A Portion of the Exhibit of the New Zealand Mines Department which was awarded Gold and Silver Medals at the Panama Pacific Universal Exposition (San Francisco, 1915).

Frontispiece.]

CONTENTS.

1915.

NEW ZEALAND.

MINES STATEMENT,

BY THE HON. W. D. S. MACDONALD, MINISTER OF MINES.

MR. SPEAKER,—

In presenting to the House my first annual Statement I think I can fairly congratulate the House and the country on the satisfactory position which the mining industry has maintained, notwithstanding the fact that for the half-year ended the 31st December last the nation has been engaged in the greatest war the world has ever known.

The war has had a greater effect on the mining industry than on most other industries. Not only have the miners of the Dominion found their full quota of men to go to the front and actively engage in upholding the Empire's cause, but the men who have been left behind to carry on the industry have been subject to special and peculiar disadvantages. Mining is an industry in which explosives of all kinds are largely used, and owing to the enormous demand for ammunition and other explosives for warlike purposes there has been, and still is, great difficulty in procuring a sufficient supply for the use of our miners. Then, again, our larger mining enterprises are greatly dependent on British and other imported capital for their prosecution and development; and since the outbreak of hostilities the inflow of capital to the Dominion has practically ceased. Moreover, the export of some minerals has been prohibited, and in the case of others has been greatly restricted owing to the closing of the usual markets or to the lessened demand. Notwithstanding these disadvantageous circumstances, however, the industry has held its own fairly well, and in some branches actually shows better results than during the preceding year.

The value of minerals exported, together with the coal-output for the year, amounted to £2,752,730, but as the exportation of gold was prohibited on the 5th August by the Banking Amendment Act, 1914, shortly after the outbreak of war, the value of minerals exported during the year does not even approximately represent the total production.

The value of the bullion produced from our gold-mines amounted to £1,502,649, of which £957,452 was exported, there having been a decrease in production as compared with the previous year amounting to about £60,716. Compared with 1912, however, it shows an increased output of £72,779.

The output of coal was the highest yet recorded, being 2,275,593 tons, an increase of 387,588 tons over the output of 1913.

Kauri-gum to the value of £497,444 was exported, being £51,662 less than that of the previous year, but as a considerable quantity of this resin is ordinarily utilized on the Continent of Europe by the nations now at war the decline is not remarkable.

The value of other minerals exported was small.

MINERAL-PRODUCTION.

The following table shows the quantity and value of gold, silver, and other minerals, coal, and kauri-gum, exported during the years 1913 and 1914, also the quantity of native coal consumed in the Dominion during the same periods :—

Product.	Year ending 31st December, 1913. Quantity.	Value.	Year ending 31st December, 1914. Quantity.	Value.
		£		£
Gold	376,161 oz.	1,459,499	227,954 oz.*	895,367*
Silver	975,616 "	103,866	599,162 " *	62,085*
Mixed minerals	2,927 tons	31,532	5,395 tons	29,224
New Zealand coal exported	211,749 "	205,010	302,908 "	282,163
New Zealand coal used in New Zealand	1,676,256 "	838,128	1,972,685 "	986,342
Kauri-gum	8,780 "	549,106	8,473 "	497,444
Coke	28 "	50	17 "	48

	£
Total value for 1914	2,752,730*†
" 1913	3,187,191

* The value of the bullion produced as stated in the official returns from the mines amounted to £1,502,649.
† The total value of minerals produced during 1914 amounted to £3,297,984.

AURIFEROUS-QUARTZ MINING.

The value of bullion obtained from our quartz-mines during 1914 amounted to £1,154,214, as a result of treating 501,339 statute tons of ore, in addition to which scheelite concentrates, value £21,825, was also obtained from such ore.

The dividends distributed by gold-quartz mining companies amounted to £288,265.

The above-recorded output shows an increase of £82,401 above that for 1913.

The following is a statement of the quantity of quartz treated, the value of bullion obtained, and the amount of dividends paid by the more important quartz-mining companies during 1914 :—

Name of Company.	Quantity of Quartz treated.	Value of Bullion.	Dividends paid. 1914.	Dividends paid. Total to End of December, 1914.
	Statute Tons.	£	£	£
Waihi Gold-mining Company (Limited)	163,754	324,038	99,181	4,577,720
Waihi Grand Junction Gold-mining Company (Limited)	103,321	227,637	48,047	105,703
Talisman Consolidated (Limited)	52,210	263,516	116,437	935,478
New Big River Gold-mining Company (Limited) ..	6,273	30,185	9,606	91,200
Blackwater Mines (Limited)	50,426	93,848	12,500	112,496
Other quartz-mines	125,355	214,990	2,500	*
Totals	**501,339**	**1,154,214**	**288,265**	*

* Unknown.

During the past year the development of new ore-bodies at our quartz-mines generally has been unimportant.

At the Talisman Consolidated Company's property at Karangahake, the Woodstock and Talisman Mines have quite recently been connected by a lengthy cross-cut at level No. 14 of the last-named mine. Satisfactory development of ore in the Bonanza section between levels Nos. 14 and 15 has recently been effected.

At Thames mining operations at the 1,000 ft. level have ceased owing to a dangerous influx of water and black-damp from the vicinity of the Moanatairi fault, and pumping has been suspended by the Thames Drainage Board, thereby rendering idle most of the mines on the goldfield. In the Waihi Mine at the 1,300 ft. or bottom level an improvement has taken place in the Martha lode, and sulphide-ore bodies are again to be seen, which is satisfactory.

On the Inangahua Goldfield there has been satisfactory development of ore at level No. 6 of the Blackwater Mine ; also in the New Big River Mine at a depth of 120 ft. below the tenth or 1,575 ft. level.

At Wakamarina, Marlborough, the Dominion Consolidated Gold-scheelite Mine continues to develop satisfactorily and produce satisfactory returns.

In Otago and Southland quartz-mining operations have not of late been very profitable.

ALLUVIAL AND DREDGE MINING.

There has been a considerable decrease in the gold-production from alluvial mines, the value of the output during 1914 amounting to £157,323 only, as against £295,704 during the previous year. Considerable fluctuations may be expected in the returns from a branch of mining which is greatly dependent upon copious and frequent rainfall.

During the year sixty-four gold-dredges in commission produced gold to the value of £191,112, and eleven of these the property of registered companies paid £23,080 as dividends. The profits of the privately owned dredges are not obtainable for publication.

During the past decade the gold-dredging industry has declined by about two-thirds in the number of dredges in commission and in the value of gold obtained ; ground suitable for dredging is gradually becoming exhausted.

The following statement shows the production of the principal dredges owned by registered companies :—

Name of Dredge.	Production during 1914.	Dividends declared.	
		During 1914.	Total to the End of 1914.
	£	£	£
West Coast, South Island—			
Worksop	14,602	6,150	41,850
Otago and Southland—			
Rise and Shine (two dredges)	14,723	4,800	39,900
Rising Sun	8,103	2,400	21,600
Earnscleugh (three dredges)	10,780	550	26,950
New Golden Run	9,293	1,600	2,000
Lower Nevis	3,166	780	2,040
Willowbank	4,922	2,400	6,000
Paterson's Freehold (two dredges)	3,435	1,500	21,600
Fifty-two other dredges	122,088	2,900	Unknown.
Totals	**191,112**	**23,080**	Unknown.

KAURI-GUM.

During the first seven months of the year and prior to the outbreak of war the kauri-gum trade had been good, most of the 8,473 tons, valued at £497,444, the export for 1914, having been produced during those earlier months. Subsequently the European market for gum became closed, with the result that considerable depression was experienced on the gumfields. To afford a measure of relief the Government, in terms of the Kauri-gum Act, 1914, has since purchased from the diggers gum to the value of £5,000 on the basis of prices ruling on the 1st July, 1914, the gum thus

purchased being stored in Auckland. Many of the regular gum-diggers are still working and storing their gum on the fields, being of the opinion that at the close of the war all grades of gum will command higher rates than those which have ruled hitherto.

SULPHUR.

I regret to report that the operations of the New Zealand Sulphur Company at White Island were suddenly terminated on or about the 11th September, when eleven lives were lost and all the company's plant and works completely obliterated, as the result of an earthquake which caused a fall of about 4 chains of cliff 600 ft. in height, the debris blocking the great active thermal crater known as the Blowhole, which subsequently erupted with extreme violence, considerably changing the topography of the island. No trace of the eleven inhabitants, all employees of the company, has been found, and it is believed the unfortunate men were hurled out to sea.

It is stated that the sulphur company has no intention to recommence operations.

PETROLEUM.

Although drilling in search of petroleum has been carried out during the year at Moturoa, Taranaki, and near Waipatiki, Hawke's Bay, the results have not been very successful.

The quantity of crude oil produced at Moturoa by the Taranaki Oil-wells (Limited) amounted on the 24th March, 1915, to 776,161 statute gallons, of which 525,475 gallons were refined by the company. The product meets with a ready sale at prices equal to the imported article.

In addition to the Government bonuses which have for some years been offered for the production of crude petroleum and refined oil, two of which, amounting together to £5,000, have already been paid to the Taranaki Oil-wells (Limited) on the production of 500,000 gallons of crude oil, provision has been made in the Appropriation Act, 1914, for a loan or loans of a sum not exceeding in the aggregate £9,000 for the purpose of encouraging the production and refinement of mineral oil in New Zealand. No portion of this amount was advanced before the 31st December last, but a considerable sum has been lent since that date.

TUNGSTEN-ORES.

In consequence of the war, ores containing tungstic acid (wolfram, scheelite, &c.) are in increased demand, and it is intended to offer a reward to stimulate their production. The same remarks also apply to molybdenite-ores.

COAL-MINING.

The output of coal during 1914 amounted to 2,275,593 tons, as against 1,888,005 tons during 1913, being an increase of 387,588 tons. The output during 1914 constituted a record for New Zealand.

The principal activity in the coal-mining industry occurred in the Westport, Greymouth, and Waikato districts.

The following is a comparative statement of the coal and lignite raised during the years 1912, 1913, and 1914 :—

Inspection District.	Output for 1913.	Output for 1914.	Increase, 1914.	Output for 1912.	Decrease, between Years 1913 and 1912.
	Tons.	Tons.	Tons.	Tons.	Tons.
Northern (North Island) ..	349,586	440,453	90,867	383,847	34,261
West Coast (South Island) ..	1,057,564	1,351,182	293,618	1,301,461	243,897
Southern (Canterbury, Otago, and Southland)	480,855	483,958	3,103	492,307	11,452
Totals	**1,888,005**	**2,275,593**	**387,588**	**2,177,615**	**289,610**

The comparative tonnage of the various classes of coal for the years 1913 and 1914, is summarized as follows :—

Class of Coal.	Output for 1914.	Output for 1913.	Increase or Decrease for 1914.	
	Tons.	Tons.		Tons.
Bituminous and semi-bituminous ..	1,492,315	1,160,274	Increase	332,041
Pitch-coal	1,998	2,397	Decrease	399
Brown coal	691,367	624,852	Increase	66,515
Lignite	89,913	100,482	Decrease	10,569
Totals	**2,275,593**	**1,888,005**	**Increase**	**387,588**

The only new colliery of importance opened during the year was that of the Waipa Company, which produced from its mine at Glen Massey, near Ngaruawahia, an output of 50,000 tons of superior lignite or brown coal. The new mine of the Pukemiro Collieries (Limited), in the same locality, has not yet reached the productive stage.

PERSONS ENGAGED IN MINING.

The number of persons employed in and about the mines of the Dominion during 1914 is estimated at 9,204, or about the same as during the previous year, The number employed at metalliferous mines was 4,470, and at coal-mines 4,734. The number of gum-diggers is not known, but exceeds 1,000.

The following table shows the number of miners in each inspection district, and the branch of mining in which they are engaged :—

Classification.	Inspection District.			
	Northern.	West Coast.	Southern.	Totals.
Gold, silver, and scheelite	1,971	1,369	1,104	4,444
Coal	1,019	2,654	1,061	4,734
Other minerals	5	11	10	26
Totals	**2,995**	**4,034**	**2,175**	**9,204**

STATE COLLIERIES.

The output from State collieries during 1914 amounted to 200,188 tons, of which 128,188 tons was produced from the Point Elizabeth Mine, and 72,000 tons from the newly opened Liverpool Mine. The total output from State mines was 3,906 tons greater than that of the previous year. At the Liverpool Colliery, by boring operations carried out during the year in the valley of Seven-mile Creek, a valuable seam of superior bituminous coal has been proved over an area of about 130 acres. The seam, which is to be called the Morgan seam, averages in thickness 17 ft., and the estimated quantity of coal already proved amounts to about 3,500,000 tons. Boring operations are still in progress, and further reserves of coal will in all probability be proved. This, the most important mineral discovery in the Dominion during the year, was made by a Government prospecting-drill, and is a further tribute to the efficacy of such drills for the purpose of accurately determining the extent and value of mineral deposits.

From a financial point of view the year's business was more satisfactory than during the previous year, though I regret to say that a loss of £14,152 13s. 11d. is shown in the balance-sheet appended. This loss may be attributed to the approaching exhaustion of the old Point Elizabeth Mine, and the fact that the new Liverpool Colliery had not been sufficiently developed to supply all requirements, which is not remarkable, as the mine only reached the output stage during the latter part of 1913.

The State Coal-mines Branch was reorganized on the retirement of the late Mr. W. C. Gasquoine, who for several years occupied the position of General Manager, the management being transferred to the Head Office of the Mines Department.

GEOLOGICAL SURVEY.

During the year detailed geological surveys of the Egmont (Taranaki) and Gisborne subdivisions were begun. Good progress has been made, and it is expected that the field-work in these districts will be finished before the end of the present year. Officers of the Survey have also visited a number of localities in order to make brief geological examinations and to furnish special reports that were required.

In addition to the annual report, Palæontological Bulletin No. 2 was published during the year. Palæontological Bulletin No. 3 and Bulletin No. 17, the latter an exhaustive report on the Westport district, are now ready for publication.

The work of the Geological Survey is proving of great value, and the demands for such survey-work to be undertaken in different parts of the Dominion are numerous. It will be impossible to meet these demands within anything like a reasonable time without increasing the staff, and I propose therefore at a very early date to recommend the Public Service Commissioner to appoint additional geologists.

STONE-QUARRIES.

During the past year 2,024 persons were employed at 179 quarries and works which come under the provisions of the Stone-quarries Act, 1910, which includes every place, not being a mine, in which persons work in quarrying stone by means of explosives, and any part of which has a rock-face more than 20 ft. deep, also any tunnel in the construction of which explosives are used.

About thirty Quarry Inspectors have been appointed to see that the provisions of the Act are duly observed. These appointments have been made from officers of the Public Works and Mines Departments located in the districts, without extra remuneration.

During 1914 only two fatal accidents occurred at such quarries, being in proportion of less than one person killed per 1,000 employed during the year.

MINING ACCIDENTS.

The number of fatalities in connection with operations at our metalliferous mines during 1914 was six, as against ten during 1913; the proportion of fatal accidents per 1,000 persons employed at such mines being 1·34, a low average when compared with that of other countries.

In our coal-mines there were seven fatal accidents, and it is with sincere regret that I have to record that by one of these no less than forty-three lives were lost and several persons were injured. This disaster occurred on the 12th September at Ralph's Colliery, Huntly, the property of the Taupiri Coal-mines (Limited). The cause of the disaster was at once investigated by a Royal Commission, who found that it was due to an ignition of fire-damp by a naked light carried in the old workings of the mine by a miner when proceeding to his work, the ignition of gas causing a concussion which raised a quantity of fine inflammable lignite-dust, by which the explosion was intensified and carried to the top of the upcast shaft, a distance of about three-quarters of a mile. The Commission considered the management of the mine was, speaking generally, good, but in certain respects—*e.g.*, the prompt carrying-out of the Inspector's orders, the precautions taken against danger from gas, the ordering of safety-lamps, and the examination of the old workings—it was lax and unsatisfactory.

MINING LEGISLATION.

The past year was somewhat prolific in legislation for the advancement of the mining industry and the safety of the miner.

By the Iron and Steel Industries Act, 1914, provision was made for the payment of bounties at the rate of 12s. per ton on pig-iron and £1 4s. per ton on puddled bar iron and steel respectively, to cover a period of three years, and with a proviso that the total sum payable as bounty shall not exceed £150,000. Regulations have since been gazetted prescribing the minimum quantity, also the standard quality of the bounty goods. With this inducement the extensive iron-ore and ironsand deposits of Parapara and Taranaki should no longer remain unutilized.

Important amendments in the Mining and Coal-mines Acts were also made. These for the most part were for the purpose of giving effect to the recommendations of the Royal Commission on Mines, and to bring the law into line with recent enactments in the United Kingdom, in the interest of greater safety. The most important provisions in these amending Acts were in connection with ventilation and miners' baths at metal-mines, and with safety-lamps, flameless (or permitted) explosives, ventilation, systematic timbering, miners' baths, and the prevention of the accumulation of inflammable dust in coal-mines.

A new appointment—viz., that of an Inspecting Engineer of Coal-mines, who by virtue of his office would also be Chief Inspector of Coal-mines—was provided for. For this position applications were publicly invited, the appointment being eventually conferred upon Mr. Frank Reed, M.I.M.M., who during the past nine years has held the position of Inspecting Engineer of Mines. Mr. Reed formerly held a similar position under the Government of Western Australia.

To give effect to many of the safety provisions in the amended Acts, regulations are required, and for the preparation of these a conference of the Inspectors of Mines of the Dominion was held in Wellington. As a result of such conference very comprehensive regulations were drafted, and subsequently submitted to representatives of the employers and workers at mines throughout the Dominion. It is gratifying to state that the proposals were received in a very friendly spirit, and but few alterations were suggested.

SCHOOLS OF MINES.

With the gradual decline of the gold-mining industry at some of the centres where schools of mines were established during the more prosperous years of mining, the attendance at some of the subsidized schools has fallen off a good deal. At the Government examination held in connection with these schools throughout the Dominion during 1914 only one student presented himself for examination in the subject of metal-mining, and only five for coal-mining certificates.

The expenditure by the Department on schools of mines during the year ended the 31st March, 1915, amounted to £5,047.

SUBSIDIZED PROSPECTING.

During the year ended the 31st March, 1915, twenty prospecting and other mining parties were granted subsidies for prospecting, also for the construction of a jetty, water-races, and tail-races, the amount of subsidies granted being £1,399, of which sum £600 was expended during the year; in addition to which, £1,386 granted during the previous year was expended by fifty parties during the past financial year. There continues to be a growing disinclination among miners and others to prospect the back country, nearly all the sixty-two persons engaged during the year upon work which had been subsidized being occupied upon the development of ground held as claims in settled districts.

LOANS FOR THE DEVELOPMENT OF MINING.

The statutory Board appointed for the purpose of reporting upon applications for mining loans did not report favourably upon any applications during the year. Since 1905, when provision was made in the Mining Act for such loans, the amount lent has been £35,225.

ROADS AND TRACKS ON GOLDFIELDS.

The expenditure on roads and tracks by subsidies and direct grants during the financial year ended the 31st March, 1915, amounted to £30,064; in addition to which, North Island goldfields' local bodies were credited with gold duty amounting to £12,450. The total amount of State aid thus given on behalf of the mining industry was £42,514.

GOVERNMENT PROSPECTING-DRILLS.

The demand for the diamond and placer drills, which are lent free of charge, has declined somewhat, owing no doubt to the difficulty in obtaining capital for mining ventures during the present crisis.

By the use of one of these drills a very important discovery of bituminous coal was made at the Liverpool State Colliery during this year, which is referred to elsewhere in this Statement.

GOVERNMENT WATER-RACES.

The Waimea–Kumara and Mount Ida water-races, which are maintained by the Government to enable alluvial gold-mining to be carried on in the Kumara and Naseby districts, have supplied 105 miners during the year, by whom gold to the value of £25,675 was obtained.

The receipts for water sold amounted to £3,493, and the expenditure in upkeep and supervision was £3,782.

GOLD-MINERS' RELIEF FUND.

This fund, which was inaugurated by the passing of the Mining Act Amendment Act, 1910, is still unfinancial, the credit balance on the 31st March last being only £51 12s., against unpaid claims amounting to over £1,175. During the year payments from the fund amounted to £2,123, and the contributions thereto were £1,716.

With the view of assisting the fund to meet its obligations a special vote of £900 was taken on last year's appropriations, for allowances to sufferers from pneumonoconiosis. The amount actually paid out of this special vote during the year was £705, but regular allowances are being paid to several incapacitated miners; and to enable these to be continued, and other urgent cases to be met from time to time as occasion requires, a further vote of £900 is provided on the estimates for the current year.

COAL-MINERS' RELIEF FUND.

As required by the Coal-mines Act, 1908, the owner of every coal-mine contributes ½d. per ton on all the coal he sells, for the relief of coal-miners who may be injured whilst working, and for the relief of the families of coal-miners who may be killed or injured.

The following is a statement of the accounts of the fund during the two last financial years:—

	Year ended 31st March, 1915.	Year ended 31st March, 1914.
	£	£
Contributions	2,068	1,893
Allowance on account of accidents, &c.	2,782	1,720
Balance	6,320	7,034

TABLES TO ACCOMPANY THE MINES STATEMENT.

No. 1.

TABLE SHOWING COMPARISON IN QUANTITY AND VALUE OF GOLD ENTERED FOR EXPORTATION, ALSO THE QUANTITY AND VALUE OF OTHER MINERALS, FOR THE YEARS ENDED THE 31ST DECEMBER, 1913 AND 1914, AS WELL AS THE TOTAL VALUE SINCE THE 1ST JANUARY, 1853.

Name of Metal or Mineral.	For Year ending the 31st December, 1914.		For Year ending the 31st December, 1913.		Total from the 1st January, 1853, to the 31st December, 1914.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Precious metals—	Oz.	£	Oz.	£	Oz.	£
Gold	227,954	895,367	376,161	1,459,499	21,112,266	82,953,910
Silver	599,162	62,085	975,616	103,866	18,382,783	2,000,799
Total gold and silver*	827,116	957,452	1,351,777	1,563,365	39,495,049	84,954,709
Mineral produce, including kauri-gum—	Tons.	£	Tons.	£	Tons.	£
Copper-ore	3	11	..	..	1,498	19,209
Chrome-ore	..	..	..	..	5,869	38,002
Antimony-ore	..	..	..	..	3,768	54,941
Manganese-ore	..	..	..	..	19,364	61,905
Hæmatite ore	1	25	..	..	77	469
Mixed minerals	†5,395	29,224	2,927	31,532	46,837	342,821
Coal (New Zealand) exported	302,908	282,163	211,749	205,010	3,838,940	3,537,095
Coke exported	17	48	28	50	16,508	25,023
Coal, output of mines in Dominion (less exports)	1,972,685	986,342	1,676,256	838,128	35,785,472	17,800,925
Shale	21	21	..	..	14,444	7,236
Kauri-gum	8,473	497,444	8,780	549,106	339,248	17,257,007
Total quantity and value of minerals	2,289,503	1,795,278	1,899,740	1,623,826	40,072,025	39,144,633
Value of gold and silver, as above ..	..	957,452		1,563,365		84,954,709
Total value of minerals produced, including gold and silver	..	‡2,752,730	..	3,187,191	..	124,099,342

* On the 5th August the exportation of gold was prohibited by the Banking Amendment Act, 1914; the value of gold and silver exported during 1914 does not therefore even approximately represent the value of production, which is shown by returns from the mines to be £1,499,072.

† Scheelite, 204 tons; gold concentrate, slime, tailing, &c., 2,847 tons; jewellers' sweepings, 5$\frac{13}{28}$ tons; pumice, sand, &c., 2,425$\frac{7}{28}$ tons.

‡ The total value of mineral production was £3,297,984, which included the gold and silver won (but not exported) after the 5th August, when the Banking Amendment Act, 1914, came into operation

No. 2.

TABLE SHOWING THE QUANTITY AND VALUE OF GOLD ENTERED FOR EXPORTATION FROM NEW ZEALAND FOR THE YEARS ENDED THE 31ST DECEMBER, 1914 AND 1913, AND THE TOTAL QUANTITY AND VALUE FROM 1857 TO THE 31ST DECEMBER, 1914.*

District and County or Borough.	Year ending 31st December, 1914		Year ending 31st December, 1913.		Increase or Decrease for Year ending 31st December, 1914.		Total Quantity and Value from January, 1857, to 31st December, 1914.	
	Quantity.	Value.	Quantity.	Value.	Increase.	Decrease.		
AUCKLAND—	Oz.	£	Oz.	£	Oz.	Oz.	Oz.	£
County of Coromandel ..	943	3,960	3,694	14,607	..	2,751	..	..
County of Thames ..	3,964	14,672	7,694	28,643	..	3,730	..	..
County of Ohinemuri ..	36,682	149,792	89,090	325,645	..	52,408	..	..
County of Piako	136	574	52	217	84	..	..	..
Borough of Thames ..	..	..	275	1,146	..	275	..	..
Great Barrier Island ..	3	12	2	9	1	..	..	..
Borough of Waihi ..	74,086	286,867	116,830	463,661	..	42,744	..	..
	115,814	**455,877**	217,637	833,928	85	101,908	**5,939,655**	**22,659,416**
WELLINGTON	..	..	..	..	..	..	**188**	**706**
MARLBOROUGH—								
County of Marlborough ..	**930**	**3,611**	1,533	5,944	..	603	**93,414**	**363,800**
NELSON—								
County of Waimea ..	42	168	..	..	42	..	..	..
County of Collingwood ..	850	3,401	624	2,492	226	..	..	..
County of Takaka ..	3	12	..	..	3	..	..	..
County of Murchison ..	..	..	38	150	..	38	..	..
	895	**3,581**	662	2,642	271	38	**1,731,297**	**6,863,996**
WEST COAST—								
County of Buller	2,785	10,670	3,302	12,559	..	517	..	..
County of Inangahua ..	45,733	173,641	59,169	226,963	..	13,436	..	..
County of Grey	6,456	26,517	9,492	37,761	..	3,036	..	..
County of Westland ..	5,053	20,483	9,782	39,484	..	4,729	..	..
Ross Borough	1,366	5,465	120	479	1,246	..	..	..
	61,393	**236,776**	81,865	317,246	1,246	21,718	**5,901,773**	**23,446,415**
CANTERBURY—								
County of Ashburton ..	..	..	..	..	..	..	**99**	**387**
OTAGO—								
County of Taieri	229	930	528	2,221	..	299	..	..
County of Tuapeka ..	10,571	41,735	14,296	57,230	..	3,725	..	..
County of Vincent ..	11,626	46,848	19,409	78,279	..	7,783	..	..
County of Maniototo ..	5,503	21,575	4,952	19,547	551	..	..	..
County of Waihemo ..	413	1,527	646	2,324	..	233	..	..
County of Waitaki ..	2,010	7,870	2,326	9,169	..	316	..	..
County of Bruce	716	2,864	878	3,515	..	162	..	..
County of Lake	1,825	7,373	2,921	11,800	..	1,096	..	..
County of Wallace ..	2,084	8,333	2,141	8,596	..	57	..	..
County of Fiord	..	..	18	74	..	18	..	..
County of Southland ..	13,615	55,178	24,931	101,286	..	11,316	..	..
County of Clutha	..	..	778	3,191	..	778	..	..
	48,592	**194,233**	73,824	297,232	551	25,783	**7,433,368**	**29,609,647**
Unknown	**330**	**1,289**	640	2,507	..	310	**2,472**	**9,543**
Totals	**227,954**	**895,367***	376,161	1,459,499	2,153	150,360	**21,112,266**	**82,953,910**

* See the first footnote to Table No. 1.

No. 3.

GOLD PRODUCED, 1857 TO 1914.

TABLE SHOWING THE TOTAL QUANTITY AND VALUE OF GOLD ENTERED FOR EXPORTATION FROM THE 1ST JANUARY, 1857, TO THE 31ST DECEMBER, 1914. (This Return shows the Output of the various Goldfields. Gold entered at Nelson from Hokitika, Greymouth, and Westport is put under the Head of "West Coast," and Gold from Invercargill and Riverton under the Head of "Otago.")

Year.	Auckland.		Nelson.		Marlborough.		West Coast.		Otago.		Wellington.		Canterbury.		Grand Totals.	
	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.
		£		£		£		£		£		£		£		£
1857 ..	..	..	10,437	40,422	..	..	..	..	..	..	..	..	..	..	10,437	40,422
1858 ..	308	1,192	13,226	51,272	..	..	..	..	..	..	..	..	..	..	13,534	52,464
1859 ..	..	..	7,336	28,427	..	..	..	..	..	..	..	..	..	..	7,336	28,427
1860 ..	..	..	4,538	17,585	..	..	..	..	..	..	..	..	..	..	4,538	17,585
1861 ..	..	..	6,335	24,552	..	..	..	..	187,696	727,321	..	..	..	..	194,031	751,873
1862 ..	1,239	4,098	10,422	40,386	..	..	..	..	399,201	1,546,905	..	..	..	..	410,862	1,591,389
1863 ..	4,483	13,853	9,580	37,120	..	..	..	..	614,387	2,380,750	..	..	..	..	628,450	2,431,723
1864 ..	3,448	10,552	14,410	55,841	24,838	95,231	1,463	5,560	436,012	1,689,653	..	..	..	..	480,171	1,856,837
1865 ..	5,449	17,096	12,137	47,030	7,952	30,814	289,897	1,127,370	259,139	1,004,163	..	..	..	..	574,574	2,226,474
1866 ..	5,814	17,463	7,650	29,643	469	1,818	552,572	2,140,946	168,871	654,647	..	..	..	..	735,376	2,844,517
1867 ..	6,637	18,277	9,123	35,918	501	1,978	511,974	2,018,874	158,670	623,815	..	..	..	..	686,905	2,698,862
1868 ..	53,660	168,874	5,999	38,396	404	1,616	405,762	1,608,844	171,649	686,596	..	..	..	..	637,474	2,504,326
1869 ..	132,451	434,687	10,631	42,524	666	2,664	317,169	1,269,664	153,364	613,456	..	..	..	..	614,281	2,362,995
1870 ..	85,534	319,146	12,244	48,692	1,852	7,408	280,068	1,121,525	165,152	660,694	30	120	..	..	544,880	2,157,585
1871 ..	330,326	1,188,708	10,014	40,056	1,867	7,468	232,882	931,528	154,940	619,760	..	..	..	..	730,029	2,787,520
1872 ..	104,890	369,341	8,175	32,700	2,057	8,228	172,574	690,296	157,574	630,696	..	..	..	..	445,370	1,731,261
1873 ..	119,449	437,123	13,697	54,786	1,274	5,050	188,501	756,442	182,416	734,024	..	..	..	..	505,337	1,987,425
1874 ..	76,910	305,068	5,642	22,158	1,198	4,748	157,531	631,203	135,107	542,154	..	..	..	..	376,388	1,505,331
1875 ..	69,485	262,156	4,577	17,866	1,159	4,636	158,678	635,480	121,423	487,632	..	..	..	..	355,322	1,407,770
1876 ..	56,057	221,905	14,018	55,862	450	1,796	133,014	531,274	118,477	473,491	..	..	..	..	322,016	1,284,328
1877 ..	99,081	403,627	5,367	21,092	870	3,197	153,198	612,823	113,169	455,341	..	..	..	..	371,685	1,496,080
1878 ..	55,982	220,454	4,463	17,223	404	1,617	144,634	578,508	105,003	422,277	..	..	..	..	310,486	1,240,079
1879 ..	37,901	154,295	2,993	11,424	879	3,460	142,822	571,061	102,869	407,868	..	..	..	..	287,464	1,148,108
1880 ..	42,720	176,416	3,222	12,223	1,550	5,650	144,090	575,258	113,666	457,705	..	..	..	..	305,248	1,227,252
1881 ..	35,516	141,326	3,453	13,039	1,378	4,531	127,544	509,971	102,670	411,923	..	..	..	..	270,561	1,080,790
1882 ..	33,059	131,007	3,289	12,494	1,352	5,400	130,048	519,978	83,446	333,804	10	37	..	..	251,204	1,002,720
1883 ..	41,291	163,618	2,064	7,724	636	2,524	116,905	467,152	87,478	352,334	..	..	..	..	248,374	993,352
1884 ..	36,087	143,564	2,159	8,002	1,079	4,306	111,686	446,517	78,810	318,932	101	380	24	96	229,946	921,797
1885 ..	42,989	170,416	2,798	10,337	540	2,160	117,861	471,325	73,183	294,378	..	..	..	..	237,371	948,615
1886 ..	32,271	128,140	2,582	9,979	404	1,451	112,671	446,287	79,104	317,543	47	169	..	..	227,079	903,569
1887 ..	30,697	121,564	2,914	10,829	1,041	3,759	98,774	395,430	70,443	279,518	..	..	..	..	203,869	811,100
1888 ..	35,223	139,556	3,027	11,320	699	2,547	100,139	400,405	62,107	247,142	..	..	24	96	201,219	801,066
1889 ..	28,655	113,191	3,252	12,310	5,189	20,167	101,696	406,451	64,419	256,430	..	..	..	..	203,211	808,549
1890 ..	31,745	125,760	2,856	11,049	6,073	24,285	89,096	356,368	63,423	255,976	..	..	..	..	193,193	773,438
1891 ..	45,392	181,185	4,445	16,896	5,649	22,576	109,268	437,126	87,209	349,573	33	132	..	..	251,996	1,007,488
1892 ..	45,555	183,655	2,535	9,604	3,898	15,429	103,106	412,383	82,933	333,467	52	206	..	..	238,079	954,744
1893 ..	45,714	186,553	2,145	8,187	2,165	8,644	99,127	396,516	77,660	313,238	..	..	..	..	226,811	913,138
1894 ..	52,916	211,974	2,860	10,634	2,536	10,123	86,950	347,464	76,353	307,644	..	..	..	..	221,615	887,839
1895 ..	111,213	430,862	2,460	9,016	2,695	10,771	89,429	357,719	87,694	355,796	..	..	..	..	293,491	1,162,164

No. 3—*continued.*

GOLD PRODUCED, 1857 TO 1914—*continued.*

TABLE SHOWING THE TOTAL QUANTITY AND VALUE OF GOLD ENTERED FOR EXPORTATION FROM THE 1ST JANUARY, 1857, TO THE 31ST DECEMBER, 1914. (This Return shows the Output of the various Goldfields. Gold entered at Nelson from Hokitika, Greymouth, and Westport is put under the Head of "West Coast," and Gold from Invercargill and Riverton under the Head of "Otago")—*continued.*

Year.	Auckland.		Nelson.		Marlborough.		West Coast.		Otago.		Wellington.		Canterbury.		Grand Totals.	
	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.	Oz.	Value.
		£		£		£		£		£		£		£		£
1896 ..	92,346	350,355	2,753	10,333	916	3,588	79,317	317,161	88,362	359,991	..	..	..	..	263,694	1,041,428
1897 ..	105,477	392,337	1,892	7,055	810	3,195	58,817	235,430	84,649	342,187	..	..	..	..	251,645	980,204
1898 ..	142,383	527,786	1,720	6,882	781	3,003	79,948	319,789	55,343	223,231	..	..	..	..	280,175	1,080,691
1899 ..	168,769	624,737	419	1,571	..	..	90,031	360,149	130,311	526,605	..	..	28	111	389,558	1,513,173
1900 ..	166,342	605,398	3,718	14,605	535	2,147	73,923	295,733	129,075	521,629	..	..	23	90	373,616	1,439,602
1901 ..	191,968	695,551	7,212	28,138	133	513	113,286	454,006	142,940	575,492	..	..	22	83	455,561	1,753,783
1902 ..	201,583	721,977	5,947	23,649	601	2,404	118,796	475,272	181,116	728,124	..	..	2	7	508,045	1,951,433
1903 ..	232,681	832,334	7,962	31,710	972	3,845	125,241	501,090	166,458	668,852	..	..	..	..	533,314	2,037,831
1904 ..	223,010	791,529	5,049	20,141	473	1,890	122,310	489,177	169,478	684,764	..	..	..	..	520,320	1,987,501
1905 ..	232,215	935,602	6,469	25,862	..	..	109,704	438,258	172,098	694,214	..	..	..	..	520,486	2,093,936
1906 ..	295,417	1,195,541	2,944	11,746	..	..	104,743	414,292	160,739	649,325	..	..	..	..	563,843	2,270,904
1907 ..	298,101	1,187,079	3,893	15,274	795	3,009	87,069	343,146	118,352	478,982	..	..	..	..	508,210	2,027,490
1908 ..	296,971	1,171,375	3,196	12,783	297	1,145	86,052	335,722	119,907	483,900	..	..	..	..	506,423	2,004,925
1909 ..	288,614	1,142,098	2,572	10,286	39	155	95,014	369,930	120,132	484,431	..	..	..	..	506,371	2,006,900
1910 ..	286,526	1,136,057	117	466	53	212	92,036	358,099	99,556	401,494	..	..	..	..	478,288	1,896,328
1911 ..	263,791	1,049,204	2,149	8,586	229	867	92,403	368,545	96,654	389,580	..	..	..	..	455,226	1,816,782
1912 ..	179,863	693,949	3,234	12,911	439	1,643	68,269	270,580	91,358	366,048	..	..	..	..	343,163	1,345,131
1913 ..	217,637	833,928	662	2,642	1,533	5,944	81,865	317,246	74,464	299,739	..	..	..	..	376,161	1,459,499
1914 ..	115,814	455,877	895	3,581	930	3,611	61,393	236,776	48,922	195,522	..	..	..	..	227,954	895,367
Totals ..	5,939,655	22,659,416	311,878	1,232,839	93,260	363,223	7,321,346	29,078,149	7,445,731	29,618,756	273	1,044	123	483	21,112,266	82,953,910

No. 4.

TABLE SHOWING THE TOTAL QUANTITY AND VALUE OF MINERAL ORES OTHER THAN GOLD (THE PRODUCT OF NEW ZEALAND MINES), COAL, COKE, AND KAURI-GUM EXPORTED FROM THE DOMINION UP TO 31ST DECEMBER, 1914.

Year.	Silver.		Copper-ore.		Chrome-ore.		Antimony-ore.		Manganese-ore.		Hæmatite Ore.		Mixed Mineral Ores.*		Coal.		Coke.		Kauri-gum.		Totals.		
	Oz.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Oz.	Tons.	Value.
		£		£		£		£		£		£		£		£		£		£			£
1853 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	830	15,972	..	830	15,972
1854 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,661	28,864	..	1,661	28,864
1855 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	355	4,514	..	355	4,514
1856 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,440	18,591	..	1,440	18,591
1857 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2,522	35,251	..	2,522	35,251
1858 ..	..	..	351	5,000	3	25	..	..	..	..	..	..	..	..	2	4	..	..	1,811	20,037	..	2,167	25,066
1859 ..	..	..	245	2,605	8	120	..	..	..	..	..	..	..	..	..	..	..	..	2,010	20,776	..	2,263	23,501
1860 ..	..	..	137	1,590	116	1,440	..	..	..	..	..	..	..	..	1	2	..	..	1,046	9,851	..	1,300	12,883
1861 ..	..	..	110	1,300	52	520	..	..	..	..	..	..	..	..	..	..	..	..	856	9,888	..	1,018	11,708
1862 ..	..	..	51	1,024	3,843	24,719	..	..	..	..	..	..	..	..	..	..	..	..	1,103	11,107	..	3,997	36,850
1863 ..	..	..	..	..	595	4,318	..	..	..	..	..	..	..	..	..	..	..	..	1,400	27,026	..	1,995	31,344
1864 ..	..	..	..	..	768	4,910	..	..	..	..	..	..	..	..	..	..	..	..	2,228	60,590	..	2,996	65,500
1865 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1,867	46,060	..	1,867	46,060
1866 ..	..	..	..	..	281	1,315	..	..	..	..	..	..	..	..	261	400	..	..	2,535	70,572	..	3,077	72,287
1867 ..	..	..	246	2,700	..	..	..	..	..	..	..	..	..	..	973	1,228	..	..	2,685	77,491	..	3,904	81,419
1868 ..	..	..	84	977	..	..	..	..	..	..	..	..	..	..	1,027	1,210	..	..	2,690	72,493	..	3,801	74,680
1869 ..	11,063	2,993	..	..	..	..	..	..	..	..	..	..	..	..	750	800	..	..	2,850	111,307	11,063	3,600	115,100
1870 ..	37,123	11,380	7	120	..	..	..	..	..	..	..	..	..	..	1,672	1,508	..	..	4,391	175,074	37,123	6,070	188,082
1871 ..	80,272	23,145	..	..	..	..	..	..	..	..	..	..	..	..	1,696	1,612	..	..	5,054	167,958	80,272	6,750	192,715
1872 ..	37,064	9,910	..	..	..	..	..	..	..	..	..	..	..	..	990	855	21	50	4,811	154,167	37,064	5,882	164,982
1873 ..	36,187	9,850	..	..	..	..	..	..	..	..	..	..	..	..	724	655	..	..	2,834	85,816	36,187	3,558	96,321
1874 ..	40,566	10,380	..	..	..	..	..	..	..	..	..	..	..	..	1,463	1,363	87	228	2,569	79,986	40,566	4,119	91,957
1875 ..	29,085	7,569	..	..	..	..	..	..	..	..	..	..	..	..	3,385	3,129	15	51	3,231	138,523	29,085	6,631	149,272
1876 ..	12,683	3,171	..	..	..	..	..	..	..	..	..	..	3,180	14,824	1,854	1,954	53	189	2,888	109,234	12,683	7,975	129,372
1877 ..	33,893	7,556	..	..	..	..	..	..	..	..	..	..	2,366	9,664	2,658	2,071	25	72	3,633	118,348	33,893	8,682	137,711
1878 ..	23,019	5,755	6	115	..	..	4	102	2,516	10,416	..	..	2	8	6,362	5,139	85	177	3,445	132,975	23,019	12,120	154,687
1879 ..	20,645	4,512	54	1,105	..	..	..	..	2,140	8,338	..	..	..	..	7,144	6,187	154	324	3,229	147,535	20,645	12,722	168,001
1880 ..	20,005	4,500	..	..	..	..	60	612	2,611	10,423	..	..	2,674	11,335	7,020	5,977	87	135	4,725	242,817	20,005	17,177	275,799
1881 ..	18,885	4,236	5	36	..	..	2	24	1,271	3,283	..	..	1,955	4,303	6,621	5,610	223	353	5,461	253,778	18,885	15,538	271,623
1882 ..	5,694	1,286	9	41	..	..	30	900	2,181	6,963	..	..	2,784	8,597	3,207	2,380	275	480	5,533	260,369	5,694	14,019	281,016
1883 ..	16,826	3,785	46	678	..	..	31	804	384	1,155	1	12	22	110	6,522	4,879	1,430	2,057	6,518	336,606	16,826	14,953	350,086
1884 ..	24,914	5,125	20	106	..	..	..	..	318	809	..	..	..	..	6,104	4,461	236	372	6,393	342,151	24,914	13,071	353,024
1885 ..	16,624	3,169	..	..	..	..	666	5,289	602	1,716	50	208	114	993	43,893	51,257	267	385	5,876	299,762	16,624	51,468	362,779
1886 ..	12,108	2,946	20	390	..	..	62	1,784	328	1,316	..	..	445	1,846	46,136	52,133	497	715	4,921	257,653	12,108	52,409	318,783
1887 ..	20,809	3,453	..	..	..	..	134	3,989	305	895	..	..	144	4,142	44,129	44,650	183	266	6,791	362,449	20,809	51,686	419,844
1888 ..	403	71	2	75	..	..	376	6,246	1,085	2,404	..	..	162	2,955	68,087	64,971	953	1,646	8,482	380,933	403	79,147	459,301
1889 ..	24,105	4,043	..	..	..	..	493	5,319	1,080	2,569	..	..	199	9,985	86,405	84,347	2,132	3,407	7,519	329,590	21,105	97,828	439,260
1890 ..	32,637	6,162	..	..	..	..	515	11,121	482	1,004	1	5	19	273	69,614	67,003	2,218	3,334	7,438	378,563	32,637	80,287	467,465
1891 ..	28,023	5,151	1	4	..	..	413	4,950	1,153	2,634	..	1	2	6	91,664	91,173	2,544	3,658	8,388	437,056	28,023	104,164	544,633
1892 ..	22,053	3,996	..	..	..	..	364	4,900	521	1,239	..	..	84	631	78,911	80,225	4,306	5,691	8,705	517,678	22,053	92,891	614,360
1893 ..	63,076	9,743	..	..	..	..	331	3,467	319	943	..	..	37	650	69,136	72,699	51	53	8,317	510,775	63,076	78,191	598,330
1894 ..	54,177	6,697	..	..	..	..	44	761	534	1,156	..	..	25	353	75,004	73,438	107	160	8,338	404,567	54,177	84,052	487,132
1895 ..	85,024	10,679	..	..	..	..	54	1,486	210	525	..	..	62	880	85,987	83,342	288	715	7,425	418,766	85,024	94,026	516,393
1896 ..	94,307	10,589	..	..	..	..	21	450	65	205	..	..	37	1,335	79,524	71,984	105	263	7,126	431,323	94,307	86,878	516,149
1897 ..	183,892	20,872	..	2	..	..	10	157	180	541	..	..	1,561	5,892	76,073	69,595	..	..	6,641	398,010	183,892	84,465	495,069
1898 ..	293,851	33,107	2	70	..	..	..	..	217	703	..	..	1,828	4,792	56,332	50,381		14	9,905	586,767	293,751	68,253	675,834

No. 4—*continued.*

TABLE SHOWING THE TOTAL QUANTITY AND VALUE OF MINERAL ORES OTHER THAN GOLD (THE PRODUCT OF NEW ZEALAND MINES), COAL, COKE, AND KAURI-GUM, EXPORTED FROM THE DOMINION UP TO 31ST DECEMBER, 1914—*continued.*

Year.	Silver.		Copper-ore.		Chrome-ore.		Antimony-ore.		Manganese-ore.		Hæmatite Ore.		Mixed Mineral Ores.*		Coal.		Coke.		Kauri-gum.		Total.		
	Oz.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Oz.	Tons.	Value.
		£		£		£		£		£		£		£		£		£		£			£
1899 ..	349,338	40,838	..	..	..	..	..	..	135	407	..	..	1,309	6,591	89,480	83,085	18	9	11,116	607,919	349,338	102,058	738,849
1900 ..	326,457	38,879	12	45	28	110	3	101	166	588	..	..	2,126	12,751	112,707	98,136	..	..	10,159	622,293	326,457	125,201	772,903
1901 ..	571,134	65,258	3	105	..	..	30	136	208	614	..	..	696	7,775	159,643	142,176	..	..	7,541	446,114	571,134	168,121	662,178
1902 ..	674,196	71,975	..	..	175	525	..	..	..	..	17	116	415	4,422	188,677	154,747	..	..	7,430	450,223	674,196	196,714	682,008
1903 ..	911,914	91,497	6	123	..	..	..	..	70	210	..	1	625	7,014	152,332	128,927	..	..	9,357	631,102	911,914	162,390	658,874
1904 ..	1,094,461	112,875	..	..	..	..	..	..	196	570	7	96	1,404	10,168	165,220	139,898	..	..	9,203	501,817	1,094,461	176,030	765,424
1905 ..	1,179,744	120,542	4	17	..	..	..	..	55	165	..	..	632	8,136	122,817	107,062	15	15	10,883	561,444	1,179,744	134,406	797,381
1906 ..	1,390,536	143,572	..	..	..	..	..	..	16	40	..	..	1,297	18,421	141,641	122,614	5	6	9,154	522,486	1,390,536	152,113	807,139
1907 ..	1,562,603	169,484	56	595	..	..	98	2,118	5	26	..	5	1,492	30,448	128,950	114,737	15	15	8,708	579,888	1,562,603	139,324	897,316
1908 ..	1,731,336	175,337	13	275	..	..	5	73	..	..	..	..	1,691	16,179	100,502	85,846	2	4	5,530	372,798	1,731,336	107,742	650,512
1909 ..	1,813,830	180,872	5	100	..	..	2	60	6	29	..	..	1,837	11,709	201,685	183,961	22	23	8,250	552,698	1,813,830	211,806	929,452
1910 ..	1,711,235	171,562	..	..	..	..	..	..	5	15	..	..	2,088	22,202	277,011	259,562	6	10	8,693	465,044	1,711,235	287,803	918,395
1911 ..	1,311,043	131,587	..	..	..	..	20	92	..	4	..	..	3,470	22,104	223,275	204,379	24	41	7,587	395,707	1,311,043	234,375	753,914
1912 ..	801,165	84,739	..	..	..	..	..	..	..	..	..	..	1,729	20,571	229,012	216,170	4	7	7,908	401,305	801,165	238,653	722,792
1913 ..	975,616	103,866	..	..	..	..	..	..	..	..	..	..	2,929	31,532	211,749	205,010	28	50	8,780	549,106	975,616	223,484	389,564
1914 ..	599,162	62,085	3	11	..	..	..	..	..	..	1	25	5,395	29,224	302,908	282,163	17	48	8,473	497,444	599,162	316,797	871,000
Totals	18,382,783	2,000,799	1,498	19,209	5,869	38,002	3,768	54,941	19,364	61,905	77	469	*46,837	*342,821	3,838,940	3,537,095	16,508	25,023	339,248	17,257,007	18,382,783	4,272,105	23,337,271

* The following are the principal minerals included under this heading :—

Year.	Scheelite-ore.		Auriferous Ore.		Sulphur.		Mixed Minerals.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
		£		£		£		£
1898	..	..	22	380	1,765	4,097	..	315
1899	32	2,788	5	153	1,227	3,483	..	167
1900	54	2,635	219	4,450	1,692	4,824	..	842
1901	2	83	390	6,663	143	360	..	669
1902	39	1,200	231	2,560	100	475	..	187
1903	42	1,439	472	4,449	..	..	..	1,126
1904	17	791	977	8,898	..	..	..	479
1905	28	1,848	535	5,997	..	..	..	291
1906	55	3,407	1,186	13,940	..	..	..	1,074
1907	137	15,486	1,244	14,650	..	..	..	312
1908	68	6,055	654	6,993	..	..	..	3,131
1909	58	4,263	182	2,450	..	..	..	4,996
1910	143	15,070	100	1,538	..	..	..	5,594
1911	138	11,853	138	1,419	..	..	..	8,832
1912	135	13,347	..	..	..	..	..	7,224
1913	221	22,933	6	226	..	..	..	8,373
1914	204	21,498	2,847	..	..	..	..	7,840

No. 5.

TABLE SHOWING THE INCREASE OR DECREASE IN THE ANNUAL PRODUCTION OF COAL AND 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 over 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	..

No. 6.

TABLE SHOWING THE OUTPUT OF COAL FROM THE VARIOUS COALFIELDS, AND THE COMPARATIVE INCREASE AND DECREASE, FOR THE YEARS 1913 AND 1914, TOGETHER WITH THE TOTAL APPROXIMATE QUANTITY OF COAL PRODUCED SINCE THE MINES WERE OPENED.

Name of Coalfield.	Output of Coal.		Increase.	Decrease.	Approximate Total Output of Coal up to 31st December, 1914.
	1914.	1913.			
	Tons.	Tons.	Tons.	Tons.	Tons.
North Auckland	141,133	102,710	38,423	..	3,268,246
Waikato	295,442	243,316	52,126	..	3,769,526
Mokau	3,878	3,560	318	..	88,998
Nelson	16,574	14,717	1,857	..	255,895
Buller	818,176	679,283	138,893	..	12,976,087
Inangahua	11,362	13,708	..	2,346	240,956
Grey	505,070	349,856	155,214	..	7,637,142
Canterbury	11,707	14,430	..	2,723	683,178
Otago	312,685	306,647	6,038	..	8,277,981
Southland	159,566	159,778	..	212	2,426,403
Totals	**2,275,593**	1,888,005	387,588	..	**39,624,412**

No. 7.

TABLE SHOWING THE DIFFERENT CLASSES OF COAL FROM THE MINES IN THE DOMINION.

Name of Coal.	Output of Coal.		Increase.	Decrease.	Approximate Total Output of Coal up to the 31st December, 1914.
	1914.	1913.			
	Tons.	Tons.	Tons.	Tons.	Tons.
Bituminous and semi-bituminous	1,492,315	1,160,274	332,041	..	23,978,642
Pitch	1,998	2,397	..	399	1,995,592
Brown	691,367	624,852	66,515	..	11,766,311
Lignite	89,913	100,482	..	10,569	1,883,867
Totals	**2,275,593**	1,888,005	387,588	..	**39,624,412**

No. 8.

RETURN SHOWING THE TOTAL QUANTITY AND VALUE OF COAL IMPORTED INTO AND EXPORTED FROM NEW ZEALAND DURING THE YEAR ENDED THE 31ST DECEMBER, 1914.

Imported.			Exported.		
Countries whence imported.	Quantity.	Value.	Countries to which exported.	Quantity.	Value.
	Tons.	£		Tons.	£
India	27,677	39,184	United Kingdom	140,010	149,239
British South African Union	35,588	52,258	Straits Settlement ..	902	654
Australia	449,555	459,243	Canada via West Coast ..	2,530	2,599
Japan	5,250	7,875	Australia	53,703	44,414
U.S.A. via West Coast ..	..	4	Fiji	10,016	7,934
			France	400	430
			Germany	30	52
			Chile	250	265
			U.S.A. via East Coast ..	4,065	4,196
			U.S.A. via West Coast ..	6,191	6,208
			Uruguay	260	299
			Bismarck Archipelago ..	3,347	2,594
			Caroline Islands	1,218	944
			Samoa	2,199	1,924
			Guam	75,333	58,759
			New Caledonia	2,623	1,914
			Society Islands	1,666	1,751
			Tonga	1,517	1,395
			Tuamotu Archipelego ..	1,440	1,332
Totals	**518,070**	**558,564**	Totals	**307,700**	**286,903**

No. 9.

NUMBER OF PERSONS ORDINARILY EMPLOYED IN MINING DURING THE YEAR ENDED 31ST DECEMBER, 1914.

County or Borough.	Number of Persons Ordinarily Employed at				Total.
	Gold-quartz Mines.	Gold Alluvial Mines.	Gold-dredges.	Mines other than Gold and Coal.	
NORTHERN INSPECTION DISTRICT.					
County of Thames	159	..	..	..	159
,, Ohinemuri	511	..	..	2	513
,, Coromandel	71	..	..	..	71
,, Piako	3	..	..	..	3
Borough of Thames	56	..	..	..	56
,, Waihi	1,166	..	..	..	1,166
Puhipuhi district	..	..	..	3	3
Great Barrier Island	5	..	..	..	5
WEST COAST INSPECTION DISTRICT.					
County of Marlborough	70	4	..	..	74
,, Waimea	..	..	..	..	..
,, Collingwood	12	9	..	..	21
,, Murchison	..	34	..	..	34
,, Buller	9	46	..	11	66
,, Inangahua	715	6	49	..	770
,, Grey	..	117	25	..	142
,, Westland	4	183	11	..	198
Borough of Ross	..	75	..	..	75
SOUTHERN INSPECTION DISTRICT.					
County of Taieri	..	6	..	2	8
,, Tuapeka	6	198	63	..	267
,, Vincent	17	78	161	..	256
,, Maniototo	11	78	7	..	96
,, Waihemo	46	..	..	3	49
,, Waitaki	..	24	..	..	24
,, Lake	2	53	11	31	97
,, Wallace	..	49	..	..	49
,, Bruce	..	..	22	..	22
,, Clutha	..	..	..	..	..
,, Southland	..	94	142	..	236
Stewart Island	..	..	..	10	10
Totals	2,863	1,054	491	62	4,470

SUMMARY OF PERSONS ORDINARILY EMPLOYED IN OR ABOUT NEW ZEALAND MINES DURING 1914.

