopped at 150 ft., disclosing nothing of value.

No. 4 bore, No. 15 level, was started 170 ft. west of No. 12 winze, and put down 501 ft. From 431 ft. to 439 ft. the core was quartz carrying zinc sulphides but no values. From 468 ft. to 490 ft. the core was quartz carrying a fair percentage of pyrites and zinc sulphides, but practically no values. At a recent meeting of the shareholders this company decided to go into voluntary liquidation.

New Zealand Crown Mines (Limited), Karangahake.—During the year five men have been employed dismantling the machinery and keeping the water-races in repair.

Ohinemuri Gold and Silver Mines, Maratoto.—Camoola section: The drive has been extended south of crosscut for 150 ft. and north 157 ft. On the footwall of the lode at different points the ore carried blotches of sulphide of silver, and this portion is being saved for treatment. During the year Mr. Stansfield, superintendent of the Talisman Mine, was asked to report, and advised that the crosscut known as the Silverstream be extended to intersect the Camoola lode about 200 ft. below the top level. This work is now in progress.

Waiotahi Gold-mining Company, Thames.—This mine has been held under protection during the year. Any portion is open to tributers, but there are no applications. All the ground above high-water mark has been worked out.

Evening Star Gold-mining Company, Thames.—This claim was formerly held by Bird Bros., and was taken over by the present company. The principal work in progress is sinking a winze on the Waiotahi-Cambria lode. This winze has now attained a depth of 70 ft. Gold is frequently seen in the ore broken out, and the mineral indications are favourable.

Nonpareil Gold-mining Company, Thames.—Four men have been employed driving a crosscut to intersect a lode worked in the upper levels with payable results.

Gloaming Gold-mining Company, Thames.—Ore has been won from small leaders. Gold valued at £295 was produced from 7 tons 2 qr. of ore treated.

Kuranui Gold-mining Company, Thames.—During the year four men have been employed driving north-west on a lode 2 ft. in width from the Magazine tunnel. A distance of 314 ft. has been driven, but nothing payable has been met with.

Kuranui-Caledonian-Moanataiari.—This company was formed with the object of testing the continuation of the gold-producing reefs from the Moanataiari tunnel, on the eastern side of what is known as the Moanataiari fault. This tunnel has been retimbered up to the Inverness crosscut, and a drive started towards the fault.

Waitangi Gold-mining Company, Thames.—Work is confined to driving on the main reef at No. 1 level. A distance of 262 ft. has been driven without disclosing anything of value, the lode being small and values low.

Sylvia Mines, Tararu Creek, Thames.—The principal work in progress is driving from a shaft on the Norfolk lode. The shaft has reached a depth of 76 ft. at an angle of 45° below No. 5 level. The reef is the full width of the drive. The quartz is highly mineralized, and is said to contain good assay values. This shaft is equipped with a winding plant. A considerable amount of money has been spent in repairing the water-race and installing an air-compressor to supply power for haulage and ventilating the mine.

Great Northern, Waihi.—Eight men have been employed prospecting and excavating the site for a battery. The stamps and greater portion of machinery are already on the site.

Golden Belt, Neavesville.—Work is confined to rising, driving, and stoping above No. 1 level. The 398 tons treated produced gold valued at £1,385 7s. Owing to the shortage of competent miners the company has been granted six months' protection.

Tairua Golden Hills.—Two men have been employed. The 152 tons treated yielded gold valued at £460 13s.

Old Hauraki Gold-mining Company, Coromandel.—Bailing and pumping were started on the 15th March, 1920, but owing to the difficulty of obtaining a sufficient supply of coal the workings were not unwatered until the 8th August. Mining was commenced and gold was found in Legge's reef between the 200 ft. and 300 ft. levels. The lode was followed in a winze, from which 45 lb. of picked stone were obtained. A connection has been made with the 300 ft. level and a few pounds of picked stone selected. The lode is of promising appearance.

Mount Welcome Mine, Tokatea.—This mine was recently taken up by a small syndicate, and driving is proceeding on the Welcome Find lode. It is proposed to crosscut and test the Harbour View lode from this level.

Four-in-Hand, Waikoromiko.—During the year three men have been employed. Work was confined to prospecting, but so far nothing of importance has been discovered.

Bonanza Gold-mining Company, Waiorongomai.—200 ft. has been driven upon the Silver King lode and 15 ft. on the Bonanza lode. The ore is highly mineralized. There are 300 tons stacked awaiting treatment when the oil-flotation plant is completed.

Muir's Gold Reefs, Te Puke.—Early in the year the mill was burnt down. Arrangements were at once made for the purchase of a 20-head stamp mill from the Barrier Reefs Gold-mining Company. Owing to the difficulty in obtaining cement the erection of the mill has been delayed. All the necessary plant is now on the site, and the mill, which will be one of the most modern crushing plants in New Zealand, will be completed in about five weeks from date. Electric power will be used, and is being obtained from the Tauranga Borough Council. This power, however, will not be available until about the end of June, owing to delay in obtaining suitable motors.

In the mine a surface crosscut has been driven and the lode intersected 100 ft. above the low level. It has been driven upon 36 ft. north and 179 ft. south in ore said to be payable. At the low level a leading stope has been taken along, passes put in, and rises connected with the intermediate level to facilitate filling when stoping is commenced. A winze has also been sunk to a depth of 35 ft. below the bottom level with the object of ascertaining water-level. The ore is said to be highly payable.

Accidents.

One fatal accident occurred during the year, in the Rising Sun Mine at Owharoa (9th August), whereby a miner named Thomas Liddell, aged forty-eight years, was killed by a blasting accident due to a misunderstanding between deceased and his mate working on the other side of the drive.

A number of minor accidents have also occurred, but none were of a serious nature.

Oil-wells.

Taranaki Oil-wells Company (Limited).—Early in February this company went into voluntary liquidation. The depths of the wells at present are: No. 2 bore—depth, 3,045 ft. The water is shut off at this depth with a string of 8 in. collar casing. No. 3 bore—depth, 4,015 ft. Oil continues to flow intermittently, but no record has been kept of its production. No. 4 bore—depth, 2,210 ft. The water is shut off at 2,149 ft. with 8 in. casing, and again with 6½ in. casing at 2,210 ft. Rotary bore—depth, 3,005 ft., with 4 in. casing. The water is shut off at 2,185 ft. with 8 in. casing, all below 8 in. having been withdrawn. The well now stands at 2,185 ft., with 8 in. casing intact.

British Petroleum Development Company, Carrington Road.—After drilling 368 ft. the sinking-tool by some means became disconnected. Attempts were made to recover it, but without success. In the meantime the capital of the company became exhausted, and the men, being unable to obtain the wages due to them, had a distress-warrant issued through the Magistrate's Court to sell the wire rope, motor-car, &c. An average of four men have been employed. The company went into voluntary liquidation on the 26th November, 1920.

Blenheim Oil Company (Limited).—The depth of Blenheim bore at the end of November was 5,725 ft. During the year 191 ft. were drilled. From 5,065 ft. to 5,590 ft. sandstone mixed with iron was passed through, and from this point to the bottom, blue claystone, which drills very slowly. Gas has always been present to a greater or lesser degree throughout the year. The bore at the time of my visit—25th November—was in good working-order. An average of three men was employed.

Waipatiki Oil-wells Company.—Depth of bore, 3,524 ft. Operations during the year were chiefly confined to taking the broken casing out of the bore. Four men were employed.

Prosecutions.

Inadequate Ventilation.—31st March, 1920: J. Hayes, mine-manager, St. Hippo Gold-mining Company; J. Caisley, mine-manager, Waitangi Gold-mining Company; A. A. Adams, mine-manager, Golden Belt Gold-mining Company. As these were the first cases of the kind brought before the Court I did not plead for a penalty, as I wished to make it publicly known that it was my intention to see that the regulations were strictly adhered to. The parties pleaded guilty, and were convicted and ordered to pay costs.

15th September, 1920: F. Sawyer, manager, Nonpareil Mine, was convicted for the same offence, and fined £5 and costs.

18th November: J. R. Spearing, mine-manager, Rising Sun Gold-mining Company, was convicted and fined £5 and costs.

18th August: J. Connolly was prosecuted for removing timber from the Thames-Hauraki pumping plant, and was convicted and ordered to pay value of timber, £2.

NORTHERN INSPECTION DISTRICT (Mr. BOYD BENNIE, Inspector of Mines).

Quicksilver-mines.

New Zealand Quicksilver-mines (Limited), Puhipuhi.—There has been experienced considerable difficulty in obtaining miners, although the situation of the mining camp is good. Owing to scarcity of labour the treatment plant was rendered idle for some months during the year.

To prove the extent of the ore deposits on the claim the Mines Department granted the company the use of one of their drilling plants, and by the end of the year 1920 five boreholes had been drilled on the claim. In each of the bores cinnabar-quartz was proved. On the whole the results of the boring were satisfactory.

The treatment plant was worked during part of August and September, when 142 tons of ore were treated for a return of 24 flasks of mercury, each at 75 lb.; and again in December 116 tons of ore were treated for a return of 25 flasks, each 75 lb.: in all 258 tons of ore were treated for a return of 3,675 lb. of mercury, valued at 7s. 6d. per pound = £1,378 2s. 6d., averaging £5 6s. 9d. per ton of ore treated, which may be considered satisfactory.

The Rising Sun Quicksilver-mine.—The mine is situated about two miles east of the New Zealand Quicksilver Company's mine, and is still only in the prospecting stage. The ore was found outcropping on what appears to be a large landslide. A prospecting-drive was driven 200 ft., most of the distance on a rubbly cinnabar deposit. An effort is now being made to locate the deposit beyond the slide. The Mines Department granted assistance to prospect the ground under Regulation 127 (6) (*e*). The future prospects of the claim depend on the finding of the lost portion of the cinnabar deposit, for although there are possibly 600 tons or more of the ore available in the slide portion of the claim through which the drive penetrated, but that quantity would not warrant the erection of a treatment plant.

Mount Mitchell Cinnabar-mining Syndicate, Puhipuhi.—This claim is situated about two miles south-west of the New Zealand Quicksilver-mine. There are possibly 20 acres of cinnabar-coloured quartz without rock or earth covering. In the joints of the broken rock the usual mercury staining is seen.

WEST COAST INSPECTION (J. F. DOWNEY, Inspector of Mines).

Quartz-mining.

MARLBOROUGH DISTRICT.

Dominion Consolidated Mining and Development Company (Limited).—Owing partly to the serious decline in the price of scheelite, and partly to the necessity of reconstructing the treatment plant, work was at a standstill in the company's mine for a good portion of the year. Only 1,649 tons of quartz was crushed, as against 8,443 tons during the previous year. The amount of gold won amounted to 359 oz. 5 dwt., valued at £2,291 3s. 2d. Some 8½ tons of scheelite was also recovered, estimated to be worth £850. A small amount of development in the nature of rising was done. Reconstruction of the plant is well in hand, and work should be actively resumed early in 1921.

Alford and Party (Mountain Camp).—Very little work has been done here for the year, and there was no output.

Cadigan's Treatment-works.—This plant also failed to produce for the year.

NELSON DISTRICT.

Colossus Gold-mining and Development Company.—Work by this company during the year has, owing to its inability to secure miners, been confined to prospecting. Three men have been kept employed, and it is reported that four new reefs have been located, several of them showing good values.

LYELL.

New Alpine Consols (Limited).—The driving of the low-level tunnel on the Alpine line of reef was continued steadily throughout the year, the face being advanced to a total of 1,014 ft. Some further boulders of quartz were met with, but they were practically barren.

New Creek Prospecting and Development Company.—The adit referred to in my last year's report was continued to 460 ft., when it was discontinued. At about 170 ft. in a reef was intersected, and driving was started on this. Up to the end of the year this reef had been followed for about 80 ft. For 40 ft. of the distance it was about 12 in. wide, but it gradually opened out then till, in the face, it was approximately 3 ft. It carries a little gold all the way, the value, as far as I could learn, being about 8 dwt. per ton. The management considers this reef to be identical with that worked in the upper levels years ago. A distinct reverse of underlay would, however, have had to take place to bring the old reef into this position. Some five men have been employed.

CAPLESTON.

Boatman's Consolidated Mines (Limited).—For a considerable portion of the year this mine was idle, but towards the end of the year work was resumed with the intention of prospecting the ground between the Fiery Cross and Welcome-Hopeful shoots in the upper levels. An attempt was made to reopen the old No. 6 Welcome tunnel, but owing to a heavy flow of water this was abandoned. Attention was then turned to the old Fiery Cross No. 1 level, and the work of picking this up to the north was carried on successfully to the end of the year.

REEFTON.

Blackwater Mines.—The main shaft of this mine was sunk a farther 221 ft., and chambers were cut for Nos. 10 and 11 levels. The total depth of the shaft is now, including 25 ft. for sump, 1,690 ft. Further development carried out was as follows: No. 6 level south was extended 239 ft., of which 208 ft. was on reef averaging 19·1 in., with average value 11·08 dwt. No. 7 level south was extended 106 ft., of which 73 ft. was on reef averaging 12·97 in., with average value 12·45 dwt. No. 8 level south was driven 120 ft., of which 89 ft. was on reef averaging 6·45 in., with average value 5·22 dwt. No. 9 level south was extended 196 ft., of which 111 ft. was on reef averaging 42·48 in., with average value 11·36 dwt. No. 9 north was driven 17½ ft., all off reef. A large reef has, however, been since picked up in this latter drive. A certain amount of rising and winzing was also done in the southern section of the mine. No dividends were paid during the year, and continued scarcity of suitable labour seriously retarded output. The amount of stone crushed was approximately the same as during 1919, being 24,468 tons, as compared with 24,969 tons. The total value received for gold won was £58,887 18s. 9d., which showed a considerably better average per ton than during the previous year. This increase in value was, however, due to premiums received on gold sold overseas. Deducting the premium, the average value, based on the figures of previous years, showed a falling-off of 1s. 1d. per ton as compared with those of 1919.

Blackwater South Mine.—Owing to no road yet having been provided to the site of the proposed main shaft no work has been done on this property. Approval has, however, now been given to the expenditure of a grant for the construction of this road, and it is expected that the sinking of the shaft will be started during the coming year.

North Blackwater Mine.—During the year attention has been devoted to pushing on with the erection of a large air-compressing and winding plant. This is not yet completed, but everything should be ready for the resumption of underground work in about three months' time.

Murray Creek Mine.—Practically the only work done on this property during 1920 was the sinking of two winzes below the bottom (No. 4) level with a view to determining whether the gold-bearing shoot lived down. One of these winzes was sunk to a depth of 47 ft., and the other to 94 ft. In the first the quartz cut out at a comparatively shallow depth, but in the latter more or less was got down to about 60 ft., but it was in broken or bouldery form. The values in such quartz as was got was said to be equal to those of the reef above No. 4 level. The mine ceased active operations in October, but I understand it is the intention of the company to resume work again shortly.

New Big River Mine.—This mine, like all others in the district, has suffered from shortage of labour. The amount of quartz crushed showed a big decrease on the figures of 1919, being only 2,970 tons, as compared with 4,254 tons. Despite, however, the smallness of the tonnage crushed, the total value received for gold during the year was in excess of that received in 1919. This was due partly to the fact that the average grade of quartz treated was about 2 dwt. higher per ton, and partly to the receipt of premium on the gold disposed of. The development during the year was practically limited to the sinking of several winzes below the bottom (No. 11) level. This development served to show that the reef continued down below that level, of satisfactory size and value.

New Keep-it-Dark Mine.—About fourteen men on an average were employed throughout the year, but most of the work done was in the nature of repairs or of making new air-connections. A new block of ore was located in No. 8 level south, and driven on for about 100 ft., and a trial crushing of 263 tons put through, but this only yielded a total of 29 oz. 8 dwt. gold, which was far from being a payable return. The mine ceased operations in October, but the water is being kept down, and it is expected that a further attempt will be made to carry out some prospecting below No. 9 level.

North Big River Mine.—Three of the adit levels opened up a few years ago were put in repair, and in Nos. 1 and 3 some further driving was done on reef-tracks. The result, however, could not be described as satisfactory, for, although a little quartz was got in places, it was very limited, and the values contained in it were not, as far as I can learn, of a payable nature. Another adit, which may be called No. 4, was driven on a second reef to the westward of the reef on which the other tunnels referred to were driven. This adit was carried in about 100 ft., but was only at a shallow depth below the surface. A large reef-formation was shown in it, but I believe the values were very low.

South Big River.—Owing to inability to get labour no work was done on this property.

Wealth of Nations and Energetic Mines.—The work of replacing the surface plant destroyed by fire in 1918 was completed, but beyond a certain amount of repairs to levels and the opening-up and repairing of the main air-courses little underground work was done.

Progress Mine.—An average of forty-three men was employed, but in the latter half of the year, owing to the complete deletion of the few remaining stopes, active breaking and crushing operations ceased. During the period the mine was in active work some 8,102 tons of quartz were mined, and treated for a return of gold valued at £13,668 18s. 6d. An effort is now being made to raise further funds for the purpose of prospecting for the reef beyond the fault, which has cut out all the known quartz-bodies.

Ready Bullion Mine.—At this mine, which was formerly known as the New Ulster, the deep-level adit was continued, the face being advanced to 350 ft.

New Discovery Mine.—A low-level adit to intersect the reef about 200 ft. below the previous workings was started, and driven a distance of 340 ft.

New Millerton Mine.—Work was resumed by the new company, and a good deal of development carried out underground, particularly on No. 3 level, which was extended 187 ft. north and 335 ft. south. A considerable amount of this driving was on reef which, although rather small and broken, is said to contain very fair gold values. An average of eleven men was employed.

HOKITIKA AND ROSS.

Mount Greenland Mine.—Very little breaking or crushing was done during the year, 140 tons only of quartz being mined, which yielded 24 oz. 4 dwt. of gold. Some prospecting was carried out in the William Tell low level with a view to locating the reef beyond the fault which cuts it off in the north end of the workings, but without success. A good deal of surface prospecting was also carried out for the purpose of tracing the reef farther to the south.

Mount Greenland Extended.—Two men were employed extending the prospecting crosscut, which was carried in to about 500 ft. Some stringers of quartz were met with, but the result of the work was not satisfactory.

STILLWATER.

Victory Mine.—A start has been made here to intersect the old Victory reef (worked years ago by Curtis Bros.) by means of a new adit which is about 60 ft. lower than the previous workings. Up to the end of the year this had been pushed in about 260 ft., and it is expected to cut the reef at about 450 ft. A little prospecting was also done in the neighbourhood of the antimony lode.

General Remarks on Quartz-mining.

A number of things combined to injuriously affect the quartz-mining industry in the district during the period under review. There has been a pronounced shortage of labour, which has kept progress back in all the working-mines. The high cost of mining-materials has also helped in this regard. Most of the new mining companies formed during the previous year to develop reefing properties have carried out a certain amount of work, but all of them have experienced great difficulty in getting parties of competent miners together. Some of the older mines in which the supply of quartz had been deleted had to close down. Notable among these was the Progress Mine, which, since being taken up by an English company in 1895, has produced gold to the total value of £1,463,770, and paid in dividends £326,562. During the year the last of the known blocks of ore was worked out, and mining operations had to cease. It is well known that the reef in this mine has been seriously affected by a strong fault, beyond which it has not been traced. It is to be hoped that it will be possible for the company to undertake further prospecting in the effort to locate this reef beyond the fault. Others of the old mines, in which the values have fallen too low to pay for working under present circumstances, have also had to close down. Amongst these are the New Keep-it-Dark and Murray Creek Mines.

Inspection of all mines has been systematically carried out, and it has been found that the provisions of the Mining Act have been well observed.

I am pleased to have to report that throughout the year there have been no fatal accidents, nor, indeed, accidents of any kind of a serious nature.

Proceedings were taken during the year against one mine-manager for a breach of section 254 (11) of the Mining Act. A conviction was recorded, and a fine of £5 inflicted.

An inquiry before the Warden and two assessors was also held under the provisions of section 266 of the principal Act, as amended by section 17 (4) of the Mining Amendment Act of 1914, concerning the death of L. Humphreys in the Dominion Consolidated Development Company's mine at Wakamarina, which occurred late in 1919. As a result the certificate of the mine-manager, James Carroll, was suspended for four months.

A considerable number of applications was made by companies and small parties of miners for assistance to prospect, a number of which was granted, but no discoveries of any great value have been reported.

Dredging.

This industry has been extremely quiet during the year. The Chambers Reward dredge was the only one in commission, and this only worked for a few months in the early part of the year, recovering 560 oz. 17 dwt. 16 gr. of gold, valued at £3,310. The values in the ground worked were found to be very patchy, and the recovery was too small to be payable, consequently dredging operations had to cease.

The Rimu Dredging Company, formed to work the extensive alluvial flats west of Rimu Township, has been busy with the construction of a large modern dredge. A pontoon is nearing completion, and a large amount of machinery has arrived on the ground from America, but it will be a good while yet before active operations can be started.

Alluvial Mining.

In this branch of the mining industry a further falling-off has been noticeable during the year. Some 144 men have been employed, as compared with 161 in 1919. The total production of gold amounted to 4,045 oz., valued at £18,336. The following notes refer to the principal localities in which work was carried out:—

Howard Diggings.—Returns showed that sixteen men were employed on the various claims, 297 oz. of gold being won, valued at £1,229. Conlon's claim was the largest producer, with 154 oz., valued at £654.

Murchison.—The largest production was from Thornton and Scholefield's claim, at Upper Matakitaki, which yielded 80 oz., valued at £331.

Addison's Flat.—The Addison's Flat Company ceased operations, but I understand the claims have been taken over by another party. The total production for the year from this locality amounted to 508 oz., valued at £2,064 (Addison's Flat Sluicing Company, 138 oz., valued at £506; and Mouat and party, 369 oz., valued at £1,558).

Charleston.—The total production amounted to 280 oz., of which 241 oz., valued at £1,013, came from Powell's claim.

Grey Valley.—Some 1,063 oz., valued at £5,198, were produced in the various claims. The largest producer was the Hochstetter Goldfields (Limited), where a recovery was made of 669 oz., valued at £3,294. It is expected that recoveries from this company's claim will increase during this coming year, as, up to the present, it is doubtful if more than a small portion of the extremely fine gold known to be in the gravels is being saved. A large area of tables is now being installed, and this provision should result in the saving of much more gold. The other producers of note were the Grey Valley Sluicing Company (63 oz.), McVicar and Hurley (110 oz.), and Donnellan Bros. (210 oz.).

Barrytown.—The Barrytown Sluicing and Elevating Company was the only producer, with 40 oz., valued at £160.

Kumara.—On the Kumara, Greenstone, Stafford, and Callaghan's fields there was a slight falling-off in production from last year's figures, only 1,103 oz. being won, as compared with 1,375 oz. The value of the gold was, however, approximately the same as during the previous year, owing to premiums having been received in some cases on gold disposed of. The principal producers were—Blackmum Bros., 111 oz., and Linklater Sluicing Company, 284 oz., at Stafford; Stubbs and Steel, 247 oz., and R. Kean, 114 oz., at Greenstone; and G. Lawrence, 97 oz., at Westbrooke.

Hokitika.—In this district 683 oz. were recovered, valued at £2,874. The leading producers were Rimu United (311 oz.), Brookes and party (104 oz.), and Knight and Ford (172 oz.).

Reefton.—From this locality only two returns were received, one from Antonios Limited (142 oz., valued at £725), and the other from Sewell's claim (41 oz., valued at £168).

Accidents.

No serious mining accident occurred in the West Coast Inspection District during 1920.

Southern Inspection District (Mr. A. Whitley, Inspector of Mines).

Quartz-mining.

GLENORCHY.

Glenorchy Scheelite-mining Company (Limited).—Owing to the demand for scheelite having practically ceased, very little work was done during the year. Operations were confined to rising on the lode at No. 1A level and stoping on a block of high-grade ore at No. 6 level in the Glenorchy Mine. The scheelite produced, amounting to 12 tons, is being held for a rise in the market value of the mineral.

MACETOWN.

Black and McPherson and Sutherland and Hood were the only small parties operating in the district.

United Goldfields (Limited).—Anderson's reef was driven on 780 ft. Small seams of gold-bearing quartz were met with at 670 ft., but as no payable ore was opened up the company ceased operations.

MACRAE'S.

Golden Point Gold and Scheelite Company.—The Home reef was opened up for a length of 200 ft. at the intermediate level, and carried payable gold values throughout.

Ounce Mine (Callery and Bickerton, owners).—A level was driven from the surface to give 120 ft. of backs on the reef. The battery was put in order and a vanner installed for saving scheelite. The 35 tons of ore treated produced gold valued at £41, and 6 tons 17 cwt. of scheelite.

THE REEFS.

Pukerangi Mining Company.—The prospecting done on the Marion reef did not result in any discovery of importance.

BANNOCKBURN.

Otago Central Gold-mines.—This company's efforts to find payable ore in the Carrick low level resulted in failure, and the mine was closed down.

OLD MAN RANGE.

Advance Mine (R. T. Symes, owner).—110 tons of ore from White's reef, at the battery level, was crushed for a return of gold valued at £639.

Alluvial Mining.

TUAPEKA COUNTY.

Gabriel's Gully Sluicing Company (Lawrence).—Two elevating plants have been kept at work in the tailing deposit, of which very little now remains for treatment. The pipe-line has been lengthened to deliver water under high pressure for breaking down the cement deposit in the company's claim.

Lawrence Sluicing Company (Munro's Gully).—Water under an hydraulic head of 750 ft. is used for treating the auriferous cement in this claim. The hardest portions of the deposit are broken down by means of explosives, for which purpose a jack-hammer drilling plant has been installed.

Golden Crescent Sluicing Company (Weatherstone's).—Profitable returns were secured from the cement treated during the year.

Sailor's Gully Sluicing Company (Waitahuna).—A new claim was opened out on the north-east side of Waitahuna Township, from which payable returns are being won.

Waipori.—Six small parties of miners are carrying on sluicing operations in this locality.

Teviot-Molyneux Gold-mining Company (Roxburgh).—The returns from this claim show a falling-off in the quantity of gravel treated and value of gold won. A new paddock of about 3 acres in extent is being opened up, in which a second elevator has been installed for dealing with the lower gravels.

MANIOTOTO COUNTY.

Naseby.—Eleven small parties of miners continue to find employment in this district.

Scandinavian Water-race Company (St. Bathan's).—Operations were confined to the Kildare section of the claim. Returns for the year show an improvement in the yield of gold.

Morgan Bros. (Cambrian's).—This party's operations continue to give satisfactory results. Gold to the value of £2,493 was produced.

VINCENT COUNTY.

Matakanui.—The Undaunted Tinkers Gold-mining Company produced gold valued at £1,066 from shallow gravel deposits.

Nevis.—Six claims were worked in this locality. Graham and party were the most successful, producing gold valued at £2,911.

LAKE COUNTY.

Shotover River.—Campbell and Murray's claim, in the gorge below Moke Creek Junction, continues to yield payable returns. The value of the gold won for the year amounted to £1,527. Other parties working were Smith and Jacobson, Skipper's Sluicing Company, and W. G. Gordon, at Skipper's; F. and D. Ward, at the Branches; and Atley Bros., at Long Gully.

Cardrona.—Lafranchi Bros. are prospecting for "Robertson's lead," to the south of the old workings. A subsidy was granted to assist them in the work.

WAITAKI COUNTY.

Livingstone and Maerewhenua.—A further decline is noticeable in the production of gold from this district.

SOUTHLAND COUNTY.

Nokomai Hydraulic Sluicing Company.—This company produced 1,787 oz. 11 dwt. gold, valued at £8,547, and paid £2,400 in dividends. Two elevators were kept steadily at work throughout the year.

Muddy Terrace Sluicing Company (Waikaia).—The high-level water-race on the terrace was connected with the workings in Nuggety Gully, and an additional 100 ft. of pressure secured. This will enable the company to elevate the auriferous wash at the base of the terrace, where payable results were obtained from boreholes.

Blakely and McLister (Athol).—This party is working a deposit of sandstone gravel in Old Wakatipu Gully for payable returns. Operations are hampered by a shortage of water for sluicing.

WALLACE COUNTY.

Round Hill Mining Company.—Only one of the company's claims was worked during the year. Returns show that twelve men were employed and gold valued at £3,304 produced.

Ourawera Gold-mining Company (Round Hill).—This company has kept one elevator steadily working. The yield of gold for the year is valued at £2,311.

Orepuki.—Six men were engaged in alluvial mining in this locality. The total value of the gold produced amounted to £787.

Dredge Mining.

This branch of mining provided employment for eighty men, and produced gold to the value of £31,362.

The Kura dredge, at Freshford, Waikaia, was again the largest producer, yielding 1,596 oz. gold, valued at £7,982.

Minerals other than Gold.

Scheelite.—There being practically no demand for this mineral, and the price having fallen to 17s. 6d. per unit, very little mining was done. The total output from the mines within the district amounted to 30 tons 12 cwt. Of this quantity 4 tons 7 cwt. were sold for export in the early part of the year. The balance is being held by producers for an improvement in the market.

Petroleum.—The Canterbury Petroleum Company's borehole at Chertsey has reached a depth of 2,170 ft. Emissions of gas and traces of oil were given off from the sands and conglomerates penetrated below 1,368 ft. Drilling has been retarded through the sand-pump becoming jammed in the 4 in. casing at 2,132 ft. Efforts are being made to remove the obstruction.

Accidents.

No serious accidents occurred at metal-mines or dredges in this district during 1920.

ANNEXURE B.

(1.) REPORT ON A KONIMETER TEST OF MINE-DUST IN THE WAIHI AND WAIHI GRAND JUNCTION MINES.

Method of Taking and Examining Samples.

The principle on which the konimeter is based consists in causing a definite volume of the air to be tested to impinge at a high velocity through a small nozzle against a glass slide thinly coated with vaseline. The dust is caught on the surface of the vaseline, forming a small circular spot, which is examined under a microscope, and the dust-particles counted.

It was found advisable to have the coating of vaseline as thin as possible, the best results being obtained by spreading a very small quantity on a warmed glass slide with a round glass rod. In cold weather it was necessary to warm the instrument and slides before going underground, in order to prevent the deposition of moisture, which causes the spots of dust to be patchy and difficult to count. As a rule six samples were taken on each slide in two parallel rows.

In the microscopic examination a $\frac{1}{2}$ in. objective was used with an eye-piece magnifying eight times, the magnification being about 150 diameters. To facilitate counting, two spider lines making an angle of 18° with each other were fixed on the diaphragm of the eye-piece, so that a count of the dust in both the sectors thus formed was one-tenth of the total dust in the spot. A micrometer was also placed in the eye-piece to enable the size of the particles to be estimated.

Classification of Dust.

Examination of dust from silicotic lungs has revealed the fact that the particles are invariably extremely small, averaging 1·2 microns in diameter and rarely exceeding 5 microns. (Note: 1 micron = $\frac{1}{1000}$ millimetre = $\frac{1}{25000}$ in. approximately. The minuteness of these particles will be best appreciated by comparing them with human-blood corpuscles, which are from 7·5 to 8 microns in diameter). Hence the dust may be classified, according to its size, into injurious and non-injurious dust, the former including all particles up to 5 microns in diameter, and the latter the particles over 5 microns.

This division, although in the right direction, seems to me not altogether satisfactory, in that it makes no distinction between the effect on the lungs of a particle 1 micron in diameter and of a particle of 5 microns, although the latter weighs 125 times as much as the former. Suppose, for example, two spots each gave counts of 300 particles under 5 microns per cubic centimetre, but in one sample the particles averaged 3 microns while in the other they averaged 1 micron: both samples would be returned as equally injurious, whereas the dust in the former would weigh many times as much as that in the latter; and it seems reasonable to suppose that it is not the number of particles, but their mass, that determines the degree of silicosis produced. It would be too tedious to count the number of particles of various diameters in each spot in order to estimate their weight; and, in any case, even this would not give a correct value for the harmfulness of a particular sample of dust, as it does not take into account the relative chances of the larger and smaller particles of being caught on their way to the lungs. The data available tend to show that proportionately more of the larger particles than of the smaller do not reach the lungs, and this will to a considerable extent counterbalance the fact that no allowance is made in the count for the difference in weight of the particles.

This point has an important bearing in relation to the different character of the dust produced by the "wet" and "dry" machine drills respectively. The axial water-feed drills produce dust of a greater degree of fineness than those with solid steel. This may be seen clearly by comparing the micro-photographs of the dust from the Ingersoll wet and dry stopers. The former contains a large proportion of particles round about 1 micron in diameter, while the latter has a considerable proportion of particles 3 and 4 microns in diameter. The counts of injurious particles are approximately the same, but the weight of the dust produced by the dry stoper is undoubtedly much greater. It does not follow, however, that this dust is more injurious, as it is almost certain that a much smaller percentage of the particles in it would reach the lungs.

Result of Tests.

In all over two hundred samples were taken and examined from the two local mines, and most of the results are summarized in the attached table. Although the tests should extend over a considerable period to enable definite conclusions to be drawn, it may safely be said that they show that in the two mines sampled the amount of harmful dust in the air under ordinary working-conditions is small, and much less than that contained in the South African mines. In fact, in places other than closed ends, the amount is as a rule no greater than might be present in air on the surface on a windy day. This satisfactory state of affairs is no doubt primarily due to the effective measures taken to lay the dust by water-jets wherever it is produced, as in drilling, blasting, &c. Other contributing causes are the large volume of circulating air required by the New Zealand Mining Act (150 cubic feet per man per minute, compared with 30 cubic feet in South Africa), and the large amount of water in the reef-system and consequent humidity of the air-current, producing rapid precipitation of the dust.

Some of the figures, however, emphasize the absolute necessity for keeping the working-places damp when drilling and shovelling, and for laying the dust produced by blasting, by means of some device such as an atomizer.

Effect of Varying Conditions.

The wide variations in the working-conditions underground will naturally cause considerable differences in the counts obtained from the various samples, even from those taken at short intervals at the same place. Among the more important of the causes affecting the sample obtained may be mentioned—

(*a.*) The air-space. In confined places like winzes and dead ends the counts are likely to be higher than in open stopes, &c.

(*b.*) Quantity of air circulating. The larger the volume of air circulating, the more the dust is diluted and the smaller the count.

(*c.*) Eddy currents. These are especially produced by the exhaust from the machine drills, and the counts will vary considerably according to the position where the instrument is held.

(*d.*) Character of rock drilled. Hard rock as a rule produces more dust-particles than softer rock, even though it is not drilled so fast.

(*e.*) Rate of drilling. Other things being equal, the number of particles of dust projected into the air should be approximately proportional to the rate of drilling.

(*f.*) Type of hole. It seems probable that a hole bored below the horizontal will produce less dust than an "upper," as the dust has a greater chance of being killed by the water in the hole.

(*g.*) Humidity of the air. This will affect the amount of dust in suspension in levels and return airways. Saturated air rapidly precipitates dust, and this accounts for the almost entire absence of dust in the upcast shafts.

(*h.*) Dryness of the rock. Where the rock or country being drilled is moist, less dust is given off. Reference has already been made to the necessity for thoroughly wetting dry working-places.

Micro-photographs.

A few micro-photographs accompanying this report will afford ocular evidence of the nature of the dust produced in several operations. The magnification is in all cases forty diameters. The photographs are not necessarily of average spots—in fact, represent some of the worst samples obtained during the course of the work.

Summary of Results.

Samples: Where taken.	Number of Samples.	Average Number per Cubic Centimetre of Injurious Particles (under 5 Microns).	Per Cent. of Particles under 5 Microns to Total Dust.	Remarks.
Upcast shafts	16	10	100	Air saturated.
Levels	8	25	94	Intake air.
Levels, vicinity of shrinkage stopes	2	54	90	After filling trucks.
Stopes (no drilling in progress) ..	8	47	98	Drawing off shrinkage stope.
Stopes, hammer-drill, axial water-feed	3	62	97	Holman stoper.
Ditto	11	50	98	Ingersoll Leyner 248.
Winzes (no drilling in progress)..	6	48	95	..
Winzes, hammer-drill, axial water-feed	3	147	98	Denver "Clipper."
Winzes, 15 minutes after firing ..	6	97	94	Ventilated by compressed air.
Rises (no drilling in progress) ..	3	29	98	..
Drives, reciprocating-drill, water-jet	15	94	97	Holman.
Drives, reciprocating-drill, axial water-feed	3	81	96	Edgar.
Ditto	2	125	96	Ingersoll E. 33.
Drives, hammer-drill, water-jet..	11	127	92	Ingersoll "dry" stoper.
Drives, hammer-drill, axial water-feed	10	117	94	Ingersoll "wet" stoper.
Ditto	30	76	98	Ingersoll Leyner 248.
,, ...	27	177	96	Waugh's "Tubro."
,, ...	4	485	99	Dry place not hosed down before working.
Drives, after shovelling ..	6	135	90	..
Drives, face 10 minutes after blasting.	3	84	96	Dust cleared by fan.
Drives, return air 10 minutes after blasting	3	744	93	Blasting dust.
Rise, 15 minutes after blasting..	4	990	99	Blasting dust.

Waihi School of Mines, 18th August, 1920. A. H. V. Morgan.

(2.) NOTES ON THE KATATHERMOMETER.*

Compiled by FRANK REED, M.I.M.M.

This is an instrument for ascertaining a *general measure* of the cooling effect of air on the body when every physiological means of promoting heat-loss is brought into play (Haldane). The ordinary thermometer is of very little use in indicating what the body requires, because it only gives the average temperature of the surroundings, and does not show the influence of wind, which is the most potent thing in cooling persons or animals. The wet katathermometer shows the influence of wind and humidity.

The katathermometer† was invented by Dr. Leonard Hill, F.R.S., before the war, and was described by him in a Local Government Board Blue-book, No. 100 of the medical publications of 1914, also in Part I of the "Science of Ventilation," by Dr. Hill, being series 32 of the Government Medical Research Committee, 1919.‡

This instrument consists of a large-bulb spirit-thermometer graduated from 100° to 95° F. It is heated up in hot water until the spirit comes up into the top bulb in excess of 100°. For such heating a thermos flask is very suitable.

The time required to cool between the above ranges is measured with a stop-watch. This figure divided into a coefficient or factor number for each instrument (stated on the back of each instrument) gives the cooling-power expressed in millicalories per square centimetre of cooling-surface per second. The instrument can be used either dry, or wet with a small glove on it of very thin material. Generally both observations are necessary, for when it is dry it cools by convection and radiation, and when wet it cools by convection, radiation, and evaporation. The difference gives the cooling by evaporation.

As an example, assuming an instrument having factor number§ of 488 and that it took 100 seconds to cool, 100 divided into 488 gives 4·8, and the cooling-power would thus be 4·8 millicalories per square centimetre per second. There are no means as yet of expressing the exact relation between cooling-power and the physiological effect, and the approximate table hereunder is the best that can be done at present to indicate this relation approximately.

Wet *kata* Cooling-power in Millicalories per Square Centimetre of Wet Surface per Second.	
5	Extremely oppressive condition, inducing profuse perspiration. There is very little evaporation from the respiratory track, and a severe strain on the heat-regulating mechanism.
10	Oppressive.
15	Lower limit of satisfactory conditions unless no physical work is being done.
20	Best conditions; the higher figure necessitating a fair amount of clothing, or the performance of physical work.
30	Upper limit of satisfactory conditions; induces a feeling of cold; and danger of chill unless the body is well clothed or physical work is being done.
35	Uncomfortably cold unless hard work is being done or winter clothing is worn.
40	Heavy winter clothing necessary.

This table is a rough approximation, and is subject to reservations. For instance, if certain of the components, such as high air-velocity or excessive dryness, are extreme the conditions may be unhealthy, notwithstanding a satisfactory cooling-power. Further, the amount and condition (*i.e.*, wet or dry) of the clothing, even if there is only one thickness worn, profoundly affect the cooling-power of the air on the body. The dry katathermometer is warmed up by the wind, and the wet katathermometer is cooled by the wind. It could be used as an anemometer in very low velocities.

The influence of barometric pressure even at altitudes up to 5,000 ft. is so small that it may be neglected in *kata* computations.

The katathermometer, no doubt, will be further tested under mining conditions, and more exact relations between the cooling-power and the physiological effect will be ascertained. It will be of material advantage in ascertaining the necessary velocity of mine-air in warm working-places for healthful working-conditions, and will probably supersede the thermometer as a statutory measure for ascertaining the physiological conditions in a mine.

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* Price 18s. 6d. each (postage extra) from Mr. S. Hicks, 8 Hatton Garden, London E.C.

† *Kata* (Greek) equivalent to "anti"—the "katathermometer" being observed with a *descending* column.

‡ Price 10s., published by H.M. Stationery Office, Imperial House, Kingsway, London E.C.