Gold, silver, and scheelite	4,444
Other metalliferous mines	26
Coal-mines	4,734
Total	9,204

DIAGRAM showing QUANTITY & VALUE of GOLD exported annually from N.Z.
For the years 1857 to 1914

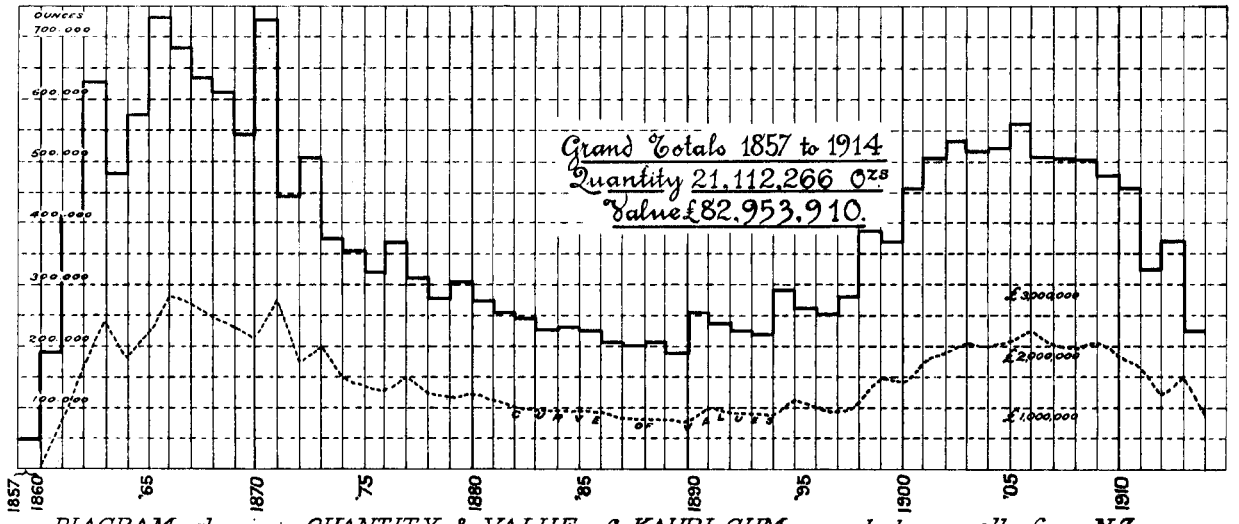


DIAGRAM showing QUANTITY & VALUE of KAURI GUM exported annually from N.Z.
For the years 1853 to 1914

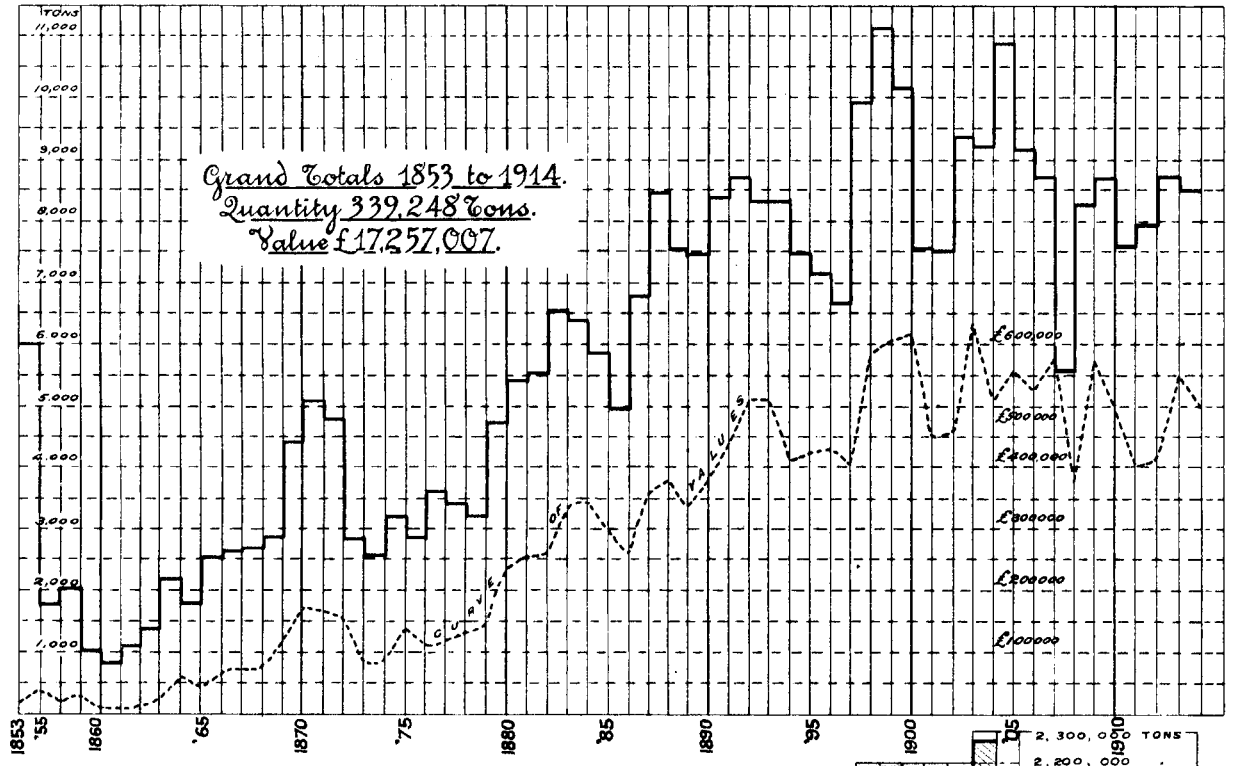
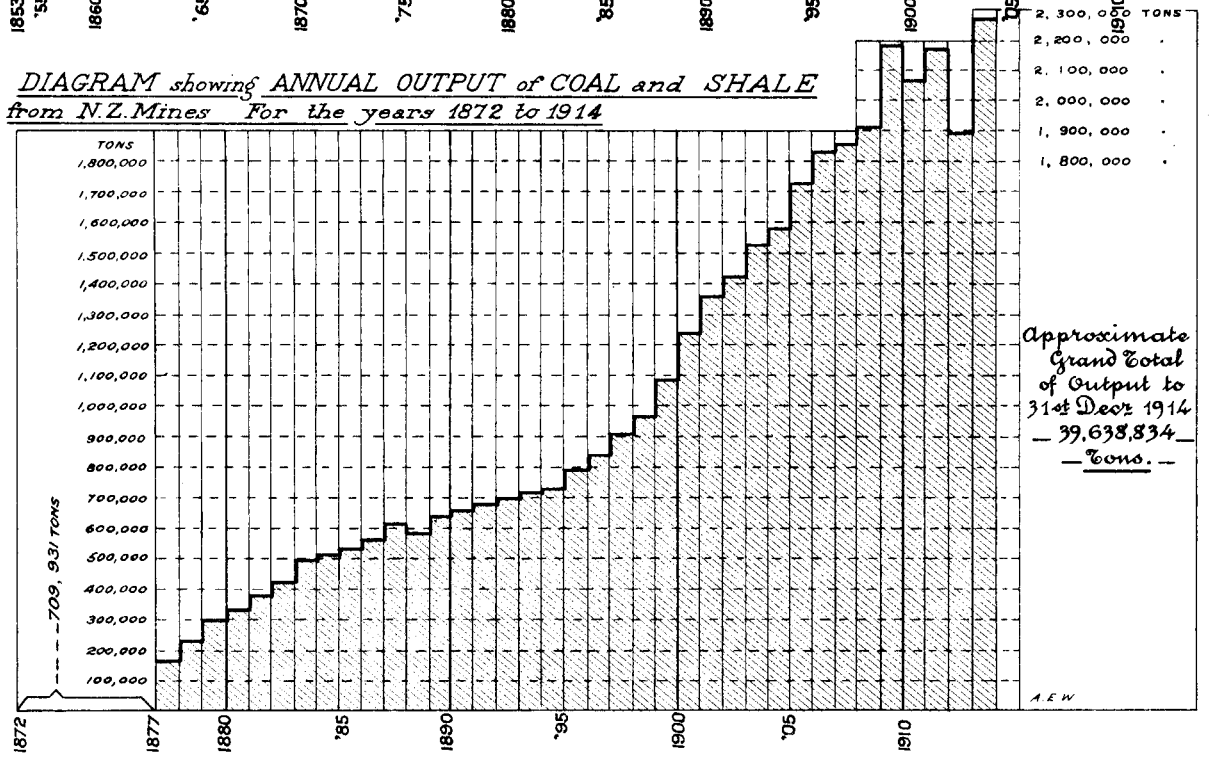


DIAGRAM showing ANNUAL OUTPUT of COAL and SHALE from N.Z. Mines For the years 1872 to 1914



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, 28th May, 1915.

I have the honour to present the annual reports of inspection of mines and stone-quarries, together with accompanying statistical information, for the year ended 31st December, 1914.

In accordance with the usual practice, the tables showing expenditure through the Mines Department on roads, bridges, tracks, prospecting operations, &c., are for the period covered by the financial year—viz., from the 1st April, 1914, to the 31st March, 1915.

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

I. Production of Minerals.

II. Persons employed.

III. Accidents.

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

V. Minerals other than Gold.

VI. Stone-quarries.

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

VIII. Schools of Mines.

Annexures,—

Reports of—
- (*a.*) Water-race Managers.
- (*b.*) Directors of Schools of Mines.
- (*c.*) Mining Statistics.
- (*d.*) Examinations under the Mining Act, 1908, and Lists of Certificate-holders.

I. PRODUCTION OF MINERALS.

The following statement shows the value of the exports from metal-mines and kauri-gum fields from the 1st January, 1853, to the 31st December, 1914:—

Classification.	1913.	1914.	Decrease.	Total from the 1st January, 1853, to the 31st December, 1914.
	£	£	£	£
Gold	1,459,499	895,367*	564,132	82,953,910
Silver	103,866	62,085*	41,781	2,000,799
Other minerals	31,532	29,338	2,194	517,425
Kauri-gum	549,106	497,444	51,662	17,257,007
Totals	**2,144,003**	**1,484,234**	**659,769**	**102,729,141**

Owing to the prohibition by the Banking Amendment Act, 1914, of the export of gold except with the consent of the Minister of Finance, the value of gold and silver exported during 1914 is no indication of the annual production.

The official returns from gold-mines show that bullion to the value of £1,502,649 was produced during 1914, being approximately £60,716 less than the production of the previous year. This decline is confined to alluvial and dredge mining. The Banking Amendment Act came into operation on the 5th August, 1914.

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, 1914.
	Northern.	West Coast.	Southern.	
Gold, silver, and scheelite	1,971	1,369	1,104	4,444
Cinnabar	5	...	...	5
Tin	...	...	10	10
Copper	...	11	...	11
Total for 1914	1,976	1,380	1,114	**4,470**
Total for 1913	...	...	...	4,941

III. ACCIDENTS.

A satisfactory reduction in the number of fatal accidents at metal-mines can be recorded. Six fatal accidents occurred, by which six lives were lost; two of these were due to absence of caution by the sufferers; one was due to defective plant; the remainder being of a nature difficult to provide against.

The following is a summary of persons killed or seriously injured in metalliferous mines during 1914:—

Inspection District.	Explosions.		Falls of Ground.		In Shafts.		Miscellaneous Underground.		Surface.		About Dredges.		Total.	
	Killed.	Seriously Injured.	Killed.	Seriously Injured.	Killed.	Seriously Injured.	Killed.	Seriously Injured.	Killed.	Seriously Injured.	Killed.	Seriously Injured.	Killed.	Seriously Injured.
Northern	...	...	1	3	...	...	...	...	1	...	...	...	2	3
West Coast	...	...	2	1	1	...	...	1	1	1	...	...	4	3
Southern	...	...	...	...	...	...	...	...	...	1	...	...	...	1
Totals	...	...	**3**	**4**	**1**	...	...	**1**	**2**	**2**	...	...	**6**	**7**

Being at the rate of 1·34 fatalities per 1,000 persons employed.

TABLE SHOWING NUMBER OF DEATHS FROM ACCIDENTS AT NEW ZEALAND METAL-MINES AND DREDGES DURING THE YEARS 1906 TO 1914.

Cause of Accident.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.
Explosion	3	...	3	2	2	1	...	...	...
Fall of ground ...	3	2	2	1	1	2	1	5	3
In shafts	1	...	1	3	5	...	1	3	1
Miscellaneous—									
Underground ...	...	...	2	1	...	...	2	...	...
On surface ...	1	2	6	5	3	2	...	2	2
About dredges ...	6	3	1	2	4	...	1	...	...
Total killed ...	14	7	15	14	15	5	5	10	6
Number of employees...	8,716	9,389	8,880	7,651	8,121	7,400	5,239	4,941	4,470
" persons killed per 1,000 employed	1·60	0·84	1·69	1·83	1·84	0·67	0·95	2·02	1·34

The following is a brief description of accidents at mining operations other than coal-mining during 1914:—

Name of Person killed.	Date of Accident.	Mine or Claim.	Cause of Accident, and Remarks.
Edward Downey ..	17/1/14	Energetic Mine (quartz)	The deceased mine-foreman was killed while picking down ground preparatory to standing a set of timber near the pass on No. 11 level, middle block. About 2 tons of dirt fell away from hanging-wall of pass, crushing his head against the cap-piece and killing him instantly. The jury brought in the following verdict: "The fatality occurred by a fall of stone in No. 11 level," with a rider that the manager's orders, which were disregarded, should in future be more strictly observed.
Reminyi Sarginson	11/5/14	Ross Mine (alluvial) ..	This fatality occurred in the company's hydro-electric power-house at Kanieri Forks. The body of this youth was found partly inside the danger-guards, consisting of a fence 5 ft. 3 in. high covered with wire netting which guards the lightning-arrester. It is believed by some that he was practical joking with a syringe, the water therefrom coming in contact with a live wire, transmitting the current to his body. The Coroner found that the deceased was killed by an electric shock, but that there was no evidence to show how the fatality occurred.
John L. Williams ..	18/5/14	White Island (sulphur-works)	The deceased was scalded to death at the works of the New Zealand Sulphur Company, White Island, by the bursting of a cast-iron retort used for steaming the sulphur. The cast-iron retort, which had only been in use six weeks, was originally 1¼ in. in thickness, but owing to the extremely acid water (containing 5·47 per cent. hydrochloric acid) the metal had wasted to $\frac{1}{16}$ in. The jury returned a verdict that the fatality occurred through a defect in a retort, and added that there should be some means of communication between the mainland and White Island.*
Enos Page Marks ..	24/9/14	Watchman Mine (quartz)	After firing two shots in a stope under 8 ft. in height the deceased and his mate returned and worked the loose rock down; later, when shovelling the broken quartz into a pass, about 1 ton fell, striking deceased on the back. The jury brought in a verdict that the accident occurred by a fall of rock, and that no blame was attachable to any one, with a rider that in future the hanging-wall shall not be broken or shot down as a means of filling in the stopes.

* At White Island, on the 11th September, 1914, at about 2.30 a.m., as the result of an earth-tremor, a fall of about 4 chains of a cliff 600 ft. in height occurred, the debris blocking up the great active thermal crater known as the Blowhole, which subsequently erupted with extreme violence, considerably changing the topography of the island, and hurled out to sea all the eleven inhabitants of the island—the company's employees—no trace of whom or of the company's plant and buildings being discernible. The danger of living upon this weird island was referred to by the Inspector of Mines, Mr. Bennie, in a report shortly prior to the calamity; but being freehold property he had no legal authority to order the men to leave the island. This disaster is not included in the list of fatal mining accidents, as it did not occur when the men were at work, and was an act of God.

Description of Fatal Accidents at Mining Operations other than Coal-mining—continued.

Name of Person killed.	Date of Accident.	Mine or Claim.	Cause of Accident, and Remarks.
William Rolla Beale	28/9/14	Blackwater Mine (quartz)	The deceased, a carpenter engaged upon repairs in the shaft, was lowered in a cage by himself to the No. 3 level; shortly afterwards the signal-bell was rung once (to hold the cage) presumably by deceased. The cage was left stationary for about sixty minutes, when, no further communication being received from him, the chamberman descended the shaft by another cage, and eventually the body of deceased was found in the sump at the bottom of the shaft. The Coroner found that deceased was killed by accidentally falling down the shaft, with a rider that provision should be made in the Mining Act that no person other than a braceman or chamberman should be allowed to give signals for the moving of the cage in the shaft, as already provided for in the Coal-mines Act.
Harry Nicholls ..	14/12/14	Bolitho's Claim (alluvial)	After firing four holes in the auriferous conglomerate of this cement claim, the deceased and H. Bolitho, both experienced miners, returned to fire two more that were already charged; and Bolitho had just reached the face when a very heavy stone fell behind him, crushing Nicholls to the floor, death being probably instantaneous. The stone which fell was too large to be sounded for safety. The jury found that no blame was attachable to any one.

IV. GOLD-MINES.

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

——	Production of Bullion, 1914.* (All Mines.)	Dividends paid, 1914. (By Registered Companies only.)	Number of Persons ordinarily employed.	Number of Working Mines, Dredges, and Claims.
	£	£		
Quartz-mining	1,154,214	288,265	2,863	61
Dredge mining †... ...	191,112	23,080	491	64
Alluvial mining ‡ ...	157,323	10,992	1,054	258
Totals, 1914 ...	**1,502,649**	**322,337**	**4,408**	**383**

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

† The bullion-production is from 64 dredges, but the dividends given are only from 16 of these, the property of registered companies. The profits of privately owned dredges and mines are unobtainable, which renders this statement incomplete.

‡ The bullion-production is from 258 alluvial claims, but the dividends are only ascertainable from those few that are the property of registered companies.

(1.) Quartz-mining.

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 1913 and 1914:—

Inspection District.	Statute Tons of Ore treated.		Value of Bullion.		Dividends paid. (By Registered Companies only.)	
	1914.	1913.	1914.	1913.	1914.	1913.
			£	£	£	£
Northern	347,194	327,590	911,733	865,619	266,165	260,188
West Coast	148,069	126,260	239,237	201,987	22,100	26,900
Southern	6,076	10,658	3,244	4,207	...	...
Totals	**501,339**	**464,508**	**1,154,214**	**1,071,813**	**288,265**	**287,088**

There has therefore been an increase during 1914 of 36,831 tons of ore treated: £82,401 in value obtained, and £2,177 in dividends declared.

The following is a statement of the production, dividends declared, and the number of persons employed by the principal gold-quartz mining companies during 1914:—

Name of Company.	During 1914.			Dividends paid.		Number of Persons ordinarily employed.
	Quantity of Quartz treated.	Value of Bullion.	Average Value per Ton.	1914.	Total to End of December, 1914.	
	Statute Tons.	£	£ s. d.	£	£	
Northern District—						
Waihi Gold-mining Company (Ltd.)*	163,754	324,038	1 19 7	99,181	4,577,720	700
Waihi Grand Junction Gold-mining Company (Ltd.)	103,321	227,637	2 4 1	48,047	105,703	440
Talisman Consolidated (Ltd.) ..	52,210	263,516	5 11 4	116,437	935,478	330
West Coast District—						
Blackwater Mines (Ltd.)	50,426	93,848	1 17 3	12,500	112,496	213
New Big River Gold-mining Company (Ltd.)	6,273	30,185	4 16 5	9,600	91,200	75
Other quartz-mines throughout New Zealand	125,355	214,990	1 14 4	2,500	§	1,125
Totals, 1914	**501,339**	**1,154,214**	**2 6 0**	**288,265**	§	**2,863**

* The total value of the output of this company at the end of the year was £10,787,038. The dividends here given are free of income-tax.

† In the annual report of the directors of this company for 1914 the value of the bullion-production is stated to be £332,165; but the figures given in the table above are the official returns from the company to the Inspector of Mines. The discrepancy occurs owing to the actual value of the bullion not being known until it is refined in England.

‡ 144,300 statute tons of old tailing from Waihi and Karangahake mines dredged from Ohinemuri River sludge-channel, crushed during former years and recorded therein, but re-treated during 1914.

§ Unknown.

Northern Inspection District.

Waihi Goldfield.—At the Waihi Mine, athough no ore-bodies of importance have been developed during the past year, at No. 11 (or 1,301 ft.) level the Martha lode has shown a decided improvement, the oxidized quartz being in parts replaced by smaller lenses of sulphide ore, and the country has become more settled, which is decidedly encouraging, and upsets the most prominently published of the geological theories regarding this mine—viz., that the Martha lode had passed from a productive intrusive to an unproductive bedded dacite country at a depth of about 1,000 ft.

The production and dividends paid during 1914 was practically the same as during the previous year.

Early in 1914 the company's extensive hydro-electric power-installation from the Horahora Falls, distant about fifty miles, was brought into commission, and the whole of the power required for the reduction-works, air-compressors, winding, and three-throw pumps was thus provided.

The Waihi Grand Junction Mine has experienced a record year in every respect, the output, yield, average value, and dividends all being higher than during any previous year. Development at the No. 7 (or 1,200 ft.) level has proved a considerable quantity of ore in the Empire lode. The water problem at this mine referred to in former reports is still considerably in evidence, the electrical high-lift turbo-installation proving unequal to the influx of water; in consequence another unit has been ordered.

Karangahake Goldfield.—The Talisman Consolidated Mine has produced an increased tonnage with a higher value per ton treated during 1914, but development has not been entirely satisfactory in the Bonanza section, although ore of good value has been proved in winzes Nos. 2, 6, and 8, between Nos. 14 and 15 levels. In the Woodstock section, south of the Woodstock shaft, the Maria lode at the three points where it has been intersected from the connecting crosscut appears better than at the same points in the level 250 ft. overhead, and the value, although not high-grade, is payable. The country at the bottom of the mine is also favourable, although in the Bonanza section it is not so open for drainage.

The Talisman shaft has been sunk to a sump past the random of the 15th level, and a drive is being put out therefrom to enable ore to be stoped below No. 14 level. A considerable amount of work will be necessary in the Woodstock section, south of the Woodstock shaft, before the amount of ore available may be proved and prepared for stoping at a depth between 250 ft. and 500 ft. from the Woodstock shaft. Connection has quite recently been made between a point about 40 ft. below the No. 14 level from the Talisman shaft and the crosscut from the bottom of the Woodstock shaft, by a stairway of 73 ft., which will be of great advantage to mining operations.

At the New Zealand Crown Mine operations at the reduction-works have been discontinued, and at the mine the number of men has been greatly reduced, owing to shortage of funds.

The Waihi-Paeroa Gold-extraction Company, who operate upon the tailing deposited by the Waihi and Karangahake mines in the Ohinemuri River (sludge-channel) near Paeroa, has during 1914 treated 144,300 tons of tailing for a return of £42,950, being an average of 6s. per ton. It is stated that there has been an increase in working-cost, owing to timber and other river-debris. To remove this a modern Priestman dredger is being obtained.

Thames Goldfield.—Owing to a great influx of black-damp and water from the vicinity of the Moanatairi fault at the 1,000 ft. level crosscuts, it was found dangerous to make a connection with the Kuranui-Caledonian Company's shaft, although there remained only 130 ft. to be driven to make such connection. It was decided therefore by the Deep Levels Board to cease operations. In consequence of the shrinkage in contributions the Thames Drainage Board subsequently ceased pumping (on the 19th October), thereby permitting water to rise in the Waiotahi and Queen of Beauty shafts (connected with the 1,000 ft. crosscut) to a height of 441 ft. Unfortunately the black-damp has now inundated all the mines situated within the drainage area to within 400 ft. of the surface; until this is removed by ventilation mining at Thames will be practically at a standstill.

Coromandel Goldfield.—Profitable mining here, which has been gradually approaching stagnation during the past decade, has now ceased.

A small Auckland company has been formed to treat a tailing-deposit now lying at the Old Kapanga claim, Coromandel. Between 1864 and 1906 that claim produced bullion to the value of £204,903. It has since been idle. The tailing in the company's ground is lying in a swamp, and amounts to about 2,300 tons, which has been carefully sampled by the Inspector of Mines, the assay value varying between £1 6s. 8d. and 6s. 3d. per statute ton, the average being about 15s. The company has erected a plant consisting of one tube mill, two B. and M. agitating-vats, two filter-vats, one vacuum filter, with air-compressors and suction-gas engine, at a total cost of about £5,600. As the profit on the 2,290 tons of tailing available is unlikely to exceed £1,000, it appears probable that the tailing was not accurately measured and sampled before the scheme was undertaken. There has been one clean-up since the plant was started.

West Coast Inspection District.

Inangahua Goldfield.—The Blackwater Mine, the most productive quartz-mine in the South Island, has increased its annual output and maintained its dividends, but development on the 5th and 6th levels proved the lode to be smaller than in the upper levels. There are indications at the 7th level of an improvement.

At the Progress Mine nothing of importance has been disclosed and the ore-reserves are nearing depletion.

In the Wealth of Nations Mine at No. 6 level a block of ore has been proved, which is now being satisfactorily developed at three levels.

The prospects at the Keep-it-Dark Mine are not at present promising: the country below the 7th level is faulted and the lode undefined.

The annual production at the New Big River Mine has increased, but the value per ton of ore treated has declined from £5 12s. 9d. during 1913 to £4 16s. 5d. during 1914, and the amount of dividends declared has decreased from £14,400 to £9,600 during the same years. At this mine very good ore has quite recently been developed at 120 ft. below the No. 10 (or 1,575 ft.) level. The main shaft is now being sunk to No. 11 (or 1,760 ft.) level.

Marlborough Goldfield.—The Dominion Consolidated Gold-scheelite Mine at Wakamarina has been worked continuously throughout the year, and development has proved the lode to maintain its size and value as depth is attained. A lengthy crosscut is now being driven which it is believed will add considerably to the ore-reserve when the lode is intersected.

Southern Inspection District.

Otago and Southland.—Gold-quartz mining in these provincial districts has been of declining importance for several years, and no dividend-paying mines are now in operation.

(2.) Dredge Mining.

The number of working gold-dredges has declined by four on the West Coast and by six in Otago and Southland, and the year's operations have been unimportant.

On the West Coast six dredges were in commission, being situated at Hokitika, Grey Valley, Nelson Creek, Blackwater, Antonio's Flat, and near Reefton respectively. One or two new dredges are now being constructed for use on the West Coast.

In Otago and Southland the fleet of fifty-eight dredges was distributed as follows: Waikaia Valley, fifteen; at or near Alexandra, nine; Waikaia and Miller's Flat, five each; Nevis and above Cromwell, three each; Lowburn Ferry, Manuherikia, Cardrona, Glenore, and Charlton Creek, two each; and one at Kawarau, Clutha Gorge, Coal Creek Flat, Roxburgh, Ida Valley, Kyeburn, Adams Flat (Glenore), and Mataura River respectively.

Notwithstanding the decrease in the number of dredges the production has almost equalled that of the previous year, the average yield per dredge having increased by £340; and the amount of dividends has also increased.

The Worksop dredge, operating at Antonio's Flat, near Reefton, continues to be the most profitable dredge. During 1914 this dredge produced gold to the value of £14,600, and provided £6,150 for dividends. In Southland and Otago the two Rise-and-Shine dredges were the most profitable.

The following is a statement regarding the most productive dredges owned by registered companies :—

Name of Dredge.	Production during 1914 of all Dredges.	Dividends paid by Dredges owned by Registered Companies.	
		During 1914.	To 31st December, 1914.
West Coast, South Island—	£	£	£
Worksop	14,602	6,150	41,850
Pactolus	1,682	1,875	66,875
Otago and Southland—			
Rise-and-Shine (2)	14,723	4,800	39,900
Rising Sun	8,103	2,400	21,600
Earnscleugh (3)	10,780	550	26,950
Ngapara	3,394	375	1,875
New Golden Run	9,293	1,600	2,000
Cardrona	2,016	400	400
Lower Nevis	3,166	780	2,040
Crewe	1,845	250	8,875
Willowbank	4,922	2,400	6,000
Paterson's Freehold (2)	3,435	1,500	21,600
Forty-eight other New Zealand gold-dredges	113,151	Unknown	Unknown
Totals	**191,112**	**23,080***	Unknown

* The dividends paid by sixteen dredges the property of registered companies amounted to £23,080 during 1914; the profits of privately owned dredges are unobtainable.

The following table shows the result of dredge-mining operations in New Zealand during the past nine years :—

Year.	Total Number of Dredges working.	Value of Production.	Average Production per Dredge.	Dividend-paying Dredges owned by Registered Companies.		Number of Persons employed.
				Number.	Dividends.	
		£	£		£	
1906 ..	167	505,199	3,025	66	103,722	..
1907 ..	128	419,634	3,278	65	89,707	1,150
1908 ..	123	373,818	3,039	47	75,800	1,013
1909 ..	111	327,676	2,952	37	56,788	893
1910 ..	104	315,237	3,031	35	51,918	838
1911 ..	93	297,900	3,203	31	45,318	775
1912 ..	87	257,333	2,958	28	38,841	694
1913 ..	74	195,848	2,646	11	18,750	621
1914 ..	64	191,112	2,986	16	23,080	491

The greatest weekly output by a gold-dredge was attained by the "Lady Ranfurly," on the 4th November, 1904. This dredge, operating on the River Molyneux (Clutha), obtained 1,273 oz. of gold in six consecutive days; it was owned by the Electric Gold-dredging Company, who at the end of 1913 had obtained gold to the value of £222,155 by dredging, of which £130,643 was distributed as dividends.

(3.) Alluvial Mining.

There has been a considerable decrease in the annual gold-production by alluvial mines, which is not remarkable, as the richer and more accessible deposits become worked out.

The most profitable of the alluvial claims were the Nokomai (Otago), Round Hill (Southland), and Mont d'Or (Westland).

The mine of the Ross Goldfield Reconstructed (Limited) was worked throughout the year at the No. 6 level, but the grade of wash obtained has not been rich enough to cover all expenses, including the expensive hydro-electric pumping-installation. An excellent plan of this mine by Mr. K. M. Barrance, mining superintendent to the company, accompanies this report. The operations of this company are deserving of praise. Great difficulties in connection with unwatering the deep leads have been successfully overcome, extensive and scientific prospecting has been carried out, and much has been done to solve the problem regarding the value of these, the only deep leads being worked in the Dominion, which has engaged the attention of mining men for over forty years.

A recently formed company, the Lake Hochstetter Goldfields (Limited), is engaged in bringing to its claims a water-race about four miles in length and 60 heads capacity, from Lake Hochstetter. The

claims are situated at Riverview, on the southern bank of the Ahaura River, between Fox's Creek and German Gully. The ground to be sluiced consists of fine terrace-gravel, the terrace rising abruptly from the river-flat for about 200 ft. The gravel has not been prospected by boring, but from the many faces exposed experts reporting for the company have estimated that an average return of from 3d to 4d. per cubic yard will be obtained. The system of working to be adopted is hydraulic sluicing and tail-race tunnels.

Towards the end of 1914 a discovery of alluvial gold was made at Louie Creek on the Howard River, a tributary of the Buller River, near Tophouse. At the time of writing about fifty men were engaged at this new rush, many claims having been pegged out. The greater part of the gold won has been obtained by "fossicking" among the boulders on the creek-bed, and it is reported that the average earnings are about £8 per man per week; but the returns from the authorized gold-buyers do not corroborate this estimate. The locality is approached by the road from Glenhope to Lake Rotoiti.

That the independent life of the alluvial miner is attractive is proved by the low average earnings. During 1914 the average value of gold obtained per European miner on the West Coast, where 424 persons were thus employed, was £138, and in Otago and Southland £170 for each of 580 persons there employed; but from these amounts must be deducted all working-expenses, together with depreciation of plant and interest on capital. It is probable that if these men had been employed at coal-mines during a similar period their earnings would have been very much greater.

The following is a statement showing the value of production and dividends paid by the principal sluicing companies during 1914:—

Name of Company or Party.	Value of Gold produced.	Dividends declared.	
		During 1914.	Totals to End of 1914.
	£	£	£
Mont d'Or (Westland)	3,630	1,800	57,000
Naseby Hydraulic Sluicing Company ..	909	375	4,500
Deep Stream Gold-mining Company ..	1,098	250	1,812
Gabriel's Gully Sluicing Company	7,425	258	1,863
Golden Crescent Sluicing Company ..	2,502	875	10,500
Havelock Sluicing Company	3,212	900	5,500
Ladysmith Gold-mining Company	2,958	992	11,413
Nokomai Hydraulic Sluicing Company ..	11,659	3,000	43,283
Round Hill Gold-mining Company	6,800	2,542	11,015
249 other claims	117,130	Unknown	Unknown
Totals	157,323	10,992	Unknown

V. MINERALS OTHER THAN GOLD.

Scheelite.

The quantity of scheelite exported during the year amounted to 204 tons, valued at £21,498, as compared with 221 tons, valued at £22,933, in 1913. The following statement shows the quantity and value of scheelite exported since the year 1899:—

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Tons.	£		Tons.	£
1899	32	2,788	1908	68	6,055
1900	54	2,635	1909	58	4,263
1901	2	83	1910	143	15,070
1902	39	1,200	1911	138	11,853
1903	42	1,439	1912	135	13,347
1904	17	791	1913	221	22,933
1905	28	1,848	1914	204	21,498
1906	55	3,407			
1907	137	15,486	Totals ..	**1,373**	**124,696**

Plan of ROSS GOLDFIELDS MINE, 1915.

REFERENCE.

Cassius workings, discontinued 1872,

Ross United Coy's workings, discontinued 1887,

Ross Goldfield (reconstructed) Coy's workings on 1st May, 1915

Approximate depth of leads indicated at point (A):—

Cassius lead: 161 ft. below H.W.M.

6th level blocking: 174 ft. ,,

Ross United lead: 191 ft. ,,

K. M. Clarrance
Superintendent
May 1st 1915

ADIT LEVEL
MOORHOUSE STREET
N.W. BLOCKING STOPE
NORTH DRIVE N°7 L. N°8 RISE
N°2 S.W. DRIVE
N°3 SHOOT
WEST DRIVE N°7 LEVEL
MAIN DRIVE N°7 LEVEL
N°8 LEVEL
ROSS UNITED SHAFT
MAIN SOUTH ROAD
N°2
N°3
N°4
WINZE DRIVE EAST
LOCK
(A)
N°6 LEVEL
N°2 EAST
N°3 EAST
ADIT LEVEL
WINZE
AYLMER STREET
STORM CHANNEL RESERVE
JONES FLAT
JONES
MORNING STAR SHAFT
SCANDINAVIAN SHAFT
DRAINAGE SHAFT
EXCELSIOR SHAFT

Scale of Chains
Links 100 0 1 2 3 4 5 6 7 Chs.

Scale of Feet
Ft 100 0 100 200 300 400 Feet

In the following table is shown the quantity of quartz crushed, and scheelite (tungstic trioxide) concentrates obtained by the seventeen companies and parties of miners engaged in this industry, together with the value, during the year 1914 :—

Name of Mine or Company.	Locality	Quartz crushed.	Scheelite (Tungstic Trioxide) Concentrate obtained.	Value.
		Tons.	Tons cwt.	£ s. d.
Dominion Consolidated Development Company	Wakamarina Valley, Marlborough	15,814	83 15	9,300 0 0
Glenorchy Scheelite Syndicate and seven parties of miners	Glenorchy, Lake County	554	79 12	6,815 13 6
Buckland and Ewart	Barewood, Taieri County	50	5 0	500 0 0
Fraser and party (Morning Star) ..	Waihemo County ..	97	16 10	1,720 10 0
Deep Dell Gold and Silver Company	,, ..	1,650	21 12	2,080 0 0
Golden Point Gold-mining Company	,, ..	1,377	1 0	80 0 0
Mitchell and Dowie	,, ..	21	1 5	97 15 0
Stoneburn Gold and Silver Company	,, ..	1,115	8 3	735 0 0
Mareburn Gold and Silver Company	Hyde, Maniototo County	955	4 1	396 0 0
Alta Mining Syndicate	Bendigo, Vincent County	112	1 0	100 0 0
Totals	..	21,745	221 18	21,824 18 6

In addition certain of the above mines produced gold as follows :—

	£
Dominion Consolidated	7,833
Fraser and party	12
Deep Dell	220
Golden Point	867
Stoneburn	23
Mareburn	280
Alta Syndicate	234

The principal market for scheelite concentrate being Germany, the demand ceased after the outbreak of the present war.

Kauri-gum.

The value of kauri-gum exported during 1914 amounted to £497,444, or £51,662 less than that exported during the previous year. The decline is due to the war, much of the gum exported being formerly used in Europe by the belligerents. Since the outbreak of hostilities the quantity of gum shipped weekly from the Northern Wairoa, it is estimated, does not exceed 3 tons, whereas prior thereto 30 tons were so handled. The average weekly quantity dug now approximates 8 tons, but owing to the depressed state of the market country buyers are chary of purchasing more than is necessary to liquidate the indebtedness of diggers for food-supplies. At the same time the regular diggers, amongst whom are some three hundred Croatians, do not appear over anxious to sell, and are storing their gum on the fields, being satisfied that at the cessation of the war all grades of the material will command higher rates than those which have ruled hitherto.

Prior to the war about six thousand persons were more or less intermittently employed at gum-digging, but owing to the decline in the demand for gum this number has been greatly reduced.

To afford a measure of relief to unemployed gum-diggers the Government, in terms of the Kauri-gum Act, 1914, has recently purchased from such diggers gum to the value of £5,000 on the base of prices ruling on the 1st July, 1914. The gum thus purchased is being stored in Auckland.

Iron.

The Parapara iron-ore leases continue to remain unworked, the Cadman lease having now been under protection for the past two years and a half, and under partial exemption from the labour conditions of the lease the previous two years and a half. These leases have been obviously held for sale for many years, and *bona fide* mining operations are apparently not intended by the holders.

At Moturoa Messrs. Hesketh and Son have during the year produced 3 tons of pig iron from Taranaki ironsand, by a special process described in my last annual report. The furnace employed is of large cupola type, the ironsand being first briquetted with 40 per cent. of non-sulphurous coal. Two sintering-furnaces were at the time of my inspection, in March, 1915, being constructed.

I was informed that the pig iron produced is phosphoric—*i.e.*, above the Bessemer standard in phosphorus—but that the excessive titanium contained in the ironsand was greatly eliminated in the furnace. The operation being of an experimental nature, further information regarding the quality and analysis of the pig iron was not obtainable by me upon application to Mr. Hesketh, jun.

For the encouragement of the manufacture in New Zealand of iron and steel the Iron and Steel Industries Act, 1914, has been passed. In this statute provision has been made for the payment of bounties at the rate of 12s. per ton on pig iron, and £1 4s. per ton on puddled bar iron and steel respectively, to cover a period of three years, and with a proviso that the total sum payable as bounty shall not exceed £150,000. Regulations have since been gazetted prescribing the minimum quantity and the standard of quality of the bounty goods, also the procedure to be followed by applicants for bounty.

Petroleum.

The year's operations have been uneventful, no new productive wells having been drilled; and several of the prospecting companies have ceased operations.

The Taranaki Oil-wells (Limited) has treated at the new refinery at Moturoa 525,475 statute gallons of crude oil, the product meeting with a ready sale at prices equal to the imported article. Unfortunately, however, the three productive wells of this company, Nos. 2, 3, and 5, have declined in yield from an average of 689 statute gallons prior to the 27th August, 1912, to about 300 gallons per day for the period intervening between that date and the 24th March, 1915. Unless a more permanent supply of oil is tapped by the drilling operations, which are now being continued to a greater depth, there is little prospect of the company's refinery, which is capable of refining 10,000 gallons per day, being kept actively employed. On the 24th March, 1915, this company had proved to my satisfaction that 776,161 gallons of crude oil had been impounded, and that it contained on an average 97 per cent. of oil capable of distillation.

Drilling operations are being continued at the Blenheim well, Moturoa, by the Taranaki Oil-lands (Limited). A depth of 3,315 ft. has been attained, and a feeble flow of oil was issuing from the well at the time of my visit on the 24th March, 1915, of which 21,000 statute gallons had then been impounded in the No. 7 tank of the Taranaki Oil-wells (Limited).

The following is a list of oil-wells and prospecting-boreholes recently drilled, together with their depths and the results* attained:—

Name of Company.	Name or Number of Well.	Locality.	Total Depth, in Feet.	Result.
Taranaki Oil-wells	1	Moturoa	3,030	Abandoned or suspended.
,, ...	2	,, ...	3,030	Feebly productive.
,, ...	3	,, ...	4,040	,,
,, ...	4	,, ...	850	Unproductive.
,, ...	5	,, ...	2,890	Productive.
,, ...	6 (rotary)	,, ...	2,885†	Drilling; feebly productive.
,, ...	1	Bell Block, Waitara ..	3,821	Unproductive; abandoned.
,, ...	2	,, ,, ..	2,970	,, ,,
Taranaki Oil-lands, &c. ..	Blenheim	Moturoa	3,315‡	Productive at 2,171 ft. and 2,211 ft.
Phœnix Oil	..	,, ...	2,300‡	Abandoned or suspended.
Consolidated Oilfields of Taranaki	..	Huiroa	3,700‡	Drilling.
Bonithon Freehold Oil	..	Near New Plymouth ..	2,505	Drilling suspended.
United Oil	..	Tikorangi, Waitara River	695‡	Abandoned or suspended.
Kotuku Oilfields	..	Near Lake Brunner ..	952	Abandoned (in primary rock).
,, ...	1	Near Waipatiki, Hawke's Bay	3,000	Abandoned or suspended.
,, ...	2	Ditto	2,000	,,
New Zealand Oilfields	1	Totangi, Gisborne ..	511	,,
,, ...	2	Waihirere	1,375	,,
Mangaone Oilfields	1	Mangaone Valley, near Eketahuna	3,000†	,,
,, ...	2	Near Eketahuna ..	114†	,,

* The depths and results here given are from the best evidence obtainable by the Mines Department, but information in some cases is difficult to obtain, and the depths are not guaranteed as correct.

† The rotary system of drilling was employed.

‡ The Canadian-Galician percussion system of drilling is employed.

Sulphur.

Owing to the destruction by earth-tremor and subsequent irruption of the whole of the New Zealand Sulphur Company's works, and the loss of all the eleven employees living on White Island on the 11th September, as described in Section III of this report, operations have ceased, and it is to be hoped that no further attempt will be made to exploit the sulphur-deposits of doubtful commercial value upon that weird island.

Phosphate Rock.

The Ewing Phosphate Company, operating at Clarendon, Otago, produced 9,700 tons of phosphates, being 1,300 tons less than during the previous year. The Dominion Lime and Phosphate Company, operating in Otago, produced 1,043 tons.

VI. STONE-QUARRIES.

New Zealand possesses a great variety of handsome and durable building-stones scattered throughout both Islands. In Auckland there is basalt, andesite, porphyrite, and quartz-biotite-diorite, known in the building trade as Coromandel "granite," a hard coarsely crystalline rock capable of taking a fine polish. Besides these rocks are the Whangarei limestone and Raglan stone, the former an excellent building-stone, the latter a good freestone. Taranaki has the hornblende andesites of New Plymouth and Mount Egmont, and Wellington the andesites of Ruapehu.

In Nelson there is the granite of Tata Island and Tonga Bay, and the marble and crystalline limestones of the Pikikiruna (Riwaka) Range. West Nelson and Westland are well provided with granites and limestones of good quality, well adapted for building purposes; and in the Griffin Range, North Westland, there is found an abundance of finely coloured serpentine, unsurpassed as a decorative stone. Building-stone is scarce in Marlborough, but Canterbury is well supplied, having an abundance of Lyttelton bluestone (andesite) and Mount Somers stone, a limestone of exceptional quality. In Otago there is an abundance of excellent building-stone, ranging from the well-known Oamaru stone to the granite, gneiss, and limestones of Fiordland, all close to deep water. In Southland there is the so-called Ruapuke "granite," the norite of the Bluff, and the granites of Stewart Island.

The principal buildings in New Zealand have been constructed in stone from local quarries.

The following is a table showing the locality and names of the owners of the principal building-stone quarries:—

Class of Stone.	Locality.	Owners of Quarry or Land.	Principal Buildings erected thereof.
Quartz-biotite-diorite	Coromandel ..	New Zealand Granite Company Auckland	Parliament House, Wellington; Post-office, Auckland.
Granite	Tonga Bay ..	J. and A. Wilson, Wellington ..	Post-office, Wellington.
,, ...	Ruatuna ..	J. G. Coates, Matakohe ..	Not yet developed.
Trachyte	Drury	W. Parkinson, Auckland ..	,,
,, ...	Pukekaroro ..	Trachyte Stone Company, Auckland	,,
Andesite	Sumner ..	..	..
Basalt	Mount Eden ..	Government of New Zealand ..	H.M. Prison, Auckland; churches, &c.
Andesite	Christchurch ..	Cashmere Estate, Christchurch	Anglican Cathedral, Christchurch; Bank of N.Z.
Basalt	Timaru ..	..	..
Andesite	New Plymouth ..	Government of New Zealand ..	H.M. Prison, New Plymouth.
,, ...	Ruapaki ..	..	..
Fossil limestone ..	Whangarei Heads	..	..
Limestone (white) ..	Mount Somers ..	Blackburn and Smith, Christchurch	..
,, (pink) ..	,, ..	Ditto	Banks of Australia and Australasia, Christchurch.
,, "T" ..	Oamaru ..	Teschemaker Estate, Oamaru	Many important buildings, including town halls, churches, and banks in New Zealand and Australia.
,, "K" ..	,, ..	H. S. Bingham and Co., Dunedin	
Marble, white and grey (2 varieties)	Sandy Bay, Nelson	New Zealand Marble and Cement Company, Palmerston North	Quarries newly developed. In the New Zealand House of Parliament this marble will be used.
Serpentine ..	Griffin Range, Westland	New Zealand Greenstone (Limited), Greymouth	Now being developed, and a large plant installed.

In the following table there are only included those quarries and places coming within the provisions of the Stone-quarries Act, 1910, which applies to every place, not being a mine, in which persons work in quarrying stone by means of explosives, and any part of which has a rock-face more than 20 ft. deep, also to any tunnel in the construction of which explosives are used. In these tables there are thus included gravel-pits, railway cuttings and tunnels, in addition to stone-quarries as usually understood.

The following is a table showing for each inspection district the number of quarries, persons ordinarily employed thereat, also the number of certificated quarry managers or foremen during 1914 :—

Inspection District. (Counties.)	Number of Quarries being worked.	Number of Persons ordinarily employed.	Number of Permits granted during 1914. Managers or Foremen.	Total Number of Permits granted to Managers or Foremen.
North Island.				
Mongonui, Whangaroa, Bay of Islands	7	32	2	14
Hokianga	..	..	3	3
Whangarei	4	177	4	24
Hobson, Otamatea, Rodney, Waitemata, Eden, Raglan	41	320	19	125
Waikato, Manukau	7	21	3	3
Waikato, Waipa, West Taupo, Waitomo, Awakino, Ohura	1	..	..	..
Kawhia	..	..	..	..
Coromandel, Piako, Ohinemuri, Matamata	9	56	27	66
Thames	6	18	..	21
Tauranga	2	38	3	5
Rotorua, north part of East Taupo, Whakatane	1	5	..	3
Opotiki	4	17	4	4
Waikohu	..	..	..	8
Cook, Waiapu	..	..	..	5
Wairoa	8	35	..	..
Patangata, Waipukurau, Waipawa, Hawke's Bay, east part of East Taupo	10	69	9	29
Kaitieke	1	15	4	4
Clifton	2	7	3	3
Taranaki, Egmont	..	..	1	1
Whangamomona, Stratford	1	5	2	2
Eltham, Waimate West, Hawera, Patea	..	..	..	4
Waimarino	8	71	13	25
Waitotara, Wanganui	3	20	6	8
Rangitikei (except east part)	..	..	..	..
East part of Rangitikei, Kiwitea, Pohangina, Oroua, Manawatu, Kairanga	..	..	..	..
Woodville, Dannevirke, Weber	2	14	2	13
Pahiatua, Akitio, Horowhenua	3	46	4	4
Featherston, Wairarapa South, Masterton, Mauriceville, Eketahuna, Castlepoint	..	..	..	4
Makara, Hutt	3	29	..	46
South Island.				
Waimea, Takaka, Collingwood	1	20	2	7
Sounds, Marlborough, Awatere, Kaikoura	1	2	8	16
Buller	2	178	4	16
Murchison, Inangahua, Westland	3	14	..	6
Grey	3	38	1	9
Amuri, Cheviot, Waipara, Kowhai, Oxford, Rangiora, Eyre, Paparua, Waimairi, Halswell, Heathcote, Mount Herbert, Akaroa, Wairewa, Springs, Ellesmere, Malvern, Selwyn	6	59	11	28
Tawera, Otira Tunnel (Canterbury end)	2	68	3	16
Otira Tunnel (Westland end)	1	173	1	
Ashburton, Geraldine, Mackenzie, Levels, Waimate, Waitaki, Maniototo, Waihemo, Waikouaiti, Taieri, Vincent, Lake, Tuapeka, Peninsula, Bruce, Clutha, Southland, Wallace, Fiord, Stewart Island	37	477	26	220
Totals	179	2,024	165	742

The following is a summary of persons killed or seriously injured during 1914 at stone-quarries and places within the operation of the Stone-quarries Act (being in proportion of 1·0 persons killed per 1,000 employed) :—

Cause of Accident.	Number of Accidents.		Number of Sufferers.	
	Fatal.	Serious.	Killed.	Seriously Injured.
Explosives	..	1	..	1
Falls of ground	1	8	1	8
Machinery	..	3	..	3
Haulage	..	3	..	3
Miscellaneous	1	46	1	46
Totals	2	61	2	61

The following are details of the two fatalities :—

(9/9/14) Frederick Bonifacio, an experienced quarryman, was killed by a fall of rock at the Westport Harbour Board's quarry at Cape Foulwind.

(13/10/14) Alexander McCullogh, foreman in charge of the Oamaru Corporation stone-quarry, was killed by falling from a ledge. The quarry was not worked in a safe manner, the ledge upon which the men were standing being too narrow, and the upper portion of the face had insufficient slope.

At the inquests held in connection with each of these fatalities a verdict was returned that death was accidental, no person being held blameworthy.

VII. STATE AID TO MINING.

(1.) Subsidized Prospecting.

During the year ended the 31st March, 1915, twenty approved prospecting parties were granted subsidies amounting to £1,398 17s. 6d., of which £599 17s. 3d. was expended during that period. In addition to this, £1,386 0s. 2d. granted during previous years was expended by fifty parties during the past financial year.

The following statement shows the total expenditure during the year ended the 31st March, 1915, on authorities issued previous to that date, in subsidies to prospecting associations and parties of miners in the different counties :—

Name of County, &c.	Expenditure. £ s. d.
Rotorua County	26 0 0
Coromandel County	54 0 0
Thames County	52 15 0
Ohinemuri County	298 5 0
Buller County	60 0 0
Inangahua County	405 17 0
Murchison County	16 13 4
Grey County	94 1 0
Westland County	1,050 2 10
Lake County	50 0 0
Southland County	36 12 0
Prospecting Associations, &c.	640 11 6
Total	2,784 17 8

Altogether sixty-two persons have during 1914 been engaged upon work for which prospecting subsidies were granted. No discovery of value has been made, and neither the mining industry nor the State has benefited directly by the expenditure.

The following is a table prepared by the Inspectors of Mines, who inspected the subsidized operations :—

Number of Subsidized Prospectors, the Amount of Subsidy granted and paid, also the Character and Result of Prospecting Operations from 1st January, 1914, to 31st March, 1915.

Name of Prospecting Party.	Numbers of Prospectors.	Locality of Operations.	Amount of Subsidy granted.	Amount of Subsidy expended.	Distance driven.	Distance timbered.	Nature of Claim.	Character of Prospecting Operations.	Remarks.
Northern Inspection District.					Ft.	Ft.			
Hayes Bros.	2	Boat Harbour, Coromandel	5s. per ft. for 270 ft.		130		Quartz	Driving	Opening up a run of ore of estimated value £4 per ton.
May Bell and Scotia Claims	4	Waitekauri	£125		306		„	„	Driving in search of a lode.
O'Keefe and party	2	Karangahake	£37 10s., at 5s. per ft.		50		„	„	„
Luhrs and Ryan	2	Mahakirau, Coromandel	£1,000 at £2 subsidy for £1 subscribed					Trenching and surface prospecting	No definite lode yet found.
Turnbull and Graham	2	Thames district					„	Ditto	Found several low-grade quartz formations.
Ross and Anderson	2	Whangamata						„	Following the line of a lode.
McGregor and party	2	Horahora	£26				„	„	Nothing of value found.
Dominion Company	5	Karangahake	5s. per ft. for 350 ft.		1,618*		„	Driving	Driving to strike a lode already located.
West Coast Inspection District.			£ s. d.	£ s. d.					
Energetic Extended Syndicate	2	Murray Creek, Reefton	175 0 0	76 10 0	306	†	Quartz	Crosscut-drive	The work is still in progress.
Firmston and Franz	2	Blackwater	100 0 0	43 5 0	173	†	„	Driving on reef	Reef driven on 200 ft. not payable.
Victoria Range Syndicate	4	Victoria Range	481 0 0	246 0 0	984	†	„	Crosscut-drive	The work is still in progress.
Hopkins and party	2	Taipo Valley, Westland	52 0 0	Nil			„	Surface work and trenching	Work in progress; prospects encouraging.
Howells and Chester	2	Mokihinui	135 0 0	60 0 0	240		„	Driving in small reef	Small reef driven on not payable.
Gibb and Friend	2	South Westland	100 0 0	100 0 0	400		Alluvial	Drive in rock	Claim now being worked successfully.
Kulsen and Marks	2	Kanieri, Westland	52 0 0	20 0 0			„	Surface prospecting	Work in progress.
Lincoln and party		Ruatapu Beaches	30 0 0	Nil			Beaches	Shaft-sinking	Nothing has been done.
McNicoll Bros.	2	Mikonui, Ross	180 0 0	45 0 0	180	100	Alluvial	Drive in rock	Work in progress.
McBeath and party	2	Back Creek, Rimu	32 10 0	20 10 0	200	83	„	Driving	Work incomplete; results to date encouraging.
McPhee and party	2	Woodstock, Hokitika	150 0 0	Nil	Not measured up yet		„	„	Work is in progress.
Mitchell Bros.	2	Stafford	20 0 0	„			„	„	Work not commenced.
Southern Inspection District.									
W. McIvor	2	Waikaia	41 5 0	19 18 9	145	145	Alluvial		Result undecided.
Terry and party	3	„	46 3 0	46 3 0	300	300	„		Ground unpayable.
Browne and party	1	Lawrence	100 0 0	34 5 0	137		„		Result undecided.
Waipori Prospecting Company	6	Waipori	800 0 0	130 8 0	110	110	„		„
Stewart Island Tin Company	10	Stewart Island	800 0 0	800 0 0			Alluvial, tin	Jetty and tramway construction	Not prospecting work.
Wills and Shenahan	2	Alexandra	166 0 0	38 10 6			„ gold	Water-race construction	„
John Ryley	3	Cardrona	50 0 0	50 0 0			„ „	Tail-race construction	„
Gordon and party		Kawarau	43 15 0				„ „		No work yet done.
Carrick Gold-mining Company		Bannockburn	500 0 0				„ „		„
Total	72								

* Total. † Timber is used where required, but not measured separately.

(2.) Loans for the Development of Mining.

Since 1905, when statutory provision was made for advances by way of loans for mining development, fifty applications have been received for loans, of which six only were favourably considered by the Board appointed under the Mining Act to investigate and report upon such applications.

The amount of loans granted is £35,225, of which £33,573 has been paid to the borrowers.

Of the five concerns assisted, one has refunded the loan out of capital, never having made any profit, and three are in arrears in payment of interest. None of the fifty applicants for loans subsequently declared any dividend.

The provision regarding mining loans is taken advantage of by mining promoters who are unable to obtain subscribers for their shares, to make up shortage of capital on the extremely favourable terms—viz., bearing interest at 4½ per cent.—which the Government offers. It is perhaps unnecessary to state that such speculations, to which the investing public are not responsive, have frequently very remote prospects of success.

The result of mining loans in this Dominion has been no better than that experienced in New South Wales and Victoria, where much money was thus expended without benefit to the industry or to the State.

Statement regarding Mining Companies who have borrowed Money for Development of Mining under Part X of the Mining Act.

Initial to represent Name of Company.	Amount of Loan granted.	Amount of Loan paid, 31/3/15.	Amount of Loan refunded to Government.	Subscribed Capital.	Amount of Capital actually Paid up.	Value of Scrip given to Shareholders on on which no Cash paid.	Total Expenditure since Registration.	Total Amount of Dividends paid.	Amount of Debts owing by Company.
	£	£	£	£	£	£	£	£	£
A	10,000	8,998	..	34,193	21,937	10,000	24,175	..	9,573
B*	7,000	7,000	..	70,000	2,585	63,000	70,000	..	7,640
C†	7,725	7,075	..	..	..	..	..	..	..
D‡	10,000	10,000	3,000	14,400	14,400	5,550	73,258	..	15,525
E	500	500	500	..	..	..	..	..	..
Totals ..	35,225	33,573	3,500	..	..	..	..	..	..

* £133 13s. 10d. interest in arrears. † £336 9s. 11d. interest in arrears. ‡ £394 16s. 2d. interest in arrears; also £3,000 principal, being instalments of principal, unpaid.

(3.) Subsidized Roads on Goldfields.

The following schedule shows the amounts expended by subsidies and direct grants out of the Public Works Fund—vote, "Roads on Goldfields"—in the different counties, &c., during the year ended 31st March, 1915:—

——	Direct Grants.	Subsidies.
	£ s. d.	£ s. d.
Whangarei County	200 0 0	..
Coromandel County	1,214 16 8	..
Thames County	1,581 15 6	34 15 0
Thames Borough	150 0 0	..
Ohinemuri County	3,804 11 7	243 0 0
Pelorus Road Board	331 7 6	..
Havelock Town Board	87 19 0	..
Collingwood County	739 0 3	..
Takaka County	361 0 0	..
Waimea County	488 3 11	..
Buller County	3,492 4 6	..
Inangahua County	4,649 16 6	210 17 6
Murchison County	1,428 13 5	..
Westland County	1,499 15 7	..
Grey County	5,695 13 11	50 0 0
Vincent County	350 0 0	..
Maniototo County	10 2 6	..
Tuapeka County	..	100 0 0
Lake County	276 2 7	..
Wallace County	76 9 11	..
Otautau Town Board	101 10 4	..
Arrowtown Borough	100 0 0	..
Southland County	1,212 9 6	1,574 9 11
Totals	£27,851 13 2	£2,213 2 5

In addition to the foregoing, North Island goldfields' local bodies were credited with gold duty amounting to £12,450 1s. 8d.

The total amount of State aid thus given on behalf of the mining industry during the past financial year amounted to £42,514 17s. 3d.

(4.) Government Prospecting-drills.

Particulars of Boring during 1914 by Government Prospecting-drills.

Type of Drill.	Name of Superintendent.	To whom lent.	Mineral sought for.	Number of Holes drilled.	Approximate Depth drilled.	Diameter of Hole.	Character of Country penetrated.	Average Cost per Foot, including Transport.	Result of Drilling.
					Ft.	In.		£ s. d.	
Schram-Harker (oil-driven diamond drill	W. H. Warburton	Point Elizabeth Colliery, Cavern Creek	Coal ..	1	Hole cased to 70 ft. 552 ft.	2½	Mudstone, sandstone, shales, and grit	0 4 3	No coal.
Ditto	,,	Ditto	,, ..	1	479	2½	Sandstone, shales, grit, and shaly mudstone	0 4 0	,,
Hand-boring plant ..	,,	Point Elizabeth No. 2 Section Mine	,, ..	1	98	2½	Sandstones, shale, and grits ..	0 7 10	Coal—2 ft. 6 in. at 17 ft.; 1 ft. 6 in. at 52 ft.
Schram-Harker (oil-driven) diamond drill	,,	Liverpool Colliery, No. 3 Section	,, ..	1	532	2½ in. to 165 ft., cased, then reduced to 1⅝ in.	Sandstones, shales, grits, and shaly mudstone	0 2 11	Coal—2 ft. 6 in. at 70 ft.; 5 ft. at 126 ft.; 2 ft. at 199 ft.; 1 ft. 6 in. at 272 ft.; 2 ft. 6 in. at 316 ft.; 4 ft. 3 in. at 479 ft.
Ditto	,,	Liverpool Colliery, No. 1 Section	,, ..	1	405	2½	Sandstones, shales, grits, shaly mudstones conglomerate	0 3 9	Coal—21 ft. (Morgan seam) at 170 ft.; 3 ft. at 220 ft.; 2 ft. at 227 ft.
,, ...	,,	Liverpool Colliery, No. 1 Section East	,, ..	1	209	2½	Sandstones, grits, and shaly mudstones	0 3 6	Coal—1 ft. 6 in. at 13 ft.; 23 ft. (Morgan seam) at 180 ft.
,, ...	,,	Liverpool Colliery, No. 1 Section West	,, ..	1	105*				
Schram-Harker diamond drill	W. Carter ..	Waihi Gold-mining Company..	Gold ..	1	373	3	Dacite	2 3 0	Unfavourable.
Ditto	,, ..	West Haven Coal-prospecting Company (near Collingwood)	Coal ..	1	122	2 13/16	Alluvial and debris	0 8 6	Drilling still in progress.
Keystone No. 1 placer drill	G. E. D. Seale ..	Round Hill Gold-mining Company (Waikaia)	Alluvial gold	5	889†	5 to 6	Gravel and clay	0 6 6	,, ,,

* In progress. † Aggregate.

The demand for these drills, which are lent free of charge, has not been so great as in previous years, due, no doubt, to the difficulty in obtaining capital for mining ventures at the present time.

Only one of the three Keystone placer drills has been in commission—viz., the No. 1 plant—which has been operated for the Round Hill Gold-mining Company at Waikaia, Southland.

A Schram-Harker diamond drill has been used very successfully at the Liverpool State Colliery, six holes being drilled into the Morgan seam of bituminous coal of superior quality, free from bands, and averaging 17 ft. in thickness. Within the area drilled 130 acres of coal has been proved, containing approximately 3,500,000 tons. Further exploration and drilling now being carried out will probably increase the known estimate of this coal reserve.

(5.) Government Water-races.

The Waimea-Kumara and Mount Ida Water-races, which render possible hydraulic mining in the Kumara district, Westland, and the Naseby district, Central Otago, have supplied 105 miners with water for sluicing during 1914, by which they obtained gold to the value of about £25,675. For the year ended the 31st March, 1915, the receipts for water sold from the combined races was £3,493, the expenditure in upkeep and supervision during the same period being £3,782, as compared with £3,305 and £3,215 respectively during the previous financial year.

A new branch of the Waimea Water-race, 140 chains in length, from Macpherson's Creek to Kawhaka Valley, has been constructed to increase the water-supply.

In proximity to the branch race to Argus Terrace from the Erin-go-Bragh main race two or three successful claims have been developed.

The recently constructed and costly extension of the Kumara Water-race by siphon, two miles in length, across the valley of the River Taramakau continues to be badly supported, only one claim being now worked. The claimholders, after receiving the usual quantity of free water granted to new customers, have generally ceased operations, after very little work has been done or expenditure incurred.

VIII. SCHOOLS OF MINES.

At the last Government examinations the following students won scholarships (value £50 per annum, with free class fees tenable for three years at the Otago University School of Mines)—viz., Messrs. H. A. Ellis, of the Waihi School, and F. Smale, of the Karangahake School.

The following is a summary of the results of the Government examinations at the schools of mines during 1914 by all students:—

Position.	Locality of School of Mines.	Average Number of Marks awarded per Paper submitted.	Number of Students examined.	Number of Papers submitted.	Total Marks awarded.
		Per Cent.			
1	Waihi	61·36	18	44	2,700
2	Karangahake ..	57·70	13	34	1,962
3	Westport (including Ngakawau and Denniston)	48·24	15	24	1,158
4	Reefton (including Waiuta)	47·37	13	21	995
5	Thames	46·53	21	26	1,210
6	Coromandel	36·42	12	19	692
	Totals	51·89	92	168	8,717

The subjects examined upon included several that were common to other occupations in addition to mining. In the subject of metal-mining only one paper was received, and for coal-mining only five papers; with such a poor result it is doubtful whether these schools justify their existence.

The following table shows the expenditure by the Government on schools of mines since their inception, exclusive of subsidies paid to the University of Otago towards the School of Mines in connection with that institution:—

Financial Years.	Subsidies towards the Erection of Schools of Mines, and Maintenance.	Chemicals and Apparatus, also Mineralogical Specimens supplied to Schools of Mines.	Scholarships.	Salaries of Teachers, and Travelling-expenses, &c.	Total Sum paid by the Department towards the Schools of Mines.
	£ s. d.	£ s. d.	£	£ s. d.	£ s. d.
1885–86 ...	...	36 19 9	...	1,223 9 10	1,260 9 7
1886–87 ..	257 16 6	409 1 4	...	2,716 9 3	3,383 7 1
1887–88 ...	253 15 9	253 14 1	...	1,714 9 6	2,221 19 4
1888–89 ...	42 10 0	6 12 9	...	1,139 4 1	1,188 6 10
1889–90 ...	142 2 0	181 14 10	...	716 3 10	1,040 0 8
1890–91 ...	217 6 6	54 8 0	...	620 9 9	892 4 3
1891–92 ...	181 14 0	...	...	689 5 9	870 19 9
1892–93 ...	312 3 4	...	..	670 1 0	982 4 4
1893–94 ...	197 0 5	...	...	858 19 4	1,055 19 9
1894–95 ..	390 0 0	45 10 10	...	773 17 8	1,209 8 6
1895–96 ...	820 0 0	...	50	849 3 0	1,719 3 0
1896–97 ...	352 14 11	58 18 6	100	834 12 8	1,346 6 1
1897–98 ...	1,089 18 6	29 19 9	100	780 19 0	2,000 17 3
1898–99 ...	740 15 2	32 19 7	50	729 10 11	1,553 5 8
1899–1900 ...	990 3 4	24 3 8	50	52 16 3	1,117 3 3
1900-1901 ...	866 10 11	56 3 4	98	77 7 10	1,098 2 1
1901–1902 ...	1,155 12 3	63 5 1	49	69 16 4	1,337 13 8
1902–1903 ..	1,379 15 6	134 18 8	158	111 0 0	1,783 14 2
1903–1904 ...	1,575 15 3	88 18 8	92	109 15 10	1,866 9 9
1904–1905 ...	1,401 2 11	17 3 0	100	362 19 6	1,881 5 5
1905–1906 ...	1,806 19 5	87 2 1	49	440 9 4	2,383 10 10
1906–1907 ...	1,836 6 6	11 15 8	100	388 18 5	2,337 0 7
1907–1908 ...	2,428 19 3	94 6 2	150	345 15 11	3,019 1 4
1908–1909 ...	2,738 11 1	328 9 3	100	642 9 4	3,809 9 8
1909–1910 ...	1,882 2 6	692 2 8	100	587 3 2	3,261 8 4
1910–1911 ...	2,813 0 10	44 5 8	108	1,130 7 3	4,095 13 9
1911–1912 ...	1,852 19 11	38 9 9	92	1,138 6 7	3,121 16 3
1912–1913 ...	1,769 6 10	182 18 4	100	1,227 2 2	3,279 7 4
1913–1914 ...	1,909 14 7	70 4 2	250	1,267 17 10	3,497 16 7
1914–1915 ...	1,628 4 1	11 13 8	275	2,416 6 2	4,331 3 11
Totals ...	33,033 2 3	3,055 19 3	2,171	24,685 7 6	62,945 9 0

I have, &c.,
FRANK REED, Inspecting Engineer.

ANNEXURE A.

EXTRACTS FROM THE REPORTS OF GOVERNMENT WATER-RACE MANAGERS.

WAIMEA-KUMARA WATER-RACES, WESTLAND.—MR. JAMES ROCHFORD, Manager.

Waimea Water-race.

THE cash received for sales of water from this race for the year ended the 31st March, 1915, was £1,027 13s. 4d., and the expenditure on management, gauging, maintenance, and repairs amounted to £716 3s. 1d., showing a credit balance of £311 10s. 3d. on the year's transactions.

The average number of miners supplied with water during the year was 29·66, an increase of 1·16 on the previous year; and the approximate amount of gold obtained by them was 2,015 oz., valued at £7,858 10s., an increase on that of last year of £1,521.

The sales of water amounted to £1,027 13s. 2d., an increase of £183 14s. 5d. on the previous year.

The cash received for sales of water showed an improvement of £154 8s., and the expenditure an increase of £106 12s. 9d. for the year, and the whole of the race from the headworks at Kawhaka Creek to Ballarat Hill is now in good repair. The increased expenditure was caused by a break in the race near Fox's and the carrying-out of certain necessary repairs at the Wainihinihi and Kawhaka headworks. On the 10th October a break took place in the race at Fox's, and over 2 chains of new race had to be cut well back into the hill. The repairs cost £37 17s., and the water was off for eleven days.

Linklater and party worked out their claim at Lower German Gully in May, and they immediately set about opening up two other sluicing claims at Ballarat Hill. These claims have been working since July, 1914, but I understand that the returns so far have been disappointing.

At Tunnel Terrace four parties were supplied with water during the year, and there is still a considerable area of payable ground to be worked in this locality; and generally speaking the demand for water in Goldsborough and Stafford districts shows no indication of decreasing.

Linklater and Morgan's subsidized siphon, from the original terminus of Branch B to Scandinavian Hill, was completed in August. The siphon is composed of wrought-iron pipes, 22 in. and 18 in. in diameter, it is 74 chains in length, has a head of 47 ft., and its carrying-capacity is 12½ heads. The 18 in. pipes crossing the low ground are flanged and double-riveted, and where they cross the Waimea Creek are subject to a pressure of 139 lb. to the square inch.

The Waimea Branch Race from Macpherson's Creek to Kawhaka Valley, to augment the supply of water for the Waimea Race, was completed in March. This work was let by contract in January, 1913, but on the date for the completion of the contract less than half the work was done, and the contractor threw up the contract, and the Mines Department completed the race by day labour; and, notwithstanding that a considerable amount of extras, such as a number of overflow by-washes, sand boxes, hut, &c., had to be done, the work was completed within the original estimate. The race is 140 chains in length, including 18 chains of tunnel and 6¾ chains of wrought-iron siphons. From peg 60 to peg 71 in No. 1 section the ground was extremely rough and broken, being practically a slip from the mountain-range, and in many places the bottom of the ditch had to be excavated for a depth of 2 ft. and puddled and side-walled before it would carry water. The water was turned through the race on the 27th March, when everything worked without a hitch, and the supply was found most satisfactory.

Branch Race to Callaghan's and Middle Branch Flat.

The cash received for sales of water from this race for the year ended the 31st March, 1915, was £361 14s., and the expenditure on management, gauging, maintenance, and repairs amounted to £512 1s. 7d., showing a debit balance of £150 7s. 7d. on the year's transactions.

The average number of miners supplied with water during the year was 11·75, a decrease of 6·08 on the previous year; and the approximate quantity of gold obtained by them was 1,030 oz., having a value of £4,017, a decrease of £265 4s. on last year.

The sales of water amounted to £430 7s. 6d., a decrease of £119 12s. 6d. on the previous year.

The cash received was £173 8s. less, and the expenditure was £11 11s. 7d. greater, than during the preceding year, and the races have been well maintained and are now in good order.

The falling-off in the sales of water from this race was totally unexpected. At Middle Branch Flat Manzoni and party only sluiced for five months, and the Coronation Claim for nine months of the year, when owing to the poor returns they closed down their respective properties.

At Callaghan's Flat Havill and party sluiced intermittently throughout the year, but the quantity of water purchased was extremely small; and Honey and party, although still working their property, did practically no sluicing.

Kumara Water-race.

The cash received for sales of water from this race for the year ended the 31st March, 1915, was £234 8s. 11d., and the expenditure on management, gauging, maintenance, and repairs amounted to £338 1s. 8d., showing a debit balance of £103 12s. 9d. on the year's transactions.

The average number of miners supplied with water was 11·33, an increase of 6·75 on the previous year; and the approximate quantity of gold obtained by them was 779 oz., having a value of £3,038 2s., an increase of £2,151 8s. on last year.

The sales of water amounted to £333 4s. 6d., an increase of £309 16s. 5d. on the previous year, and the cash received showed an increase of £216 14s. 7d.

McGrath and Co. worked their claim at Upper Larrikins all the year, but the results obtained were far from satisfactory. This is greatly to be regretted, as, apart from the very large expense incurred by the company in opening up the property, it was thought by many competent judges that the lead that distributed the Kumara gold would be again picked up in this area, and that some indication of its original source would be ascertained.

Shannaughy and party was the only claim that sluiced into the No. 3 deviation during the year, and, notwithstanding the very heavy expenditure involved in maintaining about 7,000 ft. of channel and a long private tail-race, payable results were obtained.

During the year Mr. T. Moynihan took up a mining-area of 9 acres near the Kumara Borough boundary, which has since been transferred to an Auckland syndicate. Messrs. D. and T. Moynihan, on behalf of the syndicate, started to put the property in working-order in December, and, judging by the satisfactory progress made with the work up to the 31st March, sluicing operations should start some time in May. The preparatory work already carried out goes to show that the syndicate intends to work their property on a fairly large scale, and should the venture prove a success—and there is nothing to indicate otherwise—they will be large purchasers of Government water in the near future.

About twenty intermediate sets of timber and a considerable number of extra side and roof laths were placed in position in the head-race tunnel during the year. The usual quantity of flushing-water authorized by the Department was supplied when the No. 3 channel deviation was working, and water was also supplied to the Kumara Borough for fire-brigade and other purposes free of charge.

Kumara Trans-Taramakau Water-race.

The cash received for sales of water from this race for the year ended the 31st March, 1915, was £260 10s., and the expenditure on management, gauging, maintenance, and repairs amounted to £291 2s. 3d., showing a debit balance of £30 12s. 3d. on the year's transactions.

The average number of miners supplied with water was 14·25, an increase of 3·34 on the previous year; and the approximate quantity of gold obtained by them was 833 oz., having a value of £3,248 14s., a decrease of £581 2s. on last year.

The sales of water amounted to £358 12s. 9d., a decrease of £114 15s. 6d. on the previous year; and the cash received shows a decrease of £168 2s. 3d.

The sales from this race were very disappointing, as, instead of a decrease, a substantial improvement was expected. It is a significant fact that out of the five claims opened up and fully equipped at the beginning of the year only one, Bell and party, was working on the 31st March, the other four having closed down owing to the unsatisfactory results obtained. So far, however, none of those claims are dismantled, and there is reason to hope that they will be given another trial before being finally abandoned.

Although the Taramakau River has scoured considerably since the pipe-line was laid down, the pipes crossing the river show no indications of displacement, but a few more crates at the north end may be required from time to time. On the river-flat a number of joints started to leak so badly that an 8 ft. section of pipe was cut out, and the line connected up with an expansion-joint. The whole siphon is now fairly tight, and the race from the outlet end to Quinn's Terrace is in good order.

Erin-go-Bragh Water-race.

The cash received for sales of water from this race for the year ended the 31st March, 1915, was £214 7s., and the expenditure on management, gauging, maintenance, and repairs amounted to £371 9s., showing a debit balance of £157 2s. on the year's transactions.

The average number of miners supplied with water was 10·83, a decrease of 0·33 on the previous year; and the approximate quantity of gold obtained by them was 540 oz., having a value of £2,106, an increase of £464 2s. on last year.

The sales of water amounted to £222 8s., an increase of £10 17s. 6d. on the previous year.

The cash received showed an improvement of £11 10s. 6d., and the expenditure increased by £150 9s. 9d.

The increased expenditure was almost entirely due to the cost of repairing a break which took place in intake tunnel near the head of the long-drive race. The break occurred on the 30th November, and owing principally to the unsafe condition of the timber in the tunnel at both sides of it, which had to be renewed to ensure the safety of the men employed, repairs were not completed until the 10th March. The collapse of this tunnel completely cut off the water-supply from Maori Point and the new claims at Argus Terrace for over three months, and materially reduced the sales of water for the year. The tunnel is now in good order, and the cost of maintaining this race should be small for some time to come.

During the year three new claims opened out at Argus Terrace, but owing to the proximity of the Maori Point Road one of them had to temporarily cease operations before their free water was used up. The results so far obtained from these claims have been encouraging, and there is every probability of a payable field being opened up in this locality.

Wainihinihi Water-race.

As the season was exceptionally wet there was an excellent supply of water from this race during the year.

During the month of July a slip occurred on the side of the mountain immediately above the race, which broke down three sets of timber and filled up the ditch, but repairs were promptly effected by the men working on the Waimea Branch Race, and the water was only off for about four days.

Waimea–Kumara Water-races.

The following is a summary of the revenue and expenditure of these races for the year ended the 31st March, 1915: Sales of water, £2,372 5s. 11d.; cash received, £2,098 13s. 3d.; expenditure, £2,228 17s. 7d.; approximate value of gold obtained, £20,268 6s.; average number of miners employed, 77·83.

Although the sales of water showed an increase of £270 0s. 4d. on the previous year, the cash received only showed an increase of £41 2s. 10d., but a considerable percentage of the debit balances outstanding on the 31st March should be recovered during the ensuing year. In addition to the above sales, authorized free water to the value of £360 18s. 4d. was supplied to parties opening up new claims.

The total expenditure on the combined races was £2,228 17s., as against £1,803 7s. 4d. for the previous year, an increase of £425 10s. 3d. This increase was principally caused by repairs to the Waimea Water-race at Fox's and the long-drive tunnel at Maori Point, and the maintenance of the Erin-go-Bragh Race for twelve months as against nine months of the previous year.

Comparing the sales of water with the expenditure, the combined races show a profit of £143 8s. 4d. for the year.

Summary, showing Results of working the Waimea–Kumara Water-races during the Year ended 31st March, 1915.

Name of Water-race.	Expenditure.			Cash received.			Sales of Water.			Outstanding Moneys on 31st March, 1915.			Collateral Advantages.		
													No. of Men employed.	Ounces of Gold obtained.	Value of Gold obtained.
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.			£ s. d.
Waimea	716	3	1	1,027	13	4	1,027	13	2	19	12	0	29·66	2,015	7,858 10 0
Kumara ..	338	1	8	234	8	11	333	4	6	281	19	9	11·33	779	3,038 2 0
Callaghan's ..	512	1	7	361	14	0	430	7	6	113	9	4	11·75	1,030	4,017 0 0
Trans-Taramakau	291	2	3	260	10	0	358	12	9	147	8	0	14·25	833	3,248 14 0
Erin-go-Bragh ..	371	9	0	214	7	0	222	8	0	16	15	0	10·83	540	2,106 0 0
Totals and averages	2,228	17	7	2,098	13	3	2,372	5	11	579	4	1	77·83	5,197	20,268 6 0

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 £1,393 19s. 3d., an increase on that of last year of £146 2s. 11d. The expenditure on maintenance, cleaning, and repairs for the same period amounted to £1,552 10s. 9d., an increase on that of last year of £140 18s. 4d. The total cash received was £1,393 19s. 3d.

On account of payment in advance, free water was supplied to the value of £23 14s. 10d., and free water for washing up was supplied to the value of £112 16s. 2d.

The total value of water supplied from this race amounted to £1,530 10s. 3d., an increase on that of last year of £168 8s. 2d.

The approximate quantity of gold obtained by parties using water from this race during the year was 1,404 oz., valued at £5,405 8s., a decrease on that of last year of £743 1s.

The average number of men employed was 26·6.

From the 1st April until the 11th July, when hard frost compelled most of the claims to close down, there was a plentiful supply of water. A thaw set in on the 24th July, and most of the claims were again at work on the 27th. From then until the 8th October, when the water was turned out for cleaning and repairs, there was a full supply of water.

On the 14th September, the weather being favourable, and there being a good supply of water on the lower sections of the race, I started with all the available men to clean and repair the race from Hill's Creek upwards, and finished on the 8th October, when the water was turned out to clean and repair the lower sections. This work was completed and the water on again on the 22nd October. From this date until the Eweburn reservoir ran out, on the 17th January, there was a full supply of water. The weather at this time became very dry, and until rain set in on the 3rd March there was just sufficient water to supply the claims about half-time.

At the time of cleaning the race, and owing to the increased demand for water in Spec Gully, I found it necessary to give about five miles of the main race an extra good trimming and cleaning. I also lowered the bottom of the race from the intake of Wedderburn siphon to the head of Store Gully.

By doing this work it enables the race at this point to carry about 4 heads extra water, and thus saves drawing a like quantity from the Eweburn reservoir, when water is available in the Idaburn Creek. These works were to a great extent the cause of the increase in expenditure for the year.

During the year, on account of the increased demand for water in Spec Gully, I built a new storage-dam on a terrace on the west side of Spec Gully, and thus enabled all parties to work full time when water was plentiful. During the year I also re-formed the race at a point on the east side of Coalpit Gully, and removed therefrom a line of pipes, and relaid them across Main Gully, thus doing away with the old wooden flume, which was in an advanced state of decay; and it also enables the race at both places to carry extra water.

During the year the main race was very free from mishaps, only three small breaks occurring, and a burst in one of the pipes at the Wedderburn siphon. Portion of the embankment of Spec dam slipped away on two occasions, and I also had to strengthen it in two other places. There were also three breaks in the Spec branch races.

In the spring I found it necessary to put two new sets of timber in the Eweburn tunnel, and during the year I had to replace several old gauge-boxes with new ones, also renew 36 ft. of flume in Mullholland's gully which was blown down during a heavy gale, and repair a bridge over the main race on a public road.

The race at present is in good order, and the demand for water is quite equal to the supply.

ANNEXURE B.

REPORTS OF DIRECTORS OF SCHOOLS OF MINES.

Professor JAMES PARK, M.Inst. M.M., F.G.S., Dean of the Faculty of Mines, to the UNDER-SECRETARY OF MINES, Wellington.

SIR,— Dunedin, 11th April, 1915.

I have the honour to present my report on the work done at the Otago University School of Mines for the year ended the 31st December, 1914.

The Mining School for the session of 1914 showed an attendance of thirty registered students, exclusive of the arts and science students attending the lectures on geology, and the dental students attending the class of instruction in dental metallurgy. Of the thirty students, twenty-five were taking the associate course in mining engineering, and four the course for the associateship in geology. In addition to reading for the associateship in mining and geology, five new students were preparing for the B.Sc. degree of the University of New Zealand.

All passed the annual term examinations except one in mechanics and one in senior mathematics.

During the year the associate diploma in mining was granted to two students, and the diploma of land and mine surveyor to one.

Among the more important appointments obtained by our mining graduates during 1914 were the following:—

George W. Thomas, A.O.S.M., Mine-manager, Pahang Consolidated, Federated Malay States.
Aubrey Gow, A.O.S.M., Battery-manager, Radjang Gibong, Central Sumatra.
Cyril Gudgeon, General Manager, Mount Bischoff Extended Tin-mines, Waratah, Tasmania.
Hugh Crawford, A.O.S.M., Assistant Director, Thames School of Mines.
C. N. Boult, B.Sc., Engineer, Westport Harbour Board.
R. S. Thompson, A.M.I.C.E., Engineer, Patea Harbour Board.
C. H. Thompson, A.O.S.M., Manager, Mount Radiant Molybdenite-mine, West Nelson.
Walter Given, A.O.S.M., B.E., Director, Karangahake School of Mines.
W. Gibson, A.O.S.M., B.E., Assistant Geologist, New Zealand Geological Survey.

Mining Students on Active Service.—Of the undergraduates of 1914 no less than fourteen, or 47 per cent. of the whole, are now on active war service. Of these, nine went to Egypt with the main Expeditionary Force, four with the third reinforcements, and one with the fifth. In addition to these, seven graduates have joined various branches of the Forces and are now on active service. Of the fourteen undergraduates who have joined the Imperial Forces, nine, who left in August, were granted passes that count for terms without examination. The other five sat the term examination in October before leaving.

The holders of Government and University scholarships on active service have been informed that their scholarships will be held over till their return from the war, and the Chancellor of the New Zealand University has given an assurance that students reading for the B.Sc. degree will not be penalized in their examinations through absence with the Imperial Forces.

The names of the students on war services are: Undergraduates—William Gibson Allan Bishop (Lieutenant), Harold P. Jeans Childs (Sergeant), William Patrick Dunphy, Henry Gray, Harold G. Hill, Charles H. Livingstone, Alexander Malcolm, Nathaniel Malcolm, Alexander H. McClean, John A. McQueen, Dundas Samuel, Spencer Gray Scoular, Steedman M. Sneddon, George Williamson. Graduates—Otto Friedlander, A.O.S.M.; Philip MacDouall, A.O.S.M., B.E.; E. Fletcher Roberts, A.O.S.M. (Lieutenant); W. Rutherfurd, A.O.S.M. (Sergeant); F. Statham, A.O.S.M. (Captain); D. M. Tomlinson, A.O.S.M., B.E. (Lieutenant); Gerard Ulrich, A.O.S.M., B.E.

I have, &c.,
JAMES PARK,
Dean of the Faculty of Mines.

Mr. U. B. INGLIS, A.O.S.M., Director of the Coromandel School of Mines, to the UNDER-SECRETARY OF MINES, Wellington.

SIR,— Coromandel, 10th April, 1915.

I have the honour to present my report on the work done at the Coromandel School of Mines during the year 1914.

Attendance, &c.—The number of students who attended was seventeen in the first term, twenty in the second term, and fifteen in the third term, taking eight different subjects of instruction.

At the annual examinations twelve students presented themselves for written papers, and seven for the practical examinations. Including the extra subjects taught at this school, seven first-class and four second-class certificates were granted, while five students passed in the practical examinations. A. J. Denize passed in senior electricity with the highest marks gained for that subject in 1914.

Assays.—The number of samples assayed for the public during the year was 197, being nearly all for gold and silver, and forwarded by a large number of different persons, many of whom are consistently prospecting on the Hauraki Peninsula.

General.—The thanks of the school and students are due to the Mines Department for further donations of valuable books to the lending library, also to the Geological Survey Department for sets of typical New Zealand fossils, carefully packed and classified. I have also to thank Colonel Boscawen, A.D.C., for donating several valuable mineral-specimens to the geological collection.

In conclusion, I wish to express my hearty appreciation of the zeal and interest shown by the Council in the support and progress of the school.

I have, &c.,
U. B. Inglis, Director.

Mr. J. F. McPadden, A.O.S.M., Director of the Reefton School of Mines, to the Under-Secretary of Mines, Wellington.

Sir,— Reefton, 10th April, 1915.

I have the honour to present my report on the work of the Reefton School of Mines for the year ended the 31st December, 1914.

Attendance.—First term, seventeen students; second term, eighteen students; third term, eighteen students; fourth term, seventeen students.

Waiuta School.—Attendance at this school averaged eight for the year.

Examinations.—At the examination for Government certificates held in March, 1914, two students gained first-class mine-manager's certificates, one a partial pass for the same, one student obtained a certificate, and two partial passes as battery-superintendents.

Assays.—During the year 141 assays were made for the public.

I have the pleasure to acknowledge, with thanks, the receipt of mineral-specimens from various gentlemen, particularly Mr. Jacobsen, of Karamea, for specimens of granite rock showing free gold. I also desire to place on record the lively interest taken in the school by the Council.

I have, &c.,
J. F. McPadden, Director.

Mr. W. H. Baker, B.Sc., Director of the Thames School of Mines, to the Under-Secretary, Mines Department, Wellington.

Sir,— Thames, 10th April, 1915.

I have the honour to present my annual report on the work done at the Thames School of Mines during the year 1914.

Attendance.—The attendance has been practically the same as during the previous year, and is shown in the following schedule:—

	First Term.	Second Term.	Third Term.
Registered students	38	40	31
Class attendance of registered students	49	53	46
Elementary science class	35	31	23
Teachers' science class	14	12	10
Total individual students	87	83	64

In the elementary science class it is customary to give prizes for attendance, and eight students qualified for these prizes. Several students have been accepted for service at the front, and these I am sure will do credit to their company and the school.

Examinations.—At the annual Government examinations eight first-class, seven second- and one third-class certificates were obtained. Seven passes were also obtained in the practical examinations. On account of the continued mining depression there were very few candidates in assaying and mining subjects. Although mining students are just now at a discount, the local foundries are employing many men, and in order to supply these with an opportunity of technical training we have this year commenced a class for engineers' certificates.

Battery and Experimental Plant.—As there are practically no new mines being opened up, the quantity of ore treated in the mill has been small. Six parcels were treated, ranging from 2 cwt. to 1 ton. These were chiefly battery concentrates and residues, and in every case satisfactory extractions were obtained. For the public 115 assays were made, including several for the Prospectors' Association. Three analyses have also been made with a view to determine suitable ore-treatment.

Museum.—The geological museum collection has been increased by several donations, among them being a valuable exhibit of cinnabar and mercury lent by Captain T. C. Bayldon, and several ore-specimens donated by Lieut.-Colonel Boscawen.

Gas-testing Plant.—The Hailwood gas-testing plant, installed by the Mines Department at the school, has been utilized to good purpose. Twelve certificates were granted, and several more candidates are presenting themselves for examination.

Library.—The reference library has been added to by donations of bulletins of the United States Geological Survey Department; mines and geological reports from Tasmania, New South Wales, Victoria, Queensland, South Australia, Western Australia, and New Zealand; and the reports of the Chambers of Mines of Westralia and Transvaal. The lending library has also been increased by several volumes forwarded by the Mines Department.

In conclusion, I wish to express my appreciation of the work done by the staff, and my thanks to the Council for the keen interest it maintains in the progress of the school.

I have, &c.,
W. H. Baker, Director.

Mr. A. H. V. Morgan, M.A., Director of the Waihi School of Mines, to the Under-Secretary of Mines, Wellington.

Sir,— Waihi, 15th March, 1915.

I have the honour to present my annual report upon the work done at the Waihi School of Mines during 1914.

Attendance.—The attendance for each of the three terms is shown in the following: First term, fifty-eight students; class attendance, 103. Second term, sixty-three students; class attendance, 110. Third term, forty students; class attendance, 74. Average, fifty-four students; class attendance, 96. The falling-off in the third term was largely due to the number of students volunteering for active service.

Examinations.—Eighteen candidates presented themselves for the written examinations, sending in forty-four papers, of which twenty-six gained first-class, seven second-class, and four third-class certificates. In addition, thirteen passes were recorded in the practical examinations out of fifteen entries.

I have much pleasure in stating that again one of our students has been successful in gaining a Government scholarship of the annual value of £50, tenable for three years at the Otago University, this distinction having been won by Albert Ellis.

The gold medal (value £2 2s.) presented by the President (Mr. Thomas Gilmour) for the highest aggregate in four subjects has this year been won by J. S. Cornes, with an average of over 77 per cent. Mr. Haszard's gold medal (value £2 2s.) for surveying was won by H. A. Ellis.

Government Certificates.—At the examination for Government certificates, held last March, three candidates from this school sat, and all three were successful. Mr. A. Burt secured a first-class coal-mine manager's certificate, and Messrs. E. J. Scoble and R. C. Ruffin first-class metal-mine manager's certificate. The two latter were the only successful candidates in New Zealand for this examination. Altogether thirty-six students of this school have obtained certificates as first-class metal-mine managers, four as first-class coal-mine managers, forty-two as battery-superintendents, and twenty-four as assayers of bullion under the Customs Department, while five have gained the Government scholarship.

In conclusion, I have again much pleasure in acknowledging the zeal and ability with which the members of the staff carried out their duties, and also the co-operation and assistance of the Council and the able and energetic Secretary.

I have, &c.,
A. H. V. Morgan, Director.

Mr. W. A. Given, M.A., Director of the Karangahake School of Mines, to the Under-Secretary, Mines Department, Wellington.

Sir,— Karangahake, 17th February, 1915.

I have the honour to present my report on the work of the Karangahake School of Mines for the year ended the 31st December, 1914.

Attendance.—The average attendance for the year was twenty-one, and the class attendance forty-eight.

Annual Examinations.—Thirteen students presented themselves at the annual examinations, and obtained eighteen first-class, seven second-class, and four third-class certificates. F. Smale obtained the Government scholarship, having passed his final section. In the practical examinations there were six passes and one failure. The Council's prize for dry assaying and mathematics was won by L. Prendergast. Mr. Cassels-Brown's prize for electricity and mathematics was won by T. Hassett, whilst the prize for the most persevering student was won by E. D. White.

School Library.—The books kindly supplied by the Mines Department are of great use to both students and staff.

Lecture.—In connection with a very successful open night held during the year, my thanks are due to the Government Tourist Department for the loan of a number of splendid geological slides. My thanks are due also to the Director of the Waihi School of Mines for assistance rendered in the same connection.

Laboratory.—In all seventy-eight public assays were put through during the year.

In conclusion, I wish to express my appreciation of the work done by Messrs. E. C. Hindsfield, A.S.M.B., Assistant Director, and H. C. Tempest, electrical instructor, and Master T. Hassett, laboratory assistant. I wish also to thank the school Council for the interest they have taken in the school's welfare, and for the consideration they have shown to me personally.

I have, &c.,
W. A. Given, Director.

Mr. H. Lovell, Director of the Westport School of Mines, to the Under-Secretary of Mines, Wellington.

Sir,— Westport, 9th April, 1915.

I have the honour to present my report on the Westport School of Mines, and its branches at Ngakawau, Millerton, and Denniston, for the year ended the 31st December, 1914.

Attendance.—The average number of students for each term was forty-one, and the average class attendance was eighty-three. It will thus be seen that the average attendance for this year is similar to that of 1913. On Saturday mornings a teacher's science class, attended by twenty-one students, was held.

Examinations.—At the annual School of Mines examinations fifteen students presented themselves, and secured five first-class, eight second-class, and four third-class certificates. Candidates sat in the following subjects: Chemistry, mathematics, mechanical drawing, surveying, mining, pumping winding and haulage, and ventilation.

Government Certificates.—At the examination for Government certificates five candidates from this school sat for mine-manager's certificates. S. Crockett and W. Pearson, who is now resident in the Huntly district, obtained certificates as first-class mine-managers; W. Hewitson secured a partial pass in the examination for second-class mine-managers. In addition to the above, thirteen students sat in the underviewers' and deputies' examinations, eight candidates being successful in the latter, while two candidates—W. Hewitson and R. Jack—were successful in the former.

Assay Laboratory.—During the year eighty-two samples of mineral-specimens and ores were examined and reported on. The bulk of these samples were sent in to be assayed for their gold and silver content. The facilities for assaying and general analytical work have been greatly improved by the erection of the new assaying laboratory.

Library and Museum.—The thanks of the school are due to the Mines and Geological Departments respectively for the donation of several standard text-books and geological bulletins which are so highly appreciated by students; also to those gentlemen who have kindly donated various samples to the museum.

In conclusion, I beg to place on record my appreciation of the keen interest evinced by the members of the Council—especially the President and Secretary—in the welfare of the school.

I have, &c.,
H. Lovell, Director.

Mr. W. F. Worley, Director of the Nelson School of Mines, to the Under-Secretary of Mines, Wellington.

Sir,— Nelson, 22nd March, 1915.

I have the honour to present my report on the work done at the Nelson School of Mines for the year ended the 31st December, 1914.

Blowpipe Analysis Classes.—Two classes were in session from the 18th June till the 3rd December. Twenty-three boys from the State school joined these classes. Five of them left after attending for a short time, but the remaining eighteen attended regularly and took great interest in the work. Each class met twenty-four times, and the average attendance of the eighteen was 13·7. These boys were taught the ordinary blowpipe manipulations, and tests were made for antimony, arsenic, tin, zinc, lead, bismuth, copper, chrome, cobalt, iron, nickel, and manganese. One lad, Ronald Simpson, who had had a two-years course, and had done the prescribed amount of practical work, was allowed to sit for examination. He passed the examination with credit, and was awarded a certificate of proficiency in elementary blowpipe analysis.

Assaying.—Fourteen assays were made for the public during the year, and these embraced tests for gold, silver, iron, coal, limestone for phosphate, and one food substance for poison.

Lectures.—Five public lectures were given during the winter months, the subjects being "Volcanoes," "Combustion," and "Garden soil." The latter subject was dealt with at a well-attended meeting of the Stoke Fruitgrowers' Association, and created a good deal of interest.

Geology.—An intrusion of granite into schist rock was discovered in the cliffs on the sea-beach at Cable Bay. The granite has not yet been examined microscopically, but in appearance it is similar to Boulderbank stone.

An examination was made of an outcrop of shaly coal in the Maitai valley. It is on the left side of the valley, quite close to the road and just one mile beyond the spot where Sharland's Creek joins the Maitai River. In Bulletin No. 12, dealing with the geology of the Dun Mountain Subdivision, the rocks at the site of this coal-outcrop are indicated as "Maitai" on the map accompanying the report. The coal, though a poor sample, evidently belongs to the Jenkins Hill series. It is on the same line as the outcrops at Enner Glyn, Brook Street, and Groom's Creek; its dip (eastward) is the same as at those outcrops; and its relation to the Brook Street igneous rocks is similar. At Brook Street and at Groom's Creek the coal-outcrops are quite close to the igneous rock. In the Maitai valley there is a mile of rock intervening between the igneous rock and the coal-outcrop. These rocks should be carefully studied, but the owner of the land objects to geological explorations in that neighbourhood. From what I have seen of them, I think that some of them belong to the Wairoa series. If so it will be an interesting discovery, as these rocks were supposed to thin out and disappear somewhere near Richmond.

Several sections of the Brook Street igneous rock have been carefully examined microscopically, and definite conclusions arrived at as to the nature and history of the rock; but I regret to say I am unable to make a report of this work, as the school does not possess any apparatus for making photographic illustrations of the rock-sections, without which the report would be scarcely intelligible.

Having resigned on superannuation from public-school work, I am now able to devote more time to school-of-mines work, and quite intended to make a strong effort to increase the usefulness of the Nelson School, but was restrained from doing so by the outbreak of war.

I have, &c.,
W. F. Worley, Director.

ANNEXURE C.

MINING STATISTICS.

Table 1.

STATEMENT SHOWING THE REVENUE OF THE GOLDFIELDS COLLECTED IN THE SEVERAL DISTRICTS OF THE DOMINION OF NEW ZEALAND FOR THE PERIOD FROM 1ST JANUARY TO 31ST DECEMBER, 1914.

District.	Miners' Rights.	Business Licenses, Machine and Residence Sites.	Water-races, Sluices, &c.	Gold-mining Leases, Rents, and Royalties.	Registration.	Fees and Fines, Wardens' Courts.	Miscellaneous.	Totals
AUCKLAND.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Coromandel ..	45 0 0	1 5 0	2 5 0	225 14 10	7 10 0	19 15 0	21 14 6	323 4 4
Te Aroha ..	28 10 0	544 19 6	19 0 0	124 2 11	4 12 0	4 12 0	2 4 0	728 0 5
Paeroa ..	74 0 0	183 8 0	..	971 18 8	5 13 0	11 10 0	17 7 0	1,263 16 8
Thames ..	63 15 0	1 4 0	..	936 15 2	11 11 0	..	85 1 4	1,098 6 6
Puhipuhi ..	6 10 0	0 1 0	0 10 0	122 9 0	1 7 0	4 11 0	1 6 0	136 14 0
Tauranga ..	0 15 0	..	..	..	..	..	..	0 15 0
Waihi ..	72 15 0	355 16 4	..	945 17 1	10 3 0	53 11 0	29 14 10	1,467 17 3
Totals ..	291 5 0	1,086 13 10	21 15 0	3,326 17 8	40 16 0	93 19 0	157 7 8	5,018 14 2
NELSON.								
Collingwood and Takaka	6 5 0	2 0 0	0 5 0	326 9 4	1 12 0	2 1 0	6 8 0	345 0 4
Westport, Seddonville, and Granity	78 0 0	33 10 0	..	164 18 0	17 8 6	16 15 6	37 11 0	348 3 0
Charleston ..	19 0 0	..	..	20 7 6	0 3 0	..	..	39 10 6
Ahaura ..	47 5 0	44 4 3	0 15 0	2,883 5 5	2 3 0	21 2 0	..	2,998 14 8
Reefton ..	137 15 0	0 9 0	..	1,169 10 3	3 8 0	44 9 0	79 15 3	1,435 6 6
Lyell and Murchison	20 15 0	0 10 0	1 10 0	116 12 1	0 14 0	7 4 0	30 15 0	178 0 1
Totals ..	309 0 0	80 13 3	2 10 0	4,681 2 7	25 8 6	91 11 6	154 9 3	5,344 15 1
MARLBOROUGH.								
Havelock ..	1 15 0	0 15 0	0 5 0	35 7 1	0 16 0	2 18 6	1 10 0	43 6 7
Blenheim ..	5 15 0	0 5 0	..	57 1 3	0 5 0	3 13 0	..	66 19 3
Totals ..	7 10 0	1 0 0	0 5 0	92 8 4	1 1 0	6 11 6	1 10 0	110 5 10
WESTLAND.								
Hokitika ..	24 5 0	..	0 10 0	1,872 13 11	5 12 0	20 19 0	38 15 0	1,962 14 11
Greymouth ..	115 5 0	46 14 3	1 10 0	4,917 3 5	8 1 0	13 2 0	20 12 0	5,122 7 8
Ross	14 0 0	0 10 0	2 0 0	273 2 10	6 6 6	9 13 6	8 9 0	314 1 10
Stafford and Goldsborough	8 0 0	..	0 10 0	85 15 9	2 15 0	10 19 0	1 3 0	109 2 9
Okarito ..	12 10 0	1 0 0	0 5 0	107 8 9	0 17 0	1 17 0	2 0 0	125 17 9
Kumara ..	43 15 0	7 0 0	1 5 0	638 13 3	12 0 0	13 3 0	86 0 3	801 16 6
Totals ..	217 15 0	55 4 3	6 0 0	7,894 17 11	35 11 6	69 13 6	156 19 3	8,436 1 5
CANTERBURY.								
Ashburton ..	2 15 0	..	..	1 4 3	0 2 0	0 4 0	..	4 5 3
OTAGO AND SOUTHLAND.								
Middlemarch ..	1 5 0	..	0 6 0	1 10 0	0 2 0	..	..	3 3 0
Naseby ..	20 5 0	..	..	679 8 7	9 3 0	18 2 0	0 2 0	727 0 7
Black's Alexandra Clyde Roxburgh Cromwell	68 10 0	40 3 0	0 10 0	1,374 8 0	16 0 0	57 13 0	29 18 2	1,587 2 2
Arrowtown ..	11 0 0	0 1 0	..	173 1 5	..	5 17 0	3 14 2	193 13 7
Queenstown ..	34 15 0	0 4 0	..	239 5 3	..	12 9 0	1 1 0	287 14 3
Lawrence ..	44 5 0	8 2 6	..	645 12 1	0 3 0	26 9 6	75 8 9	800 0 10
Orepuki ..	..	..	1 10 0	13 12 0	3 11 0	1 15 0	1 17 0	22 5 0
Riverton ..	21 0 0	1 10 0	0 5 0	108 13 3	0 8 0	3 6 0	15 11 0	150 13 3
Pembroke ..	3 0 0	..	..	..	..	1 0 0	..	4 0 0
Waikaia ..	3 10 0	..	..	83 18 10	..	8 2 0	1 1 0	96 11 10
Wyndham ..	0 10 0	..	..	30 15 7	0 1 0	0 4 0	2 5 0	33 15 7
Gore	3 5 0	..	..	7 2 11	..	0 9 0	..	10 16 11
Totals ..	211 5 0	50 0 6	2 11 0	3,357 7 11	29 8 0	135 6 6	130 18 1	3,916 17 0
Grand totals ..	1,039 10 0	1,273 11 10	33 11 0	19,353 8 8	132 7 0	397 6 0	601 4 3	22,830 18 9

Table 2.

STATEMENT SHOWING THE REVENUE OF THE GOLDFIELDS COLLECTED IN THE SEVERAL DISTRICTS OF THE DOMINION OF NEW ZEALAND FOR THE PERIOD FROM 1ST JANUARY TO 31ST MARCH, 1915.

District.	Miners' Rights.	Business Licenses, Machine and Residence Sites.	Water-races, Sluices, &c.	Gold-mining Leases, Rents, and Royalties.	Registration.	Fees and Fines, Wardens' Courts.	Miscellaneous.	Totals.
AUCKLAND.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Coromandel ..	8 5 0	0 11 0	0 10 0	110 17 4	3 5 0	4 0 0	6 2 0	133 10 4
Thames ..	12 15 0	0 15 6	..	292 17 6	1 18 0	..	3 0 0	311 6 0
Te Aroha ..	0 10 0	204 0 8	..	..	0 2 0	0 1 0	..	204 13 8
Paeroa	15 5 0	34 2 6	..	207 7 0	0 6 0	0 4 0	..	257 4 6
Puhipuhi ..	4 0 0	..	..	59 5 0	0 11 0	1 8 0	..	65 4 0
Tauranga ..	0 10 0	..	..	..	..	..	..	0 10 0
Waihi	16 5 0	553 14 10	..	334 16 3	..	14 3 0	..	918 19 1
Totals ..	57 10 0	793 4 6	0 10 0	1,005 3 1	6 2 0	19 16 0	9 2 0	1,891 7 7
NELSON.								
Collingwood and Takaka	1 5 0	1 0 0	..	158 14 2	0 3 0	1 6 0	3 2 0	165 10 2
Westport, Seddonville, and Granity	23 15 0	7 0 0	..	15 19 2	4 16 6	5 4 0	16 6 0	73 0 8
Charleston ..	2 5 0	..	..	7 14 0	..	0 4 0	..	10 3 0
Ahaura	8 15 0	6 12 2	1 15 0	488 19 10	2 4 0	3 2 0	1 1 0	512 9 0
Reefton.. ..	14 15 0	..	..	541 0 4	1 7 0	10 2 0	0 14 6	567 18 10
Lyell and Murchison	5 10 0	..	0 10 0	32 15 3	0 6 0	2 3 0	5 5 0	46 9 3
Totals ..	56 5 0	14 12 2	2 5 0	1,245 2 9	8 16 6	22 1 0	26 8 6	1,375 10 11
MARLBOROUGH.								
Havelock ..	0 10 0	0 5 0	..	23 2 6	0 4 0	1 2 0	..	25 3 6
Blenheim ..	1 0 0	..	..	10 6 3	..	..	..	11 6 3
Totals ..	1 10 0	0 5 0	..	33 8 9	0 4 0	1 2 0	..	36 9 9
WESTLAND.								
Hokitika ..	7 15 0	..	..	752 0 8	2 2 0	9 11 6	2 5 0	773 14 2
Greymouth ..	17 10 0	12 10 0	0 15 0	111 9 2	1 4 0	5 1 0	0 15 0	149 4 2
Ross	2 5 0	..	0 5 0	32 2 6	1 15 6	2 17 6	18 2 0	57 7 6
Stafford and Goldsborough	..	..	0 5 0	59 11 0	1 10 0	2 14 0	..	64 0 0
Kumara ..	12 15 0	2 5 0	..	562 4 6	3 0 0	3 0 0	36 16 6	620 1 0
Okarito	1 10 0	..	..	4 5 0	..	0 4 0	..	5 19 0
Totals ..	41 15 0	14 15 0	1 5 0	1,521 12 10	9 11 6	23 8 0	57 18 6	1,670 5 10
CANTERBURY.								
Ashburton ..	0 5 0	..	..	0 18 9	..	..	..	1 3 9
OTAGO AND SOUTHLAND.								
Naseby	5 10 0	0 2 6	..	188 14 7	4 11 0	6 10 0	0 3 0	205 11 1
Roxburgh Alexandra Clyde .. Black's .. Cromwell	9 15 0	10 6 0	..	464 0 3	3 4 0	6 17 0	0 5 0	494 7 3
Arrowtown ..	1 10 0	..	..	25 5 1	..	1 15 0	..	28 10 1
Pembroke ..	1 0 0	..	..	..	..	..	..	1 0 0
Queenstown ..	10 5 0	..	..	101 13 9	..	1 6 0	1 1 0	114 5 9
Lawrence ..	6 10 0	3 0 0	..	245 2 9	0 1 0	5 14 0	236 14 9	497 2 6
Waikaia ..	0 15 0	..	..	27 7 6	..	0 7 6	..	28 10 0
Orepuki ..	..	..	1 5 0	7 10 0	0 19 0	0 2 0	0 10 0	10 6 0
Riverton ..	3 10 0	3 0 0	0 5 0	37 8 0	1 2 0	0 18 0	40 7 0	86 10 0
Wyndham ..	0 10 0	..	..	0 18 9	..	..	..	1 8 9
Middlemarch ..	0 5 0	..	..	..	..	..	..	0 5 0
Gore	1 5 0	..	..	79 15 8	..	0 10 0	..	81 10 8
Totals ..	40 15 0	16 8 6	1 10 0	1,177 16 4	9 17 0	23 19 6	279 0 9	1,549 7 1
Grand totals ..	198 0 0	839 5 2	5 10 0	4,984 2 6	34 11 0	90 6 6	372 9 9	6,524 4 11

Table 3.

STATEMENT SHOWING QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED IN THE HAURAKI MINING DISTRICT FOR THE YEAR ENDED 31ST DECEMBER, 1914.

Locality and Name of Mine.	Average Number of Men employed.	Quartz crushed.	Gold obtained.		Value.
			Amalgam.	Cyanide.	
THAMES COUNTY AND BOROUGH.					
Waiomio—		Tons cwt. qr. lb.	Oz. dwt.	Oz. dwt.	£ s. d.
Monowai	16	1,230 0 0 0	3,924 0	..	*2,658 11 10
Tararu—					
New Sylvia	50	6,906 0 0 0	..	15,008 17	11,165 10 6
Watchman	34	8,846 0 0 0	..	5,766 0	12,054 12 0
Moanataiari—					
Adelaide	3	8 1 2 0	163 9	..	450 2 4
Foreshore Dredge	4	765 0 0 0	..	93 17	266 17 11
Waiotahi—					
Waiotahi	13	35 0 0 0	228 17	..	606 17 10
Ballarat	2	0 5 2 12	294 0	..	536 0 0
Nonpareil	3	6 0 0 0	59 10	..	177 3 3
Golden Drop	1	21 0 0 0	38 6	..	84 13 10
Thames—					
May Queen	4	93 0 0 0	50 3	..	134 11 4
Saxon	12	169 0 0 0	73 17	..	196 18 8
Karaka—					
Gladstone	2	20 1 2 0	207 5	..	500 16 9
Little Nell	2	140 1 1 0	234 13	..	554 4 4
Occidental	8	235 11 2 0	464 15	..	1,197 12 0
Hape Creek—					
Daisy	1	5 0 0 22	38 0	..	81 3 3
Tairua—					
Golden Belt	12	398 0 0 0	520 0	..	1,170 0 0
Golden Hills	4	442 0 0 0	755 10	..	1,096 2 3
Total	171†	19,320 1 2 6	7,052 5	20,868 14	32,931 18 1
WAIHI BOROUGH.					
Waihi—					
Waihi	701	163,754 0 0 0	..	523,831 0	324,038 6 2
Grand Junction	440	103,321 0 0 0	..	254,817 6	227,636 8 9
Waihi Standard	1	Cleaning up mill	..	12 5	14 4 9
Total	1,142	267,075 0 0 0	..	778,660 11	551,688 19 8
OHINEMURI COUNTY.					
Waitekauri—					
Maoriland	10	413 0 0 0	180 4	170 6	1,086 3 6
Golden Cross	5	455 0 0 0	..	312 19	452 4 11
Scotia	2	5 0 0 0	23 0	..	20 0 0
Karangahake—					
Talisman	330	52,210 0 0 0	46,143 9	148,624 12	263,516 6 10
New Zealand Crown	70	5,476 0 0 0	..	7,315 18	9,383 17 8
Shotover	1	cradl'g and pan'ng	4 15	..	13 7 7
Paeroa—					
Waihi-Paeroa Express Company	68	‡	..	111,963 11	42,950 0 0
Komata—					
Komata Reefs	3	Cleaning up slags, &c.	..	2,350 17	2,116 13 3
Total	489	58,559 0 0 0	46,351 8	270,738 3	319,538 13 9
PIAKO COUNTY.					
Waiorongomai—					
Hardy's Mines	2	1,570 0 0 0	..	3,346 15	1,427 7 8
COROMANDEL COUNTY.					
Waikoromiko—					
Four-in-Hand	4	0 6 0 0	251 8	..	703 19 0
Tokatea—					
Royal Oak	4	2 0 1 12	29 2	..	81 4 0
Venture	2	1 0 0 0	2 13	..	7 8 5
Mount Welcome	3	4 10 3 22	68 5	..	193 9 0
Kapanga—					
Gallant Syndicate	4	6 0 0 0	2 13	..	7 12 0
Hauraki Block—					
Old Hauraki	2	10 0 2 14	59 16	..	169 0 0
Kuaotunu—					
Mountain King	4	12 0 0 0	16 0	..	50 13 0
New Waitaia	20	613 0 0 0	1,686 8	..	4,778 10 2
Handsworth United	2	5 0 0 0	26 15	..	60 17 0
Prospectors	5	15 13 2 4	37 5	..	93 2 10
Total	50	669 11 1 24	2,180 5	..	6,145 15 5

*The secretary to the Monowai Mine incorrectly furnished this amount, which should be £8,050; the correction was made too late to permit of the table being amended. †This total does not include 44 men employed in unproductive quartz-mining operations. ‡144,300 tons of tailing recovered from the Ohinemuri River (sludge-channel) and re-treated; this tonnage is not included in the above statement, having been recorded when the ore was originally crushed.

Table 3—*continued.*

STATEMENT SHOWING THE QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED IN THE HAURAKI MINING DISTRICT FOR THE YEAR ENDED 31ST DECEMBER, 1914—*continued.*

Locality and Name of Mine.	Average Number of Men employed.	Quartz crushed.	Gold obtained.		Value.
			Amalgam.	Cyanide.	
SUMMARY.					
		Tons. cwt. qr. lb.	Oz. dwt.	Oz. dwt.	£ s. d
Thames County and Borough ..	171	19,320 1 2 6	7,052 5	20,868 14	32,931 18 1.
Waihi Borough	1,142	267,075 0 0 0	..	778,660 11	551,688 19 8
Ohinemuri County	489	58,559 0 0 0	46,351 8	270,738 3	319,538 13 9
Piako County	2	1,570 0 0 0	..	3,346 15	1,427 7 8
Coromandel County	50	669 11 1 24	2,180 5	..	6,145 15 5
Totals, 1914	1,854*	347,193 13 0 2	55,583 18	1,073,614 3	911,732 14 7
Totals, 1913	2,136	327,589 17 2 3	86,453 7	1,031,976 1	865,618 19 10
Increase	..	19,603 15 12 7	..	41,638 2	46,113 14 9
Decrease	282	..	30,869 9	..	..

* During the year 117 men were employed on unproductive quartz-mining operations.

STATEMENT SHOWING THE QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED IN MARLBOROUGH, NELSON, AND WEST COAST DISTRICTS FOR THE YEAR ENDED 31ST DECEMBER, 1914.

Locality and Name of Mine.	Number of Men Employed.	Statute Tons Quartz crushed.	Gold obtained by		Estimated Value.
			Amalgamation.	Cyanide.	
Marlborough—			Oz. dwt. gr.	Oz. dwt. gr.	£ s. d.
Dominion Consolidated ..	70	15,814	2,113 17 18	..	*7,833 12 10
Collingwood County—					
Golden Blocks	10	322	258 6 1	..	990 6 11
Buller County—					
Mokihinui Swastika ..	7	85	15 7 18	..	60 11 7
Inangahua County—					
Keep-it-Dark	70	13,627	3,341 1 0	1,403 1 0	18,199 9 0
Wealth of Nations	114	25,470	7,503 19 0	2,476 4 0	39,452 14 3
Progress	162	33,150	7,626 9 0	2,868 6 0	40,750 7 5
Murray Creek	25	1,824	1,540 5 0	148 10 0	6,551 4 0
Lankey's Creek	4	1,078	285 3 16	..	1,147 7 3
Gardner's (Progress Junction)	2	Old tailing†	..	89 18 0	218 10 2
New Big River	75	6,273	6,196 4 12	1,271 1 0	30,184 15 10
Blackwater	213	50,426	20,765 14 0	2,634 0 0	93,848 3 10
SUMMARY.					
Marlborough	70	15,814	2,113 17 18	..	*7,833 12 10
Collingwood County	10	322	258 6 1	..	990 6 11
Buller County	7	85	15 7 18	..	60 11 7
Inangahua County	665	131,848	7,258 16 4	10,891 0 0	230,352 11 9
Grey County	..	..	..	..	..
Total, 1914 ..	‡752	148,069	49,646 7 17	10,891 0 0	239,237 3 1
Total, 1913 ..	631	126,260	41,662 3 18	10,128 2 0	201,987 10 7
Increase	121	21,809	7,984 3 19	762 18 0	37,249 12 6

* Also produced 83 tons 15 cwt. of scheelite concentrate, value £9,300. † 420 tons of tailing previously recorded as crushed now cyanided. ‡ 58 men were employed in non-productive quartz-mining operations not shown in this table.

Table 3—*continued.*

STATEMENT SHOWING THE QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED IN THE SOUTHERN MINING DISTRICT FOR THE YEAR ENDED 31ST DECEMBER, 1914.

Locality and Name of Mine.	Average Number of Men employed.	Quartz crushed.	Gold obtained.	Estimated Value.
VINCENT COUNTY.				
Carrick—		Tons.	Oz. dwt. gr.	£ s. d.
Carrick Gold-mining Company	8	200	80 0 0	300 0 0
Star of the East Gold-mining Company.. ..	4	100	106 0 0	413 8 0
Bald Hill Flat—				
Advance	3	180	159 0 0	616 3 0
Bendigo—				
Alta Syndicate	2*	112	79 13 0	233 14 0
Total	17	592	424 13 0	1,563 5 0
MANIOTOTO COUNTY.				
Hyde—				
Mareburn Gold-mining Company	11*	955	73 18 8	280 8 4
Total	11	955	73 18 8	280 8 4
WAIHEMO COUNTY.				
Macraes—				
Golden Point	6*	1,377	229 16 0	867 4 11
Deep Dell	8*	1,650	59 10 20	220 3 11
Morning Star	2*	97	3 3 0	11 16 3
Peddie Bros.	3	160	43 16 0	173 4 5
Golden Bar	6	80	24 19 12	87 1 4
Berry Syndicate	2	50	4 13 8	18 5 4
Stoneburn	7*	1,115	6 14 0	23 0 0
Total	34	4,529	372 12 16	1,400 16 2
SUMMARY.				
Vincent County	17	592	424 13 0	1,563 5 0
Maniototo County	11	955	73 18 8	280 8 4
Waihemo County	34	4,529	372 12 16	1,400 16 2
Totals, 1914..	62	6,076	871 4 0	3,244 9 6
Totals, 1913..	39	10,658	1,166 13 7	4,206 19 0
Increase	23	..	..	..
Decrease	..	4,582	295 9 7	962 9 6

* Also employed at scheelite-mining during the year, but shown as quartz-miners in the return of number of persons ordinarily employed at metal-mines.

Twenty men were employed at non-productive mining operations not included in this table.

STATEMENT OF VALUE OF BULLION WON FROM QUARTZ CRUSHED FOR ALL DISTRICTS FOR THE YEARS ENDED 31ST DECEMBER, 1913 AND 1914.

Mining District.	Year ended 31st December, 1913.	Year ended 31st December, 1914.
	£ s. d.	£ s. d.
Hauraki	865,618 19 10	911,732 14 7
Marlborough, Nelson, and West Coast	201,987 10 7	239,237 3 1
Otago and Southland...	4,206 19 0	3,244 9 6
Totals	1,071,813 9 5	1,154,214 7 2

Table 4.

GROSS TOTALS AND VALUE OF BULLION PURCHASED BY BANKS FOR THE YEAR ENDED 31ST DECEMBER, 1914.