§ The factor number for each instrument is determined by the makers in a small still-air chamber surrounded by a water-jacket. The temperature of the chamber is read, also the cooling-power in seconds; and by a formula (?) which the inventor had evolved, using a small copper calorimeter of the same size as the *kata* bulb, the factor number of the instrument was found.

ANNEXURE C.

SUMMARY OF REPORTS OF GOVERNMENT WATER-RACE MANAGERS.

WAIMEA–KUMARA WATER-RACES (Mr. JAMES ROCHFORD, Manager).

Waimea Water-race.

The cash received for sales of water from this race for the year ended 31st March, 1921, was £351 9s. 4d., and the expenditure on management, gauging, maintenance, and repairs amounted to £1,086, showing a debit balance of £734 10s. 8d. on the year's transactions.

The average number of miners supplied with water during the year was 6·58, a decrease of 4·17 on the previous year; and the approximate amount of gold obtained by them was 437 oz., valued at £1,715 4s. 6d., a decrease of £973 8s. on that of the previous year.

The sales of water, which amounted to only £329 7s. 1d., were the smallest for the past twenty-two years, and showed a decrease of £179 2s. on the previous year. The principal cause of this continued falling-off in the sales of water was the high price of suitable labour, and the ever-increasing cost of tools, timber, pipes, and mining equipment generally, which increased the cost of gold-production out of all proportion to any corresponding rise in value per ounce obtainable by the miners. This phase of the mining industry was dealt with in my last two annual reports, and it is needless for me to again go into the matter; suffice it to say that the disabilities which then existed were not minimized in any way during the past year.

Branch Race to Callaghan's and Middle Branch Flat.

The cash received for sales of water from this race for the year ended 31st March, 1921, totalled £48 4s. 8d., and the expenditure on management, gauging, maintenance, and repairs amounted to £347 13s. 8d., showing a debit balance of £299 9s. on the year's transactions.

The average number of miners supplied with water during the year was 1·75, an increase of 1·09 on the previous year; and the approximate quantity of gold obtained was 102 oz., having a value of £400 7s., an increase of £251 4s. on last year.

The sales of water amounted to £33 15s. 2d., an increase of £18 13s. 11d. as compared with that of the previous year, and in addition to these sales authorized free water to the value of £18 4s. 10d. was also supplied from this race.

Although there is a considerable area of payable ground in the Middle Branch Flat commanded by this water-race, no mining has been carried on in this locality since 1915, when sluicing operations were stopped by the Inspector of Mines owing to the unsafe condition of the Waimea main tail-race. Since mining operations were suspended the condition of the main tail-race has become so much worse that it would be an expensive proposition to again put it in working-order, and it is now exceedingly improbable that the ground commanded by it will ever be sluiced.

The cash received was £21 1s. 8d. more than for the previous year, and the expenditure showed an increase of £119 10s. 3d.

Kumara Water-race.

The cash received for sales of water from this race for the year ended 31st March, 1921, was £10 8s., and the expenditure on management, gauging, maintenance, and repairs amounted to £202 12s. 3d., showing a debit balance of £192 4s. 3d. on the year's transactions.

No miners were supplied with water from this race during the year, and there are no indications of any mining operations being resumed on the south side of the Taramakau River.

The sales of water amounted to only £10 8s., a decrease of £9 7s. on the previous year. This water was supplied to the Kumara Sawmilling Company (which started cutting timber in January, 1921) for the purpose of developing power to haul the sawn timber from the mill-site in the Taramakau Valley to the traffic-road leading to the Kumara Railway-station.

Kumara trans-Taramakau Water-race.

The cash received for sales of water from this race for the year ended 31st March, 1921, amounted to £54 11s. 6d., and the expenditure on management, gauging, maintenance, and repairs to £555 1s. 11d., leaving a debit balance of £500 10s. 5d. on the year's transactions.

The average number of miners supplied with water during the year was 4·33, a decrease of 0·33 on the previous year; and the approximate amount of gold obtained by them was 198 oz., having a value of £777 3s., a decrease of £11 15s. 6d. on the previous year.

The sales of water amounted to £48 3s. 5d., an increase of £8 11s. 2d. as compared with the previous year; but to these sales should be added £26 1s. 10d., value of water supplied to the Payne's Gully Syndicate, which cannot be considered free water, as the company is being supplied with water in return for the cash spent by them in the restoration of the trans-Taramakau pipeline over two years ago.

Erin-go-Bragh Water-race.

The cash received for sales of water from this race for the year ended 31st March, 1921, amounted to £115 2s. 1d., and the expenditure on management, gauging, maintenance, and repairs to £459 8s. 7d., showing a debit balance of £344 6s. 6d. on the year's transactions.

The average number of miners supplied with water during the year was 4·5, a decrease of 1·16 on the previous year, and the approximate quantity of gold obtained by them was 330 oz., having a value of £1,295 5s., a decrease on last year of £39 5s.

The sales of water amounted to £115 2s. 1d., an increase of £42 9s. as compared with the previous year. In addition to the above sales, authorized free water to the value of £14 19s. 3d. was supplied to assist the miners in opening up new claims.

The cash received was £42 9s. more than for the previous year, and the expenditure showed an increase of £107 10s. 10d.

This race was well maintained during the year, and is now in good order.

Waimea–Kumara Water-race.

The following is a summary of the revenue and expenditure of these water-races for the year ended 31st March, 1921: Sales of water, £536 15s. 9d.; cash received, £579 15s. 7d.; expenditure, £2,650 16s. 5d.; approximate value of gold obtained, £4,187 19s. 6d.; average number of miners employed, 17·16. In addition to the cash received for sales of water, the sum of £375 18s. 2d. was received from J. G. and A. Watson, sawmillers, for royalty on timber cut on the Reservoir Reserve.

The sales of water show a decrease of £118 14s. 11d., and the cash received a decrease of £79 15s. 10d. In addition to the above sales, authorized free water to the value of £59 5s. 11d. was supplied to parties opening up new claims.

The total expenditure on the combined races was £2,650 16s. 5d., as against £2,387 2s. 8d. for the previous year, an increase of £263 13s. 9d. This increase is more than accounted for by the rise in salaries of the permanent staff, without taking into consideration the increased cost of casual labour, tools, and other material necessary for the maintenance of the races.

Comparing the sales with the expenditure, the combined races show a loss of £2,114 0s. 8d. for the year.

During the year the sum of £609 0s. 10d. was written off by authority of the Appropriation Act, 1920, leaving the outstanding balances on the 31st March at £40 19s. 10d.

Mount Ida Water-race, Central Otago (Mr. J. C. Buchanan, Manager).

The total sales of water from the Mount Ida water-race during the year amounted to £604 12s. 7d., a decrease on that of last year by £133 17s. 10d. The expenditure on maintenance and repairs for the same period amounted to £1,504 18s. 11d., a decrease on that of last year of £164 7s. 11d. The total cash received was £602 7s. The total amount owing for water supplied at the 31st March was £2 12s. Free water was supplied for washing up to the value of £45 1s. The total value of water supplied from this race amounted to £649 13s. 7d., a decrease on that of last year of £150 0s. 7d.

The approximate quantity of gold obtained by parties using water from this race was 822 oz., valued at £3,164 14s., a decrease on that of last year of £53 18s. The average number of men employed was 13·75.

From the 1st April to the 21st June the weather was very dry, with a shortage of water in the creeks. On the 22nd June 12 in. of snow fell, and was followed by severe frost, which compelled the claims to close down. On the 30th June a good thaw set in, and work was resumed on the 1st July. For the remainder of the winter there was a fairly good supply of water, and most of the claims were able to work throughout the winter months. From the 1st September to the end of March the season was very dry, at times the available supply being as low as 1½ heads. With the exception of a portion of the Eweburn tunnel collapsing in January, the race throughout the year was free of mishaps. At present the race as far as Johnstone's Creek is in good working-order.

ANNEXURE D.

STONE-QUARRIES.

Summary of the Report by the Inspector of Stone-quarries for the North Island (Mr. James Newton).

The correspondence dealing with quarry matters has considerably expanded during the year under review, most of which, however, has been of a minor nature, such as giving information regarding the necessary requirements of the Act, &c., to quarry operators, and applicants for quarry-manager or foreman's service permits. I have found time, however, to visit most of the quarries under the Act at least twice, some more than twice; a few have only been visited once. This has necessitated a great deal of travelling, and approximately 12,350 miles have been covered by various means of conveyance; and approximately 350 inspections have been made, a few being to quarries which, owing to their vertical height, did not come within the meaning of the Act. I am of the opinion, however, that it is a wise plan to visit such places when within reasonable access, and I have found that more care has subsequently been taken both as regards the actual operation of the quarry-face and the handling of the explosives.

I have found that reasonable care is being employed at the quarry-faces generally, and undoubtedly much improvement is shown during the last few years when compared with the conditions found prior to the handing-over of the supervision to the Mines Department. The quarry-faces are operated by safer methods; the loose material that is invariably found on the tops and sides of the quarries receives a great deal more attention than formerly; besides which the important matter of the safe handling and care of explosives now receives a great deal more attention.

Accidents.—In quarries within the Act there has been no fatality, and only two accidents of a nature calling for notification, neither of which resulted in injuries of a permanent nature. When the dangerous nature of the industry, the number of quarries actually operated, and the number of persons employed is considered I think the result is a very creditable one to all concerned, and reflects great credit on all the quarry operators.

On the 11th August Tom Hunt, an employee of the Napier Harbour Board, received slight injuries about the face from a premature explosion of powder. He was employed in Hyderabad quarry, and was engaged bulling a hole, and had prior to this exploded small quantities of powder in the bottom of the hole for bulling purposes. On the latter occasion, and whilst Hunt was lowering the small charge into the hole, it exploded, and the flame shooting out of the top of the hole struck him in the face and burnt it.

On the 10th November Thomas Blake, an employee, had the misfortune to get his arm broken by a rolling stone. The face of the quarry was being operated on a gradient of about 50° of batter: a stone rolling down struck him on the arm, with the above result. Blake himself informed me that he had plenty of time to get clear, as he saw the stone rolling, and that he walked towards the face and stood behind a portion that he considered sufficient protection, but the stone swerving in the direction where he stood struck his arm. He told me that had he walked away from the face instead of towards it he would not have been struck. This accident occurred in the Whakatane Harbour Board's quarry, Whale Island. I inspected the face shortly afterwards, and found that the operations were being conducted in a satisfactory manner.

ANNEXURE E.

MINING STATISTICS.

STATEMENT SHOWING THE QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED IN THE HAURAKI MINING DISTRICT FOR THE YEAR ENDED 31ST DECEMBER, 1920.

Locality and Name of Mine.	Average Number of Men employed.	Quartz crushed.	Gold obtained.		Value.
			Amalgam.	Cyanide.	
THAMES COUNTY AND BOROUGH.					
Waiotahi—		Tons cwt. qr. lb.	Oz. dwt.	Oz. dwt.	£ s. d.
Waiotahi	2	125 0 0 0	15 8	..	39 17 6
Evening Star	6	6 0 0 0	24 5	..	57 8 4
Karaka—					
Gloaming	2	7 0 2 0	104 14	..	295 0 0
Occidental	1	1 0 0 0	0 10	..	1 7 6
Tairua—					
Golden Hills	2	152 0 0 0	148 7	53 0	460 13 0
Golden Belt	6	398 0 0 0	218 1	224 4	1,385 7 0
Kirikiri—					
Horseshoe	2	0 1 1 10	4 10	..	12 7 6
Prospectors	7	86 2 1 12	165 10	..	334 8 3
Totals	28	775 4 0 22	681 5	277 4	2,586 9 1
WAIHI BOROUGH.					
Waihi—					
Waihi*	531	142,239 5 2 24	..	340,236 18½	233,466 9 6
Waihi Grand Junction*	296	51,294 12 3 12	..	91,763 8	86,960 8 0
Totals	827	193,533 18 2 8	..	432,000 6½	320,426 17 6
OHINEMURI COUNTY.					
Owharoa—					
Rising Sun	15	Clean-up of battery	..	524 6	800 10 5
COROMANDEL COUNTY.					
Waikoromiko—					
Four-in-hand	3	0 3 0 13	61 0	..	183 0 0
Kuaotunu—					
Waitaia	2	0 1 0 0	51 0	..	122 16 0
Prospectors	14	6 0 0 0	12 4	..	34 6 8
Totals	19	7 0 0 13	124 4	..	340 2 8
TAURANGA COUNTY.					
Te Puke—					
Muir's Gold Reefs	29	Clean-up of battery	..	708 7	1,700 0 0
SUMMARY.					
Thames County and Borough	28	775 4 0 22	681 5	277 4	2,586 9 1
Waihi Borough	827	193,533 18 2 8	..	432,000 6½	320,426 17 6
Ohinemuri County	15	Cleaning-up battery	..	524 6	800 10 5
Coromandel County	19	7 0 0 13	124 4	..	340 2 8
Tauranga County	29	Cleaning-up battery	..	708 7	1,700 0 0
Totals, 1920	918†	194,316 2 3 15	805 9	433,510 3½	325,853 19 8
Totals, 1919	1,078	226,614 10 3 25	15,690 2	514,392 18	475,998 11 10
Decrease	160	32,298 8 0 10	14,884 13	80,594 14½	150,144 12 2

* Gold obtained from the Waihi and Waihi Grand Junction Mines is here valued at £4 4s. per ounce and silver at 2s. per ounce.
† During the year 140 men were employed at unproductive quartz-mining operations.

STATEMENT SHOWING THE QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED IN THE WEST COAST INSPECTION DISTRICT FOR THE YEAR ENDED 31ST DECEMBER, 1920.

Locality and Name of Mine.	Average Number of Men employed.	Quartz crushed.	Gold obtained by Amalgamation.	Gold obtained by Cyanide and Concentrates.	Estimated Value.
		MARLBOROUGH.			
Wakamarina—		Tons.	Oz. dwt. gr.	Oz. dwt. gr.	£ s. d.
Dominion Consolidated Development	25	1,649	359 5 0	..	2,291 3 2
		WESTLAND.			
Ross—					
Mount Greenland Gold and Quartz Mining	7	140	24 4 0	..	121 0 0
		NELSON.			
Waiuta—					
Blackwater Mines	108	24,468	9,497 1 0	1,568 0 14	58,887 18 9
Globe Hill—					
Progress Mines	43	8,102	1,736 3 0	728 12 7	13,570 18 6
Big River—					
New Big River	31	2,970	2,506 1 0	226 15 16	14,332 19 3
Crushington—					
New Keep-it-Dark	14	263	29 8 0	..	129 17 4
Totals	228	37,592	14,152 2 0	2,523 8 13	89,333 17 0
		SUMMARY.			
Marlborough	25	1,649	359 5 0	..	2,291 3 2
Nelson	196	35,803	13,768 13 0	2,523 8 13	86,921 13 10
Westland	7	140	24 4 0	..	121 0 0
Totals, 1920 ..	228	37,592	14,152 2 0	2,523 8 13	89,333 17 0
Totals, 1919 ..	331	58,937	19,857 4 12	5,651 0 0	97,712 9 0
Decrease	103	21,345	5,705 2 12	3,127 11 11	8,378 12 0

During the year eighty men were employed at unproductive gold-quartz mining operations.

STATEMENT SHOWING THE QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED IN THE SOUTHERN MINING DISTRICT FOR THE YEAR ENDED 31ST DECEMBER, 1920.

Locality and Name of Mine.	Average Number of Men employed.	Quartz crushed.	Gold obtained.	Estimated Value.
	VINCENT COUNTY.			
Old Man Range—		Tons.	Oz. dwt. gr.	£ s. d.
Advance	3	110	122 12 11	63 5 10
	WAIHEMO COUNTY.			
Macrae's—				
Ounce	5*	35	8 4 12	41 4 10
	SUMMARY.			
Vincent County	3	110	122 12 11	639 5 10
Waihemo County	5*	35	8 4 12	41 4 10
Totals, 1920	8†	145	130 16 23	680 10 8
Totals, 1919	14	505¾	74 12 21	310 7 2
Increase	..	..	56 4 2	370 3 6
Decrease	6	360¾	..	..

* Also employed at scheelite-mining during the year, but shown as quartz-miners in the return of persons ordinarily employed at metal-mines. † Eight men were employed at non-productive quartz-mining operations not included in this table.

SUMMARY OF INSPECTION DISTRICTS.

Inspection District.	Average Number of Persons employed.	Quartz crushed.	Bullion obtained.	Estimated Value.
		Statute Tons.	Oz. dwt. gr.	£ s. d.
Northern (North Island)	918	194,316	434,315 12 12	325,853 19 8
West Coast (of South Island)	228	37,592	16,675 10 13	89,333 17 0
Southern (Otago and Southland) ..	8	145	130 16 23	680 10 8
Totals, 1920	1,154*	232,053	451,122 0 0	415,868 7 4
Totals, 1919	1,423*	286,057	555,665 17 9	574,021 8 0
Decrease	269	54,004	104,543 17 9	158,153 0 8

* In addition, 228 persons during 1920, and 150 persons during 1919, were employed at unproductive gold-quartz mining operations.

APPENDIX B.

REPORTS RELATING TO THE INSPECTION OF COAL-MINES.

The Inspecting Engineer of Mines to the Under-Secretary of Mines.

Sir,— Wellington, 15th March, 1921.

I have the honour to present my fifteenth annual report, together with statistical information, in regard to coal-mines of the Dominion, for the year ended 31st December, 1920, in accordance with section 78 of the Coal-mines Act, 1908. The report is divided into the following sections :—

I. Output.

II. Persons employed.

III. Accidents.

IV. Working of the Coal-mines Act—

(*a.*) Ventilation.

(*b.*) Systematic Timbering.

(*c.*) Permitted Explosives.

(*d.*) Dangerous Occurrences.

(*e.*) Electricity at Collieries.

V. Legislation affecting Coal-mining.

VI. Transportation of Coal by Flume.

Annexures—

A. Summary of Annual Reports by Inspectors of Mines.

B. Colliery Statistics.

SECTION I.—OUTPUT.

The output of the several classes of coal mined in each inspection district is summarized as follows :—

Class of Coal.	Output of Coal during 1920.				Total Output to the End of 1920.
	Northern District (North Island).	West Coast District (South Island).	Southern District (South Island).	Total.	
	Tons.	Tons.	Tons.	Tons.	Tons.
Bituminous and semi-bituminous	102,801	820,774	...	923,575	33,055,687
Brown	380,691	733	334,285	715,709	15,880,197
Lignite	...	...	204,421	204,421	2,948,509
Totals for 1920 ...	483,492	821,507	538,706	1,843,705	51,884,393
Totals for 1919 ...	511,451	845,826	490,571	1,847,848	50,040,688

The continued annual decline in coal-production was caused by stoppage of work and restriction of output at the Waikato and West Coast collieries. The Inangahua, Otago, and Southland coalfields, however, produced a record output.

Since 1916 the annual output of coal has declined from 2,257,135 tons to 1,843,705 tons during 1920, but there is evidence that such decline will be arrested during the current year.

During 1920 no new colliery of importance attained the output stage. The James and MacDonald proposed State collieries, situated respectively near Greymouth and Huntly, are being developed, and surface buildings, tramways, and equipment are being installed.

Production of coal from the Point Elizabeth State Colliery ceased, owing to its exhaustion, with a total output of 2,401,610 tons. An area of about 250 acres was worked on the bord-and-pillar system, the proportion of extraction being about 77 per cent., which probably is the highest yet attained in the Dominion, and compares favourably with the proportion of extraction at the Brunner Colliery, the only other considerable colliery worked out on the Grey coalfield; in that case the proportion was 32·6 per cent. over an area of 450 acres.

The production from and the number of persons employed at the collieries of the Dominion are shown in the following table:—

Name of Colliery.	Locality.	Class of Coal.	Output for 1920.	Total Output to 31st December, 1920.	Total Number of Persons ordinarily employed.
Northern District.			Tons.	Tons.	
Hikurangi	Hikurangi	Semi-bituminous	68,098	1,311,226	109
Taupiri Extended	Huntly	Brown	139,386	2,697,143	331
Rotowaro	Rotowaro	"	81,188	188,452	137
Pukemiro	Pukemiro	"	90,140	475,825	187
Waipa	Glen Massey	"	59,696	502,648	106
West Coast District.					
Westport (2 collieries)	Millerton	Bituminous	212,212	5,922,363	330
	Denniston	"	127,091	8,056,075	302
Westport-Stockton	Mangatini	"	131,265	1,618,002	248
State (2 collieries) Point Elizabeth	Dunollie	Semi-bituminous	4,902	2,401,610	43
State (2 collieries) Liverpool	Rewanui	Bituminous	142,519	849,713	341
Blackball	Blackball	"	101,429	2,905,084	288
Southern District.					
Kaitangata and Castle Hill (3 collieries)	Kaitangata	Brown	96,091	3,832,121	306
Taratu	Near Kaitangata	Lignite	46,870	441,274	99
Nightcaps	Nightcaps	Brown	37,669	1,393,900	90
130 other New Zealand collieries	All coalfields	Various	505,149	19,288,957	1,161
Totals	...	...	1,843,705	51,884,393	4,078

SECTION II.—PERSONS EMPLOYED.