Bank.	Bullion purchased.	Value.
	Oz. dwt. gr.	£ s. d.
Hauraki Mining District (Northern Inspection District).		
Bank of New Zealand	259,081 7 0	298,934 5 0
Bank of New South Wales	900 15 0	2,160 18 1
National Bank of New Zealand	411,733 3 0	434,283 0 1
	671,715 5 0	735,378 3 2
Marlborough, Karamea, and Westland Mining Districts (West Coast Inspection District).		
Bank of New Zealand	22,998 15 9	88,973 8 1
National Bank of New Zealand	49,939 12 10	192,680 4 8
Bank of New South Wales	5,599 4 3	22,164 0 7
Union Bank of Australia	400 0 0	1,567 0 0
	78,937 11 22	305,384 13 4
Otago Mining District (Southern Inspection District).		
Bank of New Zealand	48,427 17 22	186,076 6 11
Bank of New South Wales	6,423 2 14	24,630 13 4
National Bank of New Zealand	16,746 13 19	64,974 2 1
Union Bank of Australia	60 16 15	228 2 4
Bank of Australasia	815 6 18	2,962 16 4
Private buyers	20 3 2	77 6 9
	72,494 0 18	278,949 7 9
Totals	823,146 17 16	1,319,712 4 3
Totals, 1913	518,945 14 11	726,636 18 6

Table 5.

RETURN OF GOLD DUTY CREDITED TO LOCAL BODIES FOR THE YEAR ENDED 31ST DECEMBER, 1914, AND THE QUARTER ENDED 31ST MARCH, 1915.

Local Body.	For the Year ended 31st December, 1914.	For the Quarter ended 31st March, 1915.
	£ s. d.	£ s. d.
COUNTIES—		
Coromandel	94 6 4	..
Great Barrier Island	0 6 0	..
Ohinemuri	4,002 0 2	69 18 10
Piako	13 13 7	..
Thames	414 1 11	48 11 7
BOROUGHS—		
Thames	..	..
Waihi	7,925 13 8	..
Totals	12,450 1 8	118 10 5

Table 6.

STATEMENT OF AFFAIRS OF MINING COMPANIES, AS PUBLISHED IN ACCORDANCE WITH THE COMPANIES ACT, 1908.

Name of Company.	Date of Registration.	Subscribed Capital.	Amount of Capital actually paid up.	Value of Scrip given to Shareholders on which no Cash paid.	Number of Shares allotted.	Amount paid per Share.	Arrears of Calls.	Number of Shareholders at present.	Number of Men employed.	Quantity and Value of Gold and Silver produced since Registration.		Total Expenditure since Registration.	Total Amount of Dividends paid.	Amount of Debts owing by Company.
										Quantity.	Value.			
AUCKLAND DISTRICT.														
		£	£	£		£ s. d.	£			Oz.	£	£	£	£
Bremner's Freehold Gold-mining Company (Limited)	5/8/10	10,000	1,883	..	100,000	0 0 5½	117	44	..	562	1,557	3,415	..	1
Dominion Gold-mining Company (No Liability)	8/9/11	8,421	3,270	..	84,208	0 0 4½	..	72	3	..	..	3,369	..	10
Four-in-Hand Mines (Limited)	24/8/14	2,683	325	1,250	53,670	0 0 3	33	59	3	..	..	297	..	15
Golden Belt Gold-mining Company (Limited)	22/12/11	21,846	4,869	17,027	117,255	0 4 0	..	123	18	932	1,683	6,734	..	1,223
Good Hope Gold-mining Company (No Liability)	10/11/10	12,975	1,982	1,622	129,746	0 0 7	..	72	..	100	277	2,049	..	66
Great Northern Waihi Gold-mining Company (Limited)	13/8/14	667	418	6,000	13,350	0 1 0	..	65	2	..	..	368	..	..
Hare-Ratjen Copper Company (Limited)	5/4/07	7,600	1,000	6,600	7,600	1 0 0	..	20	..	..	..	1,421	..	74
Hauraki Reefs (Limited)	28/4/10	17,500	9,372	5,083	175,000	0 1 4	471	400	2	1,598	4,408	13,991	..	131
Kuranui Gold-mining Company (No Liability)	5/6/14	21,750	813	..	87,000	0 0 3	..	44	1	..	..	739	..	364
Luck-at-Last Gold-mining Company (Limited)	23/8/09	2,601	3,343	..	83,260	0 0 7½	..	18	..	..	..	3,440	..	841
May Queen Gold-mining Company (Limited)	15/5/07	64,000	33,094	26,767	256,000	0 4 10	970	321	1	5,248	14,720	58,164	..	112
Moanataiari Gold-mining Company (Limited)	7/12/09	22,450	13,490	..	179,596	0 1 7½	319	90	1	..	..	13,410	..	715
Maoriland Mines (Limited)	4/8/13	442	442	..	106,000	0 0 1	..	116	8	655	2,620	..	..	..
Monowai Gold-mining Company (Limited)	21/9/09	25,000	16,997	..	100,000	0 3 0	86	39	30	10,640	6,405	32,012	1,247	81
Mountain King Gold-mining Company (Limited)	12/2/08	12,000	10,000	2,000	120,000	0 2 0	..	62	..	3,548	10,000	19,709	..	..
Mount Welcome Gold-mining Company (Limited)	8/7/09	5,000	2,959	458	100,000	Various	145	52	4	131	377	4,606	..	..
New Cambria Gold-mining Company (No Liability)	23/6/14	5,050	503	..	50,500	0 0 3	128	33	3	..	..	416	..	20
New Comstock Gold-mining Company (Limited)	23/11/09	28,465	1,207	3,746	113,860	Various	..	65	..	41,198	164,747	160,289	11,016	370
New Sylvia Gold-mining Company (Limited)	2/10/05	30,000	25,679	1,208	300,000	0 1 10	612	350	22	17,730	53,207	79,514	..	236
New Waitaia Gold-mining Company (Limited)	25/2/09	15,000	7,500	2,500	150,000	0 1 4	..	145	12	4,919	19,656	18,496	1,875	70
North Prince of Wales Consolidated Gold-mining Company (No Liability)	23/3/12	4,405	3,957	1,250	35,240	0 2 0	..	24	..	..	..	3,462	..	595
Occidental Consolidated Gold-mining Company (No Liability)	3/8/09	5,847	4,033	..	107,938	0 0 11	..	134	6	2,450	7,749	11,050	1,349	56
Ohinemuri Gold and Silver Mines (Limited)	1/6/14	66,549	3,415	55,000	133,098	Various	49	53	15	..	..	3,366	..	245
Old Hauraki Gold-mines (Limited)	3/8/07	18,003	11,252	..	180,030	0 1 3	..	261	..	6,844	20,346	28,545	2,625	158
Rising Sun Gold-mining Company (Limited)	1/10/08	16,500	8,155	2,229	110,000	0 1 4	..	137	1	..	..	8,154	..	..
Saxon Gold-mining Company (Limited)	2/12/07	35,000	19,511	13,333	200,000	0 1 10½	63	180	12	113	306	19,664	..	393
Tellurides Proprietary (Limited)	2/11/09	21,158	14,412	..	..	0 2 0	698	234	1	..	..	15,393	..	..
Victoria Gold-mining Company (No Liability)	8/12/06	29,523	13,469	..	147,615	0 1 10	343	162	..	1,031	2,886	13,839	..	410
Waihi Extended Gold-mining Company (Limited)	29/5/95	149,967	50,427	5,498	149,967	0 7 5½	..	396	1	2	17	51,871	..	84
Waihi-Paeroa Gold-extraction Company (Limited)	4/3/10	125,000	65,000	60,000	125,000	1 0 0	..	148	72	268,996	119,061	188,612	12,488	2,950
Waihi Standard Gold-mining Company (No Liability)	20/11/11	19,891	2,496	5,000	198,305	0 0 3	..	15	3	1,526	601	3,202	..	7
Waitangi Consolidated Gold-mining Company (No Liability)	23/10/08	148,248	14,860	..	169,800	0 1 10	..	239	3	47	142	24,871	..	71
Waitawheta Gold-mining Company (No Liability)	22/7/14	9,698	363	4,849	96,982	0 0 0½	41	113	1	..	..	446	..	309
Waiotahi Gold-mining Company (Limited)	28/7/71	18,000	16,000	..	240,000	0 1 4	..	594	4	225,132	675,397	279,585	400,786	13
Watchman Gold-mining Company (Limited)	4/12/11	37,500	15,000	10,625	150,000	0 2 0	..	182	49	6,744	14,718	28,441	..	1,723
Zeehan Consolidated (Limited)	23/10/10	15,000	2,825	3,700	150,000	0 0 6	..	31	..	..	..	2,912	..	157

STATEMENT OF AFFAIRS OF MINING COMPANIES, AS PUBLISHED IN ACCORDANCE WITH THE COMPANIES ACT, 1908—*continued.*

Name of Company.	Date of Registration.	Subscribed Capital.	Amount of Capital actually paid up.	Value of Scrip given to Shareholders on which no Cash paid.	Number of Shares allotted.	Amount paid per Share.	Arrears of Calls.	Number of Shareholders at present.	Number of Men employed.	Quantity and Value of Gold and Silver produced since Registration.		Total Expenditure since Registration.	Total Amount of Dividends paid.	Amount of Debts owing by Company.
										Quantity.	Value.			
NELSON DISTRICT (INCLUDING WEST COAST).														
		£	£	£		£ s. d.	£			Oz.	£	£	£	£
Blackwater River Gold-dredging Company (Limited)	27/4/00	9,475	5,892	3,000	9,475	0 18 0	..	91	8	14,295	56,226	49,354	12,755	471
Blue Creek Gold, Silver, and Lead Development Company (Limited)	14/11/10	23,795	4,087	15,000	23,795	1 0 0	92	208	..	..	..	4,267	..	102
Dominion Consolidated Developing Company (Limited)	18/1/11	15,000	7,000	8,000	15,000	1 0 0	..	47	80	4,475	16,500	40,653	..	1,581
Five-mile Beach Gold-extraction Company (Limited)	16/6/13	16,305	7,465	7,000	16,305	1 0 0	1,492	75	4	..	..	5,821	..	750
Golden Flat Mining Company (Limited) ..	11/8/13	11,445	8,945	2,500	11,445	0 15 0	326	107	..	..	..	6,003	..	16
Golden Terrace Mining Company (Limited) ..	31/3/14	7,950	5,950	2,000	7,950	1 0 0	257	51	9	..	..	3,434	..	346
Keep-it-Dark Mines (Limited)	8/2/11	10,000	4,250	..	20,000	0 4 3	..	52	72	12,753	48,308	53,552	..	3,464
Mahinapua Gold-mining Company (Limited) ..	11/1/09	5,385	4,485	900	5,385	1 0 0	..	77	2	356	1,372	11,944	..	5,313
Millerton Gold-mining Company (Limited) ..	19/11/12	50,125	24,940	2,400	50,125	0 19 6	532	205	15	..	..	15,523	..	2,865
Mont d'Or Gold-mining and Water-race Company (Limited)	25/7/82	12,000	10,800	..	12,000	0 18 0	..	44	7	38,533	148,360	105,216	57,000	..
Montezuma Limited	26/1/14	5,525	2,348	..	5,525	1 0 0	..	62	8	114	430	3,622	..	551
Mount Radiant Prospecting Company (New Zealand)	11/1/13	17,000	8,093	7,000	24,000	0 10 0	407	15	12	..	..	5,220	..	367
Murray Creek Gold-mining Company (Limited) ..	30/5/11	24,000	17,272	2,000	24,000	1 0 0	1,129	107	34	1,563	6,552	25,543	..	665
New Swastika Gold-mines (Limited)	4/12/13	38,000	1,494	32,000	38,000	1 0 0	6	95	..	15	61	1,593	..	472
Ross Goldfields Reconstructed (Limited) ..	28/8/14	70,000	2,585	63,000	70,000	0 0 9	40	265	71	728	2,843	6,484	..	7,640
Stafford Gold-dredging Company (Limited) ..	17/5/05	289	289	1,734	2,023	1 0 0	..	7	7	7,486	29,083	25,457	4,046	103
Star of the East Mining Company (Limited) ..	0/2/13	36,000	300	300	36,000	1 0 0	..	29	3	188	670	2,884	..	63
Swastika North Gold-mines (Limited)	16/5/13	1,440	570	720	1,440	0 6 0	6	28	..	..	..	570	..	36
Worksop Gold-dredging Company (Limited) ..	20/3/07	12,000	8,202	1,500	12,000	1 0 0	48	88	16	21,607	83,909	43,035	41,850	207
Totals	..	1,399,473	509,288	384,799	4,905,488	9 19 11½	8,410	6,746	626	702,259	1,515,194	1,516,027	547,037	36,512
OTAGO DISTRICT (INCLUDING SOUTHLAND).														
		£	£	£		£ s. d.	£			Oz.	£	£	£	£
Bakery Flat Sluicing Company (Limited) ..	10/9/96	2,500	2,012	..	2,500	0 18 6	..	25	..	4,653	17,642	20,441	1,062	1,720
Cardrona Dredging Company (Limited) ..	29/7/09	2,000	2,000	..	2,000	1 0 0	..	19	9	2,113	8,675	1,985	..	44
Crewe Gold-dredging Company (Limited) ..	7/9/02	2,000	2,000	3,000	5,000	1 0 0	..	22	7	11,965	46,046	39,567	8,875	172
Deep Stream Gold-mining Company (Limited) ..	19/11/06	2,500	500	2,000	2,500	1 0 0	..	7	5	2,052	7,893	7,731	1,812	50
Earnscleugh Gold-dredging Company (Limited) ..	15/7/01	8	8	10,992	11,000	1 0 0	..	16	30	47,702	182,869	159,624	26,950	723
Electric Gold-dredging Company (Limited) ..	2/9/99	26,000	..	26,000	26,000	1 0 0	..	284	20	58,806	227,233	103,226	129,992	491
Gabriel's Gully Sluicing Company (Limited) ..	2/5/07	600	180	..	600	0 6 0	..	8	24	5,103	19,702	22,201	1,863	245
Golden Bed Dredging Company (Limited) ..	29/8/13	1,300	380	..	4,498	0 4 0	..	147	9	1,227	4,771	3,574	..	165
Golden Crescent Sluicing Company (Limited) ..	26/11/98	3,500	3,500	..	3,500	1 0 0	..	23	8	8,292	32,296	24,584	10,500	50
Golden Gate Gold-dredging Company (Limited) ..	19/12/13	5,000	..	5,000	5,000	1 0 0	..	5	17	884	3,392	3,202	..	215
Good Chance Dredging Company (Limited) ..	24/3/09	1,250	779	..	1,250	1 0 0	..	56	8	2,898	11,281	12,064	625	13
Havelock Sluicing Company (Limited) ..	3/3/08	4,000	3,400	600	4,000	1 0 0	..	12	6	5,002	19,195	17,680	5,500	1,500

Island Block Gold-dredging and Sluicing Company (Limited)	26/2/00	24,030	12,030	12,000	25,000	1 0 0	..	106	4	8,092	31,540	40,457	2,403	1,219
Kia-Ora Victoria Gold-dredging Company (Limited)	10/8/01	9,100	5,915	..	9,100	0 13 0	..	35	9	28,191	113,992	82,169	37,992	..
Ladysmith Gold-dredging Company (Limited) ..	19/4/00	12,000	3,964	3,000	14,500	0 10 0	..	80	8	10,186	39,264	32,041	11,414	91
Lammermoor Mining Company (Limited) ..	6/7/08	4,950	4,950	1,000	5,950	1 0 0	..	27	3	512	2,028	7,146	..	813
Lower Nevis Dredging Company (Limited) ..	29/9/06	600	600	600	1,200	1 0 0	..	7	7	4,695	18,043	16,818	2,040	139
Manila Gravel and Gold-dredging Company (Limited)	24/9/13	18,287	2,452	13,954	32,241	0 4 0	205	48	..	..	..	25,089	..	902
Manuherikia Gold-dredging Company (Limited)..	1/8/99	12,000	6,000	6,000	12,000	1 0 0	..	166	9	11,264	73,812	44,519	34,176	22
Mareburn Gold and Scheelite Mining Company (Limited)	18/4/14	6,000	5,947	..	6,000	1 0 0	53	3	11	74	280	2,659	..	257
Mount Morgan Sluicing Company (Limited) ..	2/7/02	800	800	2,000	2,800	1 0 0	..	11	3	1,910	7,640	6,324	210	..
Muddy Terrace Sluicing Company (Limited) ..	4/10/06	14,400	14,400	5,550	19,950	1 0 0	..	126	25	8,436	33,333	73,258	..	15,525
Naseby Dredging and Hydraulic Sluicing Company (Limited)	16/10/97	5,000	2,288	2,000	5,000	0 15 3	..	24	4	4,794	18,435	17,819	4,500	26
New Golden Run Dredging Company (Limited)..	21/11/07	8,000	8,000	..	8,000	1 0 0	..	20	13	5,671	21,821	23,468	2,000	18
Ngapara Gold-dredging Company (Limited) ..	9/9/11	..	..	2,400	3,000	0 16 0	..	10	9	3,443	13,213	11,451	1,875	168
Nokomai Hydraulic Sluicing Company (Limited)	26/3/98	24,000	7,000	17,000	24,000	1 0 0	..	68	49	38,684	144,853	106,947	43,284	582
Olrig Dredging Company (Limited)	13/3/99	9,955	8,955	1,000	9,955	1 0 0	..	72	8	9,658	36,960	38,396	4,473	..
Ourawera Gold-mining Company (Limited) ..	23/5/95	3,000	3,000	..	3,000	1 0 0	..	16	9	12,421	49,532	40,613	13,615	397
Paterson's Freehold Gold-mining Company (Limited)	15/7/99	12,000	8,000	4,000	12,000	1 0 0	..	32	8	20,535	82,143	89,720	21,600	..
Phœnix Water-race Company (Limited) (Regd.)	12/10/67	1,500	1,500	..	1,000	1 10 0	..	19	1	..	..	1,315	8,954	17
Pringle and Party (Limited)	24/4/14	2,000	2,000	..	2,000	1 0 0	..	5	1	327	1,287	825	..	21
Pukepouri Gold-mining Company (Limited) ..	22/1/14	2,500	895	..	2,500	0 8 0	..	24	6	125	458	1,486	..	1,405
Red Jack's Gold-dredging Company (Limited) ..	1/7/12	4,500	3,750	750	4,500	1 0 0	..	46	9	1,084	4,217	8,160	..	1,067
Rise and Shine Gold-dredging Company (Limited)	24/2/00	10,000	9,746	2,000	12,000	1 0 0	254	154	20	37,842	147,046	117,522	39,900	712
Rising Sun Gold-dredging Company (Limited) ..	16/2/01	8,000	5,500	2,500	8,000	1 0 0	..	77	10	19,984	77,298	57,128	21,600	356
Round Hill Mining Company (Limited) ..	30/7/02	28,245	6,753	21,492	5,549	5 0 0	..	180	34	41,198	164,747	160,289	11,016	370
Roxburgh Amalgamated Mining and Sluicing Company (Limited)	2/3/89	29,153	13,121	15,000	29,152	0 18 6	..	160	11	29,561	110,761	91,908	32,430	151
Sailor's Gully (Waitahuna) Gold-mining Company (Limited)	3/6/96	2,000	200	1,800	2,000	1 0 0	..	11	4	4,658	17,707	13,521	4,750	172
Scandinavian Water-race Company (Limited) ..	10/12/07	7	7	9,750	9,757	1 0 0	..	19	10	6,581	25,021	27,184	..	5,461
Skipper's Sluicing Company (Limited) ..	20/11/11	3,450	345	3,105	3,450	1 0 0	..	30	4	644	2,476	2,825	..	299
Stewart Island Tin and Wolfram Lodes (Limited)	5/12/12	5,920	5,486	3,000	8,920	Various	61	92	17	..	..	5,819	..	109
Success Gold-dredging Company (Limited) ..	25/5/10	10,000	8,000	2,000	10,000	1 0 0	..	132	11	5,033	19,836	27,650	..	5
Tallaburn Hydraulic Sluicing Company (Limited)	3/12/04	1,200	1,200	..	12	100 0 0	..	9	4	1,418	5,458	6,732	1,380	184
Teviot-Molyneux Gold-mining Company (Limited)	24/12/09	34,193	21,937	10,000	34,193	1 0 0	639	23	54	..	..	24,175	..	9,573
Tinker's Gold-mining Company (Limited) ..	29/10/10	11,500	11,500	11,500	11,500	1 0 0	..	21	9	1,681	6,548	7,557	467	1,150
United M. and E. Water-race Company (Regd.)	8/4/72 23/4/72	7,600	7,600	..	152	50 0 0	..	8	2	16,063	61,907	69,113	3,078	935
Vinegar Hill Hydraulic Sluicing Company (Limited)	23/9/00	..	6,000	..	6,000	1 0 0	..	13	5	3,619	14,476	13,272	1,050	132
Waikaka Deep Lead Gold-dredging Company (Limited)	16/6/13	6,000	6,000	..	6,000	1 0 0	..	13	17	2,296	8,724	15,710	300	986
Totals	..	382,548	220,600	200,993	418,229	195 3 3	1,212	2,511	551	491,377	1,935,851	1,726,964	491,686	48,652
Grand Totals	..	1,782,021	729,888	585,792	5,323,717	205 3 2½	9,622	9,257	1,177	1,193,636	3,451,045	3,242,991	1,038,723	85,164

ANNEXURE D.

QUESTIONS ASKED AT THE EXAMINATION HELD DURING DECEMBER, 1914, FOR MANAGERS' FIRST- AND SECOND-CLASS CERTIFICATES OF COMPETENCY UNDER THE MINING ACT.

SUBJECT I.—*Mining.*

1. A vertical shaft 14 ft. long by 6 ft. wide in the clear, three compartments, has been sunk to a depth of 850 ft.; the two winding-compartments are continuously used hauling ore and mullock from the 850 ft. level. Make out a working specification for a contract to sink the above shaft a further depth of 150 ft. of a similar size (labour only—*i.e.*, sinking, dressing timber, and putting it in position).
2. State the number of men you would employ, also how you would protect them against accident.
3. Show by sketch how the timber is fitted, the size used, the dimensions of each compartment, the distance of sets apart, also where you would place the bearing-set.
4. In stoping a lode, say, 25 ft. wide, how far apart would you place quartz passes and ladder-ways, in horizontal stopes, in rill stopes, and in shrinkage stopes respectively ?
5. Describe how you would put up a rise, with safety to the miners, 100 ft. in firm shooting ground.
6. Show by sketch how a cylindrical quartz pass, 4 ft. inside diameter, is constructed with sawn timber.
7. Give the safe uniform load that a straight-grained piece of square rimu timber, 12 in. by 12 in., 20 ft. between rests, will sustain.
8. How many machine-holes would you bore in a vertical hard face of level or drive 7 ft. high by 5 ft. wide ? Show sketch of cut-holes, front and side view.
9. What, in your opinion, is the safest way to fire ordinary safety-fuse to avoid accidents, having no electric exploder in use ?
10. Explain how you would fire a round of holes in rotation with an electric exploder, so that they would not all explode simultaneously.
11. Name the explosives generally used in quartz-mines. In your experience, which one is the most economical and gives the best results in medium-hard laminated rock ?
12. Describe what precaution you would take in driving near an abandoned mine where an accumulation of water is known to exist.

SUBJECT II.—*Mechanics.*

(First-class Candidates only).

1. State the essential qualifications of a brake for a winding-engine, and show by means of sketches two types of brakes commonly used.
2. Define the meaning of the terms " breaking-strain," " safe working-strain," " live load," " elastic limit," as applied to wire ropes.
3. State the effects of scale, sediment, and oil in a steam boiler, and what course should be taken to counteract the injurious effects.
4. Describe the construction of a water-blast for the ventilation of a level.
5. A Cornish plunger pump is required to lift 500 gallons per minute: give diameter of barrel, length of stroke, and speed per minute.
6. It being decided at a mine to install electric power for winding, operating pumps, air-compressing, &c., such electric power to be generated by water-power some distance from the site of mining operations, the head available at the water-power site being 300 ft., what particulars would you have to supply to hydro-electric firms so that they could give you a complete tender with specifications of plant ? State the quantity of water they would require to operate the plant.
7. For what work in connection with mining operations is suction-gas power suitable, and under what conditions would you consider it more suitable than a steam plant ?

SUBJECT III.—*Ventilation.*

1. Describe how dust and smoke, after blasting in mines where rock drills are used, may be immediately allayed.
2. Comment upon the anemometer, pitot tube, and powder-smoke for the measurement of mine-air velocity. State the limitations of each method.
3. What is the object of splitting the air in mines ? To what general result is it conducive, and how is it effected ?
4. A volume of gas at a temperature of 55° F. and with a barometric pressure of 30 in. occupies a space of 15,000 cubic feet. What would be the alteration in volume if the temperature were increased to 60° F. and the barometer dropped to 29 in. ?
5. The downcast and upcast shafts are each 1,200 ft. deep; the temperature of the downcast is 60° F., upcast 100° F., barometer 30 in. What is the motive column and water-gauge ?

6. The rise workings from a level are supposed to contain fire-damp: describe minutely how you would proceed to ascertain if such is the case. State how you would ascertain approximately percentages of gas present, and how you would take samples for more definite analysis. State also how you would determine approximately the amount of fire-damp in these rise workings.
7. Black-damp occurs in considerable percentage on the floor of a narrow crosscut to a depth of 18 in.; at the face of the crosscut rock drills are used; the crosscut is 7 ft. in height, near the top of which is a line of air-pipes of maximum dimensions connected to an exhaust fan; the air-current does not disperse the black-damp lying on the floor: describe how the gas may be easily shifted with the appliances at hand.
8. The following is an analysis of mine-air recently taken by the Examiner: $CH_4 = 48{\cdot}10$ per cent.; $CO = 0{\cdot}015$ per cent.; $CO_2 = 0{\cdot}35$; Oxygen = 10·10 per cent.; Nitrogen, 41·435 per cent. Describe how you would take two samples of this mixture with perfect safety; also what effect (if any) would 10 minutes' detention in this mixture have upon you; also would there be any colour, taste, or smell from the gaseous mixture?

Subject IV.—*Arithmetic, Law, and First Aid.*

Arithmetic.

1. If gold is worth £3 17s. 6d. an ounce and silver £2 14s. per pound, what is the value of a bar of silver of equal weight with a bar of gold worth £1,085?
2. Extract the square root of 900042600504 and the cube root of 1027243729000.
3. A pocket of lead-ore weighed 7 tons; one portion of it yielded lead 78 per cent. and silver 8 oz. per ton; the remaining portion yielded lead 75 per cent., and silver 7½ oz. per ton; the total yield of silver was 55 oz.: what average per cent. of lead did the whole pocket contain?
4. Work out the following pay-bill, adding an advance of 18 per cent.: 164 tons 5 cwt. at 2s. 3½d. per ton; 104 yards cutting at 4s. 5d. per yard; 6 sets of timber at 3s. 2¾d. per set; drawing 138 props at 3¼d. each.
5. There are four legs for the construction of poppet-heads, each 69 ft. long, 22 in. square at one end and 15 in. square at the other: the contract price being 18s. 7½d. per 100 ft. super., required the number of superficial feet in the legs and the total cost.

First Aid.

1. Name the different kinds of fractures, and describe the difference in the symptoms of a fracture and a dislocation.
2. If part of a limb has been torn off, but there was not much bleeding, how would you act?
3. Briefly describe Schafer's method of artificial respiration; and why it is usually preferred to other methods.
4. What are the signs and symptoms, and what would you do, in a case of carbolic-acid poisoning?

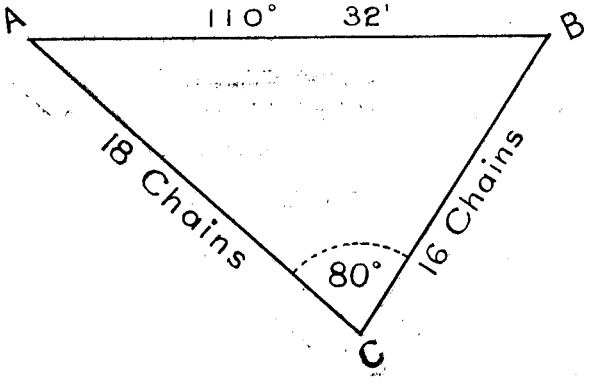
Law.

1. What are the duties of the workmen's inspectors?
2. What duties has the mine-manager to carry out when a serious accident happens in a mine of which he has charge?
3. Under what conditions are explosives used in a mine? Quote rules as to storage of explosives on the surface and underground.
4. What are the conditions under which ropes and chains may be used?

Subject V.—*Surveying.*

(First-class Candidates only).

1. A tunnel is driven from A to B, due west, a distance of 168 ft. A lode is found at B and worked to C in a general northerly direction, as shown by the following traverse: Bearing 347° 42′, distance 83 ft.; bearing 24° 53′, distance 74 ft.; bearing 353° 25′, distance 90 ft., where a fault occurs. A prospecting-drive is then run in an easterly direction from C to D, as follows: Bearing 85° 33′, distance 108 ft.; bearing 103° 45′, distance 132 ft., where the lode is again struck. Compute the direct bearing and distance from A to D.
2. Two drill-holes, one mile apart, are put down to a seam of coal; the depth of the first is 634 ft., and that of the second 850 ft.; the surface of the former is 25 ft. above the top of the latter: what is the inclination of the coal-seam between the two points, measured in inches per yard?
3. A line passing through plumb-lines A and B suspended down two shafts bears 110° 32′; from a station C underground a line CB measures 16 chains, and a line CA 18 chains; the angle ACB = 80°: compute the bearings of AC and CB, and the distance AB.



4. Explain the advantages of plotting by co-ordinates, and the simple method of check which can be applied to any point.

SUBJECT VI.—*General and Applied Geology.*

1. Define the terms *weathering, denudation, sedimentary rock, conformity, unconformity.*
2. Give a brief account of the geological work of streams and rivers.
3. Describe the general geology of any quartz-mining district in New Zealand with which you are familiar.
4. Briefly describe each of the following rocks, and state how it is formed: Sandstone, conglomerate, slate, quartz-mica-schist, granite.
5. What is a fault? With the aid of diagrams describe examples of faulting, in each case stating (if possible) the approximate amount and direction of movement.
6. How have mineral lodes been formed?
7. Where in New Zealand are found—Petroleum, iron-ore, tungsten-ore, antimony-ore, limestone suitable in quality and situation for cement-manufacture?
8. Give a rule for the recovery of a faulted lode. State clearly when this rule does and does not apply.
9. What are the chief conditions influencing the occurrence of water in mines? (If you wish, confine your remarks wholly or mainly to one mining district.)
10. What are the geological conditions favouring the accumulation of petroleum?
11. How have auriferous alluvial deposits been formed? Give an account of some New Zealand occurrences.
12. It has been said that the petrological microscope can be of great assistance to the miner. Discuss this matter, stating the case for (or against) the microscope.

QUESTIONS ASKED AT THE EXAMINATION HELD DURING DECEMBER, 1914, FOR BATTERY SUPERINTENDENTS' CERTIFICATES OF COMPETENCY.

SUBJECT A.—*The Different Modes of reducing and pulverizing Ores.*

1. Describe in detail how you would erect a crushing-battery of 40 heads of stamps, with rock-breakers, ore-crushers, concentration plants, and all necessary reduction and pulverizing machinery to reduce the ore to such a fine state of division that the largest percentage of the bullion in the ore can be extracted by the cyanide process.
2. Describe how you would construct a cyanide plant to deal with the ore in the foregoing question. Give full detail of the treatment and the process the bullion is subjected to before it is sent to market.
3. Give an estimate in detail of the cost of the construction of a crushing and cyanide plant as mentioned in the two foregoing questions.
4. If you found that a solid rock foundation could not be procured for a stamp battery, how would you construct a foundation for the stamp-beds? Describe fully.
5. If you had to light a battery electrically with 90 lamps of 16 candle-power and 15 lamps of 25 candle-power, what would be the power in kilowatts of the dynamo required? What volume and pressure would you recommend? Give your reasons for same.

SUBJECT B.—*Amalgamating-machines.*

1. What is the use of amalgamating-machines? Why are they required, and how is amalgamation effected?
2. Describe in detail what is meant by an amalgam-trap, also the use of the following machines: Watson-Denny pan, Fraser pan, combination pan and berdan. State their capacity and the speed they are worked at, and the quantity of quicksilver used in each machine.

SUBJECT C.—*The Use of Quicksilver, and Methods of using it in connection with the Extraction of Gold and Silver from Ores.*

1. State in detail where quicksilver is first used in a crushing-battery, and for what purpose.
2. How do you ascertain when quicksilver is in a pure state, and what effect lead, antimony, and copper has on it when used for amalgamation of gold and silver?
3. If quicksilver contains base metals, how would you render it again in a pure state? Describe in detail.
4. State fully the process by which bullion is extracted from quicksilver and made into a marketable commodity.

SUBJECT D.—*Cyanide, Chlorination, and other Chemical Processes of recovering Gold and Silver from Ores.*

1. In recovering gold and silver from ores, how do you ascertain the best mode of treatment to get it extracted?
2. What is meant by the cyanide process? How is the bullion extracted from the ore? What class of ore is most suitable to be treated by KCN solutions and also by chlorination?
3. Give an intelligent sketch of a modern plant where ores are treated with KCN solutions, and also a modern chlorination plant. State in detail how the bullion is extracted.

4. How do you ascertain the strength of KCN solutions to satisfactorily treat the particular class of ore you have to deal with ?
5. In making up 30 tons of a sump solution containing 0·01 per cent. of KCN to a 2·5 solution, how many pounds of crude cyanide containing 75 per cent. of KCN would be required ?
6. In using 40 tons of a sump solution containing 0·03 per cent. of KCN to make up 2 per cent. solution, how many tons of 3 per cent. KCN would be required ?
7. How many tons of 1·6 solution would be required to make up 20 tons of a 0·2 solution using 0·02 of a sump solution ?
8. How is KCN solution prepared ? State fully.
9. A vat 30 ft. in diameter contains pulverized ore to a depth of 5 ft. 3 in. : how many tons of ore would it contain, allowing 70 cubic feet to the ton ? Also, what quantity of KCN solution would be required to treat this amount of ore ?
10. Describe the effect ores containing lead, antimony, zinc, and copper have on the treatment of auriferious ores containing these metals, by KCN solutions.
11. If a workman suffered from hydrocyanic poisoning, how would you treat him, and what antidote would you apply ?
12. What effect (if any) has chlorine-gas on the workmen if they inhale it, and what remedy would you apply ?

SUBJECT E.—*The Sampling and Testing of Ores.*

1. A gold-silver ore-sample weighs 5 lb., and is found to contain " metallics," the amount of which in the sample weighs 0·078 grain bullion ; this bullion on parting is found to contain 0·024 grain of gold ; an assay of 1 A.T. of the sample (free from metallics) gives bullion 9·32 milligrams, containing 2·65 milligrams gold : how would you report the results so as to show the amounts and values of gold and silver respectively per ton ? (Gold, 84s. per ounce ; silver, 2s. per ounce).
2. What precautions have to be taken in determining the amount of moisture in a bagged lot of pyrite concentrates, and why ?
3. Describe a method of assaying a gold cyanide solution for gold.
4. A sample of tailings has been tested for cyanide-consumption, and shows an excessive amount : what tests would you make to determine the likely cause or causes of such consumption ?
5. A sample of tailings fron a cyanide plant has been assayed for gold, and shows a high assay ; it is assumed that this result is owing to the ore not being crushed fine enough : how would you, as an assayer, proceed to determine whether such is the case or not ?
6. How would you assay a sample of gold-amalgam for gold only ? (Give outline only of process).
7. A bar of bullion weighs 472 oz. 9 dwt., and assays 927. State the following : (*a*) Fine weight of bar ; (*b*) " standard " weight of bar ; (*c*) value of bar.
8. Describe the preparation of pure silver from waste silver-chloride of the assay laboratory.

SUBJECT F.—*A Knowledge of Arithmetic and the Method of keeping Battery Accounts.*

1. The wages in connection with a crushing-battery and cyanide plant amount to £560 a month of 24 days, 40 men being employed at different rates—the A division are paid £14 8s. per man ; B division, 20 men, 90 per cent. per man of the amount paid to each of the men in A division ; the C division, 13 men, 106 per cent. of the amount paid to each man in B division ; and the balance is paid to 3 men in D division : how much does each man receive per day ?
2. A certain piece of work was done by 14 men and 6 youths in 20 hours : how long would it take 4 men, 7 youths, and 4 boys to do the same amount of work, taking 4 youths to be equal to 3 men, and each boy to do three-fourths of the work to be done by each youth ?
3. The value of bullion containing gold, silver, and copper was £6,000 ; 10 per cent. of the bullion was gold, 85 per cent. silver, and the balance copper : taking gold at £4 per ounce, silver at 2s. 2d. per ounce, and copper at £65 per ton of 2,000 lb. troy weight, what would be the weight and value of the gold, silver, and copper in the bullion ?
4. In crushing with a battery of stamps having a drop of 7 in., show by calculation how many drops per minute can be made without the tappets on the stamps' shanks falling on to the cams.
5. Square 0·00312, and extract the cube root arithmetically of the quotient.

LIST OF MINE-MANAGERS, BATTERY SUPERINTENDENTS, AND DREDGE-MASTERS WHO HAVE OBTAINED CERTIFICATES UNDER THE MINING ACTS.

First-class Mine-managers' Certificates.

Certificates of Service issued under the Mining Act, 1886, without Examination.

Adams, H. H., Waiorongomai.
*Anderson, P., Thames.
*Andrews, R., Coromandel.
Andrews, T., Thames.
Barclay, T. H., Thames.
Bennett, J., Alexandra.
*Benney, J., Coromandel.
Black, T., Waiomio.
*Bollersley, N., Boatman's.
*Bradbury, M., Reefton.
*Bray, John, Lyell.
Burch, W. H., Thames.
*Byrne, J. F., Stafford.
Cameron, A., Macetown.
*Cameron, E., Te Aroha.
Chapman, J. A., Dunedin.
*Clarke, G. S., Thames.
*Comer, R., Thames.
Conradson, M., Lyell.
*Corin, W., Thames.
*Cornes, C. A., Karangahake.
*Coutts, J., Thames.
*Crawford, T. H., Thames.
*Crowley, C., Reefton.
*Cummings, W., Reefton.
Davis, J. E., Queenstown.
*Davey, C., Ross.
*Donald, J., Cromwell.
*Dryden, S., Thames.
*Dunlop, T. A., Thames.
Edwards, J., Skipper's.
Elliott, J., Macetown.
*Evans, F., Skipper's.
Evans, J. H., Skipper's.
*Fitzmaurice, R., Reefton.
Frewen, J. B., Queenstown.
*Gavin, T., Te Aroha.
Gilbert, J., Reefton.
Gilmour, T., Thames.
*Giles, G. F., West Wanganui.
Glass, W. M., Naseby.
*Goldsworthy, J., Waiorongomai.
*Greenish, J., Reefton.
*Greenville, W., Ohinemuri.
*Hall, J. P.
*Hansen, P. C., Thames.
*Harris, J., Owen's Reefs.
Harrison, R. H., Coromandel.
*Hicks, T. B., Thames.
*Hilton, G. P., Bendigo.
*Hodge, F., Coromandel.
Hollis, W., Thames.
Hunter, R., Thames.
James, F., Thames.
Jamieson, A., Coromandel.
Jenkins, M., Wakatipu.
Johnstone, H., Bluespur.
*Julian, J., Boatman's.
Kelly, J., Lyell.
Kerr, J., Thames.
*Lawn, E., Black's Point.
*Lawn, H., Boatman's.
*Lawn, J., Reefton.
*Littlejohn, W., Karangahake.
*Lowe, E. W., Thames.
*Malfroy, J. M. C., Ross.
*Martin, W. G., Thames.
*McCallum, J., Reefton.
McCullough, R., Thames.
McGruer, G. N., Karangahake.
*McIlhaney, J., Thames.
McIntosh, D., Bluespur.
*McKay, J., Ross.
*McKenney, J., Reefton.
*McKenzie, W., Thames.
*McLeod, G., Coromandel.
*McLiver, F., Thames.
*McLiver, H., Thames.
McMaster, J., Reefton.
Moore, H. W., Thames.
*Moore, J. H., Thames.
*Morgan, R., Otago.
Morrisby, A. A., Glenorchy.
*Nasmyth, T., Reefton.
Newman, W., Naseby.
*Northey, J., Thames.
*O'Sullivan, D. E., Thames.
Polton, A., Karangahake.
Porter, J., Waipori.
*Purvis, G., Ross.
Quinn, E., Te Aroha.
*Radford, T., Thames.
Ralph, J. G., Thames.
*Ranger, J., Reefton.
*Rasmussen, C. L., Mokihinui.
Rasmussen, C. P., Mokihinui.
Reid, P., Coromandel.
Resta, L., Macetown.
*Roberts, E., Ross.
Rooney, F., Reefton.
Scott, T., Waiorongomai.
*Searight, A., Reefton.
*Senior, J., Thames.
Smith, J. E., Thames.
Stone, F., Karangahake.
*Steedman, J. B., Thames.
Sturm, A., Waipori.
Taylor N., Thames.
Todd, C., Heriot.
Treloer, J. S., Reefton.
*Tripp, R. S., Arrowtown.
*Vivian, J. G., Thames.
*Vivian, S., Reefton.
*Waite, C. D., Thames.
*Waite, E., Thames.
Walker, J. W., Thames.
Watson, T., Reefton.
*Wearne, J. E., Endeavour Inlet.
Wearne, T., Endeavour Inlet.
*Wilcox, J., Thames.
Williams, J., Skipper's.
*Wright, G., Boatman's.
Wylie, W., Ross.
Young, G., Skipper's.

Issued after Examination under the Mining Act, 1886, and Amendment Acts.

Adams, B., Thames.
Baker, W., Thames.
Black, G., Reefton.
*Caples, P. Q., Reefton.
*Carter, J., Thames.
*Casley, G., Reefton.
Cochrane, D. L., Reefton.
Colebrook, J. D., Coromandel.
Coombe, J., Reefton.
Crawford, J. J., Thames.
*Cummings, W., Reefton.
Donaldson, W., Otago.
Fleming, M., Thames.
*Gardner, W. P., Reefton.
Harris, W., Thames.
Horn, G. W., Thames.
Horne, W., Coromandel.
Hornick, M., Thames.
Hosking, G. F., Auckland.
Kruizenza, W., Reefton.
*Lawn, T., Reefton.
Logan, H. F., Wellington.
Mangan, T., Thames.
Mouat, W. G., Dunedin.
*Truscott, G., Thames.
Watkins, W. E., Reefton.
*Wilkie, J., Reefton.

Issued on Production of Certificate from a Recognized Authority outside the Dominion under the Mining Acts 1886, 1891, 1898, 1905, 1908, and 1913.

Argall, W. H., Coromandel.
Beckwith, L. H., Wellington.
Brook, R. H. T., Reefton.
†Cock, J., jun., Ross.
Cock, W., Waiomio.
Datson, J., Manaia.
Dodd, William, Milton.
Evans, A. W., Reefton.
Griffiths, A. P., Auckland.
Griffiths, H. P., Auckland.
Hailey, R. C., Dunedin.
Hall, E. K., Reefton.
McKenna, Thomas, Dunedin.
Molineaux, H. S., Gore.
Rich, F. A., Auckland.
Williams, W. H., Auckland.

Issued after Examination under the Mining Act, 1891.

Agnew, J. A., Thames.
Annear, William, Reefton.
Arcott, R., Waihi.
Bennett, E. P., Thames.
Boydell, H. C., Coromandel.
Bradley, R. J. H., Te Puke.
*Bray, E., Reefton.
*Bruce, Malcolm, Thames.
Carroll, J., Lyell.
Cartwright, E., Thames.
Crabb, J., Reefton.
*Dobson, J. A., Auckland.
Evans, H. A., Wellington.
*Fahey, P., Reefton.
*Flannigan, Francis, Reefton.
Gilmour, J. L., Thames.
Hodge, J. H., Thames.
*Hughes, D., Thames.
*James, T., Thames.
Keam, P. E., Thames.
*Lane, J., Reefton.
Lawn, C. H., Capleston.
Linck, F. W., Thames.
*Marshall, F., Reefton.
Morrison, R., Thames.
McDermott, J., Thames.
McDermott, G., Thames.
McDermott, W., Thames.
McGregor, W. T., Thames.
McKenzie, H. J., Coromandel.
McPeake, J., Thames.
O'Keeffe, M. D., Thames.
Paul, Matthew, Thames.
Paltridge, Henry, Thames.
*Prince, F. H., Reefton.
Robertson, D. B., Stafford.
Ross, Richard, Thames.
Russell, Murray, Dunedin.
Shepherd, H. F., Thames.
Stanford, W. J., Macetown.
*Steedman, J. G., Thames.
*Sutherland, Benjamin, Reefton.
Tierney, R., Thames.
Vialoux, F., Coromandel.
Warne, George, Thames.
Waters, D. B., Skipper's.
*Watt, J., Thames.
White, G. H., Thames.
Whitley, A., Thames.
Williams, C., Capleston.

* Deceased since issue of certificate. † Alluvial.

FIRST CLASS MINE-MANAGERS' CERTIFICATES—*continued.*

Issued after Examination under the Mining Acts, 1898, 1905, and 1908.

Allen, Henry, Waihi.
Autridge, L. E., Thames.
Baker, S. G., Thames.
Barker, B., Thames.
Barrance, K. M., Karangahake.
Bell, O., Waihi.
Bennie, Boyd, Waihi.
Bishop, Thomas Otto, Skipper's, Otago.
Blenkhorn, C., Coromandel.
Bolitho, Joseph, Reefton.
Bower, J. W., Coromandel.
Broad, R., Waihi.
Buddle, Frank, Coromandel.
Bull, C. W., Waihi.
Caisley, John, Karangahake.
Carroll, A. M., Reefton.
Carroll, John, Kuaotunu.
Carter, R. P., Waihi.
Clouston, R. E., Kaitangata.
Cooper, J. H., Thames.
Cooper, Thornhill, Waihi.
Cordes, F. M., Karangahake.
Cornes, J. G., Waihi.
*Daley, John William, Waihi.
Docherty, W. H., Coromandel.
Downey, J. T., Reefton.
Dutton, W. F., Waihi.
Ellery, John, Reefton.
Fry, S., Waimangaroa.
Evered, N. J., Waihi.
George, M. T., Waihi.
Goldsworthy, C., Karangahake.
Goldsworthy, W., Coromandel.
Gordon, J. A., Thames.
Grayden, P., Thames.
Greening, W., Karangahake.
Gudgeon, C. W., Macrae's.
Hitchcock, W. E., Barewood.
Hooker, John, Coromandel.
Irwin, Samuel, Waihi.
Jackson, G. T., Waihi.
Johnson, J. H., Coromandel.
*Katz, C. A., Waihi.
Langdon, H., Waihi.
Langford, G. S., Waihi.
Lautour, H. A. de, Waihi.
Lawn, Nicholas, Reefton.
Lewis, Ralph Reginald, Waihi.
Mackie, Portland George A., Waihi.
McConachie, W., jun., Waihi.
McDonald, R. M., Table Hill.
MacDuff, R. B, Thames.
McGruer, A., Karangahake.
MacLaren, J. A. J., Coromandel.
McMahon, J. H., Reefton.
McMahon, T., Reefton.
McMillan, T., Waihi.
Mitchell, William J., Barewood.
Moore, L. O., Waihi.
Morgan, William, Waihi.
Morrison, William, Waihi.
Moye, Michael, Reefton.
Oats, John, Black's Point, Reefton.
O'Sullivan, J. W., Thames.
*Rabe, John, Thames.
Rimmer, J. C., Helensville.
Rodden, John, Reefton.
Ruffin, R. C., Reefton.
Saunders, W. H., Reefton.
Scoble, E. J. Waihi.
Sheehan, D., Karangahake.
Smith, Walter, Karangahake.
Spearing, J. R., Waihi.
Stewart, F., Waihi.
Stewart, R. A., Reefton.
Sullivan, T., Reefton.
Thomson, J. R., Waihi.
Thomson, Thomas, Waihi.
Thorne, G. M., Waihi.
Tucker, E. S., Coromandel.
Turner, G. W. E., Reefton.
Turnbull, E. V., Coromandel.
Turner, C. E., Murchison.
Ulrich, G. A. C., Waihi.
Walker, A. J., Waihi.
Watson, J. L., Thames.
Webber, J. H. A., Reefton.
*Weir, Thomas, Waihi.
*Whyte, N. McG. H., Waihi.
*Williams, C., Thames.
Wilson, Allan, Thames.
Wood, P. H., Reefton.
Wotherspoon, James, Waihi.

Issued under Section 313 of the Mining Act, 1891.

*Edwards, George, Westport.
Hornibrooke, H. P., Coromandel.
Martin, James, Reefton.
Rickard, John, Thames.
Snow, Thomas, Huntly.
Thomas, James, Thames.
Trelease, J. H., Thames.
Williams, John, Kuaotunu.
White, John S., Karangahake.

Certificates of Competency granted to Holders of Provisional Warrants under Section 32 of the Mining Act Amendment Act, 1896.

Alexander, Thomas, Deep Creek.
Argall, A. E., Coromandel.
Battens, H., Coromandel.
*Begley, Thomas, Reefton.
Bennett, Charles Henry, Kuaotunu.
Bunney, Joseph, Waihi.
Campbell, Alexander, Cullensville.
Carlyon, Samuel, Coromandel.
Cornes, C. A., jun., Karangahake.
Daldy, Edward Arthur, Coromandel.
Draffin, Samuel, Waitekauri.
Farmer, C. S., Waitekauri.
*Goldsworthy, Thomas, Tokatea.
Goldsworthy, William, Karangahake.
*Govan, Joseph, Thames.
Harvey, A. G., Coromandel.
*Howard, Samuel, Karangahake.
James, Robert, Thames.
Jamieson, John, Reefton.
Johns, Thomas, Waihi.
Kennerley, W. H., Thames.
*Langford, James, Coromandel.
McCombie, John, Karangahake.
MacDonald, H., Coromandel.
McEnteer, James, Tararu.
*McFarlane, Charles M., Tokatea.
McLean, Benjamin J., Waitekauri.
McLean, Charles, Thames.
*McLean, James, Tararu, Thames.
Meehan, James, Westport.
Moorecraft, Walter, Coromandel.
Morgan, William, Owharoa.
Moyle, Thomas, Thames.
Patton, William, Macetown.
Pearce, Francis, Reefton.
Potter, William H., Thames.
*Rabe, Henry, Karaka.
Rillstone, Charles, Waipori.
Somervell, John, Thames.
*Stackpole, Robert, jun., Karangahake.
Thomas, Archelaus, Tapu, Thames.
Turnbull, Thomas A., Whangamata.
*Willets, Henry, Thames.
*Wilson, James R. S., Kuaotunu.

Issued to Inspectors of Mines by virtue of Office under the Mining Acts, 1886, 1891, and 1898.

Bions, G. J., Dunedin.
Cochrane, N. D., Westport.
Gordon, H. A., Wellington.
*Gow, J., Dunedin.
Green, E. R., Dunedin.
Hayes, J., Dunedin.
McLaren, J. M., Thames.
Tennent, R., Westport.
*Wilson, G., Thames.

SECOND-CLASS MINE-MANAGERS' CERTIFICATES.

Certificates of Service issued under the Mining Act, 1891.

Adams, W. J., Thames.
Agnew, J. A., Coromandel.
*Allen, Richard, Reefton.
Argall, A. E., Coromandel.
*Beard, W. T., Reefton.
*Begley, Thomas, Reefton.
Bennett, C. H., Coromandel.
Blair, Thomas, Kuaotunu.
Bolitho, James, Reefton.
Bone, William, Reefton.
*Borlase, J. H., Capleston.
*Bowler, John, Thames.
*Bray, Edwin, Reefton.
Bremner, John, Coromandel.
Brokenshire, James, Thames.
Brown, John, Macrae's.
Brownlee, Thomas James, Thames.
Bunny, Joseph, Thames.
Byrne, John, Karangahake.
*Caird, Alexander McNeil, Reefton.
*Campbell, J., Kuaotunu.
*Climo, Noah, Coromandel.
Comer, W. W., Thames.
Comer, George, Thames.
Corbett, T., Paeroa.
*Cowan, Hugh, Kuaotunu.
Crabb, Thomas, Reefton.
Daniel, P. F., Greymouth.
Dobson, John Allen, Kuaotunu.
Edwards, George, Westport.
Ellery, John, Reefton.
*Flannigan, Francis, Reefton.
Foster, Thomas, Wellington.
*Gale, C. W., Coromandel.
Gemmings, Charles, Thames.
Gill, George, Thames.
*Glasgow, T. M., Thames.
Goldsworthy, Henry, Thames.
Goldsworthy, William, Mauku, Auckland.
*Govan, Joseph, Thames.
Gribble, James, Norsewood.
*Griffin, Patrick, Thames.
Grimmond, Joseph, Ross.
Guthrie, John, Wellington.
*Guy, Robert, Kuaotunu.
Hardman, James Edward, Thames.
*Harris, R., Thames.
*Harvey, William, Reefton.
Hetherington, William, Thames.
*Hicks, W., Thames.
Hill, Alexander Grey, Waikakaho.
Hollis, Frederick J., Waihi.
Hore, John, Wellington.
Hornibrooke, H. P., Kuaotunu.
Jamieson, John, Reefton.
Jobe, James, Thames.
Johns, Thomas, Thames.
Johnstone, William, Collingwood.
*Kendall, Henry, Thames.
Kerr, George, Kamo.
Kirker, Thomas, Thames.
Laughlin, David, Thames.
Law, John, Thames.
*Lough, H., Thames.
Loughlin, S., Thames.
Mackay, William, Nenthorn.
Martin, David, Black's Point.
Martin, James, Reefton.
Mayn, John, Coromandel.
McCombie, John, Karangahake.
*McCormick, Charles, Coromandel.

* Deceased since issue of certificate.

SECOND-CLASS MINE-MANAGERS' CERTIFICATES—*continued.*

Certificates of Service issued under the Mining Act, 1891—continued.

*McEwen, James, Reefton.
*McLean, James, Thames.
McLean, Alexander, Coromandel.
McLean, Charles, Thames.
*McNeill, Daniel, Thames.
McNeill, George, Upper Kuaotunu.
*McLoghry, Archibald, Karangahake.
*McQuillan, John, Reefton.
Meagher, John, Karangahake.
*Mills, George, Thames.
*Milne, John, Thames.
Morgan, William, Upper Thames.
*Moorecroft, Thomas, Thames.
Moyle, Thomas, Thames.
*Naysmith, James, Reefton.
Newdick, Alfred, Thames.
*Notman, Alexander, Reefton.
O'Keefe, M. W. D., Thames.
Page, John, Lyell.
*Parkiss, Joseph W., Reefton.
Peebles, Alexander, Kuaotunu.
Pettigrew, Robert, Sydney.
*Phillips, W. H., Thames.
*Pollock, John, Thames.
Potts, W. H., Thames.
Primrose, J., Kuaotunu.
*Rabe, Henry, Thames.
*Radford, Thomas, Thames.
Reid, Thomas Groat, Thames.
Rickard, John, Thames.
Richards, A. H., Kuaotunu.
*Rogers, Charles Henry, Reefton.
Rogers, William Henry, Kumara.
*Ross, J., Thames.
*Rowe, James, Thames.
Shaw, James, Karangahake.
Sligo, Alexander, Nenthorn.
Thomas, James, Thames.
Thomas, A., Thames.
Thomson, John, Dunedin.
*Tregellas, James, Reefton.
*Tregoweth, William, Thames.
*Wells, Charles Lewis, Thames.
*Willets, Henry, Thames.
Williams, James, Thames.
Williams, John, Thames.
*Wilson, James R. S., Kuaotunu.
Wilson, J. G., Thames.
Whisker, Charles, Thames.
White, John S., Karangahake.
*Woodcock, James, Thames.
Worth, Robert, Waihi.

Issued after Examination under the Mining Acts, 1891 and 1898.

Benney, J., jun., Paeroa.
Bennie, Boyd, Coromandel.
Cahill, T. M., Upper Kuaotunu.
Carroll, John, Upper Kuaotunu.
Christie, William, Waitekauri.
Draffin, S., Waitekauri.
Dunkin, T., Coromandel.
Evans, H. A., Skipper's.
*Gatland, V. Y., Coromandel.
Mathewson, A., Hyde.
McNeil, A. H., Coromandel.
White, F. H., Kuaotunu.
White, G. H., Thames.

Issued under Section 313 of the Mining Act, 1891.

Connon, William, Thames.
*Coran, Henry, Thames.
Edwards, E., Coromandel.
*Kelso, Archibald, Coromandel.
McCormick, W. J., Waitekauri.

Certificates of Competency granted to Holders of Provisional Warrants under Section 32 of the Mining Act Amendment Act, 1896.

Allen, W. J., Coromandel.
Barney, Montague T., Waitekauri.
Brownlee, Henry, Thames.
Collins, Charles, Waitekauri.
Curtis, Charles, Taylorville.
Davis, James, Coromandel.
Gardner, James, Waimangaroa.
Howe, Albion S., Waitekauri.
Johnson, Frank H., Collingwood.
Kirwan, William, Reefton.
*McDonald, John, Tairua.
McInnes, John, Puriri.
Martin, William, Tararu, Thames.
Murphy, Joseph, Coromandel.
O'Brien, John, Westport.
Prescott, Arthur J., Coromandel.
*Radford, Samuel, Waihi.
Ruffin, Richard, Manaia, Coromandel.

Certificates of Service issued under the Mining Amendment Act, 1910.

Adams, Albert Augustine, Thames.
Adams, R. W., Thames.
Barker, J. W., Coromandel.
Brabyn, John, Clarendon.
Butcher, F. J., Waitekauri.
Donaldson, George, Macrae's Flat.
Gillan, Thomas, Thames.
Grace, Pierce, Waitekauri.
Hansen, Charles Hans, Puketui.
Hayes, James, Thames.
Hill, Harrold Alexander, Thames.
Hyde, Henry John, Karangahake.
Iles, E. J., Bannockburn.
Inglis, Robert, Kuaotunu.
Kell, Arthur, Karangahake.
McKenzie, D., Georgetown.
Reid, George, Glenorchy.
Reynolds, Edmond Francis, Coromandel.
Sheehan, James, Thames.
Tallentire, John, Waiorongomai.
Williams, John Paul, Puriri.

BATTERY SUPERINTENDENTS' CERTIFICATES.

Issued under the Mining Act 1891 Amendment Act, 1894, without undergoing Examination.

Adams, H. H., Waihi.
Aitken, R. M., Reefton.
Banks, Edwin Gripper, Waihi.
Barry, Hubert Percy, Waihi.
Goldsworthy, Henry, Kuaotunu.
Goldsworthy, John, Kuaotunu.
Greenway, H. Howard, Auckland.
*Heard, G. St. Clair, Waihi.
Hope, John S., Waitekauri.
Hutchison, William, Karangahake.
Margetts, Frederick Ernest, Kuaotunu.
McKenna, T. N., Tararu.
McLellan, William, Waitekauri.
*Mellett, Richard Sheridan, Waitekauri.
*Napier, James, Karangahake.
Noble, James R., Karangahake.
Park, James, Thames.
Shepherd, Henry Franklin, Waihi.
Sims, C. F., Tararu.
Walker, James A., Kuaotunu.
Wilson, Arthur E., Waihi.
Wilson, James Kitchener, Auckland.

Issued after Examination under the Mining Act 1891 Amendment Act, 1894.

Adams, A. A., Thames.
Allen, F. B., Thames.
Allom, H. O., Thames.
Ansley, Comyn, Paeroa.
Ansley, Walter, Thames.
Banks, J. H., Waihi.
Bowers, W., Thames.
Brown, A. E., Thames.
*Carter, Samuel, Thames.
Clarke, J. L., Thames.
Clarke, R., Waitekauri.
Clarke, W. J., Waihi.
Day, A. T., Thames.
Dixon, Clement, Waihi.
*Doveton, G. D., Thames.
Fleming, G. C. S., Thames.
Fuller, J. P., Kuaotunu.
Gray, J. W., Waihi.
Hayward, F. W., Komata.
Horn, G. W., Kuaotunu.
Jackson, J. H., Paeroa.
Jones, Achison, Waihi.
Kidd, F. D., Thames.
Laurie, D. B., Karangahake.
Lee, J. W., Reefton.
Macdonald, W., Waihi.
McKenzie, H. J., Thames.
McMicken, S. D., Thames.
Morgan, P. G., Thames.
Morrin, W. S., Thames.
Noakes, H. L., Waihi.
Raithby, R. W., Reefton.
Robinson, J. R., Waitekauri.
Stafford, B. H., Waihi.
Taylor, C. H., Tararu.
Thorpe, A. H., Thames.
Vercoe, R. B., Thames.
Wingate, H. M., Maratoto.
Winslow, G., Thames.
Williams, A. G. R., Thames.

Issued after Examination under the Mining Acts, 1898, 1905, and 1908.

Adams, J. H., Coromandel.
Adams, Richard W., Tararu, Thames.
Adams, J. H., Thames.
Airey, Hubert, Karangahake.
Aitken, Alexander Hugh, Waihi.
Allen, D. V., Thames.
Allen, H. E., Wellington.
Anderson, David, Waihi.
ndrews, T. T., Waihi.
uld, J. B., Crushington.
aker, W. H., Thames.
anks, C. A., Waihi.
Banks, E. J., Thames.
Barrance, K. McK., Karangahake.
Barrett, J. J., Karangahake.
Barron, William E., Waikino.
Baskett, E. G., Karangahake.
Bell, L. M., Waihi.
Bidlake, A. E., Waiomo.
Bird, A. W., Thames.
Bishop, T. O., Reefton.
Blackadder, William, Crushington.
Bradley, R. J. H., Karangahake.
Browne, E., Waitekauri.
Brown, F. M., Karangahake.
Brown, J. E., Komata.
Brown, W. E., Reefton.
Burns, William, Waiomio.
Bush, E. F., Parawai.
Bush, George Arthur, Karangahake.
Bush, H. R., Thames.
Campbell, Colin, Thames.
Carpenter, W. E., Karangahake.
Carless, Noel, Waihi.
Carter, S., Waihi.
Carroll, John, Kuaotunu.

* Deceased since issue of certificate.

BATTERY SUPERINTENDENTS' CERTIFICATES—*continued.*

Issued after Examination under the Mining Acts, 1898, 1905, and 1908—continued.

Chappell, G. A., Karangahake.
Clark, John L., Waihi.
Clarke, Thomas, Waihi.
Coote, J. M., Thames.
Corbett, G. L., Waitekauri.
Couper, J., Thames.
Cowles, R. K., Crushington.
Crawford, H., Macrae's.
Crompton, H., Maratoto.
Croucher, Herbert, Waihi.
Dawson, B., Ellerslie.
Donnelly, Thomas, Waihi.
Donovan, Willie, Waikino.
Draffin, Eugene, Kuaotunu.
Eaton-Turner, Geoffrey William, Waihi.
Ellis, L. L., Waitekauri.
Empson, J. B., Karangahake.
Evans, G. C., Waihi.
Evans, J., Waihi.
Evans, W. B., Reefton.
Ewen, H. F., Auckland.
Fletcher, H. T., Katikati.
*Fraser, J. M., Reefton.
Fry, Sidney, Westport.
Fuller, John P., Kuaotunu.
Fyfe, A., Dunedin.
Gardner, E. A., Reefton.
Gibson, William, Waihi.
Gilpin, J., Waihi.
Gow, E. A., Crushington.
Grayden, J., Waitekauri.
Grayden, Peter, Thames.
Grumitt, P. H., Thames.
Gwilliam, Benjamin, Karangahake.
Halliwell, L. V., Karangahake.
Hargraves, E. P., Waihi.
Hav, Adam, Karangahake.
Harsant, C., Puketui.
Hazard, T. R. C., Waitekauri.
Hindmarsh, R., Reefton.
Hitchcock, W. E., Barewood.
Hogg, B., Karangahake.
Hogg, T. R., Karangahake.
Horn, G. W., Kuaotunu.
Gillooly, T., Roxburgh.
Gillstrom, Carl A., Berlin's.
Hutchison, R. M., Karangahake.
Johnson, Edward, Waihi.
Jones, R. D., Karangahake.
Kidd, R. B., Waitekauri.
Kingsford, A., Karangahake.
Kingsford, C., Waihi.
Langford, G. S., Waikino.
Launder, G. H., Waitekauri.
Lawless, L. J., Paeroa.
Lawn, H., Reefton.
Littlejohn, W. D., Karangahake.
Lovelock, J. E., Crushington.
Mackay, John, Crushington.
Maltman, A., Reefton.
Mann, C., Westport.
Matheson, A. M., Barewood.
Maxwell, W. L., Waihi.
McDonall, P. H., Waihi.
McEwin, J. A., Reefton.
McKinlay, John, Waihi.
McNeil, A. R., Karangahake.
McPadden, J., Coromandel.
Melrose, P., Waihi.
Montgomery, A. E., Opitonui.
Morgan, Robert James, Waihi.
Motherwell, William, Waihi.
Moyle, W. T., Upper Tairua.
Orbell, G. S., Waikouaiti.
Orr, F. S., Waiuta.
Paltridge, F., Thames.
Pond, H. C., Auckland.
Porteous, J., Crushington.
Quick, J. N., Thames.
Reid, J. E., Great Barrier.
Reynolds, E. A., Auckland.
Roberts, H. C., Waihi.
Rodden, William, Lyell.
Rosewarne, R. H., Thames.
Royse, W. G., Reefton.
Sanford, A. G., Waihi.
Shaw, D. S., Waikino.
Shaw, L. J., Waikino.
Stephens, H., Dunedin.
Sutherland, J. A., Reefton.
Thomson, G. W., Bendigo.
Thurlow, J. R., Coromandel.
Tomlinson, A., Karangahake.
Tomlinson, David Mitchell, Barewood.
Tomlinson, W. F., Dunedin.
Turnbull, E. V., Waihi.
Ulrich, G. A. C., Komata.
Ulrich, Herstall, Whangapoua.
Walker, Alfred James Dickson, Waihi.
Waters, D. B., Waihi.
Watson, A. B., Waitekauri.
Watson, A. P., Crushington.
Watson, J. R., Reefton.
Watson, J. P., Reefton.
Watson, W. A., Crushington.
Wearne, W., Reefton.
White, A. S. H., Karangahake.
Williams, A. C., Waihi.
Williams, James, Reefton.
Williams, William Eustace, Waihi.
Wilson, A. P., Crushington.

DREDGEMASTERS' CERTIFICATES.

Issued without Examination under the Mining Act, 1898, and Amendment Acts, 1901 and 1902.

Allen, Charles, Alexandra.
Anderson, L. C., Alexandra.
Andrews, Ralph, Canvastown.
Baker, J. R., Alexandra.
Ballantyne, D., Miller's Flat.
Barnes, T. J., Beaumont.
Barry, Thomas, Clyde.
Bradley, Neil, Alexandra.
Bennett, George, Gore.
Bennett, James, Kumara.
Blue, G. P., Alexandra.
Brand, Peter, Waikaka.
Brennan, Philip, Palmerston S.
Bremner, A. P., Lower Shotover.
Brice, William H., Cromwell.
Bringans, D., Alexandra.
Brown, T. G., Ahaura.
Bunting, James, Murchison.
Busbridge, P., Gore.
Butler, Ewen, Roxburgh.
Butler, M. J., Kanieri.
Cameron, Samuel, Alexandra.
Clarke, Edward, Port Chalmers.
Compton, Albert, Dobson.
Cormack, W., Greymouth.
Cornish, J. T., Miller's Flat.
Coutts, Henry, Miller's Flat.
Cowan, Alexander, Stillwater.
Cowan, James, Nelson Creek.
Crookston, W. L., Three-channel Flat.
*Crowley, J. B., Edendale.
Cumming, J. C., Beaumont.
*Cunningham, George, Kanieri.
Curtis, Charles, Stillwater.
Cutten, W. H., Dunedin.
Deniston, R. A., Cromwell.
Dewar, John, Alexandra.
Donaldson, J. G. A., Greenstone.
*Edmonds, A. R., Nelson Creek.
Faithful, William, Greymouth.
Foohy, J. M., Alexandra.
Gibb, William, Croydon Siding.
Gibson, A., Island Block.
*Goodger, G. W., Waenga.
Graham, J. M., Gore.
Grogan, William A., Miller's Flat.
*Hansen, William, Alexandra.
Hay, James, Dunedin.
Hedley, A., Cromwell.
Herbert, J., Beaumont.
Hewitt, James, Clyde.
Hogg, Thomas, Cromwell.
Hoskins, Thomas, Maori Point.
Hoy, Samuel, Alexandra.
Inwood, W. J., Rocklands Beach.
Johnston, E. A., Alexandra.
Johnstone, Alexander, Cromwell.
Keen, Thomas, Clyde.
Kennedy, Angus, Alexandra.
Kitto, Edward T., Miller's Flat.
Kitto, Francis, Lowburn.
Kitto, John F., Miller's Flat.
Kitto, W. H., Cromwell.
Kloogh, N. P., Lowburn Ferry.
Lawson, Edward, Dunedin.
Ledingham, J., Bannockburn.
Lee, George, Collingwood.
Lidicoat, R. H., Fern Flat.
Louden, Alexander, Clyde.
Luke, S. J., Alexandra.
Magnus, A., Roxburgh.
Magnus, Olaf, Box 130A, Christchurch.
Mailer, John, Stillwater.
Maitland, A. E., Miller's Flat.
*Maxwell, John, Dunedin.
McClure, F. C., Rongahere.
McConnell, J., Cromwell.
McCormack, D., Kanieri.
McDonald, E. A., Waitiri.
McDonald, J., Sofala.
McDonald, John, Cromwell.
McGeorge, J., Dunedin.
McGeorge, Alexander, Dunedin.
McGregor, D., Kanieri.
McGregor, G. R., Alexandra.
McIntosh, D. J., Lowburn Ferry.
*McLay, George, Cromwell.
McLean, D., Waitiri.
McMath, D. C., Ross.
McMath, Thomas, Alexandra.
*McVicar, Peter, Roxburgh.
Mills, Edward, Murchison.
Mitchell, D. A., Dunedin.
Morel, C. G., Inangahua Junction.
Morris, G. S., Cromwell.
Murray, D., Clyde.
Murray, Madget, Cromwell.
Neilson, S., Miller's Flat.
Nicholson, W. E., Alexandra.
O'Leary, D., Waiau.
Olsen, Charles, Roxburgh.
Parsons, J. D., jun., Clyde.
Percy, John, Clyde.
Perkins, A. C., Dunedin.
Pettigrew, George, Nelson Creek.
Poulter, G. W., Alexandra.
Pringle, John, Miller's Flat.
Ray, J. C., Totara Flat.
Reeder, Philip, Bald Hill Flat.
Rennie, Andrew, Roxburgh.
Ross, Alexander, Cromwell.
Ross, Robert, Alexandra.
Richmond, J., Gibbston.
Ritchie, J. S., Waitiri.
Sanders, H. P., Clyde.
Sanders, John, Cromwell.
Sanders, Thomas, Alexandra.
Schaumann, H., Alexandra.
Scott, M. G., Alexandra.
Scott, Robert, Capleston.
Shore, T. M., Queenstown.
Shore, William, Gore.
Simonsen, Charles, Alexandra.
Skilton, A. G., Old Diggings.
Sligo, N. K., Ahaura.
Smeaton, S. H., Inangahua Junction.
Smith, Alfred, Inangahua Junction.
Steel, Archibald, Kawarau Gorge.
Steel, Thomas, Dunedin.
Templeton, Ivie, Rongahere.
*Thompson, J., Alexandra.
Thompson, T., Miller's Flat.
Tough, John, Miller's Flat.
Troy, G. C., Cromwell.
Turnbull, W. D., Canvastown.
Tyson, John, Rongahere.
Von Haast, J. H., Clyde.
Wallace, John A., Miller's Flat.
*Watt, John, Cromwell.
Weaver, Charles, Alexandra.
Williamson, R., Miller's Flat.
Williamson, Walter, Miller's Flat.
Wilson, S. W., Waikaka Valley.
Wood, R. M., Cromwell.
Woodhouse, W. S., Roxburgh.
Young, Andrew, jun., Roxburgh.

* Deceased since issue of certificate.

DREDGEMASTERS' CERTIFICATES—*continued.*

Issued after Examination under the Mining Acts, 1898, 1901, 1902, 1905, and 1908.

Anderson, Andrew, Alexandra South.
Anderson, Bertram, Maori Point.
Anderson, G. B., Roxburgh.
Archer, D. J., Ngakawau.
Baird, William G., Clyde.
Bardsley, John James, Cromwell.
Bate, H. T. G., Greymouth.
Bishop, Hugh Arthur, Collingwood.
Blair, G., Abbotsford.
Borthwick, Robert, Alexandra.
Bourke, John, Clyde.
Brent, C. D., Cromwell.
Briggans, Thomas, Alexandra.
Briggans, William, Alexandra.
Broderick, T., Lyell.
Bruce, J. A., Kawarau Gorge.
Burley, J. P., Westport.
Burnside, Walter, Alexandra.
Burton, A. P., Miller's Flat.
Callaghan, E., Three channel Flat.
Campbell, G. W. T., Alexandra.
Carnegy, A., Three-channel Flat.
Carr, W., Alexandra.
Carter, W. W., Sandy Point.
Chapman, Robert, Maori Point.
Clark, D., Callaghan's Creek.
Clarke, R. S. B., Alexandra S.
Coup, George, Albertown.
Cox, R. D., Alexandra.
Craig, D. A., Shag Point.
Croawell, James, Three-channel Flat.
Curno, C. B., Alexandra.
Dalton, J. R., Three channel Flat.
Dalzell, T. L., Cromwell.
Donaldson, John, Lawrence.
Downie, Henry, Totara Flat.
Eaton, Edgar W., Alexandra.
Elder, D. D., Roxburgh.
Fache, S. C., Gore.
Faithful, Alfred, Bannockburn.
Farmer, Nathan C., Miller's Flat.
Farquharson, George, Alexandra.
Findley, David, Dunedin.
Fisher, Hurtle, Miller's Flat.
Filippi, S. de, Westport.
Foley, S., Lowburn Ferry.
Forno, D., Inangahua Junction.
Fraser, W. J., Roxburgh.
French, T. E. K., Three-channel Flat.
Gibson, William H., Cromwell.
Graham, Thomas Arthur, Gore.
Gunion, R. A., Alexandra.
Gunn, W. E., Beaumont.
Guy, Donald, Cobden.
Guyton, James, Dunedin.
Hanning, C. J., Clyde.
Hansen, H. C., Three-channel Flat.
Harden, J., Stafford.
Harliwick, Matthew, Roxburgh.
Hewetson, Sydney, Nelson Creek.
Hogg, J., Nevis.
Holden, Charles, jun., Cromwell.
Holden, John, Cromwell.
Hepburn, D. O., Alexandra.
Hughes, John L., Miller's Flat.
Johnston, John, Maori Gully.
Johnston, Louis, Beaumont.
Jones, David Rowland, Island Block.
Jones, T. R., Miller's Flat.
Junker, Frank J., Berlin's.
Kane, William, Clyde.
Kean, F. F., Waikaka.
Kellett, C. H., Dunedin.
Kennedy, A., Ophir.
Kitto, Henry, Alexandra South.
Kitto, John, Clyde.
Linney, William, Island Block.
Livingstone, D., Alexandra.
Lloyd, Arthur, Inangahua Junction.
Lloyd, Hubert, Lyell.
MacDonald, C. J., Cromwell.
MacGinnis, J. A., Cromwell.
MacGinnis, M. P., Alexandra.
MacLaren, John, Alexandra.
Marklund, C. O., Lowburn Ferry.
Mathews, James Halbert, Miller's Flat.
Matthews, A. A., Three-channel Flat.
Mayne, W. C., Nelson Creek.
McDonald, C. J., Waitere.
McDonald, G., Alexandra.
McCallum, W. S., Alexandra.
McGregor, Dougald S., Alexandra.
McKenzie, John, Roxburgh.
McKinnon, John, Alexandra.
McLean, John Roxburgh.
Melvin, J. R., Roxburgh.
Merchant, Isaiah, Clyde.
Milne, John A., Roxburgh.
Moffitt, R. W., Miller's Flat.
Mollison, William, Stillwater.
Moncrieff, Henry, Miller's Flat.
Monson, C. H., Miller's Flat.
Morel, A. E., Noble's.
Morel, L. H., Inangahua Junction.
Morgan, Harold, Roxburgh.
Morgan, John, Alexandra.
Morris, V., Cromwell.
Mouat, W. G., Greymouth.
Munro, C. T., Waitiri.
Munro, Hugh, Alexandra South.
Munro, R. F., Ross.
Murray, H. B., Cromwell.
Murray, Robert John, Canvastown.
Nelson, Edgar, Brunnerton.
Nelson, George L., Brunnerton.
Newick, Albion Edgar Charles Bannockburn.
Nicholson, Charles S. G., Mataura.
Noble, William, Alexandra.
Olsen, Hans, Alexandra.
Omond, Thomas, Nevis.
Orkney, H. E., Cromwell.
Orr, H. T., Cromwell.
Orr, William W., Cromwell.
Parker, P. R., Roxburgh.
Paterson, J. B., Miller's Flat.
Patterson, J., Clyde.
Plumb, E. H., Maori Point.
Poppelwell, William, Alexandra.
Rait, Hume, Albertown.
Ray, J. F., Bannockburn.
Ray, Robert Marshall, Bannockburn.
Reiderer, Edward, Cromwell.
Reynolds, T., Greymouth.
Ritchie, William John, Cromwell.
Roberts, G., Three-channel Flat.
Robertson, D. J., Alexandra.
Robertson, W. R., Alexandra.
Rooney, J. B., Roxburgh.
Rumble, Charles, Ngahere.
Rumble, Joseph, Miller's Flat.
Sanders, W. J., Ahaura.
Saunders, C. E., Cromwell.
Sawle, J., Cromwell.
Sawyer, J. F., Alexandra.
Sherwood, T. W., Greymouth.
Simpson, Edward Robert, Cromwell.
Sparrow, J. A., Upper Nevis.
Spooner, A. E., Alexandra.
Steele, Thomas, Alexandra.
Steele, W. H., Miller's Flat.
Taylor, Alexander, Alexandra.
Taylor, J. T., Dunedin.
Theyers, C., Alexandra.
Theyers, J. W., Alexandra.
Turner, T. F., Moonlight.
Vickerman, E. M., Cromwell.
Walker, J. J., Alexandra South
Wasserbrenner, M., Alexandra.
Wathen, James, Miller's Flat.
Watson, E. H., Collingwood.
Weaver, P., Alexandra.
Weir, R., Gore.
Weir, T. R., Cromwell.
Weir, W., Nevis.
Wescombe, Alfred L., Island Block.
Westcott, P. A., Miller's Flat.
Williams, Frederick, Alexandra.
Wilson, George, Marsden.
Wilson, Stephen L., Inangahua Junction.
Wood, W. W., Cromwell.
Woodhouse, F., Bannockburn.
Woodhouse, G. G., Waitiri.
Wylde, G. R., Inangahua Junction.

APPENDIX B.

REPORTS RELATING TO THE INSPECTION OF COAL-MINES.

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

Sir,— Wellington, 26th May, 1915.

I have the honour to present the annual reports of inspection, together with statistical information, in regard to the coal-mines of the Dominion, for the year ended 31st December, 1914.

The reports are divided into the following sections :—

I. Output of Mineral.
II. Persons employed.
III. Accidents.
IV. General Remarks.

Annexures—

(*a.*) Examination of Colliery Officials, and List of Certificate-holders.
(*b.*) Statistics of Working Collieries.

SECTION I.- OUTPUT.

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

Class of Coal.	Output of Coal during 1914.				Total Output to the End of 1914.
	Northern District.	West Coast District.	Southern District.	Total.	
	Tons.	Tons.	Tons.	Tons.	Tons.
Bituminous and semi-bituminous coal	141,133	1,351,182	...	**1,492,315**	23,978,642
Pitch-coal	...	...	1,998	**1,998**	1,995,592
Brown coal	299,320	...	392,047	**691,367**	11,766,311
Lignite	...	...	89,913	**89,913**	1,883,867
Totals for 1914 ...	**440,453**	**1,351,182**	**483,958**	**2,275,593**	**39,624,412**
Totals for 1913 ...	349,586	1,057,564	480,855	1,888,005	37,348,819

The annual output during 1914 constitutes a record for New Zealand, and is remarkable owing to the fact that there was a considerable quantity of imported coal stored in the Dominion at the beginning of the year, carried over from the 1913 strike reserves.

The quantity of coal imported during 1914 amounted to 518,070 tons, being 49,130 tons in excess of that imported during the previous year.

The output of coal from each coalfield is as follows :—

Coalfield.	Output during 1914.	Total Output to End of 1914.
	Tons.	Tons.
North Auckland	141,133	3,268,246
Waikato	295,442	3,769,526
Mokau	3,878	88,998
Nelson	16,574	255,895
Buller	818,176	12,976,087
Inangahua	11,362	240,956
Grey	505,070	7,637,142
Canterbury	11,707	683,178
Otago	312,685	8,277,981
Southland	159,566	2,426,403
Totals	**2,275,593**	**39,624,412**

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

Name of Colliery.	Locality.	Class of Coal.	Output for 1914.	Total Output to 31st December, 1914.	Total Number of Persons ordinarily employed.
Northern District.			Tons.	Tons.	
Hikurangi	Hikurangi...	Semi-bituminous	64,683	933,265	92
Ralphs and Extended	Huntly ...	Brown ...	234,870	2,948,261	560
Northern	Hikurangi...	Semi-bituminous	38,428	533,782	54
West Coast District.					
Coalbrookdale	Millerton ...	Bituminous	352,071	4,406,070	587
	Denniston	"	295,619	6,881,429	559
Westport-Stockton	Mangatini	"	152,233	702,708	200
State Coal-mines (Point Elizabeth	Runanga ...	"	128,188	1,865,762	243
State Coal-mines (Liverpool	Rewanui ...	"	72,000	81,114	244
Blackball	Blackball ...	"	218,497	2,035,157	380
Southern District.					
Kaitangata and Castle Hill ...	Kaitangata	Brown ...	152,988	3,140,334	411
Nightcaps	Nightcaps...	" ...	73,390	1,031,484	139
Other collieries, in all districts ...	...	Various ...	492,626	15,065,046	1,265
Totals	...	...	**2,275,593**	**39,624,412**	**4,734**

SECTION II.—PERSONS EMPLOYED.

Inspection District.	Average Number of Persons employed during 1914.		
	Above Ground.	Below Ground.	Total.
Northern	273	746	1,019
West Coast	616	2,038	2,654
Southern	287	774	1,061
Totals, 1914	**1,176**	**3,558**	**4,734**
Totals, 1913	1,053	3,197	4,250

The number of persons employed at New Zealand collieries during 1914 is the highest yet recorded.

SECTION III.—ACCIDENTS

The following is a summary of coal-mining accidents during 1914, 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 ...	1	43	2	6
Falls in mine	3	3	2	2
Explosives...	1	1	1	1
Haulage	1	1	2	2
Miscellaneous—Underground...	...	...	17	17
On surface ...	1	1	2	2
Totals	**7**	**49**	**26**	**30**

The deaths were in the proportion of 10·35 per 1,000 persons employed. The lamentable explosion at Ralph's Colliery, Huntly, was responsible for this unusual average. That explosion has been separately reported upon by a Royal Commission of Inquiry.

With the exception of the disaster at Ralph's Colliery all the fatal accidents above enumerated occurred in the West Coast inspection district. None of those, however, was due to neglect of the statutory precautions. The three fatalities from falls were attributed to cleavage planes or "backs" not visible until exposed by the falls. A youth was killed by a runaway empty truck, owing to his standing directly in the line at the bottom of a jig. He had only a little while previously been warned by Inspector Newton not to do this. New Special Rule 57A (2) provides for a back-stay or trailer to the ascending (empty) truck or set. If such had been employed at Blackball, where Harold Dancer was killed during 1914, or when George Bain was killed at Taupiri Coal-mine in 1912, these fatalities would not have occurred.

The most serious and regrettable feature I have to report is the concealment by officials of gas-ignition and discoveries of fire-damp at some important collieries, the motive for such reprehensible conduct being doubtless to evade the installation of safety-lamps and the use of permitted explosives, as such tend to increase the cost of production, and also prevent the miners from smoking while in the mine. Should any further cases of this nature be proved the guilty person will unquestionaly be proceeded against, and will suffer the utmost rigor of the law.

The following is a brief description of fatal accidents at coal-mines during 1914:—

Name of Person killed.	Date of Accident.	Name of Colliery.	Cause of Accident, and Remarks.
Walter Meadowcroft ..	9/4/14	Blackball ..	The deceased, an experienced and careful miner, was working in a bord in hard coal very closely timbered to within 3 ft. of the face, when a fall of coal occurred, breaking his back. The face was 13 ft. wide and 9 ft. high, and a series of cleavage planes or partings occurred at right angles to the bord. The Coroner found that death resulted from injuries received while at work.
George Rennie	11/8/14	Millerton ..	Deceased, a carpenter, when engaged upon the construction of a coal-bin at Granity, missed his footing and fell about 26 ft. to the floor of the bin, breaking an arm, several ribs, and received internal injuries from which he died thirty-six days later. No inquest was held.
William Allen, Thomas Baker, Thomas Berry, William Blenkinsop, John Bowler, William Burt, Hutchinson Burt, William Burton, William Brocklebank, Thomas Casson, James Darby, William Dixon (or Mitchell), William Gowans, John Greener, James Holden, William Hincho, Seymour Hopper, Alexander Izatt, Henry Jackson, John Jackson, Samuel Jackson, John W. Jones, William Kelly, Daniel Lyons, William Mayland, Charles Maloney, John Martin, Theophilus Molesworth, Robert Munsie, David Patterson, William Patterson, Henry Peckman sen., Hugh Ransome, William Roper, John Robinson, Arthur Ruston, William Slaven, John Skellern, William Smith, John Steele, Fred Taylor, Jacob Thompson, John Whorskey	12/9/14	Ralph's (Huntly) Taupiri Coal-mines (Limited)	This disaster, causing the death of forty-three persons, including the temporary manager and five deputies, was due to the ignition by a naked light of an accumulation of fire-damp in bord No. 6, district No. 5; the explosion being intensified and carried on by extremely inflammable lignite-dust. The fire-damp proceeded from a blower at a fall in the next bord. The point of origin was an unventilated and unexamined standing-pillar district. Naked lights were used throughout the mine. Several minor ignitions of gas had occurred intermittently throughout the mine. For further information, see the report of the Royal Commission of Inquiry, C.–14, published by the Government Printer, Wellington.
Isaac Crutchley ..	12/9/14	Westport-Stockton	Deceased, when working in a place 9 ft. wide and 5 ft. high having every appearance of safety, was killed by a fall of clayey sandstone, occurring in the form of a seam as a roof to the coal. The deceased, by working under this treacherous roof without timber, took a risk and lost his life.
James Robertson	9/10/14	Paparoa ..	The deceased, an experienced deputy, was in charge of a few shiftmen retimbering where a fall of coal had occurred; the work was nearing completion when a fall of coal from above the sets took place, burying deceased and some of his party. It was subsequently found that the coal came away from a well-defined back, which was not visible until exposed by the fall. The Coroner returned a verdict accordingly.
Donald McMahon	15/10/14	North Brunner	The deceased, a miner, was working in a level by himself erecting a timber chock to support the roof; no explosives were necessary for this work. The body of deceased was subsequently found in a slit about 15 yards distant, much mutilated by an explosion of gelignite. There being no fire-damp found in this mine, colliers fired their own shots. An open verdict was returned. The actual circumstances of this fatality remain a mystery.

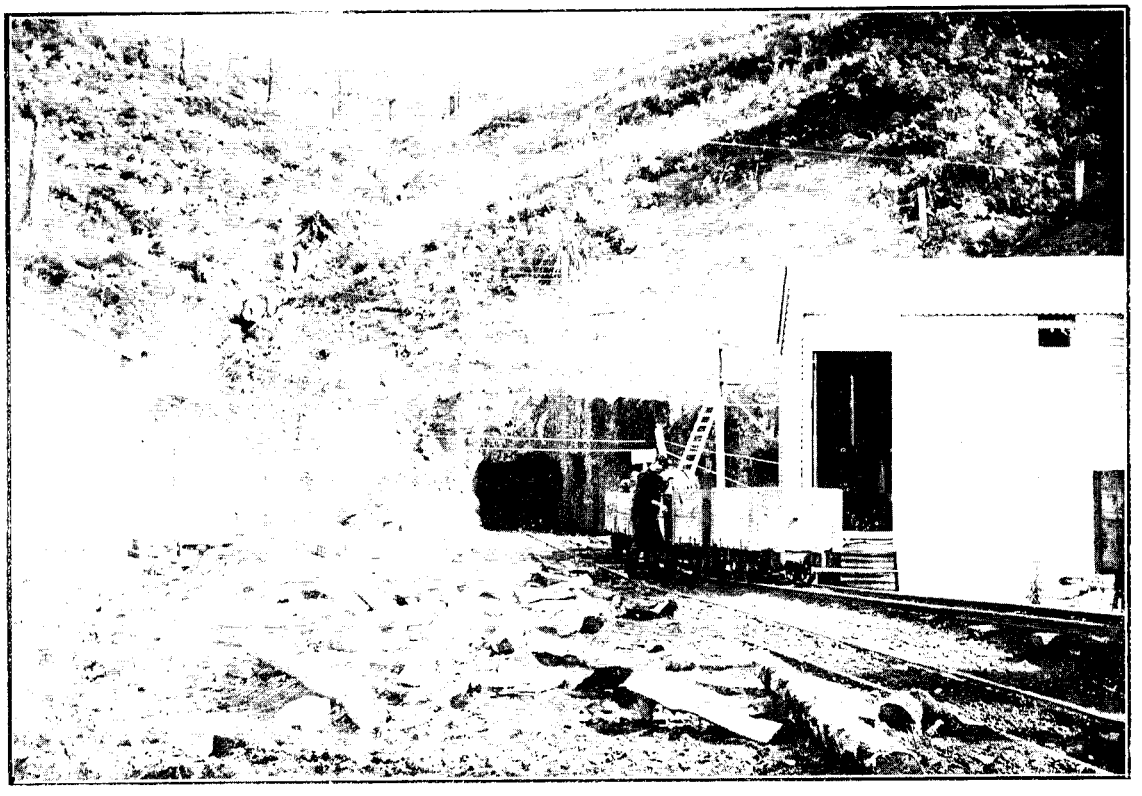
Description of Fatal Accidents at Coal-mines, &c.—continued.

Name of Person killed.	Date of Accident.	Name of Colliery.	Cause of Accident, and Remarks.
Harold Dancer	7/12/14	Blackball ..	The deceased, a trucker, was standing at the bottom of a jig in the line of running trucks which were being jigged, when owing to derailment a truck became uncoupled, and, descending the jig at a rapid rate, struck deceased, with fatal results. The deceased had shortly before been warned by the Inspector of Mines (Mr. Newton) of the danger of standing in the line of trucks. The Coroner found accordingly. The provision of a trailer or back-stay to the ascending trucks would have prevented this disaster. This safeguard is now compulsory under Special Rule 57A (2) of the Coal-mines Amendment Act, 1914.

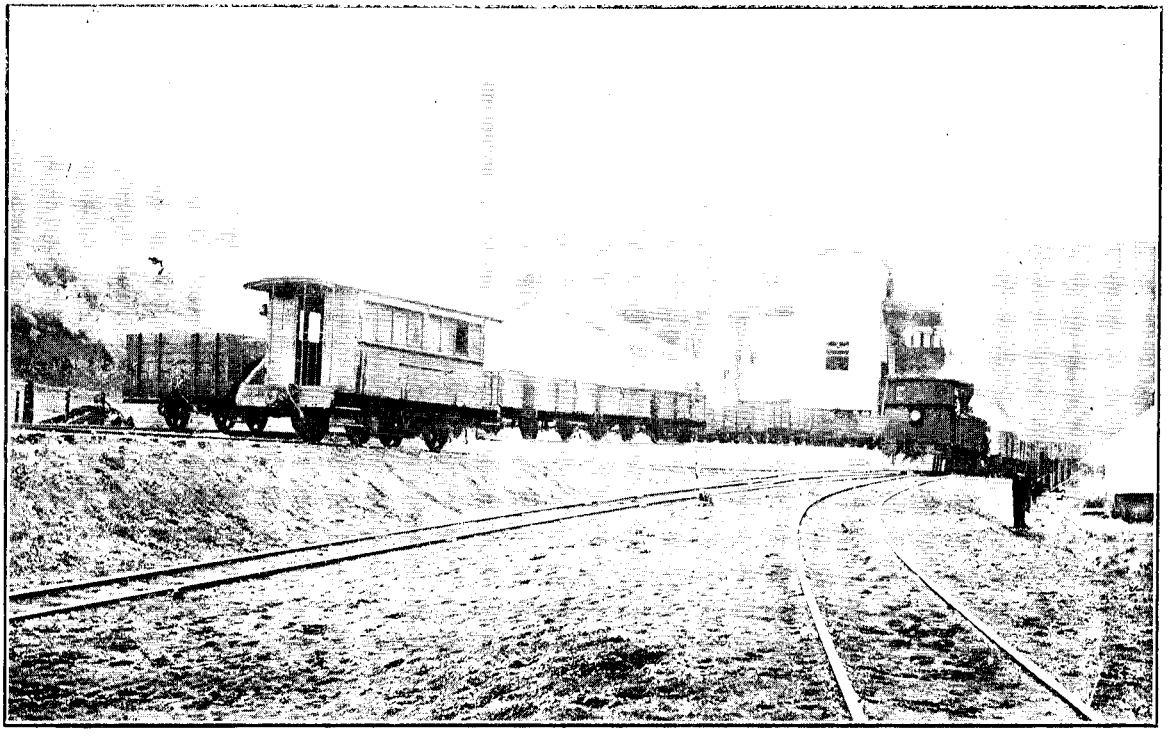
The following statement shows the tons of coal and shale raised, persons employed, lives lost, &c., from 1878 to 1914:—

Year.	Output.	Persons employed.			Tons raised per each Person employed Underground.	Tons raised per Life lost.	Persons employed per Life lost.	Lives lost per Thousand Persons employed	Number of Deaths.
		Above.	Below.	Total.					
Prior ...	709,931	...	...	...	...	...	...	...	...
1878 ...	162,218	147	366	513	443	*	*	*	0
1879 ...	231,218	...	...	802	...	4,635	23	44·00	35†
1880 ...	299,923	...	...	1,038	...	149,961	519	1·92	2
1881 ...	337,262	...	...	963	...	337,262	963	1·04	1
1882 ...	378,272	...	...	1,043	...	189,136	521	1·91	2
1883 ...	421,764	361	888	1,249	475	210,882	624	1·60	2
1884 ...	480,831	393	890	1,283	540	160,277	421	2·34	3
1885 ...	511,063	338	1,145	1,483	456	170,354	494	2·01	3
1886 ...	534,353	392	1,213	1,605	440	*	*	*	0
1887 ...	558,620	388	1,111	1,499	503	139,655	375	2·66	4
1888 ...	613,895	414	1,275	1,689	481	153,474	422	2·36	4
1889 ...	586,445	466	1,251	1,717	468	146,611	313	2·37	4
1890 ...	637,397	512	1,334	1,846	477	79,674	231	4·33	8
1891 ...	668,794	416	1,277	1,693	523	167,198	423	2·36	4
1892 ...	673,315	485	1,196	1,681	563	673,315	1,681	0·66	1
1893 ...	691,548	590	1,298	1,888	533	138,309	377	2·64	5
1894 ...	719,546	506	1,393	1,899	516	119,924	316	3·16	6
1895 ...	726,654	525	1,274	1,799	618	145,331	360	3·33	5
1896 ...	792,851	590	1,347	1,937	588	12,013	29	34·07	66‡
1897 ...	840,713	531	1,381	1,912	609	210,178	478	2·09	4
1898 ...	907,033	556	1,447	2,003	627	907,033	2,003	0·49	1
1899 ...	975,234	554	1,599	2,153	609	325,078	717	1·39	3
1900 ...	1,093,990	617	1,843	2,460	593	273,497	615	1·62	4
1901 ...	1,239,686	688	2,066	2,754	600	413,228	918	1·09	3
1902 ...	1,365,040	803	2,082	2,885	655	682,520	1,443	0·69	2
1903 ...	1,420,229	717	2,135	2,852	665	355,057	713	1·40	4
1904 ...	1,537,838	763	2,525	3,288	609	384,459	822	1·21	4
1905 ...	1,585,756	833	2,436	3,269	651	264,293	546	1·83	6
1906 ...	1,729,536	1,174	2,518	3,692	687	288,256	615	1·62	6
1907 ...	1,831,009	1,143	2,767	3,910	662	152,584	326	3·07	12
1908 ...	1,860,975	992	2,902	3,894	641	372,195	778	1·28	5
1909 ...	1,911,247	1,159	3,032	4,191	633	273,035	599	1·79	7
1910 ...	2,197,362	1,136	3,463	4,599	634	137,335	283	3·55	16
1911 ...	2,066,073	1,365	2,925	4,290	706	147,577	306	3·26	14
1912 ...	2,177,615	1,130	3,198	4,328	681	241,975	355	2·08	9
1913 ...	1,888,005	1,053	3,197	4,250	590	314,667	708	1·38	6
1914 ...	2,275,614	1,176	3,558	4,734	639	46,441	96	10·35	49§
Totals ...	**39,638,855**	...	...	...	...	...	...	...	**310**

* No life lost. † Year of Kaitangata explosion. ‡ Year of Brunner explosion. § Year of Ralphs (Huntly explosion.



Entrance to No. 1 Mine, at the Outcrop of an 11-Ft. Coal-seam.



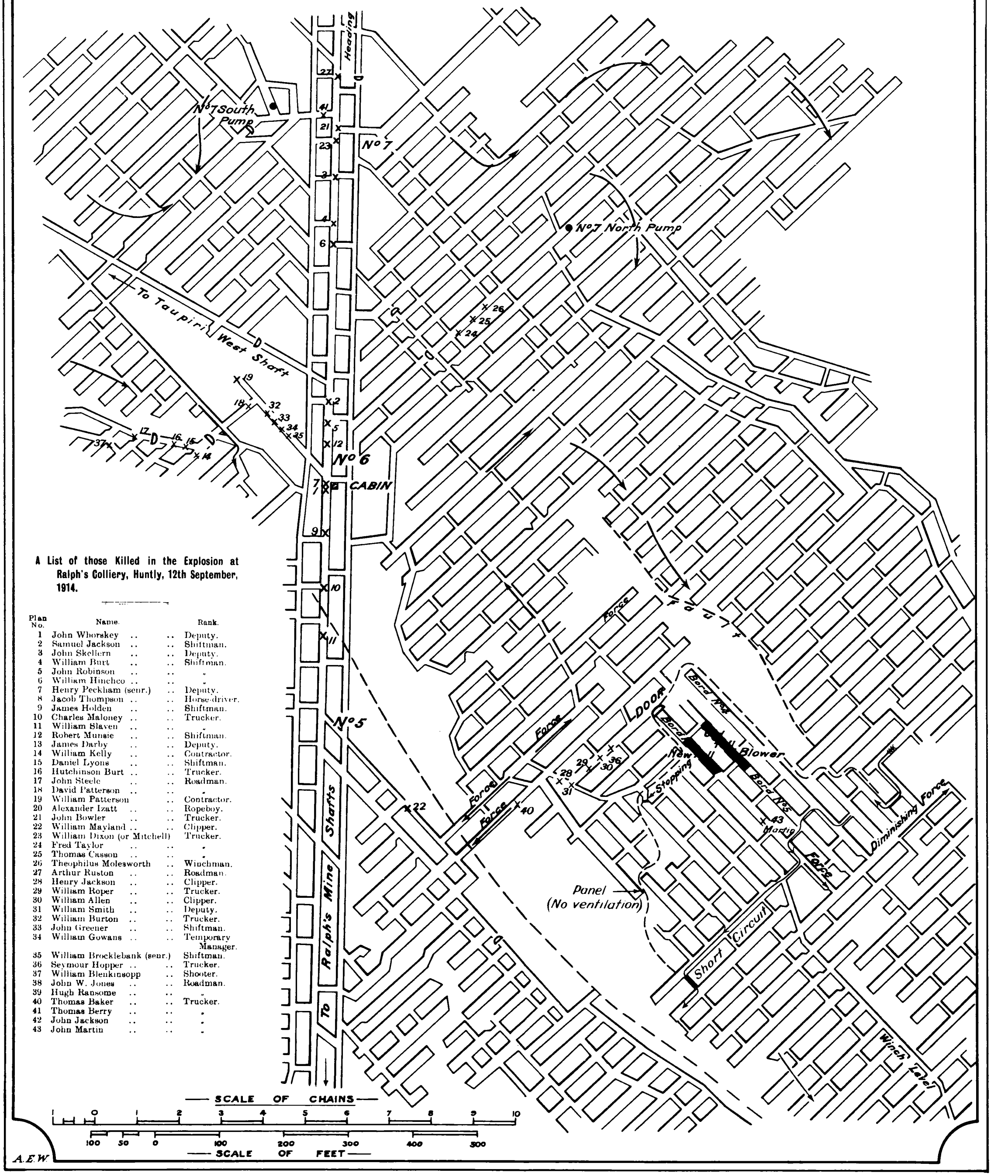
Coal screening Plant and Railway-sidings. The Waipa Railway and Colliery Company, Glen Massey (Waikato Coalfield).

Face p. 61.

Plan
of Portion of
Ralph's Mine, Huntly, N.Z.
October, 1914.

—REFERENCE—

Intake airways	shewn thus	
Falls	" "	
Return-air scaling (approx.)	" "	←
Short-circuited air-current	" "	
Isolated panel	" "	
Direction of force	" "	→
Positions and reference-numbers of bodies		X 43



A List of those Killed in the Explosion at Ralph's Colliery, Huntly, 12th September, 1914.

Plan No.	Name.	Rank.
1	John Whorskey	Deputy.
2	Samuel Jackson	Shiftman.
3	John Skellern	Deputy.
4	William Burt	Shiftman.
5	John Robinson	"
6	William Hinchco	"
7	Henry Peckham (senr.)	Deputy.
8	Jacob Thompson	Horse-driver.
9	James Holden	Shiftman.
10	Charles Maloney	Trucker.
11	William Slaven	"
12	Robert Munsie	Shiftman.
13	James Darby	Deputy.
14	William Kelly	Contractor.
15	Daniel Lyons	Shiftman.
16	Hutchinson Burt	Trucker.
17	John Steele	Roadman.
18	David Patterson	"
19	William Patterson	Contractor.
20	Alexander Izatt	Ropeboy.
21	John Bowler	Trucker.
22	William Mayland	Clipper.
23	William Dixon (or Mitchell)	Trucker.
24	Fred Taylor	"
25	Thomas Casson	"
26	Theophilus Molesworth	Winchman.
27	Arthur Ruston	Roadman.
28	Henry Jackson	Clipper.
29	William Roper	Trucker.
30	William Allen	Clipper.
31	William Smith	Deputy.
32	William Burton	Trucker.
33	John Greener	Shiftman.
34	William Gowans	Temporary Manager.
35	William Brocklebank (senr.)	Shiftman.
36	Seymour Hopper	Trucker.
37	William Blenkinsopp	Shooter.
38	John W. Jones	Roadman.
39	Hugh Ransome	"
40	Thomas Baker	Trucker.
41	Thomas Berry	"
42	John Jackson	"
43	John Martin	"

SECTION IV.—GENERAL REMARKS.

Mining Operations.

North Auckland Coalfields.

Operations at the five productive collieries in the Whangarei district have been unimportant. The Northern Coal Company has suspended work at the recently laid down Waro Colliery, owing to the unprofitable nature of operations. At the same company's Northern Mine work has been almost entirely confined to pillar-extraction. The mine is rapidly approaching exhaustion. A new property of this company at Kiripaka is being connected by tramway, about two miles in length, to the old Ngunguru Mine.

The Hikurangi Coal Company has been engaged upon pillar-extraction from the old mine, and upon the opening of the new Waro section, where a small area of coal is being developed from a dip adit. About 20 acres of standing pillars in the old No. 2 mine have been drained, and the extraction of pillars has been commenced.

Waikato Coalfield.

At the *Ralph's Colliery* (Taupiri Coal-mines, Limited) a disastrous explosion occurred on the 12th September, already referred to. From that date the output practically ceased for the remainder of the year. There exist in this colliery about 200 acres of old standing pillars, which it is not proposed to extract owing to danger of inundation. The length of bords and headings thus kept open amounts to about thirty-six miles, and of cut-throughs also maintained about eight miles. To overcome the difficulty by hydraulic (sand) filling is impracticable. To fill the space from which about 3,000,000 tons of coal has been extracted from the Ralph's and (the same company's adjoining) Extended Mine, in addition to the space left by pillar coal (if extracted), would entail an expenditure far greater than the value of pillar coal. The area of workable coal at Ralph's Colliery is becoming somewhat restricted, being confined on the southward by the Taupiri Extended Mine barrier, on the northward by faulted country, and to the eastward development toward Taupiri West and in the Dooley's dip districts proves the coal-seam to be split. In the last-named district a serious creep has occurred, covering the main haulage road and adjacent workings.

Since the explosion, safety-lamps have been installed throughout this and the adjoining Taupiri Extended Mine, and no other than permitted explosives are now used. Large accumulations of dry coaldust have been removed from both mines, and water-pipes have been laid along haulage and travelling roads to allay the dust.

At Ralph's Colliery a new double-inlet Sirocco fan of 83,580 cubic feet per minute capacity has been installed at a new shaft to supersede the old Waddel fan (capacity of about 43,818 cubic feet per minute). At the Extended Mine a Sirocco fan of 85,200 cubic feet per minute capacity has been running for some years. The old workings at both mines, where gas-blowers have occurred at falls, are travellable, and consequently accessible for inspection and air-coursing, but many more brick stoppings are required to secure adequate distribution of the air at sufficient velocity to remove accumulations of gas.

Taupiri Extended Colliery.—This colliery is separated from Ralph's Colliery by a barrier 44 yards in thickness. The same seam is worked in both mines under practically similar conditions, although there appears to have been greater attention paid to the safety of the Extended Mine. The area of coal available for development is greater at this mine than at Ralph's. A considerable area of the workings of these two mines is situated under the Waikato River, lakes, and swamps, and there is ever present the danger of subsidence and inundation. Fire-damp is reported daily at Ralph's Mine, and very frequently at the Extended Mine.

The output of the Extended Mine, the most productive colliery in the North Island, amounted to 155,808 tons during 1914.

The *Waipa Colliery*, which commenced operations in April, 1914, by the end of the year had produced about 50,000 tons, a very satisfactory output under the circumstances. This mine, the property of the Waipa Railway and Colliery Company, is situated at Glen Massey, on the Raglan Road, about seven miles by the company's branch railway from Ngaruawahia, on the Main Trunk line. The company holds mineral rights covering an area of about 6,895 acres, over a considerable portion of which the coal-measures outcrop.

The same seam as that mined at Huntly is here worked from two dip-adit sections. The seam, which is of excellent quality, is about 10 ft. thick, only slightly inclined, and is free from bands. Little or no surface-water, as at Huntly, here exists; pillar-extraction may therefore be carried out. The mining conditions are extremely favourable for the economic production of coal.

A fault has been encountered striking north and south across the faces of the mine-workings. At the time of my inspection it had not been penetrated, and its character had not been determined; but as the coal outcrops at approximately its correct level at two points on the other side, the displacement, if any, is not great. The plant and surface arrangements at this mine are well arranged.

The *Pukemiro Mine*, situated about four miles northward of the Waipa Colliery, is expected to reach the output-stage within a few weeks. At this mine the same seam as that worked at Huntly and Waipa has been developed by short adit levels, and an excellent modern screening and haulage plant has been installed. An electrically driven endless-rope surface tramway has been laid down, connecting the sections of the mine with Norton's horizontal Hecla screens, specially constructed for delicate handling of the output and prevention of the creation of small coal. A short branch railway has been constructed from Huntly, crossing the River Waikato by a new bridge at that town. As at Waipa Colliery, there is no hindrance here to pillar-extraction. The mine is capitally arranged, and should become a very satisfactory property.

Buller Coalfield.

Denniston Collieries.—Large areas of coal continue to be developed in the Wareatea and Ironbridge sections, and there yet remains coal for many years' successful operations. The endless-rope haulage system, both surface and underground, is very extensive, and as operations are proceeding eastward the distances become greater. The tramways now extend for several miles. Owing to proximity to the surface and numerous holings thereto, inflammable gas is seldom found in these mines.

Millerton Colliery.—In the Mine Creek section the Mangatini fault has been reached by some of the workings, but in a westerly direction a large area of unworked country exists. From the Mangatini section excellent coal is being won. A considerable proportion of the coal at this mine, although friable and soft, commands a ready sale for steam-production. The output from this mine during 1914 was the highest in the Dominion, 352,071 tons being produced. The haulage and travelling roads, also the ventilation and general management of this colliery from a safety standpoint, are very satisfactory. Inflammable gas has seldom been found.

At the *Westport-Stockton Colliery* the newly opened eastern section has been connected to the general haulage system by an electric tramway. Mining operations have reached a fault, which is being driven through. Numerous boreholes and some outcrops indicate a considerable area of coal at the other side of the fault. The older sections of the principal mine, the B, C, and D tunnels, are approaching exhaustion.

Grey Coalfield.

At the *Liverpool State Colliery*, No. 1 or Top Mine, boring operations have proved the existence of the Morgan seam—a lower seam of about 17 ft. average thickness and superior quality, extending over a proved area of about 130 acres from the forks of the Seven-mile Creek in a north-easterly direction. This seam was successfully correlated by Mr. P. G. Morgan, Director of Geological Survey, under whose advice the boring was carried out. In Geological Bulletin No. 13 the seam is described as "A" seam; it has since been named the "Morgan" seam. Immediate steps are being taken to develop the upper portion of this area by a short cross-measures drift from the main level of the Liverpool No. 1 Mine. The greater portion of the output from this colliery has hitherto been obtained from the No. 3 or Rewanui section, situated near the coal-bin and screens, where an upper seam is being profitably worked.

Owing to the discovery of a small quantity of inflammable gas, safety-lamps have recently been installed in this mine, and only permitted explosives are now used.

Point Elizabeth State Colliery (Runanga).—This mine is becoming rapidly exhausted, mining operations being chiefly confined to pillar-extraction. During the year underground fires occurred by the coal heating in both sections of the mine. These were successfully sealed off. Safety-lamps and permitted explosives are also used at this colliery. More dry coaldust exists in this mine than is advisable. The ventilation at all the State collieries is excellent, and the management, from a safety standpoint, is satisfactory.

At *Blackball Colliery* three sections are being worked on the panel system, and at two of these, which are to the dip, development has been retarded by influx of water. To overcome this two electrically driven turbine pumps have been installed, having a capacity of 250 g.p.m. against a head of 230 ft., and 360 g.p.m. against a head of 400 ft. Owing to the somewhat unrestricted use of explosives in this mine, and, to a lesser degree perhaps, from heating of the coal, the mine-air is frequently found to contain more smoke than is agreeable. Analysis, however, has not proved it to contain noxious gas in proportion likely to be injurious to health.

At the *Paparoa Colliery* the No. 2 seam is being extended in a north-west direction. The coal, although friable, is superior for steam, gas, and coke production. The surface arrangements and haulage system are not excelled by those at any mine in the Dominion. Safety-lamps are here used, gas being occasionally found. More coaldust occurs in the mine than is advisable. The ventilation, timbering, and roadways I found to be excellent.

Otago Coalfield.

Kaitangata Colliery (New Zealand Coal and Oil Company, Limited).—Owing to the prevalence of mine-fires and inflammable gas this is a mine which requires very careful supervision. The coal-seam is worked on the panel system, and substantial log and sand stoppings are used for sealing off the heated sections. With a falling barometer gas which has accumulated in lodgments in goafs and above falls is given off, and finds its way into the workings, and is therefore a source of danger. The capacity of the fan is about 30,530 cubic feet per minute, of which 16,191 cubic feet, or 53·3 per cent., is effective in the Munday's dip and main-seam ventilating districts. On the occasion of my inspections of this mine the barometric pressure was normal, and I found no trace of gas at the faces with a safety-lamp; samples of return air, however, taken by me at the upcast shaft upon analysis were found to contain 0·38 per cent. of methane, equivalent to a production in the mine of 116 cubic feet of CH_4 per minute. Safety-lamps only are used in this mine, also permitted explosives. More dry coaldust exists in this mine than is safe under the conditions. I believe the management to be impressed with the necessity for caution.

At the same company's Kaitangata No. 2 mine the same condition exists, but emissions of gas have not been so frequent, and the return air contains less fire-damp. Ventilation is induced by a Sirocco fan of about 20,000 cubic feet per minute capacity.

At the *Castle Hill Colliery*, also the property of the New Zealand Coal and Oil Company, where but little work is at present done, the ventilation by furnace proving altogether inadequate, a Sirocco fan has been ordered.

I have, &c.,

FRANK REED,

Inspecting Engineer and Chief Inspector of Coal-mines.

ANNEXURE A.

QUESTIONS ASKED AT THE EXAMINATIONS HELD DURING DECEMBER, 1914, FOR MANAGERS' FIRST-CLASS CERTIFICATES OF COMPETENCY UNDER THE COAL-MINES ACT.

SUBJECT 1.—*Prospecting, Opening out a Colliery, Working Coal, and Timbering.*

1. Under what conditions would you consider it necessary to drive the winning-places of a new colliery to the boundary of the lease before opening out workings, and state the advantages, if any, which would be secured by such a course.
2. Being required to work two seams of coal, the upper one 10 ft. and the lower one 5 ft. thick, separated by 20 ft. of tender strata, what method of working would you adopt, and which of the workings would you keep in the lead ?
3. Describe and give sketches of the following methods of working coal : (*a*) longwall, (*b*) pillar and stall and double stall, (*c*) the panel system, and the advantages, if any, to be derived from the adoption of this system.
4. What is meant by the term "creep or thrust" in mining ? State cause, describe how the workings of a mine are affected thereby, what are the first indications, and how you would proceed to minimize same.
5. Give sketches showing position of (*a*) the downcast shaft, and (*b*) the upcast, giving size of shaft-pillars you allow for a depth of 1,000 ft., seam of coal being 8 ft. thick. Show by calculation how the result is arrived at, and state what conditions would influence you in deciding which of the two shafts should be the largest.
6. Sketch the various systems of timbering in vogue in coal-mines, and state precautions required with (*a*) soft floor, (*b*) hard floor and tender roof, and (*c*) strong roof, tender floor and sides.
7. Describe fully the plant and appliances you would require in sinking a shaft 15 ft. diameter to a depth of 1,500 ft. ; the first 150 ft. from surface to stone-head being through running sand heavily watered, below this the measures yielding only a moderate quantity of water.
8. Show by sketches and describe the lay-out of (*a*) pit-bottom arranged to facilitate working 1,000 tons daily, and (*b*) the arrangement of the surface works, showing the position of the winding engine and boilers, screens, and railway-sidings. Three different grades or classes of coal to be made.

SUBJECT 2.—*Mine-gases, Spontaneous Combustion, and Ventilation.*

1. How would you determine the useful effect of a colliery ventilation-fan ?
2. Expla n the term "motive column." How may it be expressed, and how is it ascertained ?
3. If you obtain 250,000 ft. of air per minute with a water-gauge of 3 in., find horse-power represented, and also find horse-power required to pass that quantity of air through a drift 10 ft. by 8 ft. if friction did not exist.
4. Describe the application of air-crossings in connection with the ventilation of coal-mines, giving sketches and figured dimensions of a well-constructed crossing through which 10,000 cubic feet of air per minute has to pass.
5. State what you consider is meant by the terms "ascensional" and "descensional" ventilation, and which in your opinion is to be preferred.
6. Having to deal with an underground fire which necessitates sealing up, how would you proceed with the work, and what precautions would you adopt for the safety of the workmen ?
7. Describe the various gases met with in coal-mines, their properties, how produced, where most likely to be detected, and how they affect animal-life.
8. What would you understand is meant by "equivalent orifice" in connection with the ventilation of coal-mines ?
9. Suppose you were placed in charge of a mine giving off a little fire-damp, the workings generally being dry and dusty, what precautions would you adopt to safeguard life ?

SUBJECT 3.—*General Mining, Steam Boilers and Engines.*

1. Describe fully under what conditions you would anticipate a sudden inrush of fire-damp, and what steps you would take to prevent disaster arising from such.
2. What are the necessary precautions required to obtain the maximum safety in relation to the working of all classes of machinery in connection with coal-mines ?
3. If required to raise 1,500 tons of coal in 8 hours from a shaft 1,000 ft. deep, state power required and type of steam-engine you would erect. (Assume sizes and weight of tubs, weight of coal carried by each, and the useful effect obtained from the engine).
4. 100 tons of coal per hour is required to be delivered by endless rope 2,000 yards long, working on a grade of 1 in 8 ; speed of rope to be 2½ miles per hour ; tubs to weigh 5 cwt., and capacity 11 cwt. each : what horse-power will be required ?
5. State the special precautions you would observe in driving towards old workings where it is anticipated water under pressure may be met with, and where noxious gases have also to be guarded against.