Inspection District.	Average Number of Persons employed during 1920.		
	Above Ground.	Below Ground.	Total.
Northern	273	717	990
West Coast	519	1,375	1,894
Southern	360	834	1,194
Totals, 1920	1,152	2,926	4,078
Totals, 1919	1,095	2,849	3,944

The increase in the number of persons employed, although small, is satisfactory, and there is evidence that it will continue. There has, however, been a decrease of output per person employed

below ground in all districts, especially the Waikato coalfield, such output for the Dominion being 630 tons during 1920, as against 750 tons during 1916 (the record year).

The following statement shows the tons of coal and shale raised, persons employed, lives lost by accidents in or about collieries, &c., from 1877 to 1920 (prior to 1877 no returns of output, &c., were made to the Mines Department):—

Year.	Output, in Tons.	Persons employed.			Tons raised per each Person employed Underground.	Lives Lost by Accidents in or about Collieries.		
		Above Ground.	Below Ground.	Total.		Per Million Tons raised.	Per Thousand Persons employed.	Number of Lives Lost.
Prior	570,947	*	*	*	*	*	*	*
1877	138,984	*	*	*	*	*	*	*
1878	162,218	147	366	513	443	†	†	0
1879 ...	231,218	...	...	802	...	194·64	44·00	35‡
1880	299,923	...	...	1,038	...	6·66	1·92	2
1881	337,262	...	...	963	...	2·96	1·04	1
1882	378,272	...	...	1,043	...	5·28	1·91	2
1883	421,764	361	888	1,249	475	4·74	1·60	2
1884	480,831	393	890	1,283	540	6·23	2·34	3
1885	511,063	338	1,145	1,483	456	5·87	2·01	3
1886	534,353	392	1,213	1,605	440	†	†	0
1887	558,620	388	1,111	1,499	503	7·16	2·66	4
1888	613,895	414	1,275	1,689	481	6·51	2·36	4
1889	586,445	466	1,251	1,717	468	6·82	2·37	4
1890	637,397	512	1,334	1,846	477	12·55	4·33	8
1891	668,794	416	1,277	1,693	523	5·98	2·36	4
1892	673,315	485	1,196	1,681	563	1·48	0·66	1
1893	691,548	590	1,298	1,888	533	7·23	2·64	5
1894	719,546	506	1,393	1,899	516	8·33	3·16	6
1895	726,654	525	1,274	1,799	618	6·88	3·33	5
1896	792,851	590	1,347	1,937	588	83·24	34·07	66§
1897	840,713	531	1,381	1,912	609	4·75	2·09	4
1898	907,033	556	1,447	2,003	627	1·10	0·49	1
1899	975,234	554	1,599	2,153	609	3·07	1·39	3
1900	1,093,990	617	1,843	2,460	593	3·65	1·62	4
1901	1,239,686	688	2,066	2,754	600	2·42	1·09	3
1902	1,365,040	803	2,082	2,885	655	1·46	0·69	2
1903	1,420,229	717	2,135	2,852	665	2·81	1·40	4
1904	1,537,838	763	2,525	3,288	609	2·60	1·21	4
1905	1,585,756	833	2,436	3,269	651	3·78	1·83	6
1906	1,729,536	1,174	2,518	3,692	687	3·46	1·62	6
1907	1,831,009	1,143	2,767	3,910	662	6·55	3·07	12
1908	1,860,975	992	2,902	3,894	641	2·68	1·28	5
1909	1,911,247	1,159	3,032	4,191	633	3·65	1·79	7
1910	2,197,362	1,136	3,463	4,599	634	7·28	3·55	16
1911	2,066,073	1,365	2,925	4,290	706	6·77	3·26	14
1912	2,177,615	1,130	3,198	4,328	681	4·13	2·08	9
1913	1,888,005	1,053	3,197	4,250	590	3·18	1·38	6
1914	2,275,614	1,176	3,558	4,734	639	21·53	10·35	49‖
1915	2,208,624	1,050	3,106	4,156	711	4·07	2·16	9
1916	2,257,135	988	3,000	3,988	750	2·65	1·50	6
1917	2,068,419	1,090	2,893	3,983	715	1·93	1·00	4
1918	2,034,250	1,102	2,892	3,994	703	2·95	1·50	6
1919	1,847,848	1,095	2,849	3,944	648	5·41	2·53	10
1920	1,843,705	1,152	2,926	4,078	630	0·54	0·24	1
Totals ...	51,898,836	...	...	...	...	...	...	346

* Unknown. † No life lost. ‡ Year of Kaitangata explosion. § Year of Brunner explosion. ‖ Year of Ralph's (Huntly) explosion.

SECTION III.—ACCIDENTS.

The following is a summary of accidents in and about coal-mines during 1920, with their causes :—

—	Fatal Accidents.		Serious Non-fatal Accidents.	
	Number of Separate Fatal Accidents.	Number of Deaths.	Number of Separate Non-fatal Accidents.	Number of Persons injured, including those injured by Accidents which proved Fatal to their Companions.
Explosions of fire-damp or coal-dust	...	...	1	1
Falls of ground	1	1	5	5
Explosives...	..	...	2	2
Haulage	...	...	11	11
Miscellaneous—Underground...	...	...	3	3
On surface ...	...	...	1	1
Totals	1	1	23	23

During the year only one fatal accident occurred, the proportion per thousand persons employed at coal-mines being 0·24, and per million tons raised 0·54. This is the lowest fatal-accident rate in the Dominion for thirty-four years, and is but one-third of the lowest rate ever attained in the United Kingdom, which country is one of the most immune from colliery accidents in proportion to the number of persons employed.

Details of serious non-fatal accidents are published in the reports of Inspectors of Mines in Annexure A.

The marked reduction in the accident rate may to a certain extent be reasonably attributed to statutory safety provisions of recent years, which to a considerable extent are adopted from those of the United Kingdom.

The following is a brief description of the fatal accident: John Archibald, thirty, a single man and an experienced miner, with two partners, both of whom held firemen-deputies' certificates, and one of whom, William McMillan, held a permit as mine-manager, were working as co-operative miners reopening a dip drive in the old Dunlop's Mine, near Lovell's Flat, which had been closed for some years. The dip was originally driven in the coal-seam narrow and low, averaging 5½ ft. in height and width; very little timber had been used in the old drive, which was about 110 ft. in length, the coal roof being somewhat arched. The drive being too small for horse-haulage, the partners were engaged enlarging it and erecting sets of timber 6 ft. apart to support the roof. Preparatory to commencing work each day the manager, McMillan, made an examination of the drive. On the 21st August the repairing-work had reached a distance of about 51 ft. from the mouth of the drive. At about 1.45 p.m. the partners were squaring the drive preparatory to erecting timber, when a piece of head coal weighing about 6 cwt. or 7 cwt. fell without warning upon deceased from a smooth and previously invisible back or joint, causing a fracture of the base of the skull, leg, and of the spine in the lumbar region, in addition to other injuries. He was forthwith removed by ambulance to the Dunedin Hospital, where he received every attention, but succumbed on the 14th September, his case being considered hopeless from the first.

The Inspector of Mines for the district, Mr. E. R. Green, who inspected the place shortly after the accident, reported that had some props been temporarily erected in the middle of the drive in advance of the last permanent set they might have held the roof up till the place was squared for the permanent set the partners were preparing a place for. The Inspector also stated that co-operative miners, after hiving off from larger mines where they have been under some discipline, might not always be so careful as they should be. The Coroner in his verdict at the inquest held no person blameworthy.

SECTION IV.—WORKING OF THE COAL-MINES ACT.

(*a.*) Ventilation.

[Section 40.]

The ventilation of the large collieries continues to be generally good; occasionally, however, I have found dullness, especially in pillaring operations, which it is at times difficult to provide for. In the South Island stoppings of brattice or bords are seldom airtight, and thus much useful air is lost. At certain small collieries where natural ventilation is depended upon or the fans are too small

the quantity of air required by the law is not always attained. In no colliery airway, however, have I obtained a sample of mine-air which can be regarded as unduly vitiated or noxious. The greatest quantity of noxious or inflammable gas recently obtained by me in any airway—Oxygen, 19·86 per cent.; carbon dioxide, 0·44 per cent.; methane, 0·85 per cent. This sample was taken in the return from Mundy's and No. 6 Districts at Kaitangata No. 1 Colliery on the 13th January of the current year, being a very hot day, with low and falling barometer—viz., 29·7 in. in the mine.

Inflammable gas was reported as follows:—

Name of Colliery.	Number of Days on which Gas was reported.	Maximum Estimated Quantity of Gaseous Mixture reported.
		Cubic Feet.
Taupiri Extended	122	3,000
Kaitangata No. 1	72	200
Liverpool No. 1 (Morgan Seam)	43	1,700
Liverpool No. 3	2	Traces.
Millerton	4	Traces.
Ironbridge	2	30
Pukemiro	2	200
Rotowaro	2	Small
Wairaki	1	Small.

During the year only one accident from firedamp-ignition occurred. A fan-attendant incautiously ignited by a naked light a small quantity of gas at the fan outside the stone drive to the low level at the Morgan Seam, Liverpool No. 1 Colliery. He received slight burns.

(*b.*) Systematic Timbering.

[Section 40 (9) and Regulation 56.]

During the year one fatal and five serious but not fatal accidents occurred from falls, as against seven fatal and three serious but not fatal during the previous year. This is a considerable improvement, but it would be too sanguine to expect this considerable immunity to be maintained. In the latest annual report of H.M. Inspector of Mines for Lancashire, North Wales, and Ireland (Mr. A. D. Nicholson), it is truly stated that "There will never be any appreciable reduction in the number of accidents arising from falls of ground until every roof is regarded as dangerous and is timbered accordingly" Accidents from falls seldom occur from an obviously dangerous roof, which generally is supported forthwith, but from a roof which conceals a joint or fissure, but is considered safe by those working under it. The toll of fatal accidents from falls at New Zealand collieries well exceeds one hundred, which testifies to as many errors of judgment. The experience in other countries is similar, falls of ground being the most prolific cause of accident. It cannot too often be instilled into the minds of those employed below ground that all roof should be regarded as potentially dangerous and as concealing a joint or back. The regulations pertaining to systematic timbering should be strictly observed.

In the last presidential address at the fifty-third annual meeting of the South Staffordshire and Warwickshire Institute of Mining Engineers the following reference was made to accidents by falls: "To falls of ground were attributable over 50 per cent. of all the deaths from accidents in and about mines, and it was safe to say that a considerable number of these might be avoided by—(*a*) More careful examination of the roof and sides, and keener appreciation of the dangers likely to arise from the presence of 'slips'; (*b*) strict adherence to the systematic setting of supports in accordance with prescribed distances; (*c*) the increased use of temporary supports until the ground is cleared for the permanent timber, and also prior to commencing repair work; (*d*) more attention to the spragging of coal and overhanging sides."

On the 2nd July an opinion was published by the editor of the *Colliery Guardian*, of considerable importance, regarding the interpretation of the regulation pertaining to systematic timbering in the United Kingdom and New Zealand—as to whether timbering may be limited by the manager to a place where its necessity is obvious, and discontinued if the roof improves. The opinion in brief was that timber supports shall be continuous and of the class and at such intervals throughout the district or locality as specified in the notice of the manager approved by the Inspector. The manager, however, with the approval of the Inspector, may amend the notice as he feels disposed.

As the result of several accidents, the method of breaking down top coal in thick coal-seams by the retreating method was brought under consideration by certain mine-managers and Inspectors. In such operations a difficulty often arises, the roof on the goaf side of the hanging lip of top coal being frequently too high for props; yet miners, although often forbidden, hazard their lives by filling fallen coal under such high and unsupported roof. To reduce the risk of accident in such cases it is recommended as a slight measure of safety that there shall be erected a covered false set of timber immediately in by the lip set, and that one or more inclined props or struts shall be placed to support the lip face.

(*c.*) Permitted Explosives.

[Regulations 128 to 134 inclusive.]

Permitted explosives are now entirely used at the collieries of the Waikato, Buller, and Grey coal-fields, also at such brown-coal mines of Otago and Southland where safety-lamps are required to be used. During the year the quality of explosive has somewhat improved, but judging by the results obtained at the Taupiri Extended Colliery, where systematic and reliable records are kept, the explosive is often unsatisfactory. At that colliery, during 1920, 46,271 charges weighing 39,951 lb. were fired electrically, and 139,386 tons of brown coal, generally hard, was broken down; 364 charges misfired, chiefly owing to defective detonators; in addition to which 739 charges only partly detonated, this obviously being due to explosive in a defective condition. The explosive used was by makers of high repute. At the beginning of the current year the new "shot-firers' daily record" will begin to be kept at all collieries where permitted explosives are used. By these means tabulated totals of the number and weight of shots fired and the results therefrom will be obtainable for publication, as in the United Kingdom.

(*d.*) Dangerous Occurrences.

[Regulation 81.]

The Inspectors of Mines received written notice from managers of the following occurrences:—

Northern Inspection District.

Taupiri Extended Colliery: On the 29th June a fire occurred at a fall between the two brown-coal seams in No. 4 level, west side; the fire was extinguished by water after some trouble. On the 1st July a small ignition of gas occurred in the dome above the fall; all men were temporarily withdrawn from the mine.

Pukemiro Colliery: A miner alleged that he ignited by a naked light on the 11th May about 200 ft. of gaseous mixture near the face of the main north section back heading. The district was put on safety-lamps forthwith.

Rotowaro Colliery: A miner ignited by a naked light on the 18th November a very small quantity of gaseous mixture in a hole at the face of the back dip heading. The headings were forthwith put on safety-lamps.

West Coast Inspection District.

At Millerton Colliery slight gas-ignitions were caused by miners with naked lights in the old dip section on the 10th February, 22nd June, and 5th July, also in No. 2 dip section on the 1st June. Both sections were put on safety-lamps forthwith.

Ironbridge Colliery: A slight ignition of gas occurred on the 7th July in No. 8 pillar section.

Coalbrookdale Colliery: On the 27th July in Wallace's section the stopped-off fire burnt through a bord end; it was with some difficulty resealed by brick stoppings.

Blackball Colliery: On the 1st August smoke issued from a concrete stopping in No. 11 incline. The stopping was reinforced.

Ferndale-Timaru (formerly Lockington's) Colliery: On the 16th November heating at a fall in the goaf occurred: it was overcome by water.

Southern Inspection District.

At Kaitangata No. 1 Colliery, on the 3rd August, an ignition of a small accumulation of inflammable gas was caused by a spontaneous fire at the corner of old No. 4 dip, McGhie's level. In this locality a fire has periodically broken out for some years past, and with a falling barometer small quantities of inflammable gas have at times accumulated in a hole above roof timber. On the date mentioned the place was reported clear by deputy A. Tripp immediately prior to the day shift entering the mine. At about 1.45 p.m. ignition of gas occurred, which was felt for a considerable distance outby against the ventilating-current, but was not observed in the workings inby except by horse-drivers the brothers Edwards, who were within 2 chains of the occurrence, and who state that they heard two "puffs," the first being the louder. They then thought it wise to get away. After the ignition some of the lighter material of the surrounding timber was found to be on fire, but this was quickly extinguished by the deputies. This must be regarded as a warning, and it behoves all officials to prevent the accumulation of gas at this colliery where spontaneous fires are constantly produced owing to abnormally rapid oxidation of the brown coal. Experiments by the Home Office at Eskmeals, in Cumberland, have proved that the quantity of inflammable gas required to produce, if ignited, sufficient flame and force to cause a disastrous coaldust explosion is comparatively small, so that all gas-ignitions where fine coaldust occurs must be regarded seriously.

At the same colliery, on the 14th October, all workmen in Mundy's dip section were withdrawn owing to a 2½-per-cent. firedamp mixture issuing from waste workings. On the 26th November, at the same colliery, the workmen in No. 7 dip were withdrawn from their place owing to smoke issuing from a fire stopping.

At Mount Torlesse Colliery, on the 8th June, an outbreak of fire occurerd in No. 2 West workings (brown coal). This fire was sealed off.

At Waronui Colliery, on the 11th November, a small fire in old workings (lignite) occasioned the withdrawal of the men for one day.

At Taratu Colliery, on the 25th November, an outbreak of fire occurred in the lignite workings near the outcrop. The fire was smothered by falls of surface material.

(*e.*) Electricity at Collieries.

[Regulation 160.]

During 1920 there has been but small increase in the number or capacity of electrical installations. The following is a summary of the annual returns, in accordance with Regulation 160 (*e*), regarding electrical apparatus at collieries :—

Number of collieries at which electrical apparatus is installed	16
Number of continuous-current installations	15
Number of alternating-current installations	3
Number of collieries electrically lighted	14
Number of collieries using electrical ventilating-machines	8
Number of collieries using electrical pumping plants	5
Number of collieries using electrical haulage plants	5
Number of collieries using electrical screening plants	2
Number of collieries using electrical miscellaneous plants	2
Number of collieries using electrical locomotives	1
Total horse-power employed from motors on surface	2,125
Total horse-power employed from motors underground	773

The use of electricity has never been attended by any serious accident in or about the collieries of the Dominion, although several accidents have occurred at metalliferous mines.

SECTION V.—LEGISLATION AFFECTING COAL-MINING.

The Coal-mines Amendment Act, 1920, which was passed during the year contains the following provisions :—

Section 2 provides that on the expiry of any lease a new lease may be granted over the lands comprised in the original lease. Section 3 gives the Governor-General power to make regulations with respect to sanitary conveniences at mines. Section 4 makes provision for re-examination of an unsuccessful applicant for a mine-manager's certificate of competency on a date or dates to be fixed by the Chairman of the Board of Examiners. Section 5 provides that applicants for certificates of competency who hold certificates of corresponding class from other countries shall be of good character and repute. Section 6 repeals section 14, subsection 3, of the principal Act, pertaining to royalty, in the case of the long-closed Mokihinui mine. Section 7 provides that ventilation of mines shall be produced continuously during all times when there are any persons in the mine, and also during such other times as may be prescribed. Section 8 restricts the withdrawal of timber of mines by blasting to those mines where permitted explosives are required to be used. Section 9 amends previous legislation, and provides that, except by the consent of the Minister, a miner shall not be put in charge of any place in a mine unless he is of the age of twenty-one years or upwards and has had at least three years' experience in underground coal-mining, of which at least six months shall have been at the face with an experienced coal-miner, or has had at least two and a half years' experience in driving, stoping, timbering, or shaft-sinking, or in rises or winzes in connection with underground metalliferous mining, together with six months' experience at the face with an experienced coal-miner in underground coal-mining. Section 10 applies to the apportionment of grants appropriated for the development of the coal-mining industry. Section 11 authorizes the granting of licenses for coal-mining tramways.

Regulations under the Coal-mines Act, by Order in Council dated 12th April, 1920, contained provisions of which the following is a summary :—

26. An increase from 2½ to 5 per cent. in the amount of the allowance which may be made to a miners' association towards the expense of management of the Sick and Accident Fund.

83. (*a.*) In all working-places exceeding in height 10 ft. there shall be kept a pole, having a steel pricker attached at one end and a steel ferrule at the other end, for sounding and, if necessary, removing roof. (*b.*) In all working-places exceeding 12 ft. a ladder shall be kept.

134. The explosive "ligdynite" is placed in the Second (A) Schedule, and is permitted only in mines in which fire-damp has not been reported for three years.

154A. When and where the Inspector deems necessary, mechanical ventilating appliance shall be installed.

Form 14 provides for a shot-firer's daily record.

SECTION VI.—TRANSPORTATION OF COAL BY FLUME.

Of considerable importance for the economical working of coal-bearing areas situated in hilly country and distant from railway communication are the operations of the Montana Coal and Coke Company at their colliery at Aldridge, Montana, U.S.A. By means of a covered rectangular box flume, 10 in. by 10 in. internal dimensions, constructed of 2 in. boards and lined with black sheet iron, 0·0187 in. in thickness (No. 26 U.S.A. gauge), with a minimum gradient of 4 ft. per 100 ft., for a number of years 35 to 45 tons of coal per hour has been transported 9,000 ft. by means of a flow of 1·58 cubic feet of water per second (1·58 New Zealand sluice-heads). Based upon these results, if a storage dam is available at the head of the flume this flow of water would be sufficient to transport, through a flume of three times greater sectional area, three times the above quantity of coal in one shift of eight hours—*i.e.*, from 840 to 1,080 tons. A somewhat crude adaptation of the Montana plant has been constructed near Reefton at the small coal-mine near Merrijigs, the dimensions and inclination of the Montana outfit being followed, but the box flume is unlined and uncovered, the flume is about a mile in length, and is now being extended about a mile farther towards Reefton. The semi-bituminous coal is not perceptibly broken during water transport. The necessity for lining the box is proved by the fact that although only about 1,500 tons of coal had

been transported the interior of the rimu flume near its top end is perceptibly worn into grooves by the moving coal. In the event of further installations being made in this Dominion substitution of a galvanized-steel trough-shaped flume is well worth consideration.

The following extract from an article upon the transportation of coal by flume by the Montana Coal and Coke Company at Aldridge, Montana, was published in *Mines and Minerals* of November, 1909, the writer being Robert M. Magrew, General Superintendent of Mines:—

"*Flume Construction and Grading.*—The flume is both economical in construction and in operation. It consists simply of a *rectangular flume* lined with sheet iron. The bottom board is 2 in. by 10 in., the sides 2 in. by 12 in., and the top 2 in. by 14 in., making the inside area 10 in. by 10 in. This is lined with No. 26 gauge black sheet iron, which is shaped at the company's shops to conform to the size of the flume. In laying the iron it is lapped a few inches in favour of the grade, and if kept in reasonable repair is practically watertight.

"The flume is about 9,000 ft. in length, the first 3,000 ft. having a grade of about 4 ft. to the 100. The grade then breaks sharply and varies from 15 to 35 degrees for a distance of about 3,500 ft., the remaining 2,500 ft. being on a gradually lessening grade until it again becomes 4 ft. to the 100.

"All minor gulches are crossed on trestles constructed of 2 in. by 4 in. lumber, but where any marked degree of expense would have been entailed by trestling the flume is curved to conform to the topography of the ground. No trouble was experienced with the curves or changes of grade, but when changing from a steep to a lighter pitch the flume area had to be enlarged for some little distance to allow for the swelling of volume due to the decrease of velocity. Elevation had to be given all curves. This was easily determined by leaving the flume unnailed to stringers on all curves; then after turning on the water it was a small job to key up the outer edge to the proper elevation. These precautions would not have been necessary in the case of a flume carrying much less than its actual capacity, but for the sake of safety were carried out.

"*Construction Cost.*—About 50,000 ft. of lumber are required per mile of flume. This allows 42,240 ft. for the flume proper, the balance being for cleats, trestles, sills, &c. Taking an arbitrary figure—say, 30 dollars per thousand for lumber and cost of erection—would make a total of 1,500 dollars per mile of flume ready to receive iron lining. The cost of No. 26 gauge black iron is 3·65 dollars per hundredweight f.o.b. Chicago, freight added making it cost 5·25 dollars in Electric. This runs approximately 66⅔ linear feet per hundredweight; so the cost per mile would be 415·80 dollars. The cost of bending and putting in place the iron lining would amount to about 75 dollars, making a total cost of 1,990·80 dollars per mile for material and construction. This makes a very good showing in comparison with the cost of a surface tram road over the same ground.

"*Operation and Maintenance.*—The cost of operation of the flume is practically nil during the warmer months, but during the winter it requires the services of two men for about an hour in the morning to patrol from each end and clean out any masses of snow or slush ice which may have collected after the turning-on of the water. The washer is not started during this season until the flume is reported clear. No water is allowed to flow through the flumes during the winter months after the washer is shut down for the day, as experience has shown that it freezes from the sides and bottom, and will close the entire flume area in a very short time. The scouring effect of the coal prevents this trouble during the shift. Three 1-in. steam lines exhaust into the sludge-tank at this season, so that the first flow of water through the flume is many degrees warmer than it would otherwise be.

"The cost of maintenance is not great, the principal item being the cost of the sheet iron. The life of the iron used will average about two years. Experiments contemplated for the near future are expected to determine the relative efficiency of various weights of iron, as it is thought that a heavier iron, although higher in first cost, will last proportionately longer, thereby decreasing the maintenance account an appreciable degree. It is also intended to equip a section with galvanized iron, and another section with iron of semi-cylindrical shape. The present flume has been in operation about nine years, and it is estimated that it should last five years longer with very little repair. Taking first cost into consideration, this makes the item of maintenance a very reasonable one.

"*Carrying-capacity.*—The capacity of the flume is, of course, governed by the volume and velocity of the water. Experience has shown that a flow of 1·58 cubic feet per second, or 63·36 miners' inches will transport safely from 35 to 45 tons per hour on a minimum grade of 4 ft. to the hundred, and this at practically no cost for operation. No accurate data are at hand showing the varying amounts of coal carried per pound of water for given grades, but the above can be taken as the maximum amount it is safe to transport with this volume of water. It would not be deemed advisable to construct a flume for this purpose on less than a 4-per-cent. grade.

"*Receiving-bunkers.*—The coal is received at the discharge end of the flume in a series of large tanks located over the bunkers, the water releasing it from suspension as the larger area of the tank brings it to rest. The coarser particles are deposited near the inflow, grading down in size through the length of the first tank through the overflow into the second tank, where the fines are collected. The first tank is dumped usually about four times to one dumping of the second tank; the water being switched temporarily to the middle of the tank while one end is being dumped, and then back again until the entire tank is emptied. The tanks have a capacity of about 23 to 25 tons each, and are dumped by a series of slide-gates in the bottom, the coal falling into bunkers having a total storage capacity of about 1,400 tons. It is here drained for forty-eight hours before being charged into the ovens.

"There is also in operation a flume of about 2,500 ft. in length, connecting one of the mines with the washer. This consists of a 10 in. terra-cotta pipe laid with cement joints. The mistake was made, however, in putting it too deep in the ground, making it very difficult to locate a break if one occurs. Some of this pipe has been taken out after a service of seven years, and the wear is scarcely noticeable."

I have, &c.,

FRANK REED,
Inspecting Engineer and Chief Inspector of Coal-mines.

ANNEXURE A.

SUMMARY OF REPORTS BY INSPECTORS OF MINES.

Northern Inspection District (Mr. Boyd Bennie, Inspector).

Hikurangi Colliery.—This colliery has been working for twenty-eight years, and the present mines are nearing exhaustion. The pillar coal is being worked in all sections, which will not last a year. Several bores have been sunk on the company's property near the present mines, and it is stated that coal has been got in almost every hole. I understand that in the near future the work of opening a new colliery will be undertaken. It is hoped that the company will install a more up-to-date ventilating-fan at the proposed colliery. That now in use at the mines is small and of Waddle type ; it never was satisfactory. I examined the mines frequently during the year.

The Northern Coal Company's mine at Waro has been closed during the war, owing to the owners being unable to procure suitable machinery to deal with the haulage, pumping, and ventilation of the mine. An obsolete steam plant was previously in use, and owing to the uneven nature of the coal-seam, numerous pumps and haulage winches were required. Early in the year the owners purchased an electrical plant in Australia, and this plant is now being erected to reopen the mine and work it under improved conditions. Recently this colliery has been sold to the Wilson's Portland Cement Company. The erecting of the electrical plant is now nearing completion, and a mine-manager having been appointed, the unwatering and reopening-up of the mine will be undertaken.

Northern Collieries (Tauranga Section).—This small mine is on a portion of the Northern Company's property, and is let on tribute to a party of miners. The company could not work the mine on award rates. The coal-seam is thin and intersected by a clay band. The mine was examined a number of times by me during the year.

Kerr and Co.'s Waro Mine (McLeod's Freehold).—This mine was recently opened by a party of miners on the co-operative principle. The mine was worked some years ago, and it is believed that there are some small pillars of coal left. Another portion to be worked lies north-west of the north road, several bores having been drilled and coal located. To work that coal a dip tunnel is being driven from the old mine adit-level. That coal below a number of miners' cottages will not be worked for some time, but when that coal is worked the cottages referred to will have to be removed.

Kerr and Wyatt's Crown Lease (Section 39, Block XVI, Hikurangi Survey District).—This mine has been worked for five years, and the coal mined with great care. Altogether there have been 21,594 tons of coal won by this party. The Hikurangi Coal-mining Company considered the mine exhausted, and it is doubtful if any company could have mined the coal at a profit, yet I understand this co-operative party have done well. There is yet a little thin coal remaining. I examined the mine several times during the year.

Cunningham and Son's Co-operative Party (Crown Lease, Section 48, Block XVI, Hikurangi Survey District).—The coal-seam is from 4 ft. to 5 ft. thick, and there is only a small area available. The mine is about one mile from the county Marua-Hikurangi Road, and a ground tram-lime run to it. I examined the mine several times during the year.

Foot and Doel's Crown Lease (Section 4, Block XVI, Hikurangi Survey District).—I examined the mine several times during the year. In one section of the mine the pillar coal is being worked, and there are many tons of coal yet available. These men are working coal that was left in by three former mining parties, as it was considered to be unprofitable. No doubt the present high price for coal enables the present party to work at a profit.

Rayburn Colliery, Hikurangi (Christey's Freehold).—This mine was opened during the year. At first the prospects were considered good, but later the coal was found to be soft and a portion of it unmarketable. I examined the mine and found the coal-seam to be from 4 ft. to 5 ft. thick.

Accidents.

No fatal or serious accident occurred in the North Auckland division of the Northern Inspection District during 1920.

Northern Inspection District (Mr. Peter Hunter, Inspector).

Pukemiro Colliery.—This mine is worked in two sections, north and south respectively, which are not connected in any way. Each section is ventilated by a Burnsted and Chandler fan. The endless rope in the North section has been extended, and two subsidiary endless ropes have been put into the sections. These ropes are driven by electric machinery underground and cut down manual labour to a minimum. In the south section the coal is being hauled by a main rope, but preparations are being made to install the endless rope in the near future.

Rotowaro Colliery.—A new main road, 11 ft. by 8 ft., is being driven from the surface with the intention of installing an endless rope and cutting out the present system of haulage by main rope. The new generating plant is not yet completed. No further development work has been done at the No. 2 mine.

Waikato Extended Mine.—This mine has been working more energetically this year than formerly. A large portion of the output has been conveyed by river to Hamilton, Mercer, and Ngaruawahia, and put in railway-trucks, the balance being distributed amongst settlers and flax-millers on the banks of the Waikato and Waipa Rivers.

Greencastle Mine, Aria.—The mine-owner has made an arrangement with two miners to work the mine on the co-operative system.

Waipa Colliery.—During the year the endless-rope haulage was extended in the main heading, and a 6-ft.-diameter sirocco fan removed from the old workings and erected at the new mine. The pillars on the left side of the mine are being extracted satisfactorily.

Hunua Mine.—Considerable improvements have been made in the methods of haulage.

United Coalfields.—Work on this area has been mostly confined to boring and proving the coal. A start has been made with a prospecting-drive.

MacDonald State Mines.—A main heading has been commenced and driven some 10 ft. in clay. A workshop and magazine have been erected.

Taupiri Extended Mine.—The distance from the face to the shaft in the main west section is now approximately one mile and a quarter. A section has been developed in the top seam which appears to be equal in quality to that of the bottom seam and about 16 ft. thick. The north heading has also been advanced and the distance from the shaft to the face is approximately one mile and a quarter. In March a spontaneous heating took place at a fall in No. 4 old workings, west side, which later developed into a fire. This, however, was successfully overcome by pumping water from the sumps on to the top of the fall. Preparations are being made to hydraulically stow this section of the old workings with sand.

Non-fatal Serious Accidents.

Taupiri Extended.—13th December, 1920: Leo Long, age 21—loss of second finger, at the first joint, of the left hand. Long was caging coal at the shaft-bottom, and his finger was caught between a coal-truck and the cage. 12th June, 1920: George Peel—loss of part of little finger. Peel was employed as rope hand, when his fingers were caught by haulage-rope.

Rotowaro Colliery.—20th May, 1920: James Burton, age 14—fractured leg. Burton was employed on the pit-top, and his foot went through a hole in the decking, causing him to fall; before he could recover a truck struck him. 15th June, 1920: Joseph Atkins, age 45—loss of two fingers at the first joints. Atkins was employed about the screens, and was in the act of clearing some slack from under the wheels of a wagon when the wagon moved, running over two of his fingers. 10th August, 1920: Evan Davis—severe contusion of right hip and pelvis. Davis was engaged as a labourer, and was excavating in a clay bank when a piece of clay rolled from the top of bank, striking him.

Pukemiro Colliery.—1st December, 1920: W. F. Garner—severe scalp-wound and other minor injuries to face. Garner was employed as a trucker, and was apparently riding on the buffers of a truck; the truck went off the road, tipping up on end, and Garner was thrown over the truck, striking his head on the rail as he fell. 27th February, 1920: W. A. Colledge, age 15—abdominal muscles severely bruised. Colledge was engaged cleaning wagons, and was jammed between the buffers of two wagons.

Waipa Colliery.—19th March, 1920: J. A. Andrews, age 50—fractured leg. Andrews was employed as a miner. A piece of coal falling from the face struck him on the left leg, causing a fracture below the knee.

Hunua Colliery.—2nd February, 1920: R. R. Lewis—acute iritis of both eyes and loss of sight of one. Lewis was employed as a miner, and was struck by a piece of coal flying from his pick.

Dangerous Occurrences (Regulation 81).

Rotowaro Colliery.—18th November, 1920: Manager A. Penman reported that after a shot had been fired in McIntire's heading, No. 3 section, the men on returning to the place fired a small quantity of gas.

Taupiri Extended.—29th June, 1920: Manager W. Wood reported that a fire had taken place in No. 4 old workings, through spontaneous heating of clay and coal, where a fall had occurred some time previous. 1st July, 1920: James Allison, acting-manager, reported that an ignition of gas had taken place at the site of the fire in No. 4 old workings. All the men were withdrawn from the mine.

Pukemiro Colliery.—11th May, 1920: Manager Burt reported an ignition of gas in the main north heading. 17th May, 1920: Manager Burt reported an ignition of a small quantity of gas in Summer's heading.

WEST COAST INSPECTION DISTRICT (MR. GEORGE DUGGAN, Inspector).

Coal-output.

The coal-output was 821,507 tons. I regret to report that this shows a decrease of 24,319 tons on the previous year's return. The chief reasons for the decrease were the exhaustion of the Point Elizabeth and the North Brunner Mines, and the "go-slow" policy in vogue at all the mines until March, and again adopted at the Blackball Mine from November, and the stoppage of the Paparoa Mine owing to a labour dispute from February until the end of the year. It is pleasing to record an increase from the numerous small mines in the Reefton area, and from the Coal Creek Mine near Mokihinui. The Westport-Stockton Mine also shows a slightly increased output.

The number of men employed at the mines has not varied much from the previous year, there being fourteen less underground and nineteen more on the surface.

New Zealand State Coal-mines.

Liverpool Colliery.—No. 1 Section: The solid work in the upper seam, on the east side of the Seven-mile Creek, was completed during the year, and the pillars are now being won. Work on the west side of the creek ceased early in the year.

Morgan Seam: The east side workings in the Morgan seam proved very disappointing, the seam being split up by bands of stone which gradually thickened as driving proceeded. The main east level was stopped just after crossing under Puru Creek. The headings to the rise on the east side have also entered the stony area. On the west side the coal is fairly clean, and averages about 8 ft. in thickness. Firedamp was reported in the Morgan seam workings on forty-three occasions during the year. The low-level stone drive to the Morgan seam was stopped on the 7th April owing to firedamp and the lack of suitable permitted explosives for stonework. This drive intersected a coal-seam 11 ft. thick, but rather dirty.

On the 31st May a boiler-attendant, Thomas Fisher, after starting the electric motor to drive a fan at the stone-drive entrance went to oil the fan-bearing; the lighted slush-lamp which he was carrying ignited, inflammable gas being drawn through the ventilating-pipes by the fan, and he received burns about the head and arms, but fortunately not of a serious nature.

Steam-hoist: Since the 30th August the persons working at the Nos. 1 and 3A sections have been regularly conveyed by a car up an incline by rope haulage actuated by steam-power from the traffic road, and near the Rewanui Railway-station, to the middle brake, a distance of 24 chains, and rising 1 in $3\frac{1}{2}$.

No. 3A Section: Pillar-extraction will soon be completed in the 3A section. A high percentage of the coal has been won.

No. 3 Section: The solid work in this section is also finished, and the pillar-extraction is proceeding apace. Most of the remaining coal is less than 5 ft. in thickness.

Point Elizabeth Mine.—This mine ceased production on the 20th March, and was finally sealed off on the 31st March, 1920.

James Mine.—A level stone drive, at an altitude of 200 ft. above sea-level, pierced the coal-seam when in 15 chains. The seam is rather dirty, and is only from $2\frac{1}{2}$ ft. to 3 ft. in thickness, but as driving proceeds it will thicken and become cleaner. A return airway is now being made at an angle of 45° through the overlying stone, from a point about a chain to the east of the main drive.

Grey Valley Coalfield.

Paparoa Colliery.—On the 3rd February a strike occurred regarding taking the tare of the mine-tubs. The miners desired the weights taken on the previous pay-Saturday, and the management on the following pay-Saturday. The miners obtained work elsewhere, and no more coal was produced from the mine during the year. A settlement was arrived at during December, and work recommenced on the 5th January, 1921.

Blackball Colliery.—All production at the Blackball Mine during the past year was obtained from the No. 1 rise section and the No. 9 dip section. Owing to the heated area near the D-level workings east of No. 17 incline giving trouble, it was found necessary to build two strong dams. Nos. 4 and 5 inclines in the No. 1 rise section have reached the outcrop, and to the east of No. 5 incline troubled ground was met. A fault—between the main and back levels in the No. 9 dip section—continues to run almost parallel with these places. The main dip has progressed slowly, and is now 11 chains below the No. 9 haulage-road. The method of working top coal has been modified, the places being restricted to 18 ft. in width, and timber supports are put up under the overhanging lip. A double-inlet sirocco fan, 7 ft. in diameter, has been procured, and will be installed during the coming year. Owing to the area near the present fan-house being restricted, considerable preparatory work is necessary.

North Brunner Mine.—At this colliery activities ceased towards the end of the year.

St. Kilda Mine (Brunner).—The end of this mine is fast approaching: only about two months' further output is available. The railway-bridge over the Grey River having been condemned by the Railway Department as unsafe, the small output has to be stored in the bins until the bridge is repaired, or some other means of transit for the coal is devised.

Dobson Mine.—A dip drive at a grade of 1 in 3 is now 4 chains down. The management anticipates that the Brunner seam will be intersected at a distance of 1,200 ft. A small area of coal, at altitudes varying from 700 ft. to 900 ft. above sea-level has been prospected, and gravity planes have been constructed to convey this coal to the level of the mouth of the dip drive. The coal in this area is very soft and steeply inclined.

Reefton District.

The output from the Reefton mines was substantially increased during the year.

Reefton Coal Company's Mine.—Pillaring was commenced in the rise workings. A crosscut was driven in the coal going to the dip, but so far has proved rather disappointing, the coal becoming very soft and of poor quality. The roof is a very soft sandstone. The dip of the seam is now at right angles to the line of the crosscut. Very little work has been done in the 5 ft. seam.

Ferndale-Timaru Mine (formerly Lockington's).—The year's output from this mine was chiefly obtained from pillar-extraction. Where the overburden is shallow stripping operations have been resorted to and the coal then worked opencast. A dip drive was commenced near the lower section and good coal was met, but dipping rather steeply (about 1 in 2). Heating occurred on the 16th November in a fall in a goaf to the north-east of the main stone drive. A hand-pump was used to pump water on to the heated debris, and the fire was eventually got under control.

Morris and Learmont's Mine.—A certificated manager took charge in this mine on the 23rd July, and the output has been considerably increased. Stripping operations are in progress near the mine-entrance. Near the face of the main level a fall occurred and, owing to the shallow cover, a creek broke into the workings. This creek has since been flumed across the fall. Another area of hard coal has been found near the Reefton Coal Company's lease, and a small bin has been put up.

Birchwood Coal-mine.—Near the end of the year this company decided to reopen the old coal-mine within the Reefton Town Belt. The coal is thin (about 3½ ft.) but of fair quality.

Victory Mine.—The upper seam thins and is split up on the west, so development is only to the north. Four miners were constantly employed during the year in this seam. No work was done on the lower seam. The coal from the Victory Mine is clean and hard, and is undoubtedly one of the best in the Reefton field.