6. What will be the steam-pressure in a boiler at blow-off point, the safety-valve being 3 in. diameter, total length of lever 32 in., distance from fulcrum to centre of valve $3\frac{1}{2}$ in., and weight on lever $30\frac{5}{8}$ lb. ?
7. State conditions you would require to have for the site of a dam to resist a pressure of 50 lb. per square inch with a factor of safety of 3 ; assume dimensions, and show by sketches the form of dam you prefer ; also state kind of material to be used, and show by calculation how conclusion arrived at.
8. State rules for calculating the strength of (*a*) beams of timber, and (*b*) ropes and chains, giving sample calculation relating to each.

QUESTIONS FOR MANAGERS' SECOND-CLASS CERTIFICATES OF COMPETENCY.

SUBJECT 6.—*Arithmetic, and a Knowledge of the Coal-mines Act and Amendments, also First Aid to the Injured.*

1. Having to sink a shaft 1,200 ft. deep by 14 ft. diameter inside of bricking, how much debris (in cubic feet) would be produced, allowing for 18 in. brickwork ? And how many bricks would be required to line the shaft throughout ?
2. Having a coalfield of 500 acres with seam averaging 10 ft. thick (bituminous quality), state the total contents in tons. If £20,000 is expended in mine-development, how much should the annual profit be to provide for the repayment of the capital together with 10 per cent. interest within ten years ?
3. A plan is drawn to a scale of 198 ft. to an inch : what proportion is it to natural size, and how would such a scale be expressed ?
4. The hypothenuse of a right-angle triangle measures 765 links and the perpendicular 314 links : what is the length of its base ?

First Aid to the Injured.

1. Have you passed examination and been awarded a certificate from the St. John Ambulance Society ?
2. Describe fully any artificial-breathing apparatus of which you have a knowledge, stating the experience you have had with such, and the precaution to be observed when using it.
3. Describe (*a*) the application of first aid to persons suffering from severe burns, (*b*) the treatment of those suffering from the inhalation of noxious gases.

Knowledge of the Coal-mines Act and Amendments.

1. Briefly state the duties of the manager, underviewer, fireman, and deputies under the Coal-mines Act, giving the numbers of such rules as you may consider very important ; and state what you consider should be the position of the mine-owners regarding the supply of explosives for use in coal-mines.

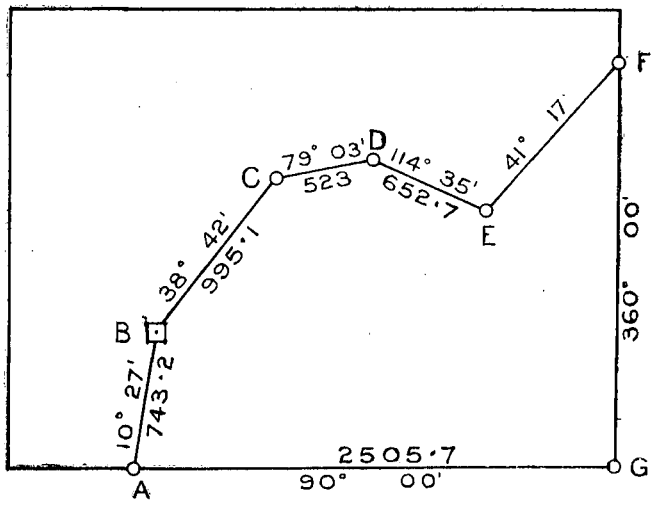
SUBJECT 4.—*Mine Drainage and Haulage ; also Practical Electricity.*

1. What do you consider the most economical and safe means of transmitting power for application in the underground workings of coal-mines ? Give your reasons.
2. If required to raise 600 gallons per minute to a height of 600 ft., what power (direct current, 500-volt electric motor) would you install to efficiently do the work, allowing that 60 per cent. efficiency is obtained ? And what size cable would be required, the transmission being one mile ?
3. What factor of safety would you allow in winding-ropes, and at what rate would you depreciate the factor ? Assuming a pair of winding-ropes raising 1,000 tons daily from a depth of 1,000 ft., how long would you consider it safe to continue their use ?
4. What are the most prolific causes of accident in coal-mines ? State what precautions you would advise the adoption of in order to reduce the number of accidents.
5. Describe the endless-rope systems of haulage—(*a*) the under-tub and (*b*) the over-tub system. State what is in your opinion the best working-speed, and where you would install the motive power for working the system underground.
6. Briefly describe the operation of blasting in coal-mines, stating how coal should be prepared for same, and the dangers to be apprehended from blown-out shots.
7. Why is coaldust considered to be explosive under certain conditions ? State what those conditions are.

Practical Electricity.

1. Having to provide electric power for application to (*a*) pumping (150 b.h.p.), (*b*) winding (400 b.h.p.), (*c*) screening (50 b.h.p.), (*d*) ventilation (100 b.h.p.), (*e*) workshop and lighting (100 b.h.p.), what would the power of the generating-sets (in kilowatts) require to be ?
2. Describe in detail the dangers to be guarded against when introducing electrical machinery into the underground workings of a coal-mine ; and where in your opinion its use would be safe, and the contrary.

SUBJECT V.—(*a.*) *Mine-surveying, Levelling, and Making of Plans.*



1. The accompanying diagram represents a mining claim, the position of a vertical shaft (B), and points (C, D, E, and F) in the underground workings. Compute the distances E to F and F to G. (The distances are given in links.)
2. Compute the area within the figure ABCDEFG.
3. A slope dips 1 ft. in 8 ft. for a distance of 504 ft., measured on the slope: what is the difference in elevation between the mouth and face, and what is the horizontal distance between them?
4. Describe the methods of transferring the true bearing from the surface to the underground workings of a mine when there is one shaft, and when there are two shafts, giving diagrams.

(*b.*) *Geology—Prospecting for Coal, Origin and Mode of Formation of Coal-seams; Faulting; also a General Knowledge of the Geology of Stratified Rocks, and more particularly of New Zealand Coal measures.*

1. Numerous outcrops of apparently workable coal-seams have been found in a mountainous bush clad district in the South Island of New Zealand. State fully what methods of prospecting you would recommend to persons prepared to invest large capital in a proved coalfield.
2. What classes of coal are found in New Zealand? Name the chief coal-bearing districts, and state approximate geological age of the coal-measures in each case.
   NOTE.—The candidate may substitute for New Zealand the name of any other country with which he is more familiar.
3. Draw diagrams illustrating each of the following terms: *Anticline, syncline, unconformity.*
4. Give your views regarding the formation of coal.

LIST OF PERSONS WHO HAVE OBTAINED CERTIFICATES UNDER THE COAL-MINES ACTS.

First-class Mine-managers' Certificates.

Issued under the Coal-mines Acts, 1886 and 1891.

Aitken, T., Wendon.
Alexander, T., Brunnerton.
Austin, J., Sheffield.
Binns, G. J., Dunedin.
Bishop, J., Brunnerton.
*Brown, T., Westport.
Brown, T., Glentunnel.
Cameron, J., Denniston.
Campbell, J. C., Fairfield.
Cochrane, N. D., Dunedin.
Collins, W., Taupiri.
Dando, M., Brunnerton.
*Elliott, R., Wallsend.
*Ferguson, A., White Cliffs.
*Freeman, J., Green Island.
*Geary, J., Kamo.
Gray, J., Abbotsford.
*Harrison, J., Brunnerton.
*Irving, J., Kaitangata.
Jamison, W., Waimangaroa.
*Kenyon, J., Shag Point.
Kerr, G., Kamo.
*Lindsay, W., Otago.
Lloyd, J., Invercargill.
*Louden, J., Green Island.
Love, A., Whangarei.
Mason, J., Nightcaps.
May, J., Greymouth.
Moody, T. P., Kawakawa.
Moore, W. J., Springfield.
*Nelson, J., Green Island.
Ord, J., Huntly.
*Redshaw, W., Whangarei.
Reed, F., Westport.
*Richardson, D., Abbotsford.
Shore, J., Kaitangata.
Shore, T., Orepuki.
*Shore, W. M., Kaitangata.
*Smart, W., Christchurch.
Smith, A. E., Nelson.
Smith, T. F., Nelson.
Sneddon, J., Mosgiel.
Swinbanks, J., Kawakawa.
Taylor, E. B., Huntly.
Thompson, A., White Cliffs.
Walker, J., Collingwood.
Williams, W. H., Shag Point.

Issued under the Coal-mines Acts, 1886, 1891, 1905, and 1908, after Examination.

Armitage, F. W., Auckland.
Armstrong, J., Brunnerton.
Barclay, T., Kaitangata.
Barclay, W., Kaitangata.
Bennie, Boyd, Waihi.
Bishop, T. O., Reefton.
Brown, J. C., Denniston.
Burt, A., Waihi.
Campbell, Peter, Fairfield.
Carruthers, J., Shag Point.
Carson, W., Kaitangata.
Coombe, J., Waihi.
Coulthard, J., Taylorville.
Crockett, S., Millerton.
Dixon, C. W., Granity.
Dixon, W., jun., Kaitangata.
*Dowgray, R. L., Granity.
Duggan, George, Burnett's Face.
Dunn, Andrew, Denniston.
Dunn, W., Brunnerton.
Dunn, W. R., Thames.
Elliott, R., jun., Denniston.
Fleming, J., Kaitangata.
Fletcher, James, Granity.
Fox, R. A., Denniston.
Fry, Sydney, Waimangaroa.
Gibson, John, Westport.
Gillanders, A., Shag Point.
*Gowans, W., Millerton.
Green, E. R., Abbotsford.
Green, J., Brunnerton.
Hamilton, J. S., Burnett's Face.
Herd, J., Brunnerton.
Heycock, C. R., Nightcaps.
Hill, Robert, Abbotsford.
Hosking, G. F., Auckland.
Hughes, D., Preservation Inlet.
*Hughes, Job, Puponga.
Jebson, D., Canterbury.
*Johnson, W. P., Thames.
Jones, T., Kuminia.
Leitch, J., Blackball.
Leitch, W., Blackball.
Marshall, A. G., Denniston.
McCaffrey, Patrick, Ferntown.
McCormack, W., Denniston.
McEwan, Robert, Coromandel.
McGeachie, J., Mokau.
Milligan, J., Denniston.
Milligan, N., Westport.
Morgan, William, Waihi.
Murray, T., Westport.
*Newsome, F., Denniston.
Newton, James, Brunnerton.
Parsonage, W., Runanga.
Pearson, W., Waihi.
Penman, A., Huntly.
Scoble, E. J., Waihi.
Shore, Joseph, Kaitangata.
Smith, George, Fairfield.
Sowerby, H., Denniston.
Talbot, H., Brunnerton.
Tattley, E. W., Huntly
Tattley, F. J., Mercer.
Taylor, A. H., Waikato.
Thomson, Thomas, Denniston.
Turner, G. F., Shag Point.
Westfield, C. H., Fairfield.
Young, James H., Waimangaroa.

Issued under the Coal-mines Act, 1886, on Production of English Certificate.

Binns, G. J., Dunedin.
Black, T. H., Waipori.
Broome, G. H., Ngakawau.
Cater, T., Auckland.
Cochrane, N. D., Dunedin.
*Garrett, J. H., Auckland.
Hayes, J., Kaitangata.
Hodgson, J. W., Ross.
*Lindop, A. B., Springfield.
*Macalister, J., Invercargill.
*Nimmo, J., Oamaru.
Reed, F., Wellington.
*Straw, M., Westport.
Tattley, W., Auckland.

Issued to Inspectors of Mines by virtue of Office, under the Coal-mines Acts of 1886 and 1891.

*Coutts, J., Thames.
Gordon, H. A., Wellington.
*Gow, J., Dunedin.
McLaren, J. M., Thames.
*Wilson, G., Thames.

Issued under the Coal-mines Acts of 1891, 1905, and 1908, on Production of Certificate from a recognized Authority outside the Dominion.

First Class.

Alison, J., Mangatini.
Alison, R., Greymouth.
Bayne, J. A. C., Roa.
Clark, W., Blackball.
Davidson, Gavin, Blackball.
*Dixon, J., Westport.
Fletcher, George, Westport.
Frame, Joseph, Kaitangata.
Gillick, J., Kaitangata.
Goold, A. L., Auckland.
Irvine, James, Dunedin.
James, Isaac Angelo, Westport.
*Jordan, R. S., Kaitangata.
Kane, D., Denniston.
Kirkwood, D., Coromandel.
Lamont, J., Devonport.
Lewis, W., Blackball.
Mark, W. S., Kaitangata.
McAvoy, H., Christchurch.
Morris, A., Huntly.
Nelson, E., Hikurangi.
*Paterson, D. S. A., Kawhia.
*Pollock, James, Green Island, Otago.
*Proud, Joseph, Wanganui.
*Scott, Joseph, Ngahere.
Tennent, R., Brunnerton.
Twining, C. E., Dunedin.
Watson, James, Greymouth.
Watson, John, Blackball.
Wight, E. S., Auckland.
Wood, William, Mokihinui.

Second-class Mine-managers' Certificates.

Issued under the Coal-mines Act, 1891.

Carson, M., Kaitangata.
Collier, Levi, Kamo.
Clarke, Edward, Shag Point.
Elliot, Joseph, Coal Creek.
Harris, John, Denniston.
Herd, Joseph, Brunnerton.
Howie, James, Kaitangata.
*Leeming, William, White Cliffs.
Lobb, Joseph, Mokau
*Love, Alexander, Orepuki.
McIntosh, Allan, Shag Point.
McLaren, J. M., Thames.
*Marshall, J., Ngakawau.
Murray, Thomas, Denniston.
*Nimmo, George Stewart, Ngapara.
Radcliffe, William, Reefton.
*Roberts, John, Brunnerton.
*Ross, John, Kawakawa.
Sara, James, Reefton.
Smith, Charles, Whangarei.
Thomas, James, Springfield.
Wallace, William, Huntly.
*Willetts, John, Papakaio.
Willetts, John Morris, Papakaio.
Young, William, Waimangaroa.

*Deceased since issue of certificate

Issued under the Coal-mines Acts, 1886, 1891, 1905, and 1908, after Examination.

Allan, J., Brunner.
Austin, W. B., Sheffield.
Ball, A., Kimihia.
Barber, John, Shag Point.
Barclay, T., Kaitangata.
Barclay, T., jun., Kaitangata.
Barclay, William, Kaitangata.
Barnes, A. E., Shag Point.
Broome, J., jun., Gore.
Brown, Robert, Kaitangata.
Cadman, J., Hikurangi.
Campbell, Peter, Fairfield.
Carruthers, J., jun., Nightcaps.
*Carson, Joseph, Kaitangata.
Charles, E., Glentunnel.
Cherrie, R. C., Mokau.
Christie, James, Saddle Hill.
Clemo, G., Whangarei.
Craig, John, Coal Creek Flat.
Crockett, S., Millerton.
Dale, E. G., Kaitangata.
Dixon, W., jun., Kaitangata.
Doel, G., Lovell's Flat.
Duncan, James, Kaitangata.
Duncan, J. E., Kaitangata.
Duncan, John, Lovell's Flat.
Ferguson, A., Kaitangata.
Ferguson, G., Roa.
Fox, R. A., Blackball.
Harris, A., Saddle Hill.
Heyes, T., Kaitangata.
Heycock, C. R., Nightcaps.
Hill, R., Abbotsford.
Hodson, John, Kaitangata.
*Holden, J., Drury.
Hughes, Job, Roa.
Hunter, A., Southland.
Kells, F. H., Denniston.
*Kirkland, H. S. S., Nightcaps.
Lewis, David, Puponga.
Lewis, J., Nightcaps.
Lindsay, J. B., Orepuki.
McAllister, Neil, Kaitangata.
McLelland, J., Kaitangata.
McLelland, A. C., Kaitangata.
McNeill, D., Fairfield.
Milligan, J., Denniston.
Mills, Walter, Huntly.
Mosley, J. T., Stirling.
Neilson, J., Runanga.
Neilson, Moffat, Abbotsford.
Newburn, S., Kaitangata.
Ogilvie, W. W., Saddle Hill.
Orr, Hugh, Fairfield.
Parcell, W., jun., Bannockburn.
Penman, C. P., Kaitangata.
Price, F. J., Burnett's Face.
Scobie, E. J., Blackball.
Snow, T., Mercer.
Tattley, F. J., Mercer.
Taylor, Joseph, Collingwood.
Thompson, Joseph, Blackball.
Todd, T., Nightcaps.
Waldie, A. B., Mokau.
Watson, A., Soldier's Creek.
Westfield, C., Fairfield, Otago.
Whittleston, A. W., Shag Point.

Issued under the Coal-mines Acts of 1891, 1905, and 1908, on Production of Certificate from a recognized Authority outside the Dominion.

Arundel, W., Hikurangi.
Baxendale, J., Mine Creek.
Black, J., Granity.
Boyd, J., Hikurangi.
Brownlie, T., Huntly.
Burt, A., Huntly.
Burt, W. Huntly.
Clarkson, S., Kaitangata.
Cross, G., Hikurangi.
Dickinson, W., Gore.
*Dodd, W., Granity.
Dowgray, R., Granity.
Eyeington, G., Huntly.
Greenwell, R., Huntly.
Grenall, S., Granity.
Inglis, A., Huntly.
Jones, T., Kimihia.
Kerr, D., Collingwood.
Lennox, W., Springfield.
Little, W., Wellington.
Littlewood, G. G., Denniston.
Longstaff, H. C., Kaitangata.
McCall, John, Wellington.
McGeachie, J., jun., Mokau.
McGuire, P., Mount Somers.
McGuire, William, Seddonville.
McHardy, A. J., Ferntown.
Molony, C. V. P., Auckland.
Parsonage, W., Dunollie.
Penman, A., Huntly.
*Robertson, J., Granity.
Robertson, R., Roa.
Sneddon, J., Blackball.
Strachan, J., Dunedin.
Tennant, D., Paparoa.
Talbot, H., Huntly.
Webb, T. E., Huntly.

UNDERVIEWERS' CERTIFICATES.

Issued under the Coal-mines Amendment Act, 1909.

Allan, James, Puponga.
Attrill, Charles Waterford, Mercer.
Berry, A. H., Huntly.
Bond, John, Waikaia.
Boustrage, T. Hubert, Brunnerton.
Broome, James, Gore.
Clough, Henry, Millerton.
Davidson, William, Mine Creek.
Davis, William, Runanga.
Donaldson, James, Kaitangata.
*Falconer, Andrew, Abbotsford.
Flynn, John, Bannockburn.
Green, Richard, Abbotsford.
Hawthorn, James, Puponga.
Hunter, Peter, Ngakawau.
Johnston, William Crowan, Gore.
Johnstone, Thomas, Denniston.
Levick, Harry, White Cliffs.
*Mann, William, Granity.
Marsh, Charles George, Glentunnel.
Muncaster, William, Runanga.
McAlister, Robert, Kaitangata.
McGrane, Reginald, Seddonville.
McKenzie, David, Nightcaps.
McNeill, William, Fairfield.
Newlands, George, Brunnerton.
Nimmo, Thomas, Papakaio.
Nimmo, William, Ngapara.
Penman, John, Denniston.
Proctor, William, Kaitangata.
Robertson, William, Mosgiel.
Todd, Thomas, Nightcaps.
Walker, John, Blackball.
Williams, William, Kaitangata.
Wilson, Daniel, Kaitangata.
Winter, John, Denniston.

Issued under the Coal-mines Amendment Act, 1909, after Examination.

Atkinson, John, Puponga.
Bashall, J., Puponga.
Berry, A. H., Huntly.
Boddy, A. J., Rewanui.
Brown, Charles Henry, Denniston.
Carson, F. Kaitangata.
Clark, W. S., State Collieries.
Duffy, F., Burnett's Face.
Griffen, J., Kaitangata.
Hewitson, W. E. G., Burnett's Face.
Hunter, Peter, Stockton.
Jack, W., Millerton.
Johnston, C. M., Seddonville.
McDonald, Thomas, Ngakawau.
McLeod, J. G., Millerton.
Morganty, L., Stockton.
Mosley, J. T., Denniston.
Nicholson, D., Huntly.
O'Brien, D. Q., Mangatini.
Peacock, Thomas, Denniston.
Pearson, William, Burnett's Face.
Strongman, C. J., Cobden.
Sweeney, J. L., State Collieries.
Tucker, J., Kaitangata.
Turnbull, E. V., Thames.
Turner, Alfred, Kiripaka.
Turton, J., Huntly.
White, Edward, Ngaruawahia.
Whittlestone, G. E., Abbotsford.

Issued under the Coal-mines Amendment Act, 1910.

Baerdsmore, E., Denniston.
Cuthbertson, Robert, Fairfield.
Evans, William, Abbotsford.
Fisher, T., Westport.
Gibson, M., Abbotsford.
Greene, M., Kaitangata.
Hadcroft, J., Runanga.
Hunt, W., Shag Point.
Jones, David, Nightcaps.
Jones, Morris, Nightcaps.
Jones, W., Waikaka Valley.
Kitto, Richard, Kaitangata.
Manderson, P., Runanga.
Mann, D., Granity.
Marshall, J. W., Westport.
Mason, Edward, Kingston Crossing.
Mitchell, Alexander, Runanga.
McCaughern, John, Kaitangata.
Neill, S., Kawakawa.
Newburn, S., Kaitangata.
Statham, Robert, Kaitangata.
Walker, J. R., Brighton.

Issued under the Coal-mines Amendment Act, 1914, on Production of Certificate of Corresponding Class granted in any British Possession or Foreign Country.

Middleton, Robert, Runanga.

FIREMEN AND DEPUTIES' CERTIFICATES.

Issued under the Coal-mines Amendment Act, 1909.

Aitken, George, Glentunnel.
Allan, A. George, Abbotsford.
Allan, Charles, Brunnerton.
Beardsmore, Edward, Denniston.
Berry, Albert Henry, Huntly.
Blaney, James, sen., Kaitangata.
Boyd, Robert, Waronui.
Bradley, Robert, Denniston.
Buchols, Joseph, Waikaka.
Burgess, William Charles, E. Gore.
Callaghan, Frederick, Kiripaka.
Campbell, Samuel, Millerton.
Chamley, William, Millerton.
Clausen, Emil P., c/o J. Worthington, 33 Hiropi Street, Newtown, Wellington.
Connelly, Michael, Denniston.
Connew, John, Puponga.
Coppersmith, John, Denniston.
Coulthard, Thomas, Brunnerton.
Cowan, Robert Black, Gibbston.
Cuthbertson, Robert, Fairfield.
*Darby, James, Huntly.
Davis, Evan, Denniston.
Deeming, William, Hikurangi.
Dellaway, Archibald, Denniston.
Dickson, Richard, Hikurangi.
Dillon, Lawrence M., Nightcaps.
Duncan, Frank, Huntly.
Duncan, Hugh, Kaitangata.
Evans, John, Granity.
Evans, William, Abbotsford.
Findlay, Charles, Denniston.
Foot, Frederick Ernest, Denniston.
*Fullick, George, Runanga.
Gibson, Matthew, Abbotsford.

* Deceased since issue of certificate.

FIREMEN AND DEPUTIES' CERTIFICATES—*continued.*

Issued under the Coal-mines Amendment Act—continued.

Gibson, Robert, Millerton.
Gilmour, William, Millerton.
Glover, Richard, Runanga.
Gray, Thomas, Abbotsford.
Grieben, John, Kaitangata.
Hadcroft, James, Runanga.
Hamilton, John, Hikurangi.
Hargreaves, Charles, Millerton.
Harris, John, Reefton.
Harris, Joseph T., Saddle Hill.
Hartley, John, Denniston.
Hay, James, Denniston.
Heron, Ralph, Kimihia.
Higgins, Thomas James, Denniston.
Hislop, William, Denniston.
Holden, Samuel, Granity.
Housley, Benjamin, Huntly.
Howe, George Charles, Shag Point.
Jackson, Samuel, Millerton.
Jarvie, William Marshall, Kaitangata.
Jaspers, George F., Denniston.
Jenkins, James, Ngakawau.
Johnston, C. Mountier, Seddonville.
Jones, David, Nightcaps.
Kaye, Charles, Runanga.
Kitto, Richard, Kaitangata.
Leeming, J. T., South Malvern.
Lutton, William, Millerton.
Mann, Duncan, Millerton.
Mason, William, Denniston.
Mears, Andrew David, Runanga.
Moncrieff, Thomas, Nightcaps.
Moore, Thomas, Mangatini.
Morganty, Charles, Ngakawau.
Murdoch, Colin McColl, Stirling.
McCaffrey, James, Seddonville.
McCoughern, John, Kaitangata.
McDonald, John T., Millerton.
McGarry, Isaac, Millerton.
McGhee, William, Kaitangata.
McGill, Douglas Thomas, Waikaka.
McGill, John, Huntly.
McKenzie, James, Nightcaps.
Newburn, Robert, jun., Kaitangata.
Newburn, Samuel, Kaitangata.
Nicholas, William, Kaitangata.
Oliver, William, Kaitangata.
Parcell, Henry Clyde, Bannockburn.
Park, Francis, Stirling.
*Peckham, Henry William, Huntly.
Penman, Robert, Kaitangata.
Richards, James, Brunnerton.
Rodgers, Edwin, Kaitangata.
Sanderson, John, Kurow.
Scott, Charles, Nevis.
Scott, John, Runanga.
*Skellern, John, Huntly.
*Smith, Edwin, Springfield.
Smith, William, Huntly.
Smith, William, Seddonville.
Snedden, James, Blackball.
Southward, John, Runanga.
Statham, Robert, Kaitangata.
Taylor, David, Roa.
Taylor, James, Springfield.
Thin, William, White Cliffs.
Travis, James, Alexandra South.
Tripp, Albert, Kaitangata.
Wallace, John, Mataura.
Wardrope, Francis, Hikurangi.
Watson, Andrew, Roa.
West, George Thomas, Waronui.
White, James, Roa.
*Whorsky, John, Huntly.
Wilson, Walter William, Springfield.
Young, Thomas Gardner, Waikaia.

Issued under the Coal-mines Amendment Act, 1909, after Examination.

Allan, George, Huntly.
Allan, James, Brunnerton.
Anderson, Walter, Blackball.
Armstrong, V., Runanga.
Atkinson, J., Puponga.
Ball, A., Kimihia.
*Berry, T., jun., Huntly.
Birchall, J., Burnett's Face.
Blair, Peter, Huntly.
Boddy, Archibald John, Runanga.
Bond, W. T., Huntly.
Brennen, J., Kaitangata.
Broadbent, Samuel, Huntly.
Brown, J., jun., Denniston.
Buchanan, William, Millerton.
Burdon, George, Denniston.
Burt, T., Huntly.
*Burt, W., jun., Huntly.
Carson, Frederick.
Chadwick, A., Millerton.
Chapman, A. E., Kaitangata.
Chippendale, J., Millerton.
Clark, W. S., Dunollie.
Connolly, John, Runanga.
Connolly, John Joseph, Runanga.
Cowan, J., Millerton.
Curran, James, Ngakawau.
Cuthbertson, John, Glentunnel.
Danks, Peter, Millerton.
Darby, W., Huntly.
Davidson, Thomas, Mine Creek.
Davis, Oliver James, Runanga.
Delaney, J. E., Puponga.
Dowgray, John, Millerton.
Downes, William Norbury, Cobden.
Duggan, Francis, Runanga.
Dutton, John, Granity.
Dymond, J., Millerton.
Fannigan, P., Ngakawa.
Ferguson, A., Kaitangata.
Forrest, John, Runanga.
Gox, Henry John, Blackball.
Gulligan, H., Runanga.
Green, T., Kaitangata.
Griffen, James, Kaitangata.
Hall, R. H., Huntly.
Hardie, J., Millerton.
Harvey, D., Huntly.
Hawkins, Joseph, Burnett's Face.
Hendry, John, Millerton.
Hicks, J. R., Kiripaka.
Hilton, Thomas, Denniston.
Honey, Archibald John, Denniston.
Hopkinson, Joseph, Seddonville.
Hughes, T. E., Huntly.
Innes, Andrew, Runanga.
Isherwood, T., Runanga.
James, F. T., Seddonville.
Johnson, J. H., Hikurangi.
Johnson, Thomas, Huntly.
Jones, B., Millerton.
Jones, J., Kimihia.
King, Thomas Henry, Granity.
Lauder, Matt Currie, Runanga.
Lowden, W., Millerton.
McAuley, P., Ngakawau.
McAvoy, William, Ngakawau.
McDonald, J., Ngakawau.
McDonald, Thomas, Burnett's Face.
McKenty, H., Denniston.
McKernan, John, Millerton.
McLaughlin, J. W., Huntly.
McMillan, John, Huntly.
McMillan, John, Kaitangata.
Mackinson, Job, Hikurangi.
Maddison, W., Huntly.
Maher, W., Denniston.
Makepeace, Henry, Runanga.
Mitchell, A., Seddonville.
Morganti, Louis, Millerton.
Moreland, S., Hikurangi.
*Mosley, J. T., Denniston.
Moye, John Patrick, Denniston.
Myers, Richard, Millerton.
*Newton, Charles, Runanga.
Nicholson, David, Huntly.
Nicholson, J., State Collieries.
Niven, Peter, Ngakawau.
Nolan, John, Granity.
O'Brien, Denis Quinsin, Millerton.
O'Brien, Martin, Millerton.
O'Fee, J., Kaitangata.
Parker, Andrew, Greymouth.
Parr, Joseph, Burnett's Face.
Paul, James, Seddonville.
Pearson, Samuel George, Burnett's Face.
Pearson, William, Burnett's Face.
Pendleton, S., Blackball.
Phillips, J., Puponga.
Ponton, F., Millerton.
Powell, J., Dunollie.
Ralph, J., Huntly.
Ramsay, J. McK., Kaitangata.
Reed, W. H., Hikurangi.
Robson, W., State Collieries.
Rodgers, J., Ngakawau.
Rowse, J., Runanga.
Ruston, Edwin Walter, Huntly.
Seddon, William, Huntly.
Smith, J. A., Seddonville.
Smith, Thomas W., Millerton.
Smith, W. A., Denniston.
Snell, J., Kaitangata.
Southward, William, Runanga.
Strongman, Charles James, Cobden.
Sutherland, J., Millerton.
Sweeney, John Lewis, Runanga.
Tate, Anthony, Seddonville.
Taylor, Christopher, Millerton.
Thawley, William, Denniston.
Thomson, J., Huntly.
Thomson, Thomas, Mine Creek.
Throp, J., Kaitangata.
Tunstall, W., Hikurangi.
Turton, John, Huntly.
Veitch, D., Blackball.
Vurlow, Frederick Alexander, Denniston.
Walker, W. T., Granity.
Wallwork, Moses, Runanga.
Wear, Daniel, Huntly.
Webster, Oliver, Huntly.
White, Edward, Granity.
Wilson, J. T., Kamo.
Woods, A., Millerton.
Wood, W., Huntly.
Worthington, T., Millerton.
Young, Joseph, Huntly.
Young, Thomas, Granity.

Issued under the Coal-mines Amendment Act, 1910.

Broadfoot, W., Millerton.
Burgess, R. S., Waikaka.
Cain, Alexander, Waikaia.
Cameron, D., North Chatton.
Churchill, S. G., Alexandra South.
Clasen, Charles, Shag Point.
Crabbe, George, Alexandra South.
Cumming, J. S., Denniston.
Cunningham, Thomas, Kaitangata.
Dixon, A., Nightcaps.
Garrey, W., Kaitangata.
Gray, Hugh, Dunedin.
Halsey, W. J., Saddle Hill.
Hartshorne, W. C., Brunnerton.
Hodgetts, I., Burnett's Face.
Hunt, William, Shag Point.
Junker, F. A., Waikaia.
Kidd, G. C., Albury.
King, J., Granity.
Lee, S., Nightcaps.
Mackie, N., Longridge.
McAuley, John, Kaitangata.
McClimont, John, Mount Somers.
McDowell, R., Nightcaps.
McIntosh, A. S., Shag Point.
McIver, W., Waikaka.
Nelson, J. H., Pukerau.
Ramsey, George, Waikaka.
Robinson, R., Ngakawau.
Russell, H. C., Bannockburn.
Saunders, W., Denniston.
Stevenson, J., Shag Point.
Thomas, B., Denniston.
Tinker, G., Nightcaps.
Whittlestone, C. F., Abbotsford.

Issued under the Coal-mines Amendment Act, 1914, on Production of Certificate of Corresponding Class granted in any British Possession or Foreign Country.

Coan, R., Huntly.
Davies, W. C., Huntly.
Malcolm, A., Nightcaps.
Quinlan, A. E., ——.
Tucker, J., Kaitangata.

* Deceased since issue of certificate.

ANNEXURE B.

STATISTICS OF WORKINGS IN COAL-MINES. 1914.

Name of Mine and Locality.	Name of Manager.	Number of Years worked.	Quality of Coal.	Number of Seams worked.	Thickness of Seams.	Thickness worked.	Dip of Seam.	System of Underground Working.	Dimensions of Shafts. Number of Shafts.	Size of Shaft or Adit.	Depth of Shaft or Length of Adit.	Output delivered by	Output for 1914. Coal.	Slack.	Total.	Approximate Total Output to 31st December, 1913.	Approximate Total Output to 31st December, 1914.	Number of Men ordinarily employed. Above.	Below.	Total.	Power used for drawing Mineral.	Pumps. Stroke.	Size of Barrel.	Height of Column.	Means of Ventilation.	Date of Inspector's last Visit.
NORTHERN INSPECTION DISTRICT.																										
North Auckland Coalfields.													Tons.	Tons.	Tons.	Tons.	Tons.									
Hikurangi Colliery	W. R. Dunn	23	Semi-bituminous	1	4′ to 14′	4′ to 12′	1 in 10	Bord and pillar	5	6′ x 6′	400′	Adit	64,683	..	64,683	868,582	933,265	17	75	92	Horse and steam	10″	8″	60′	Fan	17/7/14
Co-operative Colliery	Robert Cherrie	½	Ditto	1	6′ to 9′	6′ to 9′	1 in 10	Ditto	1	Tunnel 5′ x 6′	30′	,,	3,314	..	3,314	..	3,314	..	7	7	Manual	..	..	..	Natural	20/7/14
Northern Colliery	Edwin Nelson	17	,,	1	4′ to 12′	4′ to 9′	Varied	,,	..	9′ x 6′	990′	,,	38,428	...	38,428	495,354	533,782	14	40	54	Horse and steam	Centrifugal pump	3″ outlet	15	,,	20/7/14
Waro Colliery	E. W. Tattley	2	,,	1	7′ to 12′	7′	,,	,,	1	6½′ x 6′ Shaft 8′ x 8′	192′	Dip	33,476	..	33,476	7,611	41,087	18	64	82	Steam	10″	8″	192′	Fan	20/7/14
										Tunnel 10′ x 6′	924′										10″	6½″	192′		
																						10″	8″	60′		
																						8″	6″	30′		
																						8″	2–60″	2–60′		
																						6″	4″	30′		
Kiripaka Colliery	G. Clemo	..	..	..	..	Nil	..	..	..	Tunnel 6′ x 10′	..	..	..	..	..	291,541	291,541	..	10	10	..	6″	4½″	30′	..	..
Whangarei-Kamo Colliery	A. H. Taylor	5	Semi-bituminous	1	4′ to 6′	4′ to 6′	1 in 4	Bord and pillar	2	12′ x 6′	140′	Shaft	1,232	..	1,232	12,333	13,565	3	5	8	Steam	24″	6″	160′	Exhaust steam	20/7/14
										9′ x 6′	100′										8″	4″	100′		
Waikato Coalfield.																										
United Colliery	F. J. Tattley	2	Brown	1	50′ to 54′	25′	1 in 7	Ditto	3	15′ x 5′ 9′ diameter	212′ 140′	Adit	9,246	..	9,246	142,614	151,860	28	20	48	,,	24″	14″	120′	,,	21/5/14
										6′ x 6′ Tunnel or incline	200′														
Taupiri Extended Colliery	William Wood	26	,,	1	10′ to 34′	20′	1 in 10	,,	2	10′ diameter	166′	Shaft	98,127	57,681	155,808			51	248	299	,,	1–12″	2–5″	204′	Fan	5/11/14
Taupiri Ralph's Colliery	J. Fletcher	23	,,	1	10′ to 60′	20′	1 in 10	..	3	2–9′ x 5½′ 1–8½′ diameter	190′ 220′ 140′	,,	54,156	24,906	79,062	2,713,391	2,948,261	52	209	261	,,	1–20″ 1–12″ 1–18″ 1–12″	1–6″ 2–6″ 1–6″ 2–5″	400′ 190′ 380′ 230′	,,	2/12/14
Waipa Colliery	T. Thomson	⅔	,,	1	11′6″	9′	1 in 10	Bord and pillar	..	Tunnel 10′ x 8′	12 ch.	Adit	34,256	15,052	49,308	..	49,308	75	60	135	Horse, steam, and gravity	Centrifugal pump	2″	40′	,,	6/11/14
Mangapapa (Mokau) Colliery	William Lennox	30	,,	1	6′ to 8′	6′ to 8′	1 in 10	Ditto	1	Tunnel 9′ x 6′	1,752′	,,	3,878	..	3,878	80,908	84,786	2	8	10	Horse	..	..	..	,,	..
Huntly Brick and Fireclay Company	R. Greenwell	2½	,,	1	18′	18′	Level	Open cast	..	..	..	..	2,018	..	2,018	4,137	6,155	7	..	7	Manual	8″	3″	..	Natural	28/11/14
Pukemiro Colliery	E. S. Wight	..	,,	1	16′ to 18′	..	1 in 25	..	..	Tunnel 10′ x 6½′	25 yds.	Adit	..	..	..	..	..	6	..	6	..	..	..	..	Fan	25/5/14
Output of mines included in previous statements at which operations are suspended or abandoned													..	..	..	2,069,866	2,069,866	..	..	..						
WEST COAST INSPECTION DISTRICT.																										
Nelson Coalfield.																										
Puponga Colliery	P. McCaffrey	11	Bituminous	1	7′ to 10′	Full height	1 in 3½	Bord and pillar	..	10′ x 6′6″	41 ch.	Direct haulage	4,949	1,677	6,626	168,185	174,811	25	35	60	Steam	10″ 8″ 5″ 14″	6″ 4½″ 3½″ 8″	226′	Fan	4/9/14
North Cape Colliery	Job Hughes	4	,,	1	3′6″ to 5′6″	,,	1 in 3	Ditto	..	7′ x 7′	18 ch.	Steam and horse	9,918	30	9,948	12,999	22,947	16	24	40	Steam and oil	6″	4″	16′	Natural	5/9/14
Buller Coalfield.																										
Bennett's Mine	T. Bennett	¼	,,	1	12′	8′	1 in 4	,,	..	8′ x 6′	1 ch.	Hand haulage	188	..	188	..	188	..	2	2	Manual	..	..	..	,,	5/12/14
Co-operative Mine	H. Barlow	¼	,,	1	10′	7′	1 in 4	,,	..	10′ x 6′	2 ch.	,,	115	..	115	..	115	1	5	6	Gravity	..	..	..	,,	5/12/14
Seddonville State Colliery	I. A. James	11	,,	1	12′	Full height	Variable	,,	..	12′ x 6′	150 ft.	Endless rope	5,946	11,890	17,836	524,691	542,527	17	30	47	Steam	..	..	..	Fan	25/4/14
Westport Stockton Colliery	D. J. Davies	6	,,	1	4′ to 20′	,,	,,	,,	1	8′ x 7′	5 adits, A, B, C, D, & E	Electric and endless haulages	103,290	48,943	152,233	560,475	702,708	40	160	200	Electric	..	..	..	,,	4/11/14
Millerton Colliery	W. McCormack	23	,,	1	4′ to 40′	12′	,,	,,	1	10′ x 7′	72 ch.	Endless rope	316,088	35,983	352,071	4,053,999	4,406,070	115	472	587	Gravity	..	..	..	,,	6/11/14
										11′ x 7′ 12′ x 7′ 10′ x 6′	53 ch. 25 ch. 25 ch.															
Ironbridge Colliery	G. Smith	23	,,	2	3′ to 30′	Full height	,,	,,	1	10′ x 6′	76 ch.	,,						73	200	273	Steam	Two Tangyes, 8″ x 4″ x 12″			,,	10/11/14
Coalbrookdale Colliery	N. Milligan	33	,,	1	4′ to 20′	,,	,,	,,	1	10′ x 6′ 12′ x 8′ 10′ x 6′ 10′ x 6′	44 ch. 54 ch. 25 ch. 25 ch.	,,	242,976	52,643	295,619	6,585,810	6,881,429	73	213	286	,,	Cameron, 8″ x 4″ x 12″ One Tangye, 8″ x 4″ x 12″			,,	9/11/14
Whitecliffs Coal-mine	J. H. Burley (P.)	14	Brown	1	16′ to 20′	9′	1 in 4	,,	..	12′ x 9′	2 ch.	Hand haulage	25	..	25	7,008	7,033	..	2	2	Horse	..	..	..	Natural	29/12/14
Rocklands Coal-mine	J. P. Burley (P.)	13	Bituminous	1	16′ to 20′	8′ to 10′	1 in 4	,,	..	10′ x 8′	2½ ch.	,,	89	..	89	6,684	6,773	..	2	2	,,	..	..	..	,,	29/12/14
Inangahua Coalfield.																										
Coghlan's Freehold	J. Coghlan (P.)	18	Pitch	1	10′	Full height	1 in 3	,,	..	7′ x 5′	12 ch.	,,	140	64	204	5,103	5,307	..	2	2	,,	..	..	..	,,	15/12/14
Archer's Freehold	J. W. Archer (P.)	19	Bituminous	..	No return	..	..	,,	..	..	..	..	..	..	..	17,456	17,456	..	..	..	..	..	..	..	..	..
Waitahu Coal-mine	I. Rhodes (P.)	12	,,	1	14′	8′	1 in 4	,,	..	10′ x 6′6″	7 ch.	Hand haulage	100	..	100	4,418	4,518	2	3	5	Horse	..	..	..	Natural	20/12/14
Burke's Creek Coal-mine	J. Harris (P.)	13	,,	1	12′ to 15′	8′ to 10′	1 in 4	,,	1	6′ x 4′ shaft 12′ x 8′ adit	10 ch.	,,	2,892	440	3,332	19,025	22,357	1	5	6	,,	..	..	..	Furnace	16/12/14
Deep Creek (Lockington's)	E. F. Lockington (P.)	13	,,	1	12′ to 15′	8′	1 in 4	,,	..	10′ x 8′	6 ch.	,,	191	..	191	2,745	2,936	..	2	2	,,	..	..	..	Natural	16/12/14
Phœnix and Venus	W. Knight (P.)	33	,,	1	30′	10′	1 in 3	,,	..	6′ x 4′	6 ch.	,,	850	..	850	32,077	32,927	1	2	3	,,	..	..	..	,,	17/12/14
Watson and Moyles	G. Ward (P.)	6	,,	1	12′	12′	1 in 4	,,	..	8′ x 6′	4 ch.	,,	1,108	..	1,108	5,341	6,449	2	2	4	,,	..	..	..	,,	17/12/14
Lankey's Creek Coal-mine	F. Knight (P.)	12	,,	1	8′	8′	Variable	,,	..	7′ x 5′	3½ ch.	,,	1,844	..	1,844	17,313	19,157	..	3	3	,,	..	..	..	,,	13/5/14
Golden Point Coal-mine	R. L. Kearns (P.)	6	,,	1	Idle all the year		..	,,	..	..	..	..	..	..	..	1,585	1,585	..	..	..	..	..	..	..	..	..
Loughnan's Coal-mine	R. L. Kearns (P.)	9	,,	1	5′	5′	1 in 6	,,	..	10′ x 5′	12½ ch.	Hand haulage	175	..	175	10,911	11,086	..	2	2	Horse	..	..	..	Natural	14/12/14
Merrijigs Coal-mine	H. Griggs (P.)	4	,,	1	8′	8′	Variable	,,	..	6′ x 6′	4 ch.	,,	1,990	..	1,990	1,157	3,147	1	3	4	,,	..	..	..	,,	14/12/14
Reefton Coal-mine	C. A. Svensen (P.)	12	,,	1	8′	8′	1 in 4	,,	..	6′ x 5′	10 ch.	,,	86	135	221	5,575	5,796	1	2	3	,,	..	..	..	,,	14/12/14
Big River Coal-mine	W. Kirwin (P.)	1	,,	1	8′	8′	Variable	,,	..	6′ x 6′	2 ch.	,,	832	..	832	..	832	1	2	3	,,	..	..	..	,,	22/1/14
Morris and Learmont	F. Gibson (P.)	1	,,	1	12′	8′ to 10′	,,	,,	..	8′ x 6′	2 ch.	,,	60	..	60	..	60	..	2	2	,,	..	..	..	,,	16/12/14
Svensen's Coal-mine	C. A. Svensen (P.)	1	,,	1	4′ x 12′	Full height	,,	,,	..	Open cast	..	,,	370	85	455	..	455	..	2	2	,,	..	..	..	,,	17/12/14
Grey Valley Coalfield.																										
Paparoa Colliery	H. McAvoy	6	,,	1	8′ to 16′	10′	1 in 3	,,	..	10′ x 8′	49½ ch.	Endless rope	36,357	13,886	50,243	103,229	153,472	31	97	128	Gravity	..	..	..	Fan	11/12/14
Blackball Colliery	J. Watson	24	,,	2	15′	Full height	Variable	,,	2	9′ x 6′	18½ ch.	,,	131,098	87,399	218,497	1,816,660	2,035,157	51	329	380	Steam and electric	6″ 9″	4″ 9″	90′ 90′	,,	9/12/14
North Brunner Colliery	J. Armstrong	5	,,	1	6′ to 12′	,,	1 in 3	,,	2	9′6″ x 6′6″	6 ch.	Endless rope, gravity inclines	7,220	1,384	8,604	43,682	52,286	18	53	71	Steam	..	..	..	Three turbines Fan and natural	28/11/14
Brunner Colliery	R. Allison	50	,,	1	12′	,,	1 in 4	,,	3	12′ x 10′ 12′ x 10′ 14′ x 6′	4 ch.	Direct haulage	12,205	15,333	27,538	2,343,895	2,371,433	12	30	42	,,	11″ 6″	7″ 4″	100′ 40′	Fan	23/12/14
Point Elizabeth State Collieries— No. 1 Section	J. Coulthard	10½	Pitch	1	8′ to 16′	,,	Variable	,,	..	10′ x 7′	11 ch.	Endless rope and direct haulage	64,094	64,094	128,188	1,737,574	1,865,762	71	172	243	Steam	Electric turbine	..	380′	,,	25/11/14
No. 2 Section	J. Coulthard	10½	Bituminous	2	4′ to 12′	,,	1 in 5	,,	..	10′ x 7′	12 ch.	Ditto									,,	33″	8″	520′	,,	25/11/14
"Liverpool" Colliery	G. Duggan	1	,,	2	4′ to 20′	10′ to 12′	Variable	,,	..	12′ x 7′	94 ch.	Endless rope, gravity, and direct haulage	32,000	40,000	72,000	9,114	81,114	64	180	244	Steam and air	..	..	..	,,	26/11/14
Output of mines included in previous statements at which operations have been abandoned or suspended													..	..	..	1,562,453	1,562,453	..	..	..						
SOUTHERN INSPECTION DISTRICT.																										
Canterbury.																										
Broken River, Broken River	W. J. Cloudesley	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	4	..	..	..	..	..	31/10/14
Springfield, Springfield	James Taylor (P.)	38	Brown and fireclay	2 1	2′ 5′	All	1 in 6	Bord and pillar	1	6′ x 4′	80′	Shaft	75	200	275	91,994	92,269	1	2	3	Steam	Direct acting steam			Exhaust steam from pump	31/10/14
Bush Gully, Coalgate	James Gillick	1	..	2	5′ 7′	..	50° 50°	Ditto	..	8′ x 6′ 12′ x 6′	50′ 250′	Engine plane	..	..	..	..	..	..	..	..	..	..	..	..	..	31/10/14
Homebush, Glentunnel	James Thompson	42	Brown	1	6′	All	1 in 3	,,	1	4′ x 3′ 8′ x 6′	50′ 10 ch.	Adit	7,874	1,160	9,034	287,278	296,312	16	28	44	Horse	Tangye pump		Steam jet	29/10/14
St. Helens, Whitecliffs	William Thin (P.)	33	,,	3	6′ 5′ 3′	,,	1 in 3	,,	..	6′ x 5′	5 ch.	Engine plane	911	..	911	22,400	23,311	1	3	4	Steam	Tangye		Exhaust steam from pump	2/11/14
				1					1	4′ x 3′	80′															
Tripp's, Mount Somers	D. Kane	48	,,	1	40′	15′	1 in 9	,,	..	7′ x 6′	5 ch.	Adit	916	..	916	62,381	63,297	1	2	3	Horse	..	..	Natural	27/10/14
Albury, Albury	James Fibbes (P.)	23	,,	1	12′	8′	1 in 6	,,	..	6′ x 5′	5 ch.	,,	264	165	429	13,308	13,737	..	2	2	,,	Steam pump	..	,,	4/11/14
									1	4′ x 3′6″	68′															
New Dalethorpe, Russell's Flat	D. G. Smith	1	..	..	..	..	..	..	..	..	..	..	40	1	41	..	41	..	..	..	..	..	..	..	..	..
Dalgety, Hakataramea	C. W. Enor	33	Brown	1	30′ semi-vertical	15′	Semi-vertical	Levels	..	..	..	..	101	..	101	3,367	3,468	1	..	1	Hand	..	..	Natural	..
North Otago.																										
St. Andrew's, Papakaio	T. Nimmo (P.)	36	,,	1	7′	6′	1 in 8	Bord and pillar	..	6′ x 6′	5 ch.	Adit	1,969	..	1,969	49,885	51,854	1	4	5	Horse	..	..	..	Furnace	15/10/14
									1	4′ x 3′	60′															
Prince Alfred, Papakaio	A. Beardsmore (P.)	45	,,	1	9′	7′	1 in 9	Ditto	..	6′ x 5′	5′	,,	1,014	..	1,014	57,953	58,967	1	2	3	,,	..	..	..	Natural	15/10/14
									1	4′ x 4′	50′															
Ngapara, Ngapara	W. Nimmo (P.)	36	,,	1	25′	8′	1 in 7	,,	..	6′ x 6′	10 ch.	,,	633	..	633	29,069	29,702	1	1	2	,,	..	..	..	,,	15/10/14
									1	4′ x 4′	50′															
Broadleaf, Shag Point	G. W. Brooke (P.)	6	Pitch	1	5′	All	1 in 10	,,	..	6′ x 5′	150′	,,	320	..	320	3,215	3,535	1	1	2	,,	..	..	..	,,	6/11/14
Shag Point, Shag Point	Edward Clark	6	,,	1	3′	,,	1 in 6	Longwall	..	6′ x 5′	250′	,,	1,151	333	1,484	6,289	7,773	3	15	18	,,	..	..	..	,,	16/10/14
									1	4′ x 4′	25′															
Allandale, Shag Point	A. McIntosh	27	,,	1	7′	,,	1 in 4	Bord and pillar	..	6′ x 5′	1,000′	Engine plane	126	68	194	321,820	322,014	1	2	3	Steam	Tangye pump		Furnace	16/10/14
									1	5′ x 4′	60′															
Diamond Hill, Herbert	J. Hodson	1	Brown	1	4′	,	Level	..	..	..	..	..	100	..	100	..	100	..	2	2	..	..	..	..	..	..

ANNEXURE B—*continued.*

STATISTICS of WORKINGS in COAL-MINES, 1914—*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.	Dip of Seam.	System of Underground Working.	Dimensions of Shafts. Number of Shafts.	Size of Shaft or Adit.	Depth of Shaft or Length of Adit.	Output for 1914. Output delivered by	Coal.	Slack.	Total.	Approximate Total Output to 31st December, 1913.	Approximate Total Output to 31st December, 1914.	Number of Men ordinarily employed. Above.	Below.	Total.	Pumps. Power used for drawing Mineral.	Stroke.	Size of Barrel.	Height of Column.	Means of Ventilation.	Date of Inspector's last Visit.
SOUTHERN INSPECTION DISTRICT—*continued.*													Tons.	Tons.	Tons.	Tons.	Tons.									
South Otago.																										
Fernhill, Abbotsford	James Gray	37	Brown	1	15′	12′	1 in 10	Bord and pillar	1	6′ x 6′	5 ch.	Level	12	1,179	1,191	153,097	154,288	8	2	10	Self-acting incline	..	..	..	Natural	23/12/14
Freeman's Coal Company, Abbotsford	James Sneddon	34	,,	1	7′ to 14′	All	1 in 7	Ditto	2	6′ x 6′	1,400′	Engine plane and horse level	17,787	2,066	19,853	494,745	514,598	5	31	36	Steam and horse	..	..	..	Fan	23/12/14
									1	5′ x 4′	150′															
Green Island, Green Island	Thomas Barclay, jun.	27	,,	1	10′	8′	1 in 10	,,	..	6′ x 5′	5 ch.	Engine plane	524	..	524	118,649	119,173	2	2	4	..	..	..	..	..	22/12/14
									1	4′ x 3′	35′															
Jubilee, Saddle Hill	Thomas Barclay	17	,,	1	8′ to 18′	All	1 in 10	,,	..	6′ x 5′	10 ch.	Engine plane and horse level	17,165	2,795	19,960	260,139	280,099	6	24	30	Steam and horse	..	..	..	Furnace	31/12/14
									2	4′ x 3′	40′															
Saddle Hill (No. 1), Saddle Hill	W. W. Ogilvie	42	,,	1	20′	,,	1 in 10	,,	..	6′ x 5′	10 ch.	Engine plane	2,453	4,245	6,698	215,595	222,293	3	9	12	Steam	..	..	..	,,	22/12/14
									1	4′ x 3′	100′															
Saddle Hill (No. 2), Saddle Hill	Robert Hill	13	,,	1	22′	15′	1 in 10	,,	..	6′ x 5′	5 ch.	,,	10,124	6,300	16,424	184,320	200,744	8	16	24	,,	..	..	..	Fan	22/12/14
									1	4′ x 3′	30′															
East Taieri, Mosgiel	A. E. Rogers (P.)	3	,,	1	10′	7′	1 in 10	,,	..	6′ x 5′	300′	Adit	1,505	1,998	3,503	1,909	5,412	1	7	8	..	..	..	..	..	31/12/14
									1	4′ x 3′	50′															
Waronui, Milton	James Carruthers	10	,,	1	18′	8′	1 in 7	,,	1	6′ x 6′	50′	Engine plane	19,148	2,633	21,781	124,583	146,364	9	40	49	Electric tail-rope system	Tangye			Fan	5/12/14
										6′ x 6′	15 ch.														
McGilp's, Milton	J. J. Cooper (P.)	10	,,	1	22′	15′	1 in 8	,,	..	6′ x 6′	5 ch.	Adit	3,547	..	3,547	19,488	23,035	1	2	3	Hand	..	..	..	Natural	23/6/14
Taratu, Lovell's Flat	Thomas Shore	13	,,	1	20′	12′ to 15′	1 in 10	,,	1	13½′ x 5½′	200′	Shaft	18,578	8,317	26,895	174,425	201,320	14	34	48	Steam	Tangye			Fan	8/12/14
									1	6′ x 4′	185′															
Hawthorn Den, Kaitangata	John Dahren	6	,,	1	9′	All	..	,,	..	6′ x 4′	2 ch.	Adit	144	..	144	523	667	..	1	1	Hand	..	..	..	Natural	11/8/14
Longridge, Kaitangata	N. Mackie	6	,,	1	4′	,,	1 in 4	,,	..	5′ x 4′	100′	,,	178	..	178	3,024	3,202	..	2	2	..	..	..	..	..	24/9/14
Kaitangata Colliery (No. 1)	A. S. Gillanders	38	,,	3	30′ in aggregate	,,	1 in 1½ to 1 in 30	,,	..	10′ x 7′	60 ch.	Engine plane, endless rope haulage									Steam and compressed air	2′ 6″	6″	280′	Fan	4/12/14
									1	8′ x 4½′	580′															
Kaitangata Colliery (No. 2)	W. Carson	2	,,	..	..	..	..	,,	..	10′ x 6′	20 ch.	Ditto	102,541	50,447	152,988	2,987,846	3,140,834	76	335	411	Ditto	..	..	..	,,	3/12/14
Castle Hill, Kaitangata	W. Carson	21	,,	4	50′ in aggregate	All	1 in 1½ to 1 in 20	,,	..	11′ x 6½′	45 ch.	,,									,,	2′ 6″	6″	500′	Furnace	6/10/14
									1	9′ diameter	526′															
Benhar, Stirling	C. Murdoch (P.)	51	Lignite	1	25′	12′ to 16′	1 in 10	,,	..	6′ x 6′	5 ch.	Engine plane	4,239	848	5,087	147,915	153,002	1	6	7	Steam	..	..	..	Exhaust steam	7/10/14
									1	4′ x 4′	50′															
Mainholm, Pomahaka	J. G. Drummond (P.)	29	,,	1	20′	All	Open	Open	..	..	..	Open	2,450	..	2,450	62,557	65,007	2	..	2	..	..	..	..	..	..
Central Otago.																										
Coal Creek, Roxburgh	J. Barber	44	,,	1	20′ to 50′	10′ to 20′	..	Open, and bord and pillar	..	6′ x 5′	2 ch.	Adit	1,019	..	1,019	58,470	59,489	1	1	2	Horse	..	Siphon		Natural	4/9/14
McPherson's, Coal Creek Flat	R. McPherson (P.)	44	,,	1	80′	All	..	Open	..	..	..	Open	2,629	..	2,629	62,225	64,854	2	..	2	..	..	Drainage tunnel		,,	4/9/14
Perseverance, Coal Creek Flat	S. E. P. Vernon (P.)	27	,,	1	75′	25′	1 in 3	Bord and pillar	..	7′ x 6′	5 ch.	Engine plane	2,304	..	2,304	55,770	58,074	1	3	4	Pelton wheel	Hydraulic jet-pump			,,	4/9/14
Alexandra, Alexandra	D. Mathias (P.)	33	,,	1	9′	7′	1 in 7	Ditto	..	6′ x 5′	5 ch.	,,	981	..	981	82,227	83,208	1	1	2	Steam	..	Snow-pump		Exhaust steam	14/9/14
									1	5′ x 3½′	60′															
Molyneux, Alexandra	A. W. Whittleston	16	,,	1	28′	9′	1 in 20	,,	1	5′ x 4′	60′	Shaft	4,600	2,411	7,011	123,028	130,039	3	10	13	,,	..	Tangye		,,	14/9/14
									1	6′ x 4′	80′															
Cambrian, Cambrian	W. J. Miller	53	,,	1	30′	All	..	Open	..	..	..	Open	191	..	191	48,111	48,302	1	..	1	Horse	..	..	..	..	24/9/13
Laudervale, Cambrian	R. Jones	10	,,	1	20′	,,	..	,,	..	..	..	,,	182	..	182	872	1,054	1	..	1	,,	..	..	..	..	24/9/13
St. Bathan's, St. Bathan's	J. Enright	17	,,	1	Indefinite	15′	..	,,	..	..	..	,,	147	..	147	5,621	5,768	1	..	1	,,	..	..	..	..	24/9/13
Rough Ridge, Oturehua	J. Beck (P.)	28	,,	1	35′	All	..	,,	..	..	..	,,	691	..	691	28,017	28,708	2	..	2	,,	..	Drainage tunnel		..	23/9/13
Idaburn, Oturehua	J. White (P.)	44	,,	1	20′	,,	..	,,	..	..	..	,,	671	..	671	43,434	44,105	2	..	2	,,	..	Drainage tunnel		..	23/9/13
Oturehua, Oturehua	R. Thomas (P.)	22	,,	1	7′	,,	..	,,	..	..	..	,,	..	..	..	2,037	2,037	..	..	..	,,	..	Douglas pump		..	23/9/13
Gimmerburn, Gimmerburn	C. Dougherty	58	,,	1	12′	,,	..	,,	..	..	..	,,	24	..	24	3,169	3,193	..	..	..	,,	..	..	..	..	..
Clyde, Clyde	G. F. Turner	42	Brown	2	40′	14′	1 in 2	Bord and pillar	..	6′ x 6′	5 ch.	Engine plane	..	..	..	61,519	61,519	..	..	..	Steam	..	Tangye		Natural	5/12/13
Shepherd's Creek, Bannockburn	W. R. Parcell	37	,,	1	8′	7′	1 in 6	Ditto	..	6′ x 6′	200′	,,	2,765	..	2,765	78,877	81,642	1	6	7	,,	..	Tangye		Exhaust steam	26/8/14
Cairnmuir, Bannockburn	H. C. Russell	12	,,	1	120′	10′	1 in 1 to 1 in 3	,,	..	6′ x 6′	5 ch.	,,	2,615	..	2,615	32,092	34,707	1	6	7	,,	..	Tangye		Natural	26/8/14
Ranfurly, Bannockburn	J. Hodson, jun. (P.)	4	,,	1	10′	All	1 in 1	Levels	..	6′ x 5′	150′	,,	1,922	..	1,922	681	2,603	1	4	5	..	..	..	..	..	26/8/14
Cardrona, Cardrona	R. McDougall (P.)	30	,,	1	30′	,,	..	Open	..	..	..	Open	204	..	204	25,218	25,422	3	..	3	Horse	..	..	..	..	15/4/14
Gibbston, Gibbston	J. Duncan	28	,,	1	15′	10′	1 in 5	Bord and pillar	..	6′ x 5′	20 ch.	Adit	627	67	694	20,682	21,376	1	3	4	Steam	..	..	..	Natural	14/4/14
Ryders, Nevis	R. Toms (P.)	14	,,	1	45′	30′	Semi-vertical	Levels	..	..	..	..	1,135	..	1,135	9,361	10,496	..	3	3	Horse	..	..	..	,,	..
The Crossing, Nevis	R. Ritchie (P.)	11	,,	1	16′	16′	,,	Open	..	..	..	,,	552	..	552	10,972	11,524	2	..	2	,,	..	..	..	..	..
Dillon's, Blackstone Hill	J. Dillon	17	Lignite	1	12′	..	..	,,	..	..	..	,,	11	..	11	243	254	..	..	..	..	..	..	..	..	..
Southland.																										
Pukerau, Pukerau	F. A. Junker (P.)	34	,,	1	16′	9′	1 in 8	Bord and pillar	..	7′ x 6′	10 ch.	Adit	819	..	819	39,076	39,895	..	2	2	Horse	..	..	..	Natural	..
Heffernan's, East Gore	E. Jones (P.)	36	,,	1	20′	12′	1 in 7	Ditto	..	6′ x 6′	5 ch.	Engine plane	2,223	..	2,223	56,792	59,015	1	2	3	Steam	..	Snow-pump		,,	16/9/14
Green's, Gore	W. C. Johnson (P.)	26	,,	1	17′	12′	1 in 20	,,	..	10′ x 8′	10 ch.	,,	12,638	..	12,638	142,238	154,876	1	7	8	,,	..	Tangye		,,	9/12/14
									1	4′ x 3′	50′															
Bushy Park, Croydon	G. Gutshlley (P.)	9	,,	1	20′	All	..	Open	..	..	..	Open	1,509	..	1,509	19,204	20,713	2	..	2	,,	..	Steam pump		..	17/12/13
Burnwell, Chatton	W. McIvor (P.)	15	,,	1	20′	12′	1 in 10	Bord and pillar	..	10′ x 8′	5 ch.	Engine plane	1,425	..	1,425	33,500	34,925	1	2	3	,,	..	Steam pump		Natural	6/11/13
Ramsay's, Chatton	J. Buchols (P.)	11	,,	1	20′	15′	1 in 10	Ditto	..	8′ x 6′	10 ch.	,,	8,210	..	8,210	57,584	65,794	1	5	6	,,	..	..	..	,,	16/9/14
Springfield, Waikaka Valley	J. Duncan (P.)	21	,,	1	17′	10′	1 in 10	,,	..	9′ x 8′	5 ch.	,,	7,850	..	7,850	33,870	41,720	2	5	7	,,	..	Steam pump		,,	9/12/14
Glenlee, Waikaka	D. T. McGill (P.)	21	,,	1	14′	All	..	Open	..	..	..	Open	602	..	602	13,113	13,715	1	..	1	Horse	..	..	..	..	12/5/14
Edge's, Waikaka	A. H. Edge (P.)	15	,,	1	16′	12′	1 in 14	Bord and pillar	..	8′ x 8′	3 ch.	Engine plane	3,811	..	3,811	38,465	42,276	1	3	4	Steam	..	Steam pump		Natural	12/6/14
Rossvale, Waikaia	Robert Craig (P.)	11	,,	1	10′	8′	1 in 12	Ditto	..	6′ x 5′	10 ch.	Adit	2,571	..	2,571	30,124	32,695	1	3	4	Horse	..	..	..	,,	18/9/14
									1	4′ x 3′	60′															
Waikaia, Waikaia	T. D. Moffat	7	,,	1	10′	8′	1 in 6	,,	..	6′ x 5′	5 ch.	Engine plane	41	..	41	14,400	14,441	..	..	..	Steam	..	Steam pump		,,	18/9/14
Argyle, Waikaia	H. C. Hutton (P.)	23	,,	1	20′	All	..	Open	..	..	..	Open	143	..	143	4,108	4,251	1	..	1	Horse	..	..	..	,,	..
Waimea, Kingston Crossing	J. E. Johnston (P.)	6	,,	1	6′	,,	..	Bord and pillar	..	6′ x 6′	2 ch.	Adit	890	..	890	2,573	3,463	1	1	2	,,	..	..	..	,,	..
Lynch's, Kingston Crossing	..	4	,,	1	6′	,,	..	Ditto	..	6′ x 6′	3 ch.	,,	..	..	..	3,071	3,071	..	..	..	,,	..	..	..	,,	..
Princhester Creek, The Key	W. O. Kempthorne	12	Brown	1	6′	,,	Irregular	Open	..	..	..	..	117	..	117	1,291	1,408	1	..	1	,,	..	..	..	,,	..
Mataura Collieries, Mataura	James Broome	18	Lignite	1	17′	12′	1 in 10	Bord and pillar	..	8′ x 6′	5 ch.	Engine plane	6,923	..	6,923	161,118	168,041	3	4	7	Steam	..	Steam pump		,,	17/9/14
Mataura Lignite, Mataura	William Coster (P.)	38	,,	1	18′	All	..	Open	..	..	..	Open	10,705	..	10,705	126,315	137,020	8	..	8	Horse	..	Steam pump		,,	17/9/14
Waimumu, Mataura	G. W. Williams (P.)	15	,,	1	9′	7′	..	,,	..	..	..	,,	193	..	193	30,384	30,577	1	..	1	,,	..	..	..	..	..
Heatherlea, Waimumu	F. Barber	3	,,	1	..	..	..	,,	..	..	..	,,	95	..	95	141	236	1	..	1	..	..	..	..	..	..
Ota Creek, Wyndham	E. Gonge (P.)	34	,,	1	6′	All	..	,,	..	..	..	,,	930	..	930	16,919	17,849	1	..	1	Horse	..	Steam pump		Natural	..
Clarke's Coalpit, Wyndham	G. W. Clark (P.)	7	,,	1	12′	,,	..	,,	..	..	..	,,	1,210	..	1,210	11,181	12,391	2	..	2	,,	..	Steam pump		,,	19/9/14
Robinhood, Pine Bush	J. Couser	33	,,	1	14′	,,	..	,,	..	..	..	,,	..	..	..	3,287	3,287	..	..	..	,,	..	..	..	..	..
Nightcaps, Nightcaps	William Barclay	33	Brown	3	36′ in aggregate	34′	1 in 7	Bord and pillar	..	10′ x 10′	20 ch.	Adit	73,390	..	73,390	958,094	1,031,484	45	94	139	Steam, compressed air, and horse	Three Tangyes			Two fans	10/12/14
									1	9′ x 6′	20 ch.															
									1	8′ x 4′ 6″	90′															
New Brighton, Nightcaps	A. Hunter	8	,,	1	12′ to 20′	12′	1 in 7	Ditto	..	6′ x 6′	5 ch.	,,	10,851	..	10,851	21,654	32,505	3	14	17	Steam	..	..	..	Natural	9/10/14
									..	8′ x 8′	2 ch.															
Wairio, Nightcaps	S. Clarkson	9	,,	1	17′	9′	1 in 7	,,	..	6′ x 6′	2 ch.	,,	5,684	137	5,821	4,152	9,973	6	11	17	..	..	..	..	..	9/10/14
Beaumont, Nightcaps	Thomas Moss (P.)	6	,,	1	20′	15′	1 in 4	Open	..	..	..	..	2,577	..	2,577	4,132	6,709	4	4	8	Steam	..	Steam pump		..	8/10/14
Mount Linton, Nightcaps	Thomas Thomson	20	,,	1	20′	15′	..	,,	..	..	..	..	185	..	185	3,129	3,314	2	..	2	,,	..	Steam pump		..	8/10/14
New Wairaki, Nightcaps	M. Tikey (P.)	1	,,	1	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	4	..	..	..	..	..	8/10/14
Thistle, Nightcaps	H. Fergusson (P.)	1	,,	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3	..	..	..	..	..	9/10/14
Diamond Lignite Company, Seaward Bush	Thomas Knuckey (P.)	12	Lignite	1	32′	All	..	Open	..	..	..	..	210	..	210	..	210	..	3	3	..	..	..	..	..	9/10/14
													3,456	..	3,456	7,549	11,005	3	..	3	..	..	..	..	..	10/10/14
Lynwood, Te Anau	T. Roberts (New Zealand Tourist Department)	14	,,	1	7′	,,	..	,,	..	..	..	..	109	..	109	1,889	1,998	..	..	..	..	..	..	..	..	..
PRIVATE PITS.																										
Wellwood Park, Pukerau	A. M. Mason	13	Lignite	1	7′	All	..	Adit	..	..	..	Adit	32	..	32	272	304	..	..	..	..	..	..	..	..	..
Otikerama Station, Pukerau	W. J. Voight	17	,,	1	7′	,,	..	,,	..	..	..	,,	..	..	..	300	300	..	..	..	..	..	..	..	..	..
Riverview, Gore	J. Nicol	..	..	..	..	..	..	..	..	..	..	..	30	..	30	1,806	1,836	..	..	..	..	..	..	..	..	..
Tuach's, Waimumu	J. Tuach	8	Lignite	..	..	..	..	Adit	..	..	..	Adit	..	..	..	81	81	..	..	..	..	..	..	..	..	..
Output of mines included in previous statements at which operations are suspended or abandoned		..	..	..	..	..	..	..	..	..	..	..	..	..	..	2,223,749	2,223,749	..	..	..	..	..	..	..	..	..
Totals, Southern District, South Island		..	..	..	..	..	..	..	..	..	..	..	398,588	85,370	483,958	10,715,961	11,199,919	287	774	1,061						
Totals, West Coast District, South Island		..	..	..	..	..	..	..	..	..	..	..	977,196	373,986	1,351,182	19,649,164	21,000,346	616	2,038	2,654						
Totals, North Island		..	..	..	..	..	..	..	..	..	..	..	342,814	97,639	440,453	6,686,337	7,126,790	273	746	1,019						
Grand Totals		..	..	..	..	..	..	..	..	..	..	..	1,718,598	556,995	2,275,593	37,051,462	39,327,055	1,176	3,558	4,734						

	Tons.
Output of mines included in statement for 1890, but whose operations were suspended prior to 1890 (less three, which are again included in body of statement—namely, Hill's Creek, 779 tons; Lovell's Flat, 323 tons; Wyndham, 1,988 tons: total, 3,090 tons)	132,732
Output of mines included in former statements, but whose operations were suspended prior to 1889	172,529
Output of Waikaka, Adam's Flat, and Waimea Mines, inserted twice in statement for 1891	6,518
Trial shipment of shale	21
	39,638,855*

*This total includes 14,443 tons of oil-shale.

APPENDIX C.

GEOLOGICAL SURVEY BRANCH

(NINTH ANNUAL REPORT (NEW SERIES) OF THE).

CONTENTS.

DIRECTOR'S REPORT.

Summary of Field Operations.

During the field season ending the 31st May, 1915, detailed geological surveys were begun in the Egmont and Gisborne subdivisions. Brief visits were also made by the Director to Waikaia, Lawrence, Macrae's, Picton, Pahautanui, Huntly, Waihi, Sandy Bay district (two), various parts of North Auckland, Onewhero, Weka Pass, Liverpool State Mine, New Plymouth, Oamaru, and Clarendon. Descriptions of the first two visits were printed in last year's annual report, and accounts of most of the others are given on later pages of this report. Dr. Henderson made a flying examination of the Weber and Herbertville districts, whilst Oamaru was visited on behalf of the Geological Survey by Dr. J. Allan Thomson, Director of the Dominion Museum, who also furnishes a report on oil springs observed by him in the valley of the Ure River, Marlborough.

The Egmont Subdivision forms part of the Taranaki Division, and lies south of the New Plymouth Subdivision, geologically surveyed some years ago by Mr. E. de C. Clarke. It consists of the survey districts of Wairau, Cape, Egmont, Huiroa, and Ngatimaru, which together have an area of approximately 613 square miles. The survey of the subdivision was begun in September, 1914, by Mr. W. Gibson, Assistant Geologist, and Mr. H. S. Whitehorn, Assistant Topographer. The latter, however, joined the Expeditionary Forces in October, and thereafter all work, both topographical and geological, was under the charge of Mr. Gibson. At the end of May nearly one-half of the subdivision had been geologically surveyed in detail.

The Gisborne Subdivision is part of Raukumara Division, and lies south and east of the Whatatutu Subdivision, geologically surveyed by Mr. J. H. Adams in1908 and 1909. It has an area of approximately 790 square miles, and includes the survey districts of Patutahi, Turanganui, Waikohu, Waimata, Whangara, and Uawa. Work in this region was begun during October, 1914, by Dr. Henderson, Mining Geologist, and Mr. M. Ongley, Assistant Geologist. The latter remained in the field during the whole season, but Dr. Henderson from November to March was engaged in other work. At the end of May about three-fifths of the subdivision had been geologically surveyed in detail.

Palæontological Work.

During the year under review Mr. H. Suter, of Christchurch, Consulting Palæontologist, continued his work on the Tertiary Mollusca contained in the Geological Survey collections and on material supplied from other sources. As the result of his labours the revision of Hutton's type species has been completed, a large number of new species have been described, and numerous specimens authoritatively named. Mr. F. K. Broadgate, M.Sc., was employed during a considerable portion of the year in classifying fossils and in allied work.

Mr. E. A. Newell Arber, D.Sc., of Cambridge, England, has lately completed a monograph on the Mesozoic floras of New Zealand, based largely on material supplied from the Geological Survey collections. Numerous plates have been drawn in order to illustrate this memoir, and arrangements to publish the whole are now being made.

As a result of the work done by Mr. Henry Woods, M.A., of Cambridge, a valuable report, entitled "The Cretaceous Fauna of the North-eastern Part of the South Island of New Zealand," has been received from that gentleman. It is accompanied by a number of beautifully drawn illustrations. Mr. Woods finds that two faunas occur in the Cretaceous rocks of Marlborough and North Canterbury. The older of these, found at Coverham, is considered to correspond to the Lower Utatúr (approximately Upper Greensand and Gault) fauna. The younger, of approximate Senonian age, occurs at Amuri Bluff and other places to the south.

Mention may here be made of a paper by Dr. Marie C. Stopes, entitled "A New Araucarioxylon from New Zealand," which was published in the *Annals of Botany*, vol. xxviii, No. cx, April, 1914. The material described was from the Geological Survey collections, and consisted of fossil wood from Amuri Bluff.

To Mr. Woods, and to Drs. Newell Arber and Stopes, the sincere thanks of the New Zealand Geological Survey are due. The examination and description of the Mesozoic fossils sent to them has been undertaken without fee or any form of honorarium.

Office and Miscellaneous Indoor Work.

During the year a large amount of correspondence, chiefly in connection with New Zealand geology, ores, and minerals, has passed through this office. The library has been given as much attention as possible, but owing to want of space is in a more or less congested state.

A considerable number of mineral and rock specimens have been identified for various private persons, and brief descriptions furnished in connection therewith. A few rock-sections have been made by hand in the small laboratory which was built some years ago in the grounds attached to Government Buildings, and has proved very useful for various purposes.

Draughtsman.—Mr. G. E. Harris, Draughtsman, during the year drew seven survey-district maps to be reproduced by photo-lithography for the Reefton Bulletin (No. 18), together with four detail mining maps for the same bulletin, and ten sheets of figures for the Buller-Mokihinui Bulletin (No. 17). He visited New Plymouth and Gisborne in order to make tracings for the Egmont and Gisborne subdivisions maps. These and other tracings were reduced and transferred to ten field maps on the 20-chain scale. In addition to miscellaneous draughting, Mr. Harris undertook a considerable amount of ordinary office-work.

OFFICERS' REPORTS.

DR. J. HENDERSON, MINING GEOLOGIST, AND MR. M. ONGLEY, ASSISTANT GEOGOLIST.

During the latter part of 1914 and the early months of 1915 Dr. J. Henderson, Mining Geologist, was occupied chiefly in writing a bulletin dealing exhaustively with the geology and mineral resources of the Reefton Subdivision. As already noted, he was engaged in field-work in the Gisborne Subdivision during a brief period in October, 1914, and again from the latter part of March, 1915, to the end of May. He also visited the Weber-Herbertville district, and furnishes a report thereon, which, together with another on the Murchison district, is printed on a later page.

From October, 1914, to the end of the field season, Mr. M. Ongley, M.A., Assistant Geologist, was continuously engaged in the Gisborne Subdivision. Dr. Henderson and he furnish the following report on their work in that area :—

GISBORNE SUBDIVISION.

Introduction.

Work in the Gisborne Subdivision was begun in October, 1914, but the necessity for completing the bulletin on the Reefton Subdivision obliged the senior writer to return to Wellington within a few weeks. He was again in charge of the field-work from March till the end of the season; during the interval operations were conducted by Mr. Ongley. When completed the Gisborne Subdivision will include the survey districts of Uawa, Whangara, Waimata, Waikohu, Patutahi, and Turanganui, in all an area of nearly 790 square miles. The easy nature of the country and the favourable weather-conditions permitted about three-fifths of this area to be covered during the season.

The main objects of the work are to determine—(1) Whether oil-bearing rocks are present; (2) what is the horizon of the oil-bearing rocks, if present; and (3) what is the structure of the strata.

Although the country examined has been almost denuded of bush, and has been subject to recent elevation, conditions both favourable to the discovery of outcrops, nevertheless the rocks are on the whole of so weak a nature, and consist to such a great extent of structureless mudstone, that the determination of the above data has so far been accomplished to a minor degree only.

Topography.

The area exhibits the characteristics of a maturely sculptured land-surface which has been uplifted fairly recently for several hundreds of feet above its former level. Remnants of this old surface still exist in some localities. Thus the wide valley of the Waihako at Waerenga-o-kuri, lying at an elevation of about 1,100 ft., contains a swampy meandering stream, which down-stream becomes deeply entrenched in its valley-floor. This locality furnishes also admirable examples of stream-piracy, probably brought about by the same elevation. The Waihako drains by way of the Wairoa to the distant waters of Hawke Bay. Branches from the Te Arai and Mangatoetoe, tributaries of the Waipaoa which empties into the near-by Poverty Bay, now drain through their deeply incised valleys much territory that formerly belonged to the Waihako.

A study of the terraces of the coast-line and of the main river-systems makes it clear that the elevation has taken place intermittently. Thus at Te Karaka terraces on the hill behind the railway-station occur at a height of 550 ft. above sea-level. A middle series of terraces, 150 ft. to 200 ft. above sea-level, is well seen along the Waihuka Stream. The low terraces and old flood-plains that form the floor of the present valleys are being swept away by their originating streams, which in most cases are now entrenched from 10 ft. to 20 ft. below them. These lowest terraces and flood-plains correspond in height with the marine-built plains that form the Poverty Bay flats and the narrow coastal plains fringing the indentations of the shore-line.

In spite of these evidences of elevation, the continuation of the present stream-valleys through the wave-cut platforms, so characteristic of the coast of this portion of New Zealand, proves that within recent times the land has stood at a higher level. The present position of the strand, in fact, must be considered to be the sum of the several positive and negative movements that have occurred since the close of the Pliocene.

General Geology.

McKay, who has had better opportunity of forming an opinion than any other geologist, considers that three sets of beds occur in the Gisborne district—namely, Cretaceous, Miocene, and Pliocene. Adams, who examined in detail the Whatatutu Subdivision, which adjoins the Gisborne Subdivision on the north, was unable to make this separation, and tentatively placed all the rocks, save the manifestly superficial, in his Whatatutu Series. There is, however, little doubt of the correctness of McKay's view.

Practically the whole of that portion of the subdivision examined by the writers is covered by Tertiary beds. Only at one locality, Whangara Island, were the older rocks observed. At this place vertically disposed green sandstones, believed to form the base of the Miocene, are in contact with hard somewhat calcareous claystone, the "indurated chalk-marl" of McKay. What is the precise relation between the beds has not been determined.

The Miocene strata of the subdivision have a thickness of several thousands of feet, and may be divided into three groups of beds. The lower, in general, consist of well-consolidated green sandstones, which, as at Whangara Island, are occasionally decidedly calcareous from the inclusion of numerous shell-fragments. Again, they may become coarser and contain pebbles of hard igneous rocks, as in the Manakaha about three miles from its junction with the Waihuka, where the rock can be called a conglomerate. These greensands are evidently beach deposits, and as such they are free from mud-particles. Terrestrial conditions seem to have sometimes prevailed. Thus just south of Whangara Island coaly matter is interbedded with the sandstone.

The depression that had brought the sea over the Miocene land continued, and off-shore deposits consisting of rapidly alternating layers of sandstone and claystone were laid down. In these the sandstone-beds contain a considerable proportion of mud, indicating that the conditions of deposition were unfavourable to the perfect classification of the detritus.

The next set of beds, consisting of structureless claystone with rare sandy partings, proves the further progressive sinking of the land and adjacent sea-floor. These beds contain many Foraminifera and Echinodermata, but molluscs are very rare. Often the calcareous content has become concentrated in large concretionary boulders, of which the disposition may or may not follow the lines of stratification. In Waikohu Survey District the claystone must be of very great thickness, but towards the coast is decidedly less prominent.

The next succeeding beds are pre-eminently shallow-water deposits consisting of ripple-marked sandstone layers in rapid alternation with claystone. Sometimes irregular layers of ironsand occur; and it is from them that the blacksand of the present sea-beaches has been in great part derived. Near the upper portion of these beds layers of white pumiceous sandstone and claystone occur. No flow or dyke rocks of this type are known *in situ* nearer than the Rotorua district, and it is tempting to consider that the same crustal stress as that which caused igneous activity there manifested itself in the Gisborne district by an elevation of the land.

This uplift is considered to mark the end of the Miocene. The next succeeding beds—the Ormond beds—consist of hard blue fossiliferous sandstone, which is best seen at the head of Manakaha Creek, in the Waimata Valley, and along the course of the Waihirere above the oil-bore. A well-marked unconformity between the Miocene and Pliocene was observed in the Waihora valley about a mile from Te Karaka, and again near Waerenga-o-kuri; but generally there is a concordant transition from one series into the other.

The upward succession of the Ormond beds is as follows: (1) A coarse brown fossiliferous sandstone, which in Manakaha Creek reaches a thickness of 200 ft.; (2) a sandy limestone with brachiopods and numerous pectens; (3) soft sandstone and pumice beds.

In the Waipaoa valley and the low lands about Poverty Bay are high-level terraces, which consist of fine gravel, sand, and pumiceous deposits, with occasional beds of lignite and peat. These constitute the Waipaoa Series of Adams.

Economic Geology.

Indications of oil, such as salt-water springs, occasionally accompanied by inflammable-gas emanations and rarely by traces of oil, are abundant. The geological structure is very complicated. The writers incline to the opinion that wide fracture-zones traverse the subdivision in a general east-north-east direction, and it is along these that the oil-indications are always found. The alternative explanation, that the region has been strongly folded and that the anticlinal crests have been fractured, presents many difficulties.

Another matter not yet settled is that determining the formation in which the oil originated. This is probably in the Cretaceous sequence; and if such be the case, unless the structural conformity of the Miocene and Cretaceous can be established, the choosing of bore-sites becomes a matter of difficulty.

Stone for macadamizing purposes is scarce in the subdivision, and what does exist is in general of poor quality. The best is that furnished by the limestones of the Ormond beds; but the green sandstone near the base of the Miocene is free from clay, and may be expected to form a fair road, provided the traffic be not too heavy.

MR. W. GIBSON, ASSISTANT GEOLOGIST.

Mr. W. Gibson, B.E., Assistant Geologist, began a detailed survey of the Egmont Subdivision, Taranaki, in September, 1914, and continued in the field until the end of the season. He also made an examination of the deposits of ironsand in the vicinity of Patea. The possibilities of these sands for the production of iron are described in a special report (No. 14) on a later page. Mr. Gibson furnishes the following *résumé* of the field-work in the Egmont Subdivision during the past season:—

Egmont Subdivision.

During the season just completed, detailed surveys of the greater portions of the Ngatimaru and Egmont survey districts were made. Assistance in field-work was given for brief periods by Messrs. M. Ongley, M.A., Assistant Geologist, and Mr. H. S. Whitehorn, Assistant Topographer. Mr. F. K. Broadgate, M.Sc., was attached to the party for four months as chainman and field assistant, whilst Mr. L. Grange, of the Otago University School of Mines, performed similar duties for an equal period. The season, with the exception of parts of November, December, and May, was suitable for field-work, and thus we were able to complete the mapping of almost the whole of the two survey districts mentioned above. The remaining portions, together with the intervening Huiroa Survey District and the small survey districts of Cape and Wairau, will, it is anticipated, be readily completed in a second season.

I. Ngatimaru Survey District.

Physiographic Features.

The surface of Ngatimaru Survey District is formed by a succession of alternating ridges and valleys, the latter containing here and there relatively small river-flats. The more important ridges for the most part trend from north-east to south-west, though branches with other directions are not uncommon. Their tops are fairly uniform in level, and rarely exceed 1,300 ft. in height. The longest ridge, to which may be given the name of Te Wera Ridge, runs diagonally through the centre of the survey district, and forms its main watershed, from one side of which streams supplying the Patea River flow in a south-easterly direction, whilst those on the other side go to swell the Waitara River, which enters the North Taranaki Bight.

The Ngatimaru Survey District is part of an elevated plain of marine deposition which merges into the Wanganui coastal plain described by Marshall.* As may be inferred from the remarks already made, dissection of the land has reached a stage of advanced maturity. The streams flow in deeply entrenched meandering courses, and in places, by lateral erosion, have reduced the intervening ridges to very narrow dimensions.

General Geology.

The exposed rocks of the Ngatimaru Survey District belong almost wholly to a single formation, which by its fossils appears to be of Pliocene age, and consists of claystones, sandstones (either calcareous or nearly free from lime), and fine conglomerates, which are in places shelly. These rocks are undoubtedly a portion of E. de C. Clarke's Onairo Series,† which again may be regarded as included in the Wanganui System of Park, Marshall, and other writers. In the valleys small patches of fine gravel and sand, considered to be of Pleistocene age, rest unconformably on the Onairo strata. The only other rocks of the survey district are the Recent sands and clays of the river-flats, together with its subsoils and soils.

The Onairo rocks, as developed in Ngatimaru Survey District, are nearly horizontal, the maximum dips observed being not over 4° in a southerly direction, though in the neighbouring Huiroa Survey District decidedly greater dips may be found. Here also a few small faults have been noted.

The claystones, where unweathered, are of a bluish colour, and usually contain more or less fine sand, much of which is muscovite. As the amount of sand increases they grade into fine sandstones, and these again into coarse sandstones. When freshly exposed the sandstones are bluish in colour, but with weathering gradually assume a greyish or brownish hue. They form the major portions of the various ridges between the stream-valleys. Calcareous sandstones outcrop on the main ridge near Te Wera and on the Akama Road between Huiroa and Huiakama. In places pebbly bands occur in the sandstones and sandy claystones, whilst near Popuanui Trig. Station, south of Taihore Road, and in other localities shelly conglomerates make their appearance.

During the course of the season fossils were collected from a sandstone at Pohokura Saddle (over which the main road to Whangamomona passes), from calcareous sandstone near Te Wera, from an oyster-bed near the village of Strathmore, and from other localities. These were submitted to Mr. H. Suter, of Christchurch, for determination, with the result that out of fifteen species represented only two were found to be extinct. Thus a Pliocene age for at least the upper part of the Onairo Series is indicated.‡ Mr. Suter's determinations are as follow:—

Gasteropoda—

1. *Cerithidea bicarinata* (Gray) ?§
2. *Struthiolaria vermis* (Mart.) ?§
3. *Crepidula crepidula* (Linné).§
4. *Ancilla bicolor* (Gray) ?§

Pelecypoda—

5. *Anomia* sp.—juvenile—very likely §*A. huttoni* Sut.
6. *Glycymeris laticostata* (Q. & G.).§
7. *G. modesta* (Ang.).§
8. *Pecten triphooki* Zitt.
9. *Ostrea angasi* Sow., juv.§
10. *O. tatei* Sut.§
11. *Diplodonta ampla* (Hutt.).
12. *Dosinia anus* (Phil.).§
13. *Cytherea oblonga* (Hanley) ?§
14. *Chione mesodesma* (Q. & G.).§

Brachiopoda—

15. *Magellania lenticularis* (Desh.).§

Economic Geology.

Petroleum Indications.—Since boring for oil has until recently been proceeding in the neighbouring district of Huiroa, search for indications of petroleum has naturally been one of the objects of the geological survey. Those found consist of gas-emanations, and, in one case, of sandstone with a petroliferous odour.

Gaseous emanations occur at several points in the Mangaotuku River, especially in the bend west of Ohura Road (the main road leading from Stratford to Whangamomona and thence northward) between Huiakama Post-office and the public school. The bubbles of gas, however, rise at such long intervals that it is impossible to collect a good sample. A more satisfactory gas-emanation was found issuing from a small slipped mass of sandstone, close to Taihore Road, a few chains from its junction with Ohura Road. After a hole had been made in the sandstone by means of an iron rod, the issuing gas, on being lighted, burnt intermittently with a faintly reddish flame 6 in. or 7 in. in height, whilst the sandstone adhering to the rod smelt distinctly of kerosene for a few seconds. Some time later a second visit for the purpose of collecting a sample of the gas was made to the locality, but on this occasion neither gas nor the smell of petroleum could be detected.

Roadmaking Material.—At two localities on the main or Te Wera Ridge, one east and the other west of Te Wera Railway-station, there are outcrops of calcareous sandstone suitable for roadmaking purposes. From the former of these deposits material for making several miles of the Ohura Road between Te Wera and Ngatimaru railway-stations has been obtained. The calcareous sandstones are sometimes supposed to be limestones suitable for the manufacture of lime, but their general appearance and analyses show that they are too low in calcium carbonate to be of any value for agricultural purposes.

* "Geography of New Zealand," 1905, pp. 110–11. † N.Z.G.S. Bull. No. 14, 1912, pp. 12, 15–20, &c.

‡ Mr. E. de C. Clarke's list of Onario fossils as given in Bull. No. 14 (p. 20) contains thirty-four species of Mollusca, of which fifteen are Recent. The localities are not given, but the fossils were undoubtedly collected from several widely separated horizons. § Recent species. Nos. 6 and 14 are the only species also appearing in Clarke's list (N.Z.G.S. Bull. No. 14, 1912, p. 20).

Soils.—Samples of soils and clayey subsoils from the neighbourhood of Huiakama and Te Wera have been analysed at the Dominion Laboratory. The results indicate that the soils of the river-flats have been formed chiefly by material derived from the sandy mudstones of the Onairo Series, but in some cases there seems to be a large admixture of weathered volcanic material. These latter soils are higher in alumina, iron oxides, lime, magnesia, and alkalies than those of the former class. The subsoils similarly fall into two classes.

II. Egmont Survey District.

Physiographic Features.

Egmont Survey District was apparently once part of the Wanganui coastal plain, but the volcanic eruptions that produced the towering cone of Mount Egmont and the less lofty Pouakai Range have completely altered its physiographic character. The summit of Egmont, 8,260 ft. above sea-level, is near the southern boundary of the survey district. Near its western boundary the Pouakai Range rises to a height of about 4,600 ft. In the neighbourhood of Inglewood, in the north-east corner of the district, are numerous low conical hills, each of which appears to have been the locus of a minor eruption of lava. The only other elevation worthy of note is the dome-shaped German Hill, north of Mount Egmont, which rises prominently above the surrounding country, and has a total height of 1,300 ft. above sea-level.

Throughout last summer and autumn Mount Egmont had ice on a portion of its southern face, but late in the season all snow had disappeared from the northern side, except at the summit. On the southern side of the mountain is the parasitic cone known as Fantham's Peak, which has a well-developed crater comparable in size to that of Mount Eden (Auckland), but of less depth.

As may be seen by the inspection of any map of Taranaki, numerous consequent streams flow radially from Mount Egmont, the chief of these in the Egmont Survey District being the northerly-flowing Waiongona and Waiwakaiho. The streams rising on the eastern slopes of the mountain after a few miles assume a north-easterly course, and go to swell the waters of the Mangonui, which, turning to the north, ultimately enters the Waitara. The gorges forming the heads of the streams taking their rise on Mount Egmont were, at the time of inspection last autumn, dry from their upper ends to distances varying from half a mile to a mile below the track that runs from Bell's Fall on the north side to Dawson's Falls House on the south side. Below the points where water appeared the various streams are supplemented by numerous small brooks taking their rise in the forest reserve. Near the heads of the Mangonui and the Waiwakaiho there is evidence of probable ice-action, indicated not only by material resembling fluvio-glacial drift, but also by striations or grooves occurring both on boulders and on solid rock surfaces.

General Geology.

The rocks represented in the Egmont Survey District are andesites of almost uniform type, agglomerates, tuff and pumice of andesitic composition, together with clays and surface material which also have a volcanic origin. No outcrop of the marine sedimentaries found in Huiroa and Ngatimaru survey districts has been found in any portion of the area that has been surveyed. The oldest visible rocks of the Egmont Survey District appear to be the andesitic lavas and allied rocks forming the Pouakai Range. In date these probably precede at least the upper part of the Onairo Series, but this cannot be definitely stated at the present stage of the geological survey. The andesitic lavas, agglomerates, and tuffs exposed to view on the slopes of Mount Egmont, together with the volcanic débris, widely distributed over the surrounding country, are evidently of post-Onairo age, and may be placed in E. de C. Clarke's Pouakai Series.* In Bulletin No. 14, it will be remembered, the Pouakai rocks, with the possible exception of the andesitic rocks known as the Sugarloaves, are regarded as younger than the Onairo Series; but in order to include the rocks forming the Pouakai Range, and probably the core of Mount Egmont, it is now necessary to extend the meaning of the term "Pouakai Series," and to define it as embracing all the volcanic rocks of south-western Taranaki, whatever may be their age.

Owing to the amount of loose débris on the higher slopes of Mount Egmont, and of water-transported material on the lower slopes, the details of its geology will not be easily mastered. At a number of places massive faces of solid andesite, usually exhibiting a columnar structure, are prominent. To what extent these are connected with the central crater, and to what extent they represent flows from subsidiary orifices—all, except Fantham's Peak, now obliterated—cannot be stated.

The lava-flows that form the small conical hills near Inglewood, either wholly or in part, have already been mentioned. German Hill shows no outcrops of andesite or other volcanic rock, but probably is similar in origin to the Inglewood hills.

The fragmentary ejectamenta of Mount Egmont have been largely transported by water (and possibly in some degree by ice) to its lower slopes and to the surrounding country. The resulting deposits, being water-sorted, are, strictly speaking, sedimentary, but, as was done in Bulletin No. 14 with similar material, will be included in the Pouakai Series. The following section may be taken as typical of the streams flowing from Mount Egmont in the area outside the radius line: Immediately beneath the soil is usually a brown clay containing about one-third its bulk of andesitic pumice. This passes downward into clay free, or nearly so, from pumice, and is underlain by a bed of tufaceous material, usually of comparatively fine texture, the highest of a series of similar layers, almost horizontal in disposition, some composed of coarser material than others. Usually one or more carbonaceous bands, representing old surfaces on which vegetation flourished for a time, may be observed.

In the lower part of Mangorei Stream, a branch of the Waiwakaiho that rises in the Pouakai Range, thick beds of clay are exposed on the stream-banks. Nearer the Pouakai Range tufaceous beds have a considerable development.

* N.Z.G.S. Bull. No. 14, 1912, pp. 12, 21–26.

Economic Geology.

Gas Springs.—Groups of strong gas emanations or "springs" exist near the Huatoki-iti and Huatoki streams in the north-western part of Egmont Survey District. That adjoining the former stream is on Mr. J. Grooby's property, and has been mentioned in former reports by Dr. J. M. Bell and Mr. E. de C. Clarke. Numerous bubbles of inflammable gas rise through the water of the stream, and by digging at the foot of the adjoining slope to the east a strong flow of gas, that more particularly described by Dr. Bell, has been obtained. At the present time a portion of the gas is being used for domestic purposes by Mr. Grooby. The Huatoki group of gas-emanations is on Mr. A. S. Petch's farm, about 30 chains north of Brown Trig. Station. Both here and at Grooby's more or less peaty material is present, but its association with the inflammable gas appears to be entirely fortuitous.

Ironsand.—Much ironsand (titaniferous magnetite) is found in the streams of the district, and various samples have been submitted to the Dominion Laboratory for analysis. The ironsand in the beds of streams having their sources on Mount Egmont is mixed with much extraneous material, but in the Mangorei, a stream that rises in the Pouakai Range, small deposits of the almost pure mineral occur.

Graphite.—A specimen of graphite found in the bed of the Mangakarewarewa, a tributary of the Mangorei, and also having its source in the Pouakai Range, was shown to the writer, but search made in the locality failed to reveal any further specimen of the mineral. Work on the Pouakai Range has not yet been completed, and investigation will be renewed next season.

Roadmaking Material.—Of material suitable for roadmaking purposes there is an ample supply in the Egmont Survey District. Quarries have been opened in several of the conical hills near Inglewood, and have yielded a large amount of stone. Since the clearing of the bush much of the material used for macadamizing and repairing the roads has been obtained from the stream-beds, which abound in boulders of hard andesite. The principal roads of the district are, as a rule, parallel to the streams, and hence the haulage required for the stone is generally short. There are two quarries on the eastern lower slopes of Mount Egmont which may be specially mentioned, both being owned by State Departments. One of these, worked by the Railway Department in order to obtain ballasting-material, is in a drift deposit situated on the north bank of the Mangonui, one mile south-west from the western terminus of York Road, and is at a height of approximately 2,160 ft. above sea-level. The large boulders are hand-picked, placed on trucks and conveyed by rail to stone-breakers at the end of York Road, whence, after being broken to a suitable size, they are carried by the branch railway-line to Waipuku, the first railway-station on the main line north of Stratford. The small material produced by the quarry is also railed to Waipuku for use as railway-ballast.

The second of these quarries has been opened, or rather is to be opened, by the Public Works Department in a face of solid columnar andesite about three and a half miles west from the end of York Road. The height above sea-level is approximately 3,390 ft. A self-acting tramway from York Road to the quarry is about half constructed, but at present work on this has been suspended.

SPECIAL REPORTS.

1. PICTON COAL.

(By P. G. Morgan, Director.)

In accordance with official instructions I left for Picton on the 12th August, 1914. On the 13th, after meeting members of the Borough Council, Mr. A. P. Seymour, and others interested in the coal occurrences, I visited Shakespeare Bay, "The Elevation," and the upper Tuamarina valley. On the morning of the 14th Waikawa Bay was visited, and in the afternoon I went to Blenheim, whence I returned to Wellington on the 15th.

Former Reports.

The Picton district has been frequently visited by Hector, Hutton, Cox, McKay, and other geologists. Its geology is therefore comparatively well known, and it does not seem necessary here to give a summary of it, for those who are interested may consult the literature listed at the end of this report.

History of Coal-mining in the Picton District.

Coal was discovered near Picton in May, 1874, and during the next few years a good deal of prospecting was done by Mr. Pugh and others. From Pugh's workings on the east shore of Shakespeare Bay 40 tons of coal are said to have been extracted. The coal, McKay states, occurred in a most irregular manner, and varied in thickness from a few inches to 2 ft. or 3 ft.

In 1880 fairly thick outcrops of coal, dipping at a high angle to the eastward, were found on the western side of the valley at the head of Shakespeare Bay. These were prospected by Mr. John Renfrew. The next year a block of coal was found on the eastern side of the valley, not far from the shore of the bay; and since this was of considerable thickness, and of good quality, hopes of a coal-field being developed were again entertained by the people of Picton. For two or three years this block was worked in a small way by Mr. Fell, and some 800 tons or more of coal were obtained. The seam, according to Hector, was from 6 ft. to 23 ft. thick, but irregular, and cut by faults and slips.

I was informed that a seam of coal, 18 in. or 2 ft. thick, occurs at "The Elevation," two miles from Picton, but this is not mentioned in the old Geological Survey reports,* although the probability of coal being found in the locality is given some prominence.

After 1884 no work of any consequence was done on the Shakespeare Bay coal, but about 1893 there was a renewal of prospecting in the locality. No tangible results followed.

Recently residents of Picton have formulated a scheme for boring the possible coal-bearing country near Picton, or any area for which Picton is the natural outlet. So far nothing has been done, and those interested are waiting for the present report.

Coal Prospects near Picton.

The question to be considered here is not whether coal can be obtained near Picton, but whether coal can be mined profitably as a commercial proposition. Having definitely made up my mind concerning this matter, I will state my opinion as briefly and clearly as possible. That opinion is: There is no chance whatever of coal being mined at a profit on a large scale either at Shakespeare Bay, "The Elevation," or in the upper Tuamarina valley—for example, at Mount Pleasant. The reason for this is that the coal-bearing areas are exceedingly small, whilst the coal present is dipping at high angles almost everywhere, is much faulted, irregular in thickness, and variable in quality. Abundant confirmation of these statements may be obtained from the old Geological Survey reports.

It is possible that near Shakespeare Bay a few hundred tons of coal can be mined without loss for local use, but even this is very doubtful. A little surface prospecting may not be inadvisable, but any hope of coal being found in quantity is, I repeat, ill-founded. Boring, shaft-sinking, or any expensive form of prospecting must be condemned as leading only to disappointment and loss of money, without any compensating advantage.

Coal Prospects near Blenheim.

The Wairau Plain appears to be the depressed portion of an earth-block tilted to the north-north-west. Far below its surface there may or may not be the coal-measures of which only remnants are found near Picton. After a geological survey of the Wairau valley and adjoining areas has been made it will be possible to state in a rough kind of way what the probabilities are. At the present moment, with very few geological data as a guide, I am not able to recommend boring the plain at any point. In any case, drilling in advance of geological survey must be deprecated. Even on the supposition that the results of a survey are as favourable as can be expected according to our present slight knowledge, boring in the first place will have to be undertaken in a tentative kind of way.

Composition of Picton Coal.

The Picton coal, though somewhat variable in composition, is of a bituminous character, as shown by the following analyses by W. Skey :—

	(1.)	(2.)	(3.)	(4.)	(5.)	(6.)
Fixed carbon	40·28	44·81	63·21	61·28	50·17	47·12
Volatile matter	39·50	34·57	31·06	31·73	40·04	39·09
Water	4·88	2·08	4·32	3·18	3·99	4·06
Ash	15·34	18·54	1·41	3·81	5·80	9·73
Total	100·00	100·00	100·00	100·00	100·00	100·00

	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)
Fixed carbon	51·79	21·80	50·02	56·22	41·83	58·39
Volatile matter	39·22	13·60	33·97	35·16	34·74	16·76
Water	4·79	8·20	2·21	4·81	3·41	4·22
Ash	4·20	56·40	13·80	3·81	20·02	20·63
Total	100·00	100·00	100·00	100·00	100·00	100·00

References.

(1) and (2).—Shakespeare Bay. Ninth Ann. Rep. on the Colonial Museum and Laboratory, 1874, pp. 14–15.

(3) and (4).—Forwarded by Mr. Gell (? Fell) from Picton. Seventeenth Ann. Rep. on the Col. Mus. and Lab., 1882, p. 24.

(5), (6), and (7).—Forwarded by Mr. E. T. Conolly from Shakespeare Bay. *Op. cit.*, p. 26.

(8), (9), and (10).—From Picton and neighbourhood. Eighteenth Ann. Rep. on the Col. Mus. and Lab., 1883, p. 40. No. (8) was forwarded from Picton by Mr. John Renfrew; No. (9) from "Queen Charlotte Sound" by Mr. E. Cargill;† No. (10) from "Whangarei," Shakespeare Bay, by Mr. Plimmer.

(11) and (12).—Forwarded by Mr. W. J. Hunt from Picton. Twenty-seventh Ann. Rep. on the Col. Mus. and Lab., 1893, p. 14.

* See, however, Inspector G. J. Binns's report in H.–11, 1883, p. 8, concerning the "Queen Charlotte Sound Coal-mine," which may have been in this locality. † This sample may have been from the "Queen Charlotte Sound Coal-mine." See H.–11, 1883, p. 8.

LITERATURE.

1877. F. W. Hutton: "Report on the Geology of the North-east Portion of the South Island." Rep. Geol. Surv. during 1873–74, No. 8, pp. 27–58. See especially map and pp. 31–32.
A. McKay: "Report on Coal at Shakespeare Bay." Rep. Geol. Surv. during 1874-76, No. 9, pp. 32–35.
1879. A. McKay: "The District between the Kaituna Valley and Queen Charlotte Sound." Rep. Geol. Surv. during 1878–79, No. 12, pp. 86–97.
1882. James Hector, in Progress Report, Rep. Geol. Surv. during 1881, No. 14, pp. xiii–xvi.
A. McKay: "The Coal-bearing Deposits near Shakespeare Bay, Picton." *Op. cit.*, pp. 106–115.
1883. G. J. Binns: "Annual Report upon Inspection of Coal-mines, South Island." H.–11, p. 8.
1884. S. H. Cox: "Report upon Inspection of Coal-mines, South Island." C.–5, 1884, pp. 18–19.
1890. A. McKay: "On the Geology of Marlborough and the Amuri District of Nelson." Rep. Geol. Surv. during 1888–89, No. 20, pp. 85–185. See especially pp. 153–154.
1894. James Hector: Progress Report, in Rep. Geol. Surv. during 1892–93, No. 22, pp. xxx–xxxiii.
1913. C. A. Cotton: "The Tuamarina Valley." Trans. N.Z. Inst., vol. 45, pp. 316–322.

2. SUPPOSED INDICATIONS OF COAL AT PAHAUTANUI, ETC.

(By P. G. MORGAN, Director.)

On the 29th August, 1914, I went to Pahautanui, at the eastern end of Porirua Harbour, in order to inspect supposed indications of coal, information concerning which had been supplied by Mr. T. W. Stace, of Wellington. Mr. Stace accompanied me, and introduced me to various settlers who were interested in the possibility of coal being discovered in the Porirua district.

The chief indication of coal was found to be indistinct plant-remains in the Trias-Jura greywackes (sandstones) and argillites that outcrop on the foreshore between Mr. A. de B. Brandon's summer residence and Duck Creek. The greywacke in places contains numerous carbonaceous impressions of unrecognisable plants, whilst some of the smaller associated argillite or shale bands are so crowded with similar remains as to be perfectly black, and even coaly-looking. In no case, however, can any band be spoken of as coal, nor is even the smallest pocket of coal visible in the section examined by me. I can quite believe, nevertheless, that pieces of coal, as I was informed, have been found in the neighbourhood. These probably represent carbonized wood.

Some of those interested in the matter inquired whether coal might not be found at some considerable depth in the district. The answer to such a question is that since the rocks with plant-remains have an almost vertical dip and show numerous outcrops, any coal-seam present in them must also outcrop, and if of appreciable size could not have escaped detection during the many years that the district has been settled. There is, moreover, no probability of the carbonaceous bands of rock mentioned above being any better in depth than on the surface. In this connection one may also mention the fact that although the Trias-Jura rocks of this country do exhibit small coal-seams in several localities, yet in no case has a layer of workable thickness ever been found in them.

The existence of plant-remains in the rocks of Porirua Harbour was noted many years ago by J. C. Crawford,* who also observed similar material at Oriental Bay, Wellington.

On land near Duck Creek belonging to the Misses Jacob some carbonaceous material was found a number of years ago while post-holes for a fence were being dug. The same substance was also obtained in a test pit excavated near the fence. Judging from the small pieces lying on the surface, I would say that the carbonaceous material represents a very impure peat of Recent age, now buried beneath the surface of the little flat extending to the southward. It indicates nothing more than an old swamp, which cannot have been of any greater area than the little flat just mentioned.

I also examined some oily-looking films observed in swampy places not far from the homesteads of Messrs. Brady Brothers, Duck Creek. Most of these were due to oxide of iron, and nothing else; but in one or two cases a little oily material, probably derived from the peaty soil of the swamps, may have been present also. There is thus a possible resemblance to the unimportant oil-occurrence at Paraparaumu, described in last year's annual report.

A little to the south of Messrs. Bradys' houses a thick band of soft ferruginous rock outcrops. This, although far from being rich enough in iron to be considered an ore, may possibly be suitable as a base for red or purple paints.

A sample of a dark-coloured incrustation which is constantly forming on the rock-outcrops in Duck Creek was obtained and submitted to the Dominion Laboratory for analysis, with the following results: Iron oxide (Fe_2O_3), 19·68 per cent.; manganese dioxide (MnO_2), 5·40 per cent.

The sample was also examined for uranium, but none was found.

3. MARBLE OF SANDY BAY DISTRICT.

(By P. G. MORGAN, Director.)

Difficulties having arisen during the past year in connection with the supply of marble for the new Parliamentary Buildings, I twice visited the Sandy Bay district in company with officers of the Public Works Department in order to ascertain whether suitable stone could be conveniently obtained. The following pages include the substance of the reports written immediately after these visits, together with additional information:—

* On the Geology of the Province of Wellington," Trans. N.Z. Inst., vol. ii, 1870, p. 348.

Situation and Topography of District.

Sandy Bay is an inlet situated on the western side of Tasman Bay a few miles north of the mouth of the Motueka River. Immediately to the north are Astrolabe Roadstead and Adele Island. Inland is the Pikikiruna Range, spurs of which separate the valleys of the various streams draining into Tasman Bay, and reach the coast-line, there forming bold cliffs. The principal streams entering Sandy Bay are the Marahau and Otuwhero, each of which has a shallow estuary almost dry at low water, except for narrow channels. Into the Otuwhero estuary there also flows Holyoake Creek, which, before the moderate depression of the land that evidently took place in not very remote geological times, was a tributary of the Otuwhero Stream. The marble-deposits presently to be considered are wholly in the valley of Holyoake Creek.

Sandy Bay itself may be reached either by sea or by a road that branches from the main road over the Pikikiruna Range immediately north of the Riwaka River. The upper part of Holyoake valley is most conveniently reached by following the main road as it climbs the range until the marble-outcrops near Mr. A. J. Henderson's house are seen.

General Geology.

The chief sources of information concerning the geology of the Sandy Bay district are the reports by Messrs. S. H. Cox, James Park, and Alexander McKay, in the old Geological Survey publications. A list of these, together with other references, is given at the end of this report.

The section seen on the road over the Pikikiruna Range between Motueka and Takaka is an excellent one, but requires some detailed study before it can be fully elucidated. The rocks observable consist of highly folded mica-schist, quartzite, and marble, intruded by granite, amphibolite, and other igneous rocks. The chief rock of economic interest, the marble, occurs partly in narrow bands interbedded with calcareous schistose rocks, but mainly as a very thick bed which outcrops over an area of many square miles. There is some disagreement among geologists as to the age of the marble and the other sedimentary rocks, but for the present they may be regarded as belonging to the Aorere Series, which in part at least is of Ordovician age.

Marble.

The Sandy Bay marble is a banded grey or greyish-blue to white coarsely crystalline rock, which, although not adapted for important statuary work, is of attractive appearance, and without doubt well suited for ordinary building purposes. In most places the bedding-planes, usually disposed at high angles, are easily perceived, being indicated both by parting-planes and by alternating darker and lighter bands. In some localities, however, these indications of bedding, owing to the thorough recrystallization and metamorphism of the original rock, are almost obliterated. Regular jointing both parallel to the bedding and in other directions nearly at right angles is well pronounced, but not uncommonly the joints are somewhat close-set, and in addition more or less irregular fractures, making an acute angle with the main jointing-planes, are developed. These grade into the small almost imperceptible cracks or flaws known as "shakes" or "dries," many of which cannot be detected until the stone is dressed or sawn. In places small quartz veins traverse the marble in various directions, and thus impair its value as a building-material. Pyrite in small amount is present almost everywhere, and in some bands is abundant. There need be no difficulty, however, in selecting stone free from this objectionable mineral. Other very minor constituents of the marble are quartz, muscovite, sphene, magnetite, graphite, and probably hornblende or other amphibole. As shown by the analyses quoted later, the Sandy Bay marble is on the whole a rock of great purity, especially in upper Holyoake valley, where it carries on an average fully 98 per cent. of lime and magnesia carbonates. The specific gravity of four samples taken in March last varies from 2·68 to 2·715, with an average of 2·704, corresponding to a weight of approximately 168 lb. per cubic foot, and a volume of 13⅓ cubic feet to a ton of rock.

Sandy Bay Marble-quarry.

The Sandy Bay Marble-quarry, which has been opened by the New Zealand Marble and Cement Company, is situated at a height of nearly 600 ft. above sea-level, in the steep-sided valley of Marble Creek, a branch of Holyoake Creek, at a point almost two miles from high-water mark in the Otuwhero estuary, and over three miles from the company's wharf. A tram-line with a gauge of 3 ft. 6 in. has been constructed from the wharf to the foot of a self-acting incline, which is badly laid out, and has an unnecessarily steep grade near its head. From the top of the incline a few hundred yards of nearly flat tramway leads to the quarry. Here the main equipment consists of a large crane, but channelling-machines and the other accessories of a modern quarry are conspicuous by their absence. A considerable quantity of rock has been excavated, most of which has been dumped into the creek-bed below the quarry. No great depth has yet been reached, as is clearly shown by a glance at the surface contours and by the iron-stained joints and bedding-planes of the exposed rock-face. The quarry itself is awkwardly situated on a steep slope, has been poorly opened, and is not convenient nor yet very safe to work, largely owing to the marble dipping steeply away from the direction of working. In places the rock is badly broken, whilst in others it is traversed by aplite dykes. On the other hand, some of the stone is conveniently jointed, and apparently would furnish solid blocks weighing 5 or 6 tons. So far, however, all the larger stones have been spoiled by flaws or cracks making acute angles with the bedding and main joint planes. These flaws, as a rule, do not extend right through the larger blocks, and there is hope that if the quarry were properly opened and depth from the surface attained they would largely disappear.

The marble from the Sandy Bay quarry is of excellent appearance, and for medium or small sizes of stone little, if any, fault can be found with it. On the whole, however, it seems matter for regret that a quarry-site with the various disadvantages already mentioned, and only the one advantage of being nearer the sea than other possible sites, should have been chosen, and thus a considerable expenditure incurred for which no return is likely to accrue. The same comment applies to the abandoned quarry near the head of the incline.

Quarry on Mr. Hobson's Land.

The New Zealand Marble and Cement Company, prior to developing the Sandy Bay quarry, opened a small quarry near the head of Holyoake Creek, on land belonging to Mr. Hobson. From this quarry, which is within 2 or 3 chains of the main road over the Pikikiruna Range, and is approximately 1,750 ft. above sea-level, stone for a bank building in Palmerston North was obtained. The cartage of this for the ten or eleven miles to the point of shipment (the mouth of the Riwaka River) must have been an expensive matter. The marble of Hobson's quarry is bluish-grey to nearly white in colour, and in general is of good appearance, but is traversed by flaws and small veins of quartz. Specks of pyrite are not uncommon, and in some bands this mineral is plentiful. Owing to the quarry being near the top of a hill it cannot be conveniently worked to any great depth, nor is it likely ever to furnish large blocks, but medium-dimension stone can be obtained without difficulty. There is no lack of marble in the locality, and unlimited quantities of building-stone in the ordinary sizes, together with a small proportion of large blocks, can be obtained by opening quarries at a lower level than the present quarry.

Marble on Messrs. Hugonin and Henderson's Land.

Not far from Hobson's quarry, on the land owned by Messrs. Hugonin and Henderson, marble, both white and grey, outcrops extensively. In the upper part of Holyoake Creek valley, at points about 1,100 to 1,200 ft. above sea-level, are some promising rock-faces, as well as numerous large boulders of apparently sound rock. The stone is coarsely crystalline and nearly white in colour, without apparent bedding-planes, but traversed by horizontal joints, which will facilitate quarrying. Very little pyrite is to be seen, and iron-stains, indicating the former presence of this mineral, are not prominent. In the interval between my first and second visits two large blocks of marble were partly roughed out, the larger of which appeared to be flawless, whilst the smaller showed one flaw in its central portion.