Phœnix and Venus Mine.—The usual small output from this mine has been maintained, but the long haulage by drays debars a larger output.

Big River Mine.—Two men continue to produce coal for the boilers at the Big River Quartz-mine.

Archer's Freehold Mine (Capleston).—All the past year's output was obtained from the 24 ft. seam. A fault was met in the main east level. The output from the Capleston mines is carted along the traffic road to the Cronadun Railway-station, a distance of about four miles.

Coghlan's Mine (Capleston).—No coal was mined from the freehold area; 1,691 tons were obtained from the leasehold area.

Golden Point Mine.—Numerous short stone drives have been put into the hill from near the traffic-road to intersect the seam and work the rise coal. A dip was put down about a chain, but the coal was nearly vertical, and the dip has since been abandoned. A fleet of motor-lorries conveys the coal to the Reefton Railway-station, a distance of about three and a half miles.

Merrijigs Coal-mine.—A wooden flume about 20 chains long has been constructed, and coal is conveyed by water flowing through boxes from the mine to the traffic-road. This fluming is now being extended to the foot of the Merrijigs Hill, about three to four miles, and will replace the haulage by means of horses and drays.

Many coal leases and coal-prospecting licenses were granted during the year. A diamond-drill borehole was put down 500 ft. on the terrace behind the railway-station, but it did not reach coal. Another borehole by means of a Keystone percussive drill was bored between Capleston and Cronadun, but was abandoned at 300 ft.

Westport District.

Coal Creek Mine (Mokihinui).—Pillar work in the old section ceased on the 30th May, and all output from that date was obtained from an area farther up Coal Creek. The coal in the main heading is rather soft. A strong band came across from the west side, and work in the heading is temporarily stopped.

Co-operative Mine (Dove and Party).—This party's work early in the year consisted of extracting the few remaining pillars in the No. 4 section of the old Cardiff Mine. In September they commenced to work some of the outcrop coal between the Cardiff main drive and Chasm Creek. These places have been driven 9 ft. high in clean hard coal. A horse tramway and a jig connects the mine with the tramway from the No. 4 section.

St. Helens Mine (T. Bennett).—This mine has been worked continuously during the year. The roof is very variable, sometimes being a good strong sandstone and at others very treacherous, necessitating strong sets for support.

Chester's Mine.—This is a small mine adjoining Bennett's and working the same seam.

Other co-operative parties commenced prospecting operations towards the end of the year, and should augment the production from this field in the near future.

Westport-Stockton Colliery.—As the Stockton Colliery could no longer be considered as naturally wet throughout, early in the year the manager was instructed that it would be necessary to use only "permitted" explosives. Owing to the scarcity of labour only the E field was worked during the first half of the year, but the mine is now fully staffed, and operations have been renewed in the old mine. D section is exhausted, and the eastern portion of C section consists of small areas of coal, where four pairs of miners are now employed. There are also four pairs of miners on pillar work in B section. The cover over the coal in the E field being shallow, this continues to be a very wet area and considerably increases the cost of mining. Development work continues apace in the Nos. 2, 5, and 6 sections. In the Nos. 2 and 5 sections "rolls" are often met, making haulage difficult. A commodious bath-house is now being erected at Stockton Township, and the management have coped with the housing difficulty by providing several comfortable workmen's cottages at the township. These are being purchased by the employees on the instalment system.

Millerton.

Millerton Colliery.—Mangatina Section: The pillar area along the eastern boundary of the lease still produces a small output.

Old Dip Section: A connection has been made between the old dip section and the No. 2 dip section at Mine Creek, and ventilation is now produced solely by the Mine Creek fan. As ignitions of inflammable gas occurred in the old dip and No. 2 dip section, the management were notified, on the 28th June, that no lights other than locked safety-lamps could be used in these districts.

Mine Creek Mine.—Development still proceeds in the No. 2 dip and 4th west sections. A down-throw fault was met in the main level off No. 2. dip, and since going through this fault inflammable gas has been given off in the working-places. The barrier pillars are being extracted from the south-east section, and pillar-extraction continues in the south pillars.

The up-to-date bath-house near Millerton was completed during the year, and is being regularly used by the employees.

Denniston Collieries.

Ironbridge Mine.—The only development work is in the Deep Creek section, where seven pairs of miners are now employed. The miners are allowed forty-two minutes travelling-time to get to this section, and in a few weeks will be working in the 47-acre block, when their travelling-time will be increased to fifty minutes.

Pillar-extraction continues in the No. 8 shaft, Kruger's and Kiwi sections.

Coalbrookdale Mine.—Waratea Jig Section: The endless-rope haulage is now being installed for 62 chains from the junction of the Waratea jig and Extended sections. In the crosscut going south-east stone bands are splitting up the seam, and these are gradually becoming thicker.

Waratea and Extended Cascade Sections: Pillar-extraction continues in these sections. The haulage was shortened in the Cascade section, and miners now travel to work along the haulage-road. Blackdamp is occasionally reported in the Cascade section.

Power-house: The building, 95 ft. by 75 ft., is of concrete and wood, and two three-phase 50-cycle A.C. generators, each of 400–500 kw., have been installed. These are driven by Bellis-Morcom sets of 450 h.p. Current is generated at 3,000 volts, and is stepped down at the sub-stations to 400 volts A.C., and for underground work will be used at 200 volts. A steel cubicle switchboard of nine panels is mounted on a concrete platform.

Output for Denniston mines, 127,091 tons.

Nelson District.

Puponga Mine.—The pillars in the rise section are nearing exhaustion. A little prospecting has lately been done about 3½ chains below the bottom level of the rise section. The bins were condemned as unsafe on the 26th March, and the men were engaged for a month in effecting repairs. Output, 3,376 tons.

North Cape Mine.—This mine is also relying solely on pillar-extraction. It is intended to work the east side on the longwall system later on. Prospecting has been done on the hillside to the rise of the present workings, and a borehole, it is claimed, proved 4 ft. of coal. Boring will shortly commence on an area near Puponga.

Stone's Mine, Central Takaka.—A small mine has been opened near the traffic-bridge on the West Takaka Road by Stone Bros. This mine is near the old workings of a former mine. A drive is now in 2½ chains. The coal is split up by a band of stone 20 in. thick. The top coal is 18 in. in thickness and the bottoms are 15 in.

Murchison Mines.—A small mine was open by O'Rourke Bros., almost opposite Murchison and across the Buller River. The seam is only 2½ ft. in thickness, and is steeply inclined, being about 60°. Another thin seam, also steeply inclined and farther down the Buller River, is being worked by Mr. R. Fairhall, from which he produced 48 tons of coal.

Picton.—A small shaft has been sunk 85 ft. near the west side of Shakespeare Bay and about 40 ft. from the water's edge. It was found impossible to sink farther owing to the inrush of water from the bay.

Coal-prospecting licenses have been granted over land near Glenhope, but so far nothing of commercial value has been found.

Explosives.

Miss-shots from defective "permitted" explosives and defective electric detonators were frequent during the first half of the year, but since the African and Australian-made "permitted" explosives have been used the number of miss-shots has decreased considerably. A complete stoppage of mining operations through lack of explosives was narrowly averted.

Prosecutions.

On the 18th March two mine-managers were fined for not using magneto-electric apparatus for firing shots, in contravention of Regulation 129 (*h*). On the 25th June two miners employed at the Millerton Mine were fined for not reporting to the Deputy the presence of inflammable gas in their working-place. On the 1st November the manager of Archer's Freehold Mine, Capleston, was fined for a breach of General Rule 2 (*f*); and on the same day the manager of Coghlan's Mine was fined for a breach of General Rule 42.

Dangerous Occurrences notified under Regulation 81.

Millerton Mine.—In the Millerton Mine ignitions of firedamp occurred in the old dip section on the 10th February, 22nd June, and 5th July, and an ignition occurred in the No. 2 dip section on the 1st June.

Ironbridge Mine.—On the 7th July an ignition of gas was reported in the No. 8 pillar section of the Ironbridge Mine.

Coalbrookdale Mine.—On the 27th July the underground fire in the Coalbrookdale Mine broke through a bord-end, which had not been quite holed through, in Wallace section. It was got under control by augmenting the number of brick stoppings around the area and strengthening those already erected.

Blackball Mine.—On Sunday, the 1st August, Deputy Veitch reported smoke issuing from a stopping at the bottom of the No. 11 incline off the main level. It was controlled by reinforcing the concrete stopping.

Ferndale-Timaru Mine.—The heating in the goaf has already been referred to in this report.

Serious Accidents, 1920.

Of fatal accidents there were none. The non-fatal serious accidents are as follows:—

Millerton Mine.—On the 2nd March a horse-driver named C. H. Reynolds sustained a fractured forearm. His horse met another in the layby. The horses became nervous, and Reynolds's horse jammed him against a set, breaking his arm.

Liverpool Mine.—On the 31st May a fan-attendant named T. Fisher went to start the fan motor outside the Morgan seam tunnel. After starting the fan he walked over to the delivery, carrying a lighted slush-lamp, and ignited firedamp which came from the fan delivery. He sustained burns on the head and arms.

Blackball Mine.—A miner named George Reynolds received a blow from a falling piece of stone, which fractured his thigh. He was working "tops," and the stone fell from the high side of the place about 18 ft. inby from the "lip."

There were 433 minor accidents recorded. Of these 121 occurred at the Millerton Mine, 87 at the Denniston Mine, 80 at the State mines, 65 at the Stockton Mine, 10 at the Brunner, and 31 at the smaller mines.

Southern Inspection District (Mr. E. R. Green, Inspector).

Mount Torlesse Collieries (Limited), Avoca.—Prospecting by driving had been conducted on the northern or left-hand bank of Broken River, following a seam of 2 ft. thickness continuing to dip westerly at a moderate angle. Subsequently ten bores drilled by Government rotary drill at intervals on the north and south banks of the river had, together with the up-stream outcrop, proved about 50 acres, containing seams of coal averaging in thickness from 9 ft. to not exceeding 240 ft. in depth. The water issuing from several of the bores was accompanied by slight emissions of inflammable gas. The coal-output was being derived from the Alum Creek section of the mine, situated on the south side of the river, where the low level had been driven a distance of 15 chains, the almost vertical seam (75°) averaging about 16 ft. in thickness. A shaft driven on the full rise of the seam had proved it to be 150 ft. vertical from the lower level to the surface, the thickness at No. 5 level being 21 ft. and at surface about 25 ft. Outcrops could be seen extending over a distance of 40 chains from the tunnel-mouth. Unfortunately some heating had occurred in the west seam first working, where the coal was crushed and friable, and the place had to be stopped off meanwhile.

The following is a report by the Dominion Analyst on a sample of coal from No. 4 borehole at depth 136 ft.: Fixed carbon, 36·95 per cent.; volatile hydrocarbons, 44·70 per cent.; water, 9·85 per cent.; ash, 8·50 per cent; sulphur, 4·1 per cent.

Sheffield Coal-mine, Sheffield.—The mine was opened on a 3 ft. seam; dip, 1 in 3. A steam traction-engine was used for hauling and pumping.

Homebush Colliery, Glentunnel.—This old and well-known coal-mine is approaching exhaustion, only remnants of outcrop and small seams left at first working being now available pending continuation of drilling operations, which, although unsuccessful in finding a payably workable seam of coal in the bores drilled, have not completely tested the area.

Bush Gully Coal-mine, Coalgate.—Only a little prospecting had been conducted throughout the year, but the mine has been regularly visited and reported on by the Homebush officials.

St. Helens Coal-mine, White Cliffs.—Dip from the surface driven 200 ft.; latter portion, in 5 ft. seam, dipping east 1 in 3. The drive had passed through some old workings, and a patch of coal left at first working was being recovered. North level in 1 chain. Return airway made to surface.

Steventon Coal-mine, White Cliffs.—Dip drive, 1 in 2, down 56 yards to face. Seam 4 ft. thickness, dipping easterly. North level broken away, and an uprise stenton was being driven to air-shaft, having 8 yards to go. The dip is well timbered, stop-block and trailer provided, manholes on dip side.

Clearwater Coal-mine, Glenroy.—A new mine. Cross-measures adit 210 ft. to face, and levels broken away in the 6 ft. seam on either side. Drive well timbered and ventilation good.

Tripp's Coal-mine, Mount Somers.—Recent mine-workings closed and abandoned, but the adjoining former workings, known as Wright's, had been reopened and output resumed.

Evandale Coal-mine, Mount Somers.—A small mine opened on the south bank of Ashburton River, near Cavendish Railway-station.

Albury Coal-mine, Albury.—A new opening has been made from the outcrop of a seam previously worked and which had been lost by falls and underground spontaneous fires. The seam is 12 ft. in thickness.

Allanholme Coal-mine, Waihao Forks.—Driven to dip, from which a pair of levels were being extended to the new air-shaft. The seam is strong, very little timber required.

Meadowbank Coal-mine, Waihao Forks.—Driving on level course of stream. The new air-shaft being sunk was almost through to the workings.

Wharekuri Coal-mine, Wharekuri.—Reopening on the vertical seam formerly worked and closed down during 1913. Driven through sandstone to the seam, and connection for air was being made to an old level above. Warned Shanks as to possibility of meeting old workings, which would be full of blackdamp.

Borton's Coal-mine, Borton's.—A new mine opened on outcrop of a lignite-seam. The driving and timbering work was being creditably done by the returned "Digger" lessees.

St Andrew's Coal-mine, Papakaio.—Putting in a drive in the vicinity of the old mine, which had been worked out and abandoned last year.

Prince Alfred Coal-mine, Papakaio.—Extraction of pillars from dip workings continued safely. The temperature at the warm stopping continued at about 60°, depending upon atmospheric pressure; when this was low a slight leakage of damp was observed.

Ngapara Coal-mine, Ngapara.—The seam is strong, and carefully worked as hitherto.

Shag Point (Old) Mine, Shag Point.—7½ chains driven, also air-shaft sunk 80 ft., all in rock—a hard sandstone. Coal-seam 3 ft., split by a 6 in. band of stone; also working on a 20 in. seam through the fault.

Shag Point Coal Company's Coal-mine, Shag Point.—Ventilation at the intake, according to mine-register, 17,500 cubic feet per minute for fifty men and one horse. Mine throughout is in good working-order and condition. All pillar and working places, with one exception, systematically timbered.

Kyeburn Diggings Coal-mine, Kyeburn.—A small opencast pit worked for local supplies.

McPherson's Coal-mine, Coal Creek Flat.—Opencast pit in good working-order. The fire from the old workings is well kept down by water under pressure.

Alexandra Coal-mine, Alexandra.—Considerable trouble was being caused by the heaving floor at the fault on the dip main haulage-way. The small quantity of water from below caused the soft clay floor to swell, with consequent contraction of the roadway at the place. Pillar-extraction conducted safely.

Cambrian Coal-mine, Cambrian.—Suspended work during the year, stripping having become too heavy for the small water-supply available.

Morgan Bros., Cambrian.—The small block of coal, 171 tons, exposed while mining for gold had become exhausted during the year.

Laudervale Coal-mine, Cambrian.—Opencast workings suspended, and now driving to dip in semi-vertical seam. Drive down 60 ft., being 6 ft. by 6 ft. in the clear. A crosscut was driven northwards until the roof was penetrated; a level was then driven and connected with the dip drive. The thickness of the seam is not yet determined, but 14 ft. and upwards was known to exist.

Armitage's Coal-mine, Blackstone Hill.—A small private opencast pit.

Dillon's Coal-mine, Blackstone Hill.—A small private opencast pit.

Lowis's Coal-mine, Blackstone Hill.—A small private opencast pit.

St. Bathan's Coal-mine, St. Bathan's.—An opencast pit. Some stripping was being done, but, as previously reported, underground mining would be more profitable.

Rough Ridge Coal-mine, Oturehua.—The seam is almost worked out to water-level, below which steps had not been taken for production of lignite.

Idaburn Coal-mine, Oturehua.—The lessee is to be commended on the manner in which he had progressed with the opening of the pit.

Oturehua Coal-mine, Oturehua.—Opencast pit. Stripping well conducted. The seam to water-level is 12 ft. thickness.

Gimmerburn Coal-mine, Gimmerburn.—Small private opencast pit.

Cromwell Coal-mine, Cromwell.—The dip drive has been extended 132 ft., and three new levels have been driven northward. The seam is rather improved in quality and thickness, being now 7 ft.

Shepherd's Creek Coal-mine, Bannockburn.—Withdrawing pillars in dip section. Sand runs had broken in from the roof in several places, which had become completely filled. Ventilation is good, but air-brattices required attention.

Cardrona Coal-mine, Cardrona.—Water for sluicing had been frozen during the past fortnight, and in consequence the slip ground had not been all cleared away from the 5 ft. coal-seam, said to be only 5 ft. below the tailings. A tail-race at the lower level had been taken up at the cost of three months' labour, as stated. When water is laid on it is anticipated that the seam of coal will be found improved through the neck of the saddle.

Gibbston Coal-mine, Gibbston.—Pillars had been withdrawn to rise of the water-free low level, and it will soon be necessary to drive to dip to continue output from this mountain mine. Some prospecting by boring had been conducted, without result so far.

Nevis Coal-mine, Nevis (E. J. Williams).—License, three years from the 5th February, 1919. During the first half of the year no work was done, and during the third quarter I was not advised, only 12 tons being taken out. Coal is mined for the owner's requirements solely.

Nevis Crossing Coal-mine, Nevis.—An adit 6 ft. wide by 6 ft. high had been driven 100 ft. in a large seam of soft brown coal on the east bank of Nevis River near Coal Creek. The entrance to the drive was securely timbered.

Lower Nevis Coal-mine, Nevis.—A soft seam in the river-bed had been worked to water-level for use on the gold-mining dredge during the early part of the year.

Fernhill Coal-mine, Abbotsford.—The old mine which had stood for so many years had been stopped and blocked off. Spontaneous heating from the waste had caused the withdrawal of workmen from the workings, which, with the exception of pillars left under the Silverstream water-race, were practically exhausted.

Freeman's Coal-mine, Abbotsford.—Extraction of pillar and head coal from first working was being continued safely. Furnace ventilation was good.

Green Island Coal-mine, Green Island.—Very little coal is now obtained, the place being practically worked out.

Jubilee Coal-mine, Saddle Hill.—The small current of air travelling was insufficient to satisfactorily clear the powder-smoke from the working-places. I subsequently wrote to the agent respecting erection of the ventilating-fan to replace the furnace in use; I received a reply that the fan would be erected immediately.

Saddle Hill No. 1 Coal-mine, Saddle Hill.—The usual withdrawal of pillar and head coal from the old dip workings is being carried on safely. Arrangement with adjoining owners had resulted in the crossing of the boundary, and some coal was being obtained from the freehold of Harris and others, where working had been suspended some years ago.

Saddle Hill No. 2 Coal-mine, Saddle Hill.—Pillar and head coal extraction is conducted with safety, and the ventilation is good.

East Taieri Coal-mine, East Taieri.—Driving to the dip and opening levels from either side. New airshaft was required, also laddering, which was subsequently provided. Timber used sufficiently in working-places.

Brighton Coal-mine, Brighton.—Work was recently resumed at this mine after standing idle some considerable time.

Waronui Coal-mine, Milton.—Drawing remainder of pillars left at first working. This mine-opening may not be expected to continue production much longer, being worked back towards the outcrop. The ambulance outfit was inadequate; the manager subsequently advised me that the omissions had been made good.

McGilp's Coal-mine, Milton.—Narrow places driven in solid, and pillars subsequently extracted. Continuity of seam apparently interrupted by faulting, beyond which the seam did not appear to last.

Tres Bon Coal-mine, Milton.—A small mine reopened on the site of the old Real Mackay Mine on Coal Reserve. The output is delivered over half a mile of by-road to a siding on Waronui branch line.

Crichton Coal-mine, Crichton.—The output for sale began during September last. A steam hauling plant has been erected near the loading-bank, from which an inclined tramway had been laid to the mine. The coal-seam practically outcropped to surface, and is said to be not less than 18 ft. in thickness. The level was driven narrow, and a place was being put up to daylight for air. Coal would be carted from the loading-bank to Crichton Railway-siding, distant 92 chains.

Dunlop's Coal-mine, Lovell's Flat.—Driving for development.

New Burnwell Coal-mine, Lovell's Flat.—After a short period of production the mine was closed for the time being.

Lakeside Coal-mine, Kaitangata.—Further prospecting had resulted in the finding of what was expected to be a workable coal-seam near the Taratu to Lovell's Flat branch railway-line.

Taratu Coal-mine, Lovell's Flat.—The air-supply to the dip workings had been considerably improved by more direct ventilation conducted to bottom of dip and split, having separate currents on either side around working-faces. A spontaneous fire subsequently broke out in the old workings at the surface section known as Barclay's, which had been overcome by falls of ground, water not being available on the higher levels.

Kaituna Coal-mine, Kaitangata.—Extracting pillars in rise workings. The roof is tender, props being set close to working-faces. A new dip is being driven to the 10 ft. coal-seam.

Wangaloa Coal-mine (T. Gage).—The drive is in a few yards from the outcrop in the gully where the seam is exposed 10 ft. in thickness. A short tram-line and building loading-bank for cart traffic is being constructed.

Kaidale Coal-mine, Wangaloa.—Driving to dip and levels are broken off at regular intervals. Timber is used; ventilation good.

Kaibrook Coal-mine, Wangaloa.—Dip drive and a pair of levels on either side were in a short distance.

Williamson's Coal-mine, Wangaloa.—Two prospecting-drives had been put in apparently without success, as some of the timber had been drawn and the drives were fallen. The place showed evidence of abandonment.

Roseneath Coal-mine, Wangaloa.—Two men at work on the 20 ft. seam outcropping on sea-beach. The surface has been stripped and the output was hauled by steam-engine from the beach to the loading-bank for road transport to Kaitangata Railway-station.

Caird Bros.—Two men engaged putting in a prospecting-drive from the opencast where the seam is found outcropping "in" the gully, but apparently disturbed by faults.

Summerhill Mine (J. Brennan).—A prospecting-drive on the hillside, where a 6 ft. seam of coal was found dipping 1 in 3. Being on the cutcrop the coal is somewhat crushed, but was becoming harder at the face.

Longridge Coal-mine, Kaitangata.—Surface seam worked out. The mine is now abandoned and the plant removed.

Forsyth Coal-mine, Forsyth.—A small mine opened during the year and subsequently abandoned as unpayable, the seam being small and crushed.

Kaitangata No. 1 Mine, Kaitangata.—Ventilation at intake (mine-mouth) 31,200 cubic feet per minute, with seventy men and eight horses below. The new stone dip for a return airway in the 18 ft. seam was down to the coal, and through ventilation was provided to the upcast air-shaft. The course of the air was practically as direct as it was possible to be. The 18 ft. seam was being developed between parallel faults about 600 ft. apart from dip to rise, all places being driven narrow at first working. No. 6 dip and Mundy's dip extension workings were in as good order as could be expected with the superincumbent pressure on the timbers causing "creep" and much disturbance of floor and sides of roadways. Travelling-ways and second outlet, the latter being the upcast air-shaft, were in good working-condition. A little gas was coming from the fault to the rise in the 18 ft. seam, and small quantities of gas were reported as occurring occasionally at the fringe of the waste in Mundy's section, but seldom such as to interrupt work. An ignition of firedamp occurred on the 3rd August, 1920, at a spontaneous fire in the back airway off McGhie's level. No damage was done, and the fire was immediately suppressed with water, an ample supply of which was laid on throughout the mine.

Kaitangata No. 2 Mine, Kaitangata.—Old No. 1 dip section finished and stopped off permanently. On the 6 ft. seam work mainly consisted of withdrawal of pillars left at first working, and as places were driven narrow very little coal was being lost or left behind. Owing to heaving floor, roadways are low in places; timber plentifully supplied and used. 18 ft. seam: withdrawing pillars and driving to dip for extraction of available coal. Main seam driven to dip, and developing southward in narrow work. Owing to tender roof each place was box-bratticed for ventilation, and the smoke from shot-firing disappeared rapidly. Each place was well timbered and ventilation adequate.

Castle Hill Mine, Kaitangata.—New main seam; two places being advanced for development where small quantities of fire-damp were reported as occurring on two occasions. When the stenton was put through the gas disappeared. Ventilation, 17,750 cubic feet of air per minute.

Benhar Coal-mine, Benhar.—A new opening was being made on the western side of Main South Railway at a dip in 1 in 3.

Mount Wallace Mine, Stirling.—Mine-working suspended and abandoned. Plant mostly dismantled and removed to the new Lakeside Mine by Mr. Stevenson.

Otikerama Coal-mine, Otikerama.—A drive was being put in to the opencast face previously worked.

Reinke's Coal-mine, East Gore.—A new mine recently opened.

McLean's Coal-mine, East Gore.—A new mine recently opened.

Whiterigg Coal-mine, East Gore.—The mine formerly worked had been abandoned, and a new dip drive was opened on the northern part of the property.

Green's Coal-mine, Gore.—My inspection being nea the close of the working-day, there was plenty of powder-smoke in the working-places, but by the aid of the small ventilating-fan, a fair current of air was travelling through the workings.

Riverview Coal-mine, Gore.—A small private opencast mine.

Burnwell Coal-mine, North Chatton.—Working suspended and mine closed.

Ramsay's Coal-mine, North Chatton.—Pillars had been robbed, and the underground mine-workings closed by falls of ground. Opening out afresh from the opencast working-place.

Glenlee Coal-mine, Waikaka.—Underground mining conducted safely.

Pyramid Coal-mine, Riversdale.—Seam to dip split by a band of stone. A drive into the terrace opposite was proposed, where a seam 10 ft. in thickness was said to have been discovered by boring.

Terrace Coal-mine, Riversdale.—The new air-shaft had been completed. The seam is strong and the roof is safe.

Rossvale Coal-mine, Waikaia.—Some heating was coming from a fallen place at the head of the dip, which the manager promised would be substantially stopped off.

Argyle Coal-mine, Waikaia.—An opencast working; stripping sluiced away by water.

Waikaia Oil-shale Development Company, Waikaia.—Work on this property had been suspended throughout the year, but negotiations were stated to be in progress for the development of the oil-shale seam known to occur on the area.

Princhester Creek Coal-mine, The Key.—An opencast pit, worked for local supplies.

Mataura Collieries, Mataura.—The new ventilating-fan was being installed.

Mataura Lignite-mine, Mataura.—A fan having been installed the ventilation is improved.

Heatherlea Coal-mine, Mataura.—A small opencast mine, worked for local supply.

Torrie's Coal-mine, Mataura.—A small opencast mine, worked for local supply.

Ota Creek Coal-mine, Wyndham.—An opencast working, used for district requirements.

Clarke's Coal-mine, Wyndham.—An opencast working, for supplies used locally.

Nightcaps No. 1 Coal-mine, Nightcaps.—A small dip drive was being put down opposite the power plant, and some opencast working at the top end of the paddock is all there is left of the old mine-workings.

Lloyd's Dip.—On the left-hand side of the dip pillar the coal is mainly extracted, and preparations are being made to win the coal barrier, 30 chains by 4 chains, left at the first working between the old maritime and recent dip workings.

Nightcaps No. 2 Coal-mine, Nightcaps.—Eight men working in the opencast, and two miners with roadmen below ground.

Knight's Section.—A pair of men driving in thin seam with the object of proving continuity of seam to dip.

Black Diamond Coal-mine, Nightcaps.—Mine not at work on date of visit. Fan ventilation.

Coaldale Coal-mine, Nightcaps.—New dip driven 400 ft., 1 in 4, but a wet back had been struck, and the pump with steam boiler was to be duplicated.

Stirling Coal-mine, Nightcaps (Lyons and Currie).—Erecting a loading-stage on siding off Ohai Railway. Expected to be ready for output from opencast working at early date.

New Brighton Coal-mine, Wairio.—The mine was not working at the date of my visit. A new 49-in.-diameter sirocco ventilating-fan has been installed.

Wairio Coal-mine, Wairio.—Four miners underground and four in opencast, where coal almost exhausted. The 5 ft. seam was being developed to south of old workings.

W. Smith's Lease (57 acres).—Two men driving in resin-seam for prospecting purposes.

Willow Coal-mine (now Ohai Coal-mine), Nightcaps.—An opencast pit preparing for output to Wairio Railway Extension terminus.

Wairaki Coal-mine, Nightcaps.—Only two workmen engaged prospecting underground. Safety-lamps only in use, but gas had not been reported since January last. The ventilation was good. No. 2 Mine: Driving in solid and pillaring. The coal roof is strong. Ventilation good. Erecting additional steam boiler for pumping-power and drive for new ventilating-fan now being completed.

Mossbank Coal-mine, Nightcaps.—Workings to rise were all face-jigs. The level face was standing on a downthrow fault which was being proven. Ventilating-fan, 6 ft. diameter, and 6 h.p. oil-engine on the ground ready for erection.

J. T. Hungerford, Nightcaps.—Prospecting by boring and surface operations.

Linton Coal-mine, Nightcaps.—Two seams are being worked from separate adits, and the coal produced is conveyed 100 chains by surface tram-line to Wairio Branch Railway terminus. Ventilating-fan being constructed was expected to arrive at the mine before the end of the year.

Birchwood Coal-mine (Ross Bros. and Reed).—An opencast working recently opened on private land.

Diamond Lignite-mine, Seaward Bush.—An opencast working continued for sale of local requirements.

Orepuki Coal-mine, Orepuki.—The new tram-line of half a mile in length is being constructed to Waimeamea Railway-siding. The dip drive was stopped on a fault and had not been extended, but levels were being driven south for prospecting the field.

Linwood Coal-mine, Te Anau.—A small opencast pit worked for the requirements of the Tourist Department's steamer on Lake Te Anau.

Dangerous Occurrences notified under Regulation 81.

Mount Torlesse Colliery, Avoca.—8th June, 1920: Outbreak of fire in No. 2 west workings, which were sealed off in the meantime as reported by me to Chief Inspector, 21st June, 1920.

Kaitangata No. 1 Mine, Kaitangata.—3rd August, 1920: Ignition of firedamp at a spontaneous fire which had arisen in the back airway at the corner of old No. 4 dip, McGhie's level. Fire immediately overcome and no damage done. Reported by me to Chief Inspector, 9th August, 1920.

Waronui Mine, Milton.—11th October, 1920: Outbreak of fire and smoke from old workings; men withdrawn for one day while fire being stopped off. Reported by me to Chief Inspector, 18th October, 1920.

Kaitangata No. 1 Mine, Kaitangata.—14th October, 1920: Workmen in Mundy's dip section withdrawn owing to 2½ per cent. of firedamp in the air coming from waste workings. Place reported clear on 15th, and work resumed. Reported by me to Chief Inspector, 18th October, 1920.

Taratu Colliery, Taratu.—25th November, 1920: Outbreak of fire in the surface-seam workings, where a fire had been previously stopped off, but a shot fired at "knock-off" had evidently opened a vent emitting smoke. The fire was eventually smothered by falls of surface clay. Reported by me to Chief Inspector, 29th November, 1920.

Kaitangata No. 1 Mine, Kaitangata.—26th November, 1920: Owing to smoke from a stopping in No. 7 dip the workmen in that section were withdrawn from their places. The smoke was stopped and the places cleared in about an hour. Reported by me to Chief Inspector, 29th November, 1920.

Fatal Accidents.

Dunlop's Mine, Otago.—21st August, 1920: John Archibald, forty, miner. While squaring the coal-side for erection of a set of timber a fall of coal came away from a smooth parting in low roof, and a block of coal weighing about 3 cwt. crushed him to the floor, causing fracture of left leg and severe bruising of back, face, and head, resulting fatally on the 14th September, 1920.

Serious Non-fatal Accidents.

Mataura Colliery, Mataura.—22nd January, 1920: Duncan Ballock, miner—severely bruised shoulder. While firing a group of shots one exploded. Fifty-eight days off work.

Shag Point Mine, Shag Point, Otago.—26th April, 1920: John Atkinson, fifty-six, underviewer—injury to ribs (right side), right-kidney area, and left shoulder. Struck by runaway empty box while repairing signal wire on self-acting haulage incline. Off work 187 days.

Nightcaps Mine, Nightcaps.—24th May, 1920: Percy Braithwaite, twenty-three, miner—severe cut of eyeball by a piece of coal flying from pick-point, necessitating removal of right eye. Thirty-five days off work.

Mount Torlesse Mine, Avoca.—14th May, 1920: William Davis, forty-two, miner—unhealed ulcerating wound of right lower leg, said to have been caused while trucking, when he slipped on flatsheet and struck leg against the truck. Off work 201 days.

McGilp's Mine, Milton, Otago.—23rd July, 1920: James Scott, thirty-seven, miner—sprain and bruising of back and fracture of left ankle. Was taking a 3 ft. strip off the side when a fall of coal came from greasy parting in low roof between timber and side of place. Off work 136 days, and still off at 31st December, 1920.

Mount Torlesse Mine, Avoca.—24th July, 1920: George Littlewood, forty-two, underviewer—fracture of lower right leg. Was making alteration to short jig when empty truck landed suddenly, striking Littlewood on the leg. Off work 141 days.

Benhar Mine, Benhar, Otago.—6th August, 1920: James Walls, forty-five, deputy—burns of right hand, forearm, side of neck, and head. While reaching a pellet from powder-tin a spark fell from naked light upon the powder in tin, which instantly exploded. Sixty-two days off work.

Kaitangata No. 1 Mine, Kaitangata.—16th August, 1920: John W. Fenton, thirty-eight, miner—fracture of left fibula. Struck by piece of coal which fell from side of working-place. Sixty-nine days off work.

Waronui Mine, Milton.—30th October, 1920: Robert Robertson, fifty-three, miner—fractured right leg. Struck by lump of coal, which rolled over on the dross and caught leg against a prop. Still off work.

Kaitangata Mines (Pit-head).—10th December, 1920: Hamilton Jarvie, nineteen, box-runner, sustained fracture of left forearm, being jammed between two full boxes of coal. Forty days off work—resumed work on 27th January, 1921.

Mount Torlesse Mine, Avoca.—12th November, 1920: James Blaney, twenty-nine, miner—injured left eye. Struck by piece of steel which broke off pick-point while working at the face. Still off work.

ANNEXURE B.

COLLIERY STATISTICS, 1920.

Name of Colliery and Locality.	Name of Manager.	Number of Years worked.	Quality of Coal.	Number of Seams worked.	Thickness of Seams.	Thickness worked.	System of Underground working.	Number of Shafts.	Output for 1920.	Total Output to 31st December, 1919.	Total Output to 31st December, 1920.	Number of Men ordinarily employed.			Means of Ventilation.
												Above.	Below.	Total.	
NORTHERN INSPECTION DISTRICT.															
North Auckland.									Tons.	Tons.	Tons.				
Hikurangi, Hikurangi	A. H. Taylor	28	Semi-bituminous	1	6′ to 12′	6′ to 10′	Bord and pillar	4	68,098	1,243,128	1,311,226	40	69	109	Fan.
Northern Tauranga, Hikurangi	John Jones	2	Ditto	1	4′	4′	Ditto	2	4,162	614,412	618,574	1	2	3	Natural.
Northern Kiripaka	C. Westfield	6	,,	1	5′ to 11′	5 to 11′	,,	3	21,731	383,441	405,172	16	28	44	Fan and exhaust.
Kerr and Co., Hikurangi	F. Kells	½	,,	1	6′ to 8′	6′ to 8′	,,	1	542	..	542	1	7	8	Natural.
Silverdale (Foot and Doel), Hikurangi	J. Hamilton	2	,,	1	4′ 6″ to 5′	4′ 6″ to 5′	,,	2	3,719	1,025	4,744	1	6	7	,,
Northern Co-operative, Hikurangi	E. A. Cunningham	2	,,	1	5′	5′	,,	2	2,025	22,765	24,790	4	4	8	,,
Kerr and Wyatt, Hikurangi	W. Reed	5	,,	1	3′ to 5′	3′ to 5′	,,	2	2,220	19,374	21,594	1	4	5	,,
Rayburn (Christie's), Hikurangi	W. Tunstill	½	,,	1	4′ to 5′	4′ to 5′	,,	2	304	..	304	1	5	6	,,
Waikato (including Mokau).															
Taupiri Extended, Huntly	W. Wood	32	Brown	2	10′ to 34′	20′	Bord and pillar	2	139,386	2,557,757	2,697,143	67	264	331	Fan.
Taupiri Rotowaro, Rotowaro	A. Penman	3	,,	1	6′ to 15′	12′	Ditto	..	81,188	107,264	188,452	33	104	137	,,
Pukemiro, Pukemiro	A. Burt	5	,,	1	16′ to 18′	12′	,,	..	90,140	385,685	475,825	56	131	187	,,
Waikato Extended, Huntly	W. C. Davies	4½	,,	1	16′	12′	,,	..	8,749	5,936	14,685	6	13	19	Natural.
Waipa, Glenmassey	Thomas Thompson	7	,,	1	10′	8′	,,	..	59,696	442,952	502,648	32	74	106	Fan.
Hunua, Hunua	W. Wallace	2	,,	1	5′	5′	,,	..	878	481	1,359	3	2	5	Natural.
Greencastle, Aria	A. Morgan (P.)	4	,,	1	12′	9′	,,	..	454	630	1,084	1	2	3	,,
United, Pukemiro	R. McEwan	½	,,	1	15′	8′	,,	..	70	..	70	6	2	8	,,
Huntly Coal and Brick, Huntly	C. Greenwall	8½	,,	1	10′	Open cut	Open cut	..	130	23,367	23,497	4	..	4	..
Output of collieries included in previous statements at which operations are abandoned or suspended							..	..	..	3,796,969	3,796,969	..	..	..	..
WEST COAST INSPECTION DISTRICT.															
Nelson.															
Puponga	P. Lewis (P.)	17	Bituminous	1	5′ 6″	Full height	Bord and pillar	..	3,376	219,718	223,094	3	5	8	Natural.
North Cape	J. Walker	10	,,	1	2′ 6″ to 4′ 6″	,,	Ditto	..	11,207	76,423	87,630	16	21	37	Mechanical.
O'Rourke's, Murchison	J. Burgess (P.)	1	,,	1	2′	,,	,,	..	83	..	83	..	1	1	Natural.
Fairhall's, Murchison	R. Fairhall (P.)	1	,,	2	2′ 4″	,,	,,	..	48	..	48	..	1	1	,,
Gladstone, Motupipi	W. H. Oliver (P.)	1	Brown	1	3′	,,	Open cut	..	150	..	150	2	..	2	,,
Stone's, Takaka	W. Stone (P.)	1	,,	2	22′ and 18′	,,	Bord and pillar	..	480	..	480	..	..	..	,,

COLLIERY STATISTICS, 1920—*continued.*

Name of Colliery and Locality.	Name of Manager.	Number of Years worked.	Quality of Coal.	Number of Seams worked.	Thickness of Seams.	Thickness worked.	System of Underground working.	Number of Shafts.	Output for 1920.	Total Output to 31st December, 1919.	Total Output to 31st December, 1920.	Number of Men ordinarily employed.			Means of Ventilation.
												Above.	Below.	Total.	
WEST COAST INSPECTION DISTRICT—*continued.*															
									Tons.	Tons.	Tons.				
Buller.															
Co-operative	D. Q. O'Brien (P.)	6	Bituminous	1	10′	8′	Bord and pillar	..	2,866	10,904	13,770	3	5	8	Natural.
Coal Creek	H. Barlow	5	,,	1	6′	Full height	Ditto	..	11,109	16,601	27,710	3	15	18	,,
Chester's	H. Chester (P.)	1	,,	2	6′	,,	,,	..	399	..	399	..	2	2	,,
St. Helens	T. L. Bennett (P.)	2	,,	1	6′ to 7′	,,	,,	..	3,501	691	4,192	2	7	9	,,
Westport-Stockton	J. Fletcher	12	,,	2	4′ to 25′	,,	,,	1	131,265	1,486,737	1,618,002	84	164	248	Mechanical.
Millerton	T. King	29	,,	1	5′ to 14′	,,	,,	2	212,212	5,710,151	5,922,363	81	249	330	,,
,,	William Pearson	29	,,	..	..	..	,,	..							
Ironbridge	G. Smith	29	,,	1	3 to 30″	Full height	,,	..	127,091	7,928,984	8,056,075	40	109	149	,,
Coalbrookdale	W. Hewitson	40	,,	1	4′ to 20′	,,	,,	..				48	105	153	,,
Rocklands	J. P. Burley (P.)	18	Brown	1	27′	8′	,,	..	103	7,304	7,407	..	2	2	Natural.
Inangahua.															
Coghlan's	J. Coghlan (P.)	24	Semi-bituminous	1	12′	8′	Bord and pillar	..	1,691	8,642	10,333	1	2	3	Natural.
Archer's	F. W. Archer (P.)	25	Ditto	1	9′ to 24′	8′ to 10′	Ditto	..	4,399	23,416	27,815	1	4	5	,,
Reefton Coal Company's	J. Armstrong	19	,,	2	5′ to 12′	5′ to 8′	,,	..	13,006	46,285	59,291	10	35	45	,,
Ferndale, Timaru	William Lowden	19	,,	2	5′ to 20′	5′ to 10′	Bord and pillar and opencast	..	9,391	6,734	16,125	20	28	48	,,
Phœnix and Venus	W. Julyan (P.)	39	,,	1	25′ to 80′	8′	Bord and pillar	..	2,082	43,926	46,008	2	3	5	,,
Loughnan's	H. Griggs (P.)	34	,,	1	4′	Full height	Ditto	..	906	17,778	18,684	2	3	5	,,
Big River	W. Kirwan (P.)	7	,,	1	2′ to 12′	,,	,,	..	702	4,975	5,677	..	2	2	,,
Morris and Learmont's	J. Baxendale	7	,,	1	20′	8′	Bord and pillar and opencast	..	13,131	1,908	15,039	2	16	18	,,
Victory (Murray Creek)	P. H. Wood (P.)	2	,,	1	5′ to 12′	5′ to 10′	Bord and pillar	..	2,170	471	2,641	..	4	4	,,
Golden Point	J. Frame	7	,,	2	10′	7′	Ditto	..	8,329	2,505	10,834	1	13	14	,,
Birchwood Coal Company's	G. Lishman (P.)	1	,,	1	3½′	Full height	,,	..	645	..	645	1	6	7	,,
Grey.															
Paparoa	H. Talbot	12	Bituminous	1	5′ to 25′	Full height	Bord and pillar	..	1,636	321,484	323,120	20	40	60	Mechanical.
Blackball	G. Davidson	30	,,	2	17′	15′	Ditto	..	101,429	2,803,655	2,905,084	58	230	288	,,
North Brunner	J. Armstrong	11	,,	1	4′ 9″	Full height	,,	..	2,179	122,816	124,995	14	9	23	,,
Brunner	R. Alison	56	,,	1	4′ to 12′	,,	,,	..	8,500	2,434,467	2,442,967	6	9	15	,,
Point Elizabeth	W. Parsonage	16½	,,	..	4′ to 12′	,,	,,	..	4,902	2,396,708	2,401,610	19	24	43	,,
Liverpool No. 1	O. J. Davis	8	,,	..	3′ 6″ to 16′	,,	,,	..	142,519	707,194	849,713	57	161	218	,,
Liverpool No. 3	C. Strongman	8	,,	..	4′ to 12′	,,	,,	..				23	100	123	,,
Output of collieries included in previous statements at which operations have been abandoned or suspended								..	..	2,164,191	2,164,191				

SOUTHERN INSPECTION DISTRICT.

Canterbury.															
Mount Torlesse, Avoca ..	W. Leitch ..	3	Brown ..	1	15′	8′	Bord and pillar ..		16,027	18,955	34,982	14	44	58	Fan.
Homebush, Glentunnel ..	D. Kane	47	,, ..	1	3′	All	Ditto ..	1	9,010	321,207	330,217	4	19	23	Natural.
St. Helens, Whitecliffs ..	J. Sutherland ..	39	,, ..	1	6′	5′	,, ..	1	1,115	28,658	29,773	1	4	5	,,
Steventon, Whitecliffs ..	J. C. Campbell (P.)	..	..	1	3′ 9″	3′ 9″	,, ..	..	144	..	144	1	2	3	,,
Clearview, Glenroy	Smith and Marsh ..	..	..	..	..	..	..	..	64	..	64	..	..	..	..
Tripp's, Mount Somers ..	Thomas Harris ..	54	Brown ..	1	40′	15′	Bord and pillar	1	882	72,986	73,868	1	3	4	Natural.
Evandale, Mount Somers ..	A Harris ..	..	..	..	..	..	..	..	18	..	18	..	..	..	..
Albury, Albury	T. F. Slowey ..	29	Brown ..	1	16′	10′	Bord and pillar	1	1,545	19,979	21,524	1	4	5	Natural.
Allanholme, Waihao Forks ..	J. Campbell ..	5	,, ..	1	15′	7′	Ditto		2,307	5,200	7,507	1	3	4	,,
Meadowbank, Waihao Forks ..	A. E. Kirk ..	3	,, ..	1	10′	7′	,, ...		1,345	294	1,639	1	2	3	,,
North Otago.															
Wharekuri	A. Shanks ..	..	..	..	..	..	..	..	28	2,585	2,613	..	..	..	..
St. Andrew's, Papakaio ..	William Kyle (P.) ..	42	Brown ..	1	7′	6	Bord and pillar	1	1,321	58,550	59,871	..	4	4	Natural.
Prince Alfred, Papakaio ..	A. Beardsmore (P.)	51	,, ..	1	9′	7′	Ditto ..	1	1,119	65,178	66,297	1	2	3	,,
Ngapara, Ngapara	William Nimmo (P.)	42	,, ..	1	25′	8′	,, ..	1	1,297	33,375	34,672	1	3	4	,,
Shag Point (old mine), Shag Point	William Hunt (P.)..	6	,, ..	1	4′	4′	,, ..	1	116	412,273	412,389	1	1	2	,,
Shag Point Coal-mining Company, Shag Point	Job Hughes ..	12	,, ..	1	5′	5′	,, ..	1	27,456	62,395	89,851	11	54	65	Fan.
Central Otago															
Larsen and Brown, Kyeburn ..	Larsen and Brown	3	Lignite ..	1	2′	2	Open		23	26	49	..	..	..	Natural.
Kyeburn Diggings, Kyeburn Diggings	J. T. Weatherall ..	..	..	..	..	..	..	..	40	..	40	1	..	1	..
McPherson's, Coal Creek Flat ..	J. Weatherall (P.)	50	Lignite ..	1	60′	20′	Open ..	1	2,536	74,846	77,382	4	..	4	Natural.
Alexandra, Alexandra ..	D. Mathias (P.) ..	39	,, ..	1	11′	7′	Bord and pillar	1	2,441	100,648	103,089	1	5	6	Exhaust steam.
Cambrian, Cambrian	D. Jones.. ..	59	,, ..	1	30′	All	Open		..	49,499	49,499	..	..	..	..
Morgan Bros., Cambrian ..	J. Morgan ..	2	,, ..	1	..	..	,, ...		171	190	361	1	..	1	..
Laudervale, Cambrian ..	S. Clarkson ..	16	,, ..	1	12′	All	,, ...		612	1,612	2,224	3	4	7	..
St. Bathan's, St. Bathan's ..	J. Enright ..	23	,, ..	1	20′	20′	,, ...		167	6,428	6,595	1	..	1	..
Rough Ridge, Oturehua ..	J. T. Beck (P.) ..	34	,, ..	1	20′	20′	,, ...		1,869	33,296	35,165	4	..	4	..
Idaburn, Oturehua	R. K. Deaker (P.) ..	50	,, ..	1	20′	20′	,, ...		370	47,807	48,177	2	..	2	..
Oturehua, Oturehua	Becker Bros. ..	26	,, ..	1	7′	All	,, ...		152	3,187	3,339	1	..	1	..
Gimmerburn, Gimmerburn ..	C. Dougherty ..	64	,, ..	1	12′	12′	,, ...		24	3,265	3,289	..	..	..	..
Cromwell, Cromwell	R. B. Cowan (P.) ..	6	,, ..	1	7′	6′	Bord and pillar ..		1,308	5,773	7,081	1	4	5	Exhaust steam
Shepherd's Creek, Bannockburn	J. Hodson, jun. (P.)	43	,, ..	1	12′	6′	Ditto		3,495	97,632	101,127	1	6	7	,,
Cardrona, Cardrona	R. McDougall (P.)..	36	,, ..	1	10′	10′	Open		91	26,235	26,326	3	..	3	..
Gibbston, Gibbston	J. Cowan (P.) ..	34	,, ..	1	15′	10′	Bord and pillar ..		1,537	26,311	27,848	2	2	4	Natural.
Nevis, Nevis..	E. J. Williams ..	20	,, ..	1	20′	20′	Levels		28	7,071	7,099	1	..	1	,,
Nevis Crossing, Nevis ..	R. Ritchie (P.) ..	17	,, ..	1	16′	16′	Open		491	14,312	14,803	2	..	2	..
Upper Nevis, Nevis	Charles Scott ..	..	..	..	..	..	..	..	300	..	300	..	..	..	..
Forsyth, Forsyth	J. Hodson ..	..	..	..	..	..	..	..	156	..	156	2	1	3	..
Dillon's, Blackstone Hill ..	J. Dillon ..	23	Lignite ..	1	12′	12′	Open		6	297	303	..	..	..	..
Lowis's, Blackstone Hill ..	T. A. Lowis ..	..	,, ..	..	..	..	..	..	16	..	16	..	..	..	..
Creighton's	J. Creighton ..	..	..	..	..	..	..	..	2	..	2	..	..	..	..

COLLIERY STATISTICS, 1920—*continued.*

Name of Mine and Locality.	Name of Manager.	Number of Years worked.	Quality of Coal.	Number of Seams worked.	Thickness of Seams.	Thickness worked.	System of Underground working.	Number of Shafts.	Output for 1920.	Total Output to 31st December, 1919.	Total Output to 31st December, 1920.	Number of Men ordinarily employed.			Means of Ventilation.
												Above.	Below.	Total.	
SOUTHERN INSPECTION DISTRICT—*continued.*															
									Tons.	Tons.	Tons.				
South Otago.															
Fernhill, Abbotsford	G. F. Turner	43	Lignite	1	11′	8′	Bord and pillar	1	5,978	167,187	173,165	1	6	7	Natural.
Freeman's, Abbotsford	W. Evans (P.)	40	,,	1	10′ to 12	All	Ditto	3	4,192	574,477	578,669	2	6	8	Furnace.
Green Island, Green Island	T. Barclay, jun.	33	,,	1	10′	8′	,,	1	1,081	138,575	139,656	2	3	5	Natural.
Jubilee, Saddle Hill	T. Barclay, sen.	23	,,	1	6′ to 10′	All	,,	2	16,349	376,596	392,945	14	21	35	Furnace.
Saddle Hill (No. 1), Saddle Hill	R. Hill	48	,,	1	20′	20′	,,	1	8,460	257,657	266,117	7	8	15	,,
Harris's Burnweil, Saddle Hill	R. Hill	..	,,	1	20′	7′	,,	..	994	69,414	70,408	1	2	3	,,
Saddle Hill (No. 2), Saddle Hill	R. Hill	19	,,	1	20′	20′	,,	1	15,078	280,316	295,394	9	16	25	Fan.
East Taieri, Riccarton	D. McNeill	9	,,	1	10′	7′	,,	1	7,682	20,834	28,516	5	10	15	,,
Brighton, Brighton	D. McColl	5	,,	1	6′	6′	,,	1	10	7,182	7,192	..	..	..	Natural.
Waronui, Milton	J. Carruthers, jun.	16	Brown	1	18′	8′	,,	1	18,558	214,845	233,403	17	23	40	Fan.
McGilp's, Milton	J. Carruthers, jun.	16	,,	1	12′	10′	,,	1	13,486	69,714	83,200	2	13	15	Natural.
Tres Bon, Akatore	G. Campbell	..	,,	1	16′	8′	..	1	3,156	25,631	28,787	4	5	9	,,
Crichton, Crichton	J. Hodson	..	,,	1	20′	7′	Bord and pillar	1	463	..	463	2	2	4	,,
Dunlop's, Lovell's Flat	J. McMillan (P.)	1	Lignite	1	20′	7′	Ditto	..	1,102	434	1,536	1	3	4	,,
Lakeside	W. Stevenson	..	..	..	..	..	..	..	12	1,173	1,185	..	..	..	..
Taratu, Lovell's Flat	J. Gillick	19	Lignite	3	6′ to 30′	7′ to 15′	Bord and pillar	2	46,870	394,404	441,274	21	78	99	Fan & natural.
Kaituna, Kaitangata	G. W. Whittlestone	12	Brown	1	7′	6′	Ditto	..	5,116	6,520	11,636	5	10	15	Natural.
Wangaloa, Wangaloa	T. Gage	..	..	1	11′	7′	,,	..	167	..	167	..	1	1	,,
Kaidale (lately Wangaloa)	William Barclay	2	Brown	1	9′	7′	,,	..	2,520	2,708	5,228	2	5	7	,,
Kaibrook, Wangaloa	R. McMillan (P.)	..	..	1	10′	8′	..	..	438	..	438	1	3	4	,,
Middleton's, Wangaloa	D. Anderson	..	Lignite	1	16′	16′	Open	..	391	..	391	2	..	2	..
Caird Bros., Kai Point	J. Jack (P.)	..	,,	1	18′	7′	Bord and pillar	..	235	..	235	1	2	3	Natural.
Longridge, Kaitangata	N. Mackie (P.)	12	Brown	1	4′	4′	Ditto	..	162	4,154	4,316	1	1	2	,,
N.Z. Coal and Oil Company (Limited)—															
Kaitangata No. 1	A. S. Gillanders	44	,,	2	18′ to 30′	All	,,	1	96,091	3,736,030	3,832,121	59	118	177	Fan.
Kaitangata No. 2	W. Carson	8	,,	3	26′ to 7′	All	,,	1				..	107	107	,,
Castle Hill	W. Carson	27	,,	1	18′	18′	,,	1				8	14	22	,,
Benhar, Stirling	J. Walls (P.)	57	Lignite	1	25′	12′ to 16″	,,	1	9,958	188,704	198,662	1	7	8	Exhaust steam
Stevenson's, Stirling	F. Parks	4	,,	1	15′	10′	,,	..	2,086	7,610	9,696	1	3	4	Natural.
Southland.															
Miller Bros., Pukerau	J. Broome	2	Lignite	1	14′	8′	Bord and pillar	..	2,348	240	2,588	..	2	2	..
Otikerama Station	C. M. Wilson	..	,,	1	16′	16′	Open	..	393	462	855	2	..	2	..
Reinke's, Howe	James Phillips	..	..	..	..	..	..	..	520	..	520	1	1	2	..
McLean's, Whiterig	D. McLean (P.)	..	Lignite	1	20′	14′	Bord and pillar	..	1,347	..	1,347	1	2	3	Air-shaft.

Whiterig, East Gore	R. Craig (P.) ..	42	„ ..	1	20′	12′	Ditto ..	1	2,690	77,364	80,054	1	3	4	Exhaust steam.
Green's, Gore	J. Mason	32	„ ..	1	20′	14′	„ ..	1	16,456	224,375	240,831	3	10	13	Fan.
Burnwell, North Chatton ..	W. McIvor (P.) ..	21	„ ..	1	20′	12′	„ ..	1	150	41,888	42,038	..	1	1	Natural.
Ramsay's, North Chatton ..	P. Ramsay (P.) ..	17	„ ..	1	20′	15′	„ ..	..	3,181	90,546	93,727	1	3	4	„
Glenlee, Waikaka	A. A. Edge (P.) ..	27	„ ..	1	14′	10′	„ ..	..	2,011	18,285	20,296	1	2	3	„
Pyramid, Pyramid	D. R. Gaudion ..	4	„ ..	1	9′	8′	„ ..	..	394	3,173	3,567	1	2	3	„
Terrace, Kingston Crossing ..	E. Jones	2	„ ..	1	24′	10′	„ ..	..	1,670	1,099	2,769	1	2	3	„
Rossvale, Waikaia	James Robertson ..	17	„ ..	1	10′	8′	„ ..	1	1,282	43,296	44,578	1	3	4	„
Argyle, Waikaia	M. C. Hutton ..	29	„ ..	1	12′	12′	Open ..	..	724	6,347	7,071	1	..	1	„
Princhester Creek, The Key ..	J. A. Denton ..	18	„ ..	1	6′	6′	„ ..	..	92	1,894	1,986	1	..	1	„
Mataura Collieries, Mataura ..	R. Brown ..	24	„ ..	1	17′	12′	Bord and pillar ..	..	11,410	209,860	221,270	2	7	9	Exhaust steam.
Mataura Lignite, Mataura ..	A. E. Barnes ..	44	„ ..	1	18′	14′	Ditto ..	..	17,511	208,114	225,625	6	9	15	Fan.
Terrace, Mataura	P. Larking ..	..	„ ..	1	11′	11′	Open ..	..	130	..	130	..	..	..	..
Heatherlea, Waimumu ..	F. Barber ..	..	..	..	..	..	..	..	..	645	645	..	..	..	..
Torrie Andrew, Waimumu ..	A. Torrie	3	Lignite ..	1	8′	All	Open ..	..	81	182	263	1	..	1	..
Ota Creek, Wyndham ..	E. Todd	40	„ ..	1	9′	9′	„ ..	..	1,257	24,533	25,790	1	..	1	..
Clarke's, Wyndham	J. Bushbridge ..	13	„ ..	1	12′	12′	„ ..	..	1,351	15,552	16,903	3	..	3	..
Nightcaps No. 1, Nightcaps ..	William Barclay ..	39	Brown ..	2	6′ and 4′	All	Bord and pillar	1	27,132			18	58	76	Two fans.
Nightcaps No. 2, Nightcaps ..	William Barclay ..	4	„ ..	1	28′	20′	Bord and pillar and open	..	10,537	1,356,231	1,393,900	8	6	14	Natural.
Black Diamond, Nightcaps ..	R. W. Duncan ..	5	„ ..	1	25′	10′	Bord and pillar	..	8,834	15,217	24,051	6	10	16	Fan.
Coaldale, Nightcaps	J. Duncan ..	3	„ ..	1	10′	6′	Ditto ..	..	..	917	917	..	..	..	„
New Brighton, Nightcaps ..	W. Dixon ..	14	„ ..	1	7′	All	„ ..	1	5,773	62,757	68,530	4	15	19	„
Wairio, Nightcaps	A. Morris ..	15	„ ..	2	14′ and 6′	All	„ ..	..	17,172	100,963	118,135	8	19	27	Natural.
Ohai (lately Willow), Nightcaps	W. Stevenson ..	..	„ ..	1	15′	15′	„ ..	..	49	2,665	2,714	..	..	..	„
Wairaki, Nightcaps	A. W. Whittlestone	7	„ ..	1	9′	7′	„ ..	..	21,373	2,952	24,325	14	27	41	Exhaust steam and fan.
Mossbank, Nightcaps	A. Hunter ..	6	„ ..	1	14′	14′	Bord and pillar and open	..	16,377	19,345	35,722	4	14	18	Fan.
Linton, Nightcaps	A. W. Morris ..	5	„ ..	1	20′	20′	Open ..	..	20,041	7,966	28,007	25	..	25	Natural.
Diamond Lignite, Seaward Bush	W. Robertson (P.)	18	Lignite ..	1	25′	18′	„ ..	..	2,872	20,277	23,149	4	..	4	..
Orepuki, Orepuki	N. McAllister ..	24	Brown ..	1	10′	10′	Bord and pillar	..	3,046	27,972	31,018	3	4	7	Exhaust steam.
Lynwood, Te Anau	N.Z. Govt. Tourist Department	10	Lignite ..	1	7′	7′	Open ..	..	188	2,488	2,676	1	..	1	..
Riverview, Gore	J. J. Nicol ..	33	„ ..	1	10′	10′	„ ..	..	30	2,022	2,052	..	..	..	..
Stirling, Wairio	Lyons and Currie ..	2	„ ..	1	7′	7′	„ ..	..	20	..	20	..	..	..	Natural.
Output of collieries included in previous statements at which operations are suspended or abandoned							..	..	..	2,839,615	2,839,615	..	..	..	..
Totals, Southern District, South Island	..	..	..	..	..	..	..	..	538,706	13,573,477	14,112,183	360	834	1,194	
Totals, West Coast District, South Island	..	..	..	..	..	..	..	..	821,507	26,564,668	27,386,175	519	1,375	1,894	
Totals, North Island ..	..	..	..	..	..	..	..	..	483,492	9,605,186	10,088,678	273	717	990	
Grand totals ..	..	..	..	..	..	..	..	..	1,843,705	49,743,331	51,587,036	1,152	2,926	4,078	
Output of some collieries prior to 1890 not included in the above statement					..	..	..	..	..	..	311,779	..	..	..	
Shale exported	..	..	..	..	..	..	..	..	..	..	21	..	..	..	
											51,898,836				

Approximate Cost of Paper.—Preparation, not given; printing (890 copies), £110.

By Authority: MARCUS F. MARKS, Government Printer, Wellington.—1921.

Price 1s. 3d.]