So far as surface appearances go, the upper valley of Holyoake Creek affords a much more suitable site for a quarry than any locality lower down. The chief difficulty is transport. Connection with the upper part of the existing tramway to the Marble Creek quarry, though possible, cannot conveniently be made. A trial survey, however, has disclosed a fairly easy tram route on the north side of Holyoake Creek leading to a point overlooking the Otuwhero valley, from which a self-acting incline to the low grounds can be made. Thence there is almost flat going to the Otuwhero estuary, where a junction with the existing tramway can be made.

Since my last visit to Sandy Bay the opening-out of a quarry on Messrs. Henderson and Hugonin's land, and the construction of a tramway on the route indicated in the last paragraph, have been begun.

Prospect of obtaining Large Sound Blocks.

Though some apparently solid stone shows in the Sandy Bay quarry (Marble Creek) no definite statement that large sound blocks are obtainable can be made. In any case, it is certain that an immense quantity of material will have to be handled in order to win the large blocks needed for Parliament Buildings. Since the success of a building-stone quarry seems to depend greatly upon its capacity to furnish large-dimension stone when this is called for, the abandonment of this quarry may be deemed a wise step. The prospects on Messrs. Hugonin and Henderson's land in Upper Holyoake Creek valley are far better than those of the Marble Creek quarry, many large blocks being in sight, and the conformation of the valley suitable for opening quarries at several points. If work is to be carried on permanently the installation of modern channelling-machines may be strongly recommended.

Miscellaneous Uses for Marble.

Marble adapted for electrical switchboards, sanitary ware, floor-tiles, monumental work, &c., may be obtained in abundance from the Pikikiruna Range, including the Sandy Bay district. Owing to its great purity the stone is well suited for the manufacture of lime and cement, or, if ground, for use as a fertilizer without previous calcination. At the present time the difficulties of transport prevent any practical suggestion from being made, but if the waste rock from the quarries opened in order to obtain building-stone could be utilized without loss for agricultural purposes or for cement-manufacture, a great advantage would be gained.

Analyses.

The following analyses of Sandy Bay marble have been made in the Dominion Laboratory. Of these the first was given in a report made by Dr. J. Allan Thomson in 1913 (see "Literature"); the others are now published for the first time.

	(1.)	(2.)	(3.)	(4.)	(5.)
Insoluble in hydrochloric acid	3·11	..	..	..	..
Silica (SiO_2)	..	2·66	0·86	0·14	0·17
Iron oxide and alumina (Fe_2O_3, Al_2O_3) ..	0·20	0·51	0·25	0·21	0·20
Lime (CaO)	53·10	52·64	54·30	55·87	55·60
Magnesia (MgO)	0·64	0·65	0·30	0·10	0·10
Carbonic anhydride (CO_2)	42·50	41·36	42·50	42·76	43·26
Sulphur	0·03	..	..	..	..
Water and organic matter	..	0·80	0·47	0·30	0·30
Alkalies and undetermined	0·42	1·38	1·32	0·62	0·37
	100·00	100·00	100·00	100·00	100·00
Iron pyrites (FeS_2)	0·06	n.d.	0·04	0·01	0·025
Free carbon	n.d.	0·06	n.d.	n.d.	0·05
Specific gravity in water at 15·5° C.	n.d.	2·705	2·68	2·715	2·715

(1.) Typical sample from Marble Creek quarry (selected by Dr. J. Allan Thomson).
(2.) Dark fine-grained marble from Marble Creek quarry.
(3.) White coarse-grained marble, Messrs. Hugonin and Henderson's land.
(4.) White marble from quarry on Mr. Hobson's land.
(5.) Grey marble from quarry on Mr. Hobson's land.

Literature.

The chief references to the geology of the Sandy Bay district will be found in the following publications:—

1. Cox, S. H.: "On Certain Mines in the Nelson and Collingwood Districts, and the Geology of the Riwaka Range." Rep. Geol. Expl. during 1879 80, No. 13, 1881, pp. 1–12 (with map).
2. Park, James: "On the Geology of Collingwood County, Nelson." Rep. Geol. Expl. during 1888–89, No. 20, 1890, pp. 186–243 (with map).
3. McKay, Alexander: "On the Crystalline Limestones and so-called Marble Deposits of the Pikikiruna Mountains, Nelson." Rep. Geol. Expl. during 1890–91, No. 21, 1892, pp. 38–43 (with map and section).
4. Bell, J. M., Webb, E. J. H., and Clarke, E. de C.: "The Geology of the Parapara Subdivision, Karamea, Nelson." N.Z.G.S. Bull. No. 3 (N.S.), 1907. This report deals with the small portion of the Pikikiruna Range in Waitapu Survey District, some distance to the north-west of Sandy Bay.
5. Park, James: "The Geology of New Zealand." 1910. On pp. 55, 384, 390 are brief references to the Riwaka district.
6. Marshall, P.: "Geology of New Zealand." 1912. Brief references to the Pikikiruna Range marble are made on pp. 49 and 138.
7. Thomson, J. Allan: "Possibility of obtaining Granite and Marble suitable for Building-stones in the Sandy Bay District, Nelson." N.Z.G.S., Seventh Ann. Rep., C.-2 (Mines Report), 1913, pp. 131–33.

---

4. A PRELIMINARY INVESTIGATION OF PHOSPHATE OCCURRENCES IN NORTH AUCKLAND AND WAIKATO DISTRICTS.

(By P. G. Morgan, Director.)

In accordance with instructions given during the latter part of 1914, on the 11th January last I left Wellington for the north, in order to investigate the possibility of rock-phosphate deposits being found in various localities. Visits were made to Kaipara Flats, Warkworth, Maungaturoto, Whangarei, Kawakawa, and Bay of Islands, in the North Auckland Peninsula, and also to Onewhero, Lower Waikato district. On the 28th January I returned to Wellington.

Reasons for Investigation.

The land of New Zealand as a whole is somewhat deficient in phosphoric acid, a necessary constituent of a fertile soil. The large amount of meat and other agricultural products consumed in the towns, and more especially exported, causes a reduction in the available phosphoric acid that in the course of a generation or less will have serious consequences if the loss is not made good by a supply of phosphatic fertilizers.

Up to the present time, however, in only one New Zealand locality—namely, Clarendon, Otago—has phosphate rock been found in any quantity, and this notwithstanding a considerable amount of search during the past twelve or thirteen years. Occasionally, however, samples of phosphatic minerals have been forwarded to the Dominion Laboratory. Most of these were of poor quality, whilst others merely represented concretions, and were therefore not strongly indicative of commercial deposits. Of the few samples affording some promise, one or two came from the Whangarei district, and another from the Hoteo River, Kaipara district. The last-mentioned sample had a curious history. It was collected many years ago (probably in December, 1879, or January, 1880) by Mr. S. H. Cox, then Assistant Geologist, and labelled by him as "firestone." In 1904 Mr. Alexander McKay, then Government Geologist, suspecting the character of the specimen, submitted it to the Dominion Laboratory

for analysis, whereupon it was found to be a "rich rock phosphate, containing phosphoric acid equivalent to 71 per cent. of phosphate of lime."* In 1909 a sample of limestone from the Onewhero district was found to contain 4·855 per cent. of phosphoric acid, equivalent to 10·60 per cent. of phosphate of lime.† Such material, if present in quantity, would have considerable value as a fertilizer. The only preparation required before application to the land would be to grind it to a powder.

General Geology of Country examined.

The sedimentary rocks of the North Auckland Peninsula fall into three groups, one probably of Early Mesozoic, one of Cretaceous, and one of Tertiary age. Igneous rocks of various types and ages have a wide distribution, but seeing that they are nowhere of a character resembling the apatite-bearing rocks of Quebec Province, Canada, phosphate-deposits need not be expected to occur in association with them. Since phosphate of lime is commonly associated with limestone, calcareous rocks are of the most importance in connection with the search for that substance. In North Auckland, according to Professor Park, the Cretaceous rocks include two limestones—the "Whangarei limestone" and the "hydraulic limestone." The former is a hard crystalline rock containing, as a rule, a very high percentage of carbonate of lime, whilst the latter is a soft, impure, argillaceous limestone, of great value as a material for cement-manufacture. Both classes of rock are typically seen near Whangarei—the Whangarei limestone at the Abbey Rocks and at Te Waro, near Hikurangi; the hydraulic limestone at Limestone Island and at Mangapai. Thick beds of the last-named rock appear near Warkworth and in other localities, but very commonly it is in thin bands of a lenticular character interbedded with claystone, as at Kaipara Flats, Maungaturoto, and many other localities.

Greensands sometimes contain phosphatic concretions in sufficient quantity to form deposits of economic importance, and therefore the greensands of various localities in North Auckland deserve some investigation.

Another rock that may be associated with phosphate-deposits is the so-called firestone—a hard flinty rock, in places present in continuous bands, as at Snell's Beach, east of Mahurangi (Warkworth) Harbour, but more commonly occurring as concretions.

In the Onewhero district the chief rocks are Miocene claystones and a soft, impure, sandy limestone. At the township and for some distance around, especially to the north and north-east, these rocks are capped by volcanic débris, which has formed a deep clay-loam soil of fertile character.

Data obtained.

Kaipara Flats District.—About 20 chains north of Kaipara Flats Railway-station is a cutting where much-broken calcareous claystone of probable Cretaceous age is exposed. Impure hydraulic limestone and a dark flinty concretion from this cutting were analysed in the Dominion Laboratory, and found to contain only a very small percentage of phosphoric anhydride (or phosphoric acid). A sample of hydraulic limestone from Williams's farm (collected by Dr. J. Henderson in July, 1913) on being powdered and treated with nitric acid yielded a solution that with ammonium molybdate gave a small precipitate, indicating that phosphoric anhydride was present only in the ordinary small amount (probably about 0.1 per cent.).

Warkworth District.—No indication of phosphate was seen during the writer's brief visit. The firestones of Snell's Beach, which may possibly be associated with some phosphate, were not examined, owing to lack of time. They were, however, visited by Dr. Henderson in July, 1913, when no unusual characters were observed.

Maungaturoto District.—Two samples of impure limestone—one of hydraulic character, the other hard and probably magnesian—were obtained from the neighbourhood of the railway-line now under construction. These were found to contain phosphoric anhydride in ordinary amount only—namely, 0·10 and 0·14 per cent. respectively. Nothing appearing to have the characters of phosphate rock was seen near Maungaturoto or in the direction of Paparoa, which was also visited.

Whangarei District.—Under the guidance of Major G. Clark-Walker, who has discovered specimens of phosphate rock in several localities, the writer visited Otaika and Tikorangi (near Mangapai). A mixed sample, mainly of hard, more or less flinty, rock collected on the roadside near Mr. Dwyer's house, Otaika, when analysed yielded only 0·10 per cent. of phosphoric anhydride. A few yards away, however, inside a gate, the writer collected a sample of soft pale-brown to cream-coloured porous rock that on analysis was found to contain 24·40 per cent. of phosphoric anhydride (equal to 53·31 per cent. of tricalcic phosphate). The specimen was broken from a small boulder on the surface. The underlying rock was not to be seen, owing to the somewhat thick covering of soil and subsoil.

On the roadside near Tikorangi Hill is a small excavation, where Major Clark-Walker some years ago found a lump of high-grade phosphate rock weighing about 16 lb. A mixed sample of claystone and other material taken here gave on analysis only 0·10 per cent. of phosphoric anhydride. The overlying clay was even lower in its phosphoric-anhydride content, and material collected on the road was little better, so that evidently there is here no phosphate-deposit.‡

Between the spot last mentioned and an old limestone-quarry nearer Whangarei a sample from various hard but narrow bands seaming the claystone exposed in the road-cuttings was taken. On analysis this yielded 0·32 per cent. of phosphoric anhydride, equivalent to 0·70 per cent. of tricalcic phosphate.

Samples of greyish fine-grained limestone and of the prevailing white crystalline limestone from the Abbey Rocks contained 0·20 per cent. and 0·11 per cent. of phosphoric anhydride respectively.

---

* Dom. Lab. Rep. No. 38, 1905, pp. 9–10. † Dom. Lab. Rep. No. 43, 1910, p. 13. P_2O_5 calculated by writer from percentage of tricalcic phosphate. ‡ The same locality has also been examined by Mr. B. C. Aston with similar results. See "Rock Phosphate in New Zealand," the *Journal of Agriculture*, vol. x, No. 6, 21st June, 1915, p. 501.

A hard pinkish-coloured rock from Kamo, handed to the writer by Major Clark-Walker, on analysis yielded 0·23 per cent. of phosphoric anhydride.

In the Whauwhau valley near Whangarei there is a thin bed of limestone which contains many fossil fish, and is probably somewhat high in phosphate. The writer's attention was drawn to this occurrence by Mr. T. F. Cheeseman, who many years ago collected a specimen, now in the Auckland Museum.

Mangakahia District (Northern Wairoa).—A sample of soft, grey, very sandy limestone from this district, collected by Major Clark-Walker, contained 0·17 per cent. of phosphoric anhydride, or somewhat more than the average limestone.

Kawakawa District.—Owing to the limited time at the disposal of the writer, the limestone-outcrops in the Kawakawa district were not visited. Samples of the flinty pebbles plentifully scattered over the surface near the old coal-mine workings were collected and tested for phosphoric anhydride, but gave a very poor reaction, judged to indicate less than 0·10 per cent.

Onewhero District (Lower Waikato).—The Onewhero district is best approached by way of Tuakau, from which the township is distant seven miles. A soft sandy limestone of probable Miocene age outcrops south of the township, in the valley of the Opuatia Stream and elsewhere. Two samples of this rock, collected in a gully near the road south of the stream, on analysis yielded 0·13 and 0·17 per cent. of phosphoric anhydride respectively. A similar sample from a cutting on the Ponganui Road (which leads up the Opuatia valley) gave 0·17 per cent. of phosphoric anhydride.

A specimen of fossiliferous claystone, obtained on the roadside south of the bridge over the Waikato River, contained 0·12 per cent. of phosphoric anhydride.

It will be observed that none of these results give any indication of material approaching in phosphatic content that which was analysed by the Dominion Laboratory in 1909, and found to contain 10·60 per cent. of tricalcic phosphate.

Analyses.

The following tabulated statement gives the partial analyses (made in the Dominion Laboratory) of eighteen samples of rock collected during the examinations made by the writer:—

No.	Nature and Locality.	Phosphoric Anhydride.	Calcium Carbonate.	Insoluble in Acid.
		Per Cent.	Per Cent.	Per Cent.
1	Impure limestone from railway-cutting near Maungaturoto ..	0·10	78·86	15·61
2	Limestone from quarry near road-crossing of railway between Maungaturoto and Paparoa	0·14	49·45	17·02
3	Hard pinkish rock from Kamo (per Major Clark-Walker).. ..	0·23	1·00	64·30
4	Soft, grey, sandy limestone from Mangakahia (per Major Clark-Walker)	0·17	55·52	33·35
5	Flinty rock, &c., from roadside near Dwyer's gate, Otaika ..	0·10	0·10	83·78
6	Soft phosphate rock inside Dwyer's gate	24·40*	2·77	27·32
7	Hard rock bands in road-cuttings beyond old limestone-quarry near Tikorangi	0·32	1·63	87·34
8	Claystone, &c., from excavation on roadside at foot of hill, past old limestone-quarry (near Tikorangi)	0·10	1·82	85·55
9	Calcareous material on road near No. 8	0·11	77·36	17·60
10	Clay, &c., near No. 8	0·08	0·30	85·40
11	Greyish limestone from Abbey Rocks (east of Whangarei) ..	0·20	88·79	7·07
12	White limestone from Abbey Rocks	0·11	92·54	1·74
13	Impure limestone in gully south of Opuatia Stream, Lower Waikato district	0·13	57·73	34·80
14	Same locality as No. 13	0·17	50·75	40·38
15	Impure limestone on Ponganui Road, Opuatia valley	0·17	56·23	35·96
16	Calcareous claystone on road to Onewhero, south of Waikato Bridge	0·12	27·91	55·12
17	Dark flinty concretion in cutting 20 chains north of Kaipara Flats Railway-station	0·09	1·23	88·92
18	Impure limestone (hydraulic), same locality as No. 17	0·08	75·95	17·62

* Equivalent to tricalcic phosphate, 53·31 per cent.

A more detailed analysis of sample No. 6 is as follows:—

	Per Cent.
Silica (SiO_2)	26·92
Iron oxide and alumina (Fe_2O_3, Al_2O_3)	6·58
Lime (CaO)	30·59
Magnesia (MgO)	0·16
Phosphoric anhydride (P_2O_5)	24·40
Carbonic anhydride (CO_2)	1·50

Owing to the smallness of the sample the other constituents could not be determined.

Conclusions.

It is not to be expected that important mineral discoveries can be made by hasty examinations, and therefore the fact that during the writer's inspection only one sample of phosphate rock, and that hardly of commercial quality, was collected need not give rise to discouragement. On the whole, the indications of phosphate rock in the Whangarei district are hopeful, and further search is therefore desirable. For one thing, excavations ought to be made at the spots where phosphatic specimens have been found, in order to ascertain whether there is any workable deposit, and, failing that, to determine the geological relations of the concretions or other forms in which the phosphate may occur.

The portion of the Hoteo River district from which Mr. S. H. Cox obtained the specimen of phosphate rock analysed in 1904 was not visited owing to lack of time, but the writer has been informed that Mr. J. A. Pond unsuccessfully examined this locality soon after the analysis mentioned was made. A geological investigation may, nevertheless, be recommended as likely to give information of value.

Further exploration for the phosphatic limestone of the Onewhero district ought to be made, and its position determined. Possibly the services of the prospector who collected and forwarded to Mr. J. J. Craig the sample analysed in the Dominion Laboratory can be obtained for this work.

Something remains to be said as to how the search for phosphate rock may be undertaken. In this matter the intelligent co-operation of landowners, who are vitally interested, is desirable. To obtain this a pamphlet on phosphate-deposits similar to that written by Mr. B. C. Aston* a few years ago, but containing additional matter, could be prepared and circulated among farmers and others. The indiscriminate distribution of samples of Clarendon or other phosphate rock is decidedly not to be recommended, for phosphate occurs in many forms, and a single specimen in the hands of a layman is misleading rather than helpful. Representative sets of specimens should be procured from the United States and elsewhere, and placed in the various museums, where they could be seen by all interested. A set of Pacific Islands phosphates and so-called guanos is also desirable, and can be easily procured.

The search for phosphate should not be made the sole object of an examination, but carried on in conjunction either with a geological or a soil survey; or perhaps, preferably, both surveys should be made at the one time by the same organization and staff.

A detailed geological survey of the Whangarei district is highly desirable, mainly on account of its known mineral resources in coal and limestone.

Phosphate Occurences in the North Island.

The following list of phosphate occurrences recorded from the North Island of New Zealand may be useful. In a later report (No. 9) a similar list is given for the South Island.

Calcium Phosphate.

(1.) *Whakapara, Hokianga:* A small sample was forwarded to the Agricultural Department in 1908 or 1909. See Seventeenth Ann. Rep. Dep. Agri., Chemistry Division, 1909, p. 176.

(2.) *Whangarei District:* Samples analysed in 1909 gave 58·35 and 55·66 per cent. of $Ca_3P_2O_8$. See Dom. Lab. Rep. No. 43, 1910, p. 53.

(3.) *Hoteo River, Kaipara:* A sample collected many years ago was found in 1904 to contain 71 per cent. $Ca_3P_2O_8$. See Dom. Lab. Rep. No. 38, 1905, pp. 9–10.

(4.) *Onewhero, Lower Waikato District:* A sample of phosphatic limestone on analysis was found to contain 10·60 per cent. of $Ca_3P_2O_8$. See Dom. Lab. Rep. No. 43, 1910, p. 13.

(5.) *Tutira Block, Mangaharuru Survey District, Hawke's Bay:* A sample forwarded to the Dominion Laboratory in 1908 contained 70·84 per cent. of $Ca_3P_2O_8$. There is some doubt concerning the authenticity of this specimen. For analysis see Dom. Lab. Rep. No. 42, 1909, p. 22.

(6.) *Wellington Heads:* A sample of clayey substance from a cave, forwarded by Mr. H. N. McLeod to the Dominion Laboratory in 1908, was found to contain 46·9 per cent. of aluminium and lime phosphates. The Dominion Analyst describes the sample as a "coprolite." See Dom. Lab. Rep. No. 42, 1909, p. 22.

Aluminium Phosphates.

Wavellite and taranakite, the latter described as "a double hydrous phosphate of alumina and potash, part of the alumina being replaced by ferric oxide," occur in thin seams at the Sugarloaves, New Plymouth. See S. H. Cox: "Notes on the Mineralogy of New Zealand," Trans. N.Z. Inst., vol. xv, 1883, p. 385.

Iron Phosphate.

Vivianite, the blue hydrous phosphate of iron, occurs in a number of localities. Among these are: Thames (James Park, in "The Geology of New Zealand," 1910, p. 402); Mercer, where the mineral is for the most part impure, but occurs in some quantity (James Park, in Trans. N.Z. Inst., vol. 26, 1893, p. 367); Urenui, Taranaki (Col. Lab. Rep. No. 14, p. 28); Pohangina; Wairarapa district (Col. Lab. Rep. No. 13, p. 23); and Kaitoke.

---

* N.Z. Dept. of Agriculture, Chemistry Division, Bulletin No. 1, "Phosphate in New Zealand," 1906.

5. WEKA PASS DISTRICT, NORTH CANTERBURY.

(By P. G. Morgan, Director.)

Introductory.

On the 24th March last a visit was made by the writer to the Weka Pass district, North Canterbury, in order to examine the contact between the Weka Pass stone and the underlying limestone, which by common agreement is identified with the Amuri limestone. For many years a controversy as to whether an unconformity existed at this horizon has been in progress, and as yet shows little sign of being settled. Although the extent of country that could be examined by the writer in the few hours at his disposal was necessarily limited, and only tentative conclusions could be reached, yet a statement of the observations made and of the probable inferences to be drawn therefrom may be useful.

General Geological Features.

So much has been written concerning the Weka Pass and the adjoining Waipara district that only a very brief description of their geological features need be given, and for further information the reader may be referred to the literature listed at the end of this report. The oldest rocks of the district are greywackes and argillites of probable Trias-Jura age. These are unconformably overlain by a series of quartzose sands, greensands, and other rocks, the whole terminating in the white foraminiferal Amuri limestone. On this rock rests a calcareous glauconitic sandstone of small thickness, which as a rule gradually and almost imperceptibly passes into the arenaceous limestone commonly known as the Weka Pass stone. This is succeeded by a mudstone, the so-called Grey Marl, above which come the two series of soft sandstones interstratified with rubbly limestones and shelly conglomerates known respectively as the Mount Brown and the Motunau beds. The youngest rocks of the region are the Pleistocene and Recent gravels that form the surface of the Waipara and other river-flats.

The Trias-Jura rocks are strongly folded, whilst the overlying sedimentaries, with the exception of the Pleistocene and Recent strata, are thrown into moderately gentle but irregular folds, in places complicated by faulting, but, if broadly viewed, everywhere forming an apparently conformable succession, in which, however, various geologists believe discordances of some kind exist at several horizons. A good account of the structural relations near Weka Pass is given by Marshall, Speight, and Cotton (21, pp. 384–89).*

The greensands and associated strata below the Amuri limestone contain fossils of distinctive Cretaceous aspect. The Amuri limestone itself, except for Foraminifera, is almost devoid of fossils, but is commonly regarded as certainly belonging to the same series as the underlying beds, and therefore to be of Upper Cretaceous or possibly Early Tertiary age. The Weka Pass stone is poorly fossiliferous, but the presence of *Pecten huttoni* and *Epitonium (Cirsotrema) rugulosum lyratum* with several other fossils more or less characteristic of the Oamaru Series leaves practically no doubt of its Miocene age. Thus there appears to be a decided palæontological break between the Amuri limestone and the Weka Pass stone.

Section near Weka Pass.

The section observed by the writer in the gorge of Weka Pass Creek near the railway-viaduct and in its upper valley is as follows:—

(1.) Weka Pass stone, say 100 ft. thick, overlain by Grey Marl, Mount Brown beds, &c., and at base passing into—

(2.) Calcareous glauconitic sandstone, say 2 ft. thick. This rock is not sufficiently glauconitic to deserve the name of "greensand."

(3.) Amuri limestone, fairly pure, 40 ft. or less in thickness. This is much jointed and even shattered in places.

4.) Amuri limestone, argillaceous, about 40 ft. thick. This rock where exposed to weathering breaks into small cuboidal or irregularly shaped fragments.

(5.) Calcareous light-grey claystone, probably between 40 ft. and 50 ft. thick. Exposed surfaces break into very small fragments.

(6.) Uncemented sand, with lumps of clay. This appears to be in the horizon of the greensand well seen in the railway-cutting towards Waikari, but probably the latter rock forms the underlying stratum.

Characteristics of Amuri Limestone and Weka Pass Stone.

The Amuri limestone as developed near Weka Pass is greyish-white to almost pure white in colour, and is so much jointed as to present a somewhat shattered appearance. Bedding-planes at intervals of 1 ft. to 4 ft. are well marked by thin argillaceous layers; these appear to be perfectly parallel to the bedding of the overlying Weka Pass stone. Though fine-grained and foraminiferal, the Amuri limestone is in general so hard that the term "chalky" cannot be appropriately applied. The observation made by McKay (10, p. 83) that the uppermost layer is highly siliceous is not in accordance with the analyses quoted on a later page, which, while confirming Park's less-pronounced statement (18, p. 554), show only a slight increase in the silica-content of this layer as compared with that of those immediately below, and indicate also that the lowest layers are more impure than the uppermost. To the eye there is no change in the Amuri limestone near the contact with the overlying glauconitic sandstone.

* The number in parentheses here and elsewhere refers to the list of publications at the end of this report.

The Weka Pass stone varies in colour from pale-yellowish-white to greyish-white. Bedding-planes are well developed at intervals of a few feet, but vertical jointing, as so well seen in the Amuri limestone, is hardly noticeable, and consequently the Weka Pass stone as seen *in situ* presents a more massive appearance than the bulk of the older rock, from which it may also be distinguished even in hand-specimens by its somewhat coarser grain and more sandy nature.

Contact of Amuri Limestone with Overlying Rock.

Though, as previously stated, the Amuri limestone everywhere appears conformable in strike and dip with the overlying Weka Pass stone, which may conveniently be regarded as including the underlying thin sandy glauconitic layer into which it passes, the actual contact presents some peculiar features, not easily reconciled with the view of a perfectly conformable succession held by several observers. As seen in the gorge of Weka Pass Creek and on the road towards Waipara, the upper surface of the Amuri limestone is everywhere irregular, showing shallow basins or hollows and fissures of some depth (1 ft. to 2 ft.), all filled with glauconitic sandstone. The fissures are really irregular cavities, following joint-planes to a great extent, but evidently enlarged by chemical erosion or solution. Small peninsulas of limestone, some of which are joined only by a narrow neck to the main mass, extend several inches upward into the glauconitic sandstone. Numerous pieces of limestone, mostly of irregular shapes, but some with rounded outlines, occur in the lower 9 in. or 10 in. of the glauconitic sandstone; a few, mostly rounded, extend sporadically to about 2 ft. above the upper surface of the Amuri limestone. One or two very small pebbles of probable greywacke, together with a small rounded phosphatic lump, probably a fragment of bone, were also observed by the writer. In 1886 McKay (10, pp. 83–84) collected some phosphatic nodules near the Pigeon Rock, but his deduction that all the supposed pebbles or fragments of Amuri limestone in the glauconitic sandstone are phosphatic concretions is not borne out either by appearances or by the analysis of the writer's sample quoted on a later page. Marshall, Speight, and Cotton, who have closely examined the Weka Pass section, evidently consider the inclusions in the glauconitic sandstone to be of the same composition as the Amuri limestone, but explain them as nodules separated by interlaminations of glauconitic matter that arose through a change in the conditions of deposition (21, p. 386). The term "floaters" probably very nearly expresses their views. The writer, on the other hand, regards the limestone "nodules" as certainly formed by the action of eroding-agents on an exposed surface of Amuri limestone. The irregularly shaped fragments close to the base of the glauconitic sandstone, together with the "peninsulas," &c., may, if the reader likes, be regarded as due wholly to chemical solution; but the more rounded pieces found as much as 2 ft. above the Amuri limestone must have been transported by water, and are therefore correctly described as pebbles.

Explanations of Contact.

The explanations of the contact between the Amuri limestone and the overlying glauconitic sandstone as given by various writers have in most cases been highly coloured by preconceived ideas, nor can the present writer hope wholly to escape similar influences. The several possible explanations may be stated as follows:—

(1.) The contact indicates a distinct unconformity, both physical and palæontological, between Cretaceous and Oligocene or Miocene.—Hutton's view; Park's view in 1904 and since 1912 (17, p. 413; 24, pp. 496–97).

(2.) It indicates a break in deposition, due to currents or other minor change (probably McKay's view), or to elevation not amounting to unconformity.

(3.) No marked break in deposition, but some change in conditions of deposition.—View held by Marshall, Speight, and Cotton in 1911.

The facts observable at Weka Pass appear to the writer to be clear proof of at least local unconformity. Though, apart from palæontological evidence, they do not necessarily prove more, yet Hutton's view of strong unconformity has first claim to the consideration of the student, both on the grounds of priority* and of having the weightiest evidence in its favour. In other words, the burden of disproof is on his opponents. The chief evidence in favour of unconformity may be summarized as follows:—

(1.) Irregularly eroded upper surface of Amuri limestone.

(2.) Presence of indubitable pebbles of Amuri limestone in the overlying bed of glauconitic sandstone.

(3.) The palæontological break indicated by the presence of Cretaceous fossils in beds underneath the Amuri limestone, whilst immediately above, in the Weka Pass stone, are characteristic Miocene fossils.

(4.) The sudden change at the contact from limestone to glauconitic sandstone, the overlap of Weka Pass stone on Amuri limestone, and other minor data mentioned by Hutton and Park.

The chief reasons for favouring a conformity are—

(1.) The apparently complete agreement in strike and dip between the beds above and below the contact.

(2.) In places the contact of Amuri limestone and the overlying bed is regular. The writer has not seen such contacts, but has been informed by Dr. J. Allan Thomson that they exist in the area west of Waipara.

* Hector's brief account of 1869 (see Progress Report in Rep. Geol. Expl. during 1868–69, No. 5, pp. x–xiii) is founded on a "hurried visit," and contains no evidence that he examined the Weka Pass section. From Von Haast's paper published in 1871 (Rep. Geol. Expl. during 1870–71, No. 6, pp. 5–19) one may reasonably conclude that he did not examine the Amuri limestone and Weka Pass stone contact.

(3.) The possibility that the Amuri limestone may bridge the gap between Cretaceous and Miocene.

(4.) The elevation of a foraminiferal limestone and its subsequent erosion followed by depression and deposition of glauconitic limestone (or sandstone) without any intervening strata would necessitate extraordinary conditions.

Professor Park has already pointed out that an unconformable contact similar to that between the Amuri limestone and the Weka Pass stone exists between the Cretaceous and Eocene in the south of England (17, p. 413). The writer may draw attention to unconformable contacts between Palæozoic limestones in the United States that present even closer resemblances. According to E. O. Ulrich, "many unquestionable unconformities between two limestones have been satisfactorily located" (20, p. 463). Ulrich mentions specifically several instances of limestone succeeded unconformably by parallel-bedded shale, which he says is a rarer phenomenon than that of unconformity between two limestones (20, p. 463). Portions of a detailed description of the unconformity at the base of the Onondaga limestone in New York by Edward M. Kindle (27), with verbal alterations, could be applied to the contact of the Amuri limestone with the overlying beds.

It is clear that admitted cases of unconformity between two parallel bedded formations are not uncommon, and therefore that most of the reasons hitherto advanced for favouring conformity lose much of their force. On the other hand, although some degree of discordance is clearly present, further evidence is required before this can be regarded as proved to extend over the whole interval between Cretaceous and Miocene. Such evidence, if it exists, is most likely to be furnished by the detailed geological mapping of the whole district surrounding Weka Pass. It is possible that the supposed unconformity is in reality between Eocene and Miocene, and not between Cretaceous and Tertiary. This, however, is at present a conjecture, based upon the stratigraphy of the west coast of the South Island, where the marine Cretaceous is probably wholly unrepresented.

Analyses of Limestones, etc.

	(1.)	(2.)	(3.)
Silica (SiO_2)	11·12	7·52	6·74
Alumina and ferric oxide (Al_2O_3, Fe_2O_3)	1·78	1·64	1·50
Lime (CaO)	46·55	49·33	49·75
Magnesia (MgO)	0·22	0·22	0·67
Phosphoric anhydride (P_2O_5)	0·28	0·19	0·12
Carbonic anhydride (CO_2)	36·41	38·49	38·76
Moisture and organic matter	1·74	1·05	1·20
Alkalies and undetermined	1·90	1·56	1·26
	100·00	100·00	100·00

(1.) Amuri limestone at contact with glauconitic calcareous sandstone, in gorge of Weka Pass Creek above railway-viaduct.

(2.) Uppermost layer of Amuri limestone in same locality as (1).

(3.) Hard Amuri limestone, about 35 ft. below upper surface, in same locality as (1) and (2).

	(4.)	(5.)	(6.)	(7.)
Insoluble in acid	11·75	16·97	9·30	28·20
Calcium carbonate ($CaCO_3$)	83·75	75·73	86·60	66·60
Phosphoric anhydride	0·52	1·21	0·16	0·27

(4.) Pebbles of Amuri limestone in glauconitic calcareous sandstone, same locality as (1), (2), and (3). The sample appears to be very slightly phosphatized.

(5.) Amuri limestone, near upper surface, some distance up valley of Weka Pass Creek above railway-viaduct. The analysis shows slight phosphatization.

(6.) Amuri limestone, 30 ft. below upper surface, in same locality as (5).

(7.) Amuri limestone, 50 ft. to 80 ft. below upper surface, in same locality as (5) and (6).

	(8.)	(9.)	(10.)	(11.)	(12.)
Silica (SiO_2)	7·25	14·45	34·95	22·51	5·79*
Alumina (Al_2O_3)	0·66	1·03	6·44	3·92	n.d.
Ferric oxide (Fe_2O_3)	0·54	0·77	2·76	2·08	n.d.
Calcium carbonate ($CaCO_3$)	88·64	81·56	47·62	67·60	33·91
Magnesium carbonate ($MgCO_3$)	0·45	0·61	1·46	0·80	n.d.
Calcium oxide (CaO)	..	..	1·50	0·80	23·63
Phosphoric anhydride (P_2O_5)	n.d.	n.d.	n.d.	n.d.	17·45
Organic matter and water	2·06	1·58	3·50	2·29	4·86
Undetermined	0·40	..	1·77	..	14·36
	100·00	100·00	100·00	100·00	100·00

* Insoluble in acid.

(8.) Amuri limestone: Average sample from thickness of 40 ft. This and the following three analyses are of samples collected by Professor James Park a number of years ago.

(9.) Amuri limestone, 2 ft. below upper surface.

(10.) Weka Pass stone, 2 ft. above the Amuri limestone.

(11.) Weka Pass stone: Average sample "from Waikari end of Weka Pass, from cliffs on north side of stream, a few chains above the railway-viaduct."

(12.) Analyses by W. Skey of phosphatic nodule, "from greensand band at base of Weka Pass stone," quoted by McKay in 1887 (10, p. 84), and partly recalculated by the present writer.

All analyses except the last were made in the Dominion Laboratory under the control of Dr. J. S. Maclaurin. Nos. 8 to 11 are quoted from Park (18, pp. 544 and 545).

LITERATURE.

1. Hector, James: "Waipara District, Canterbury." Progress Report in Rep. Geol. Expl. during 1868–69, No. 5, 1869, pp. x–xii. Hector states that calcareous sandstones, with Miocene fossils [Mount Brown beds] rest unconformably on blue and grey marly sandstone, sometimes passing into chalk. [Grey Marl, Weka Pass stone, and Amuri limestone.]
2. Haast, Julius von: "On the Geology of the Waipara District, Canterbury." Rep. Geol. Expl. during 1870–71, No. 6, 1871, pp. 5–19.
3. Hector, James: "North-east Portion of South Island"; "Marlborough and Amuri Districts." Progress Report in Rep. Geol. Expl. during 1873–74, No. 8, 1877, pp. vi–xiii. Some criticism of Hutton's report cited below is given.
4. Hutton, F. W.: "Report on the Geology of the North-east Portion of the South Island from Cook Strait to the Rakaia." Rep. Geol. Expl. during 1873–74, No. 8, 1877, pp. 27–58. The principal references to the Weka Pass district are on pp. 43–46. Section X, opposite p. 56, illustrates Weka Pass stratigraphy.
5. McKay, Alex.: "Report on Weka Pass and Buller Districts." Rep. Geol. Expl. during 1874–76, No. 9, 1877, pp. 36–42.
6. McKay, Alex.: "Oamaru and Waitaki Districts." Rep. Geol. Expl. during 1876–77, No. 10, 1877, pp. 41–66. Pp. 44 and 45 refer to fossils collected in Waipara and Weka Pass districts.
7. Haast, Julius von: "Geology of the Provinces of Canterbury and Westland," 1879. The principal references to the Weka Pass district are on pp. 297, 298, and 306. See also references to Waipara district and formation.
8. Hutton, F. W.: "On the Geological Position of the Weka Pass Stone of New Zealand." Q.J.G.S., vol. xli, 1885, pp. 266–78.
9. Hector, James: Progress Report in Rep. Geol. Expl. during 1886–87, No. 18, 1887, pp. xi–xiii.
10. McKay, Alex.: "On the Junction of the Amuri Limestone and Weka Pass Stone, Weka Pass, North Canterbury." Rep. Geol. Expl. during 1886–87, No. 18, 1887, pp. 78–91.
11. Hector, James: "Waipara and Weka Pass." Progress Report in Rep. Geol. Expl. during 1887–88, No. 19, 1888, p. xxxviii.
12. Park, James: "On the Geology of Waipara and Weka Pass Districts." Rep. Geol. Expl. during 1887–88, No. 19, 1888, pp. 25–35.
13. Hutton, F. W.: "On the Relative Ages of the New Zealand Coalfields." Trans. N.Z. Inst., vol. xxii, 1890, pp. 377–87. Much of this paper refers to the supposed unconformity between the Waipara and Oamaru formations.
14. Hector, James: "Waipara." Progress Report in Rep. Geol. Expl. during 1890–91, No. 21, 1892, pp. l–liii.
15. McKay, Alex.: "On the Geology of the Middle Waipara and Weka Pass Districts, North Canterbury." Rep. Geol. Expl. during 1890–91, No. 21, 1892, pp. 97–103.
16. Hutton, F. W.: "The Geological History of New Zealand." Trans. N.Z. Inst., vol. xxxii, 1900, pp. 159–83. On pp. 168–70 are references to the geology of the Waipara and Weka Pass districts.
17. Park, James: "On the Age and Relations of the New Zealand Coalfields." Trans. N.Z. Inst., vol. xxxvi, 1904, pp. 405–18. On pp. 412–13 Park supports Hutton's view of an unconformity between Weka Pass stone and Amuri limestone.
18. Park, James: "On the Marine Tertiaries of Otago and Canterbury, with Special Reference to the Relations existing between the Pareora and Oamaru Series." Trans. N.Z. Inst., vol. xxxviii, 1905, pp. 489–551. Pp. 538–46 deal mainly with the Weka Pass district.
19. Park, James: "The Geology of New Zealand," 1910. The principal references to Weka Pass geology will be found on pp. 88–89, 95, and 116–19.
20. Ulrich, E. O.: "Revision of the Palæozoic Systems." Bulletin of the Geol. Soc. of America, vol. xxii, 1911, pp. 281–680. The matter having most application to the question of unconformity between parallel bedded formations will be found on pp. 462–67 and 526–31.
21. Marshall, P., Speight, R., and Cotton, C. A.: "The Younger Rock Series of New Zealand." Trans. N.Z. Inst., vol. xliii, 1911, pp. 378–407. Pp. 384–90 deal specially with the Weka Pass and Waipara districts. See also pp. 404, 406, 407, &c.
22. Park, James: "The Unconformable Relationship of the Lower Tertiaries and Upper Cretaceous of New Zealand." Geol. Mag., n.s., Dec. v, vol. viii, 1911, pp. 539–49.
23. Marshall, P.: "The Younger Rock Series of New Zealand." Geol. Mag., n.s., Dec. v, vol. ix, 1912, pp. 314–20.
24. Park, James: "The Supposed Cretaceo-Tertiary Succession of New Zealand." Geol. Mag., n.s., Dec. v, vol. ix, 1912, pp. 491–98.
25. Marshall, P.: "Geology of New Zealand," 1912. Pp. 188 *et seq.* have some references to the geology of North Canterbury.
26. Cotton, C. A.: "Typical Sections showing the Junction of the Amuri Limestone and Weka Pass Stone at Weka Pass." Proc. N.Z. Inst., in vol. xliv of Trans., 1912, pp. 84–85.
27. Kindle, Edward M.: "The Unconformity at the Base of the Onondaga Limestone in New York, and its Equivalent West of Buffalo." The Jour. of Geol., vol. xxi, 1913, pp. 301–19. This paper describes fully an unconformity not easily detected at all points by stratigraphical evidence alone.

6. LIVERPOOL STATE COAL-MINE, ETC.

(By P. G. Morgan, Director.)

In accordance with official instructions, on the evening of the 22nd March I left Wellington in order to inspect recently prospected coal-outcrops, &c., near the Liverpool State Coal-mine, Greymouth. Being detained, owing to the late arrival of the steamer, for two days in Christchurch, I called on Mr. Suter in order to discuss palæontological work, and made a visit to the important geological locality of Weka Pass, near Waikari. On the 25th March I arrived at Greymouth, and next day, accompanied by Mr. I. A. James, General Manager of the State Coal-mines, visited the various bores lately drilled in the neighbourhood of the Liverpool State Mine. The 27th and 28th March were spent with Mr. James in inspecting the country and the coal-outcrops north and north-west of the Liverpool Mine. On the 29th I examined the rock-outcrops seen on the main haulage-road from the Liverpool Mine to Rewanui, and on the railway-line thence to Dunollie. Next day I returned via Christchurch to Wellington, which was reached on the morning of the 31st.

Boreholes.

The results of the boring lately undertaken are very satisfactory, and show that the lowest known workable seam of the field, called in New Zealand Geological Survey Bulletin No. 13* (p. 98) the "A" seam, is of great thickness and good quality beneath the watershed of upper Seven-mile Creek. As stated in Bulletin No. 13 (p. 98), this seam can be traced by outcrops more or less continuously from the Paparoa Coal-mine towards the head of Ford Creek, and thence to the westward for over two miles into the valley of Bishop Creek. A considerable portion of the coal beneath Seven-mile Creek valley can be worked from the present haulage-road entering the Liverpool Mine.

Recent Surface Prospecting.

The recent prospecting in Bishop Creek valley directed by Mr. James shows that the A seam extends 24 or 25 chains westward of any previously known outcrop, and throughout this distance exhibits from 18 ft. to 20 ft. of perfectly clean hard coal. A reversed fault then causes the seam to be downthrown 150 ft. to the west. Beyond this point the A seam has not been traced, but an upper seam stated to be 9 ft. thick has been followed for 10 chains.

Somewhat to the south, in the valleys of Cascade Creek (probably a tributary of Bishop Creek) and of Miller Creek (a tributary of Ten-mile Creek), two apparently workable coal-seams are exposed, and have been prospected at various points. As a rule, from 5 ft. to 7 ft. of clean hard coal is seen. The lower of these seams probably corresponds to the 9 ft. seam previously mentioned as found in the valley of Bishop Creek. The upper, not improbably, is a split.

Geological Relations.

Immediately east of the area lately prospected is a zone of disturbed and more or less faulted country, which strikes north-north-east and extends down the valley of Spring Creek. East of this is a narrow belt of more solid country, but this soon gives place to the highly disturbed zone traversed by the Tararu fault.† The reversed fault previously mentioned can be traced south-south-west into Miller Creek valley, where it is indicated by a belt of steeply dipping rock, and may no longer be a reversed fault, but the effect is still the same—namely, a downthrow to the west. The block or belt of solid country has considerable length, and probably widens to the south-south-west, owing to the last-mentioned fault diverging more to the west than the easterly fault at the head of Spring Creek.

At the outcrops in Bishop Creek valley, in Cascade Creek, and in Miller Creek the dips shown by the coal-seams and the enclosing rocks are moderate. It may therefore be said that a considerable area of thick coal, workable as a single block, exists west of the upper part of Spring Creek. The outcrop of the A seam is approximately 1,500 ft. above sea-level, but as the coal is followed to the southward the elevation of the seam decreases. Hence the coal is not commanded by the present haulage-road to the Liverpool Mine.

Recommendations.

Before the coal-bearing block west of Spring Creek is developed, a certain amount of boring, in order to prove the coal to the dip of the outcrops, is necessary. As much surface prospecting as possible ought to be done, and it is desirable to extend this over the ground outside the limits of the apparently workable block. In particular, the A seam outcrop ought to be traced westward and eastward, down and up the valley of Bishop Creek, as far as possible.

The preparation of a good topographical map on a scale of 5 or 10 chains to the inch is absolutely essential. Such a map in the course of a few years will save its cost over and over again.

The services of a geologist are required in tracing faults and disturbed zones of country, in estimating throw of faults, distance apart and number of seams, in correlating the seams, and in collecting other data of a geological character. Numerous analyses of the coal are desirable. In many cases the samples should be collected under the direction of a geologist—that is, some one with an adequate training in economic geology.

In conclusion, I wish to point out that satisfactory geological reports cannot be made as the results of flying visits. For some years the Liverpool Mine will require the almost constant attendance of an experienced geologist, or mining engineer with good geological training, if the best results possible are to be obtained.

The Greymouth Coalfield is faulted and disturbed to an extraordinary degree. The coal-seams are strikingly lenticular, and in other ways variable. Under these conditions methods of prospecting and working different from those found suitable in more regular coalfields are required, and a quite unusual degree of attention to geological factors is imperatively necessary.

---

*Morgan, P. G.: "The Geology of the Greymouth Subdivision, North Westland," 1911. †N.Z.G.S. Bull. No. 13, 1911, pp. 47, 111.

7. NEW PLYMOUTH OILFIELD.

(By P. G. Morgan, Director.)

In accordance with instructions given by the Hon. the Minister of Mines on the 31st March, 1915, I left Wellington on the 5th April in order to inspect the oil-wells of the New Plymouth district with a view to determining whether deep boring is advisable, and, if so, in what locality. After spending four days in visiting oil-bores and places of geological interest, I returned to Wellington on the 10th. On the 6th and 7th April I was accompanied by Mr. W. Gibson, Assistant Geologist, who during the past field season has been making a detailed survey of the Egmont Subdivision.

Progress made during Past Year.

Since my last visit to New Plymouth very little progress has been made by the various oil companies, and the oil-production has tended to decrease. Taranaki Oil-wells (Limited) has deepened its No. 5 bore from 2,644 ft. to 2,750 ft., and its Rotary bore from 2,250 ft. to approximately 2,900 ft. The Blenheim bore of the Taranaki Oil-lands Acquisition and Development Company has been deepened from 2,223 ft. to 3,419 ft. It is a matter of regret that the Rotary bore failed to penetrate any defined oil-bearing stratum, and that the Blenheim well has so far also been unsuccessful below 2,211 ft., an horizon that was producing oil in February, 1914. The Phœnix Company's bore has met with difficulties, and has not been appreciably deepened since February, 1914.

Oil-production.

At the present time the only producing-wells are Nos. 3 and 5 of Taranaki Oil-wells (Limited). No. 3 well is giving about the same production as in February, 1914, or roughly 4,000 gallons per month. In No. 5 well the old 5 in. and 4 in.* casings have been removed, and replaced by 6 in. and 5 in. casings. As a consequence of this, the well is apparently in very good condition, and is giving a flow of oil varying from 7,000 to over 10,000 gallons per month.

Oil-horizons.

Near the breakwater and the Sugarloaves a little oil has been obtained at depths of 1,000 ft. or less, but the 1,000 ft. horizon mentioned by Mr. E. de C. Clarke is clearly of little consequence. Five bores—namely, Nos. 1, 2, 3, and 5 of Taranaki Oil-wells (Limited) and the Blenheim bore—have proved the existence of an oil-bearing horizon carrying a moderate quantity of oil at 2,100 ft. to 2,300 ft. It is fairly certain that this oil-horizon does not extend far to the east of the Blenheim well, and therefore it ought to be prospected by means of bores to the southward of the line joining Taranaki Oil-wells' No. 3 bore and the Blenheim bore. No clearly defined oil-horizon below that just mentioned has been proved, although, as it happens, the two producing-wells are both obtaining their oil from greater depths. More bores are necessary in order to obtain satisfactory information as to any oil-bearing horizon that may exist between 2,300 ft. and 4,000 ft.

Deep Boring.

Practically all qualified observers are agreed in the belief that the source of the New Plymouth oil is at a great depth, and that probably the principal oil-horizon will not be found at a much less depth than 5,000 ft. Clearly, then, the future of the field depends on the result of deep boring, and bores less than 3,000 ft. in depth will not be directly important in deciding whether Taranaki possesses a prolific oilfield or not. They may, however, in places be moderately profitable, and may indirectly be of great value in furnishing the structural data of which at present there is so great a lack.

The area most deserving of being prospected appears to be the strip of country that extends for fifteen miles south-south-east from the Sugarloaves, and contains somewhat numerous gas-vents. In this matter I concur with Mr. E. de C. Clarke.† So far as can be judged from the data at present known, the first deep bore ought to be in the neighbourhood of Moturoa, where a considerable amount of oil has already been obtained. Had the area to the south-south-east already mentioned been more thoroughly prospected by means of 2,500 ft. to 3,000 ft. bores, possibly this opinion would need modification.

Theoretically the best position for a deep bore is midway between Taranaki Oil-wells' No. 3 bore and the Blenheim bore. The available information is so scanty, however, that almost the only argument in favour of this site is that it is in the middle of the known oil-producing area. Of the various existing wells the Blenheim, according to the information supplied to me by the owners, is at present in the best condition for being taken to a depth of 5,000 ft.; and probably it would be much better to continue a well that is in good condition, and already well over 3,000 ft. in depth, than to start a new bore from the surface. Taranaki Oil-wells' No. 5 bore is possibly in a slightly better position than the Blenheim bore. It is, however, only 2,750 ft. deep, with 5 in. casing at the bottom, as against the Blenheim well's depth of 3,419 ft., with 6½ in. casing at the bottom. Moreover, it is producing oil in profitable quantity, and it would be a mistake to deepen it at present.

The New Zealand Standard Oil Company's bore near the Carrington Road, at a point five miles east-of-south from the Moturoa oil-producing wells, is not far from the gas springs on Messrs. Grooby's, Gilbert's, and Vetch's farms, and is well located for a prospecting-bore. The well is 3,246 ft. deep, and is lined with 12 in. to 5 in. casing. No work has been done at this bore for several years, and I am doubtful as to the state of the casing. Deep boring in this locality deserves encouragement, but if assistance is to be granted to one well only, then in the present state of our knowledge preference must be given to a bore near Moturoa.

* The measurements represent outside diameter.

† N.Z.G.S. Bull. No. 14, 1912, p. 47.

8. STONE FOR OAMARU HARBOUR WORKS.

(By P. G. Morgan, Director.)

General Statement.

From the 11th to the 14th May I was in the Oamaru district inspecting possible sites for quarries from which stone suitable for harbour-works could be obtained. A report on this subject had previously been made by Dr. J. Allan Thomson,* and from correspondence with the Harbour Board I understood that all the Board required was an inspection of two proposed quarries—one on the coast near the breakwater, and one at Enfield, on the Ngapara railway-line, a few miles from Oamaru. I found, however, that it was desirable to examine other localities, and regret that the time at my disposal did not enable me to obtain data for an exhaustive report.

As regards the present Harbour Board quarry and adjacent coast-line near the breakwater, I had no difficulty in deciding that the 12-ton blocks required for the proposed extension of the breakwater cannot be obtained in that locality.

At Enfield dolerite dykes or masses have been quarried to some extent for roadmaking material. So far as hardness and resistance to marine erosion are concerned, the rock is suitable for harbour purposes. Appearances indicate that blocks weighing several tons can be obtained without difficulty, but there will be considerable waste material, and the character of the jointing is such as to make me doubtful as to the likelihood of single stones weighing 10 or 12 tons being won in large number. Positive statements, however, cannot be made until either several trial drifts have been made some distance into the rock or a quarry opened at a lower level than the existing one near the railway-station. Since the expense of doing so will be considerable, and the financial resources of the Harbour Board are limited, I must hesitate before giving advice that may result in nearly useless expenditure, and in any case is more properly in the province of a skilled quarryman. In addition to trial openings, further geological examination, in order to determine the extent of the dolerite mass, is desirable.

At the Borough quarries in the valley of Oamaru Creek a fine-grained dolerite similar to that at Enfield is being quarried for roadmaking purposes. In the lower quarry the rock is so jointed that blocks over 4 or 5 tons cannot be obtained. The prospect of larger blocks being won at the upper quarry now being worked appears to be somewhat better.

Mr. Alexander McKay, formerly Government Geologist, informs me that suitable stone for a breakwater is probably to be found in the Kakanui valley, some distance west of the railway. The rock here is a solid basalt or dolerite, overlain by loess (the yellow wind-blown clay of the Oamaru district).

Some of the grit and fine conglomerate boulders near Ngapara are of large size, and well adapted for the construction of a breakwater. As stated by Dr. Thomson, solid rock does not extend far into the hill-slopes, and practically only the material in sight is available.

Large blocks can be easily obtained from the limestone of the Oamaru district, both at the various building-stone quarries and near Ngapara, Tokorahi, &c. The stone obtainable from the quarries is soft, and will corrode somewhat rapidly under the action of sea-water, but owing to facilities for quarrying being available I am inclined to agree with Dr. Thomson in recommending that a trial of it be made at the breakwater.

The limestone near Tokorahi and Ngapara contains hard crystalline bands, interbedded with softer layers similar in most respects to Oamaru building-stone. At first sight some of the Ngapara stone appears to be suitable for the breakwater, but closer inspection leads to the conclusion that there is little difference in durability between this stone and that of the Oamaru quarries. Hence, unless further examination gives ground for a change of opinion, the expense of a trial, much less that of opening out a quarry, is not warranted.

Recommendations.

In making the recommendations numbered 1 to 3 that follow, I wish it to be understood that these are made with hesitation, and that it is desirable that they should be considered by some authority on quarrying and on harbour-works before being put into practice. My recommendations are,—

(1.) To make a trial of Oamaru building-stone for the breakwater by constructing, say, a length of 60 ft. or 70 ft. with this material. The largest blocks conveniently obtainable should be used.

(2.) To endeavour to obtain suitable blocks of stone at the upper Borough quarry in the valley of Oamaru Creek.

(3.) In the event of Oamaru stone being deemed unsuitable by any competent authority, and large blocks unobtainable at the Borough quarry or elsewhere, to open out the Enfield quarry at a lower level. It is necessary, however, that suitable arrangements be made to sell small material as road-metal, otherwise the cost per ton of large blocks will be excessive.

Conclusion.

I am not at all satisfied that sufficient exploration for possible stone-quarries has been made, and therefore further geological examination of the country near Oamaru is desirable. This should be a careful piece of work, and extend over the whole district. Quite apart from the present question, there are powerful reasons why a detailed geological survey of the Oamaru district should be made.

See *postea*, pp. 98–100.

9. PHOSPHATE OCCURRENCES IN THE SOUTH ISLAND.

(By P. G. Morgan, Director.)

During the past season visits were paid to several localities in the South Island where phosphatic substances occur, but no material discovery was made. A sample from the upper surface of the Amuri limestone at Weka Pass was found to contain 1·21 per cent. of phosphoric anhydride, equivalent to 2·61 per cent. of calcium phosphate, thus showing that some phosphatization of the limestone had taken place. Hard limestone from Hutchinson's quarry, Oamaru, portions of which resemble the phosphate rock occurring at Clarendon, on being tested gave disappointing results, the heighest percentage of phosphoric anhydride obtained from several samples being 1·26 per cent., equivalent to 2·75 per cent. of calcium phosphate. A sample of soft limestone from Mr. J. K. McCulloch's property, west of Ngapara, yielded 3·63 per cent. of phosphoric anhydride, equivalent to 7·92 per cent. of calcium phosphate. Such material, if it occurs in quantity, will make a useful dressing for agricultural purposes, either in the form of pulverized rock or applied after calcination. Small phosphatic concretions were collected from a greensand overlying the Burnside marl near Dunedin, but cannot be considered as of much economic importance. The greensand itself contains 3·35 per cent. of phosphoric anhydride, and 4·12 per cent. of potash, so that it is of some value as a fertilizer.

A visit to the rock-phosphate quarries at Clarendon was made, and various features of interest noted; but since the deposits have been well described by Professor Park and Dr. Andrew, it is not necessary at the present time to embody the observations made in a report, much of which would traverse old ground.

The following list of phosphate occurrences in the South Island is here given for general information:—

Calcium Phosphate.

(1.) *Wangapeka, Nelson.*—A specimen of highly phosphatic limestone forwarded to the Colonial (now Dominion) Laboratory about thirty years ago contained 20·78 per cent. of phosphoric anhydride, equivalent to about 45 per cent. of tribasic phosphate of lime. See Col. Lab. Rep. No. 20, 1886, p. 57.

(2.) *Cheviot District.*—In 1906 a sample of phosphatic rock forwarded from Port Robinson was found by B. C. Aston to contain 35 per cent. of tricalcic phosphate. (See the *Journal of Agriculture*, No. 6, vol. x, June 1915, p. 501.

(3.) *Amberley, North Canterbury.*—A sample forwarded to the Dominion Laboratory in 1908 contained 29·94 per cent. of P_2O_5, equivalent to 65·38 per cent. of $Ca_3P_2O_8$. See Dom. Lab. Rep. No. 42, 1909, p. 22.

(4.) *Weka Pass, North Canterbury.*—Phosphatic nodules occur here in greensand between the Weka Pass and Amuri limestones. See Col. Lab. Rep. No. 22, 1887, p. 46, and Rep. Geol. Expl. during 1886–87, No. 18, 1887, p. 84. An analysis is quoted on an earlier page (No. 12, p. 92).

(5.) *Waimate District, South Canterbury.*—In 17th Ann. Rep. Dep. Agri., Chemistry Division, 1909, B. C. Aston states that he had received a sample of high-grade phosphate rock from the Waimate district. Limestone containing 8 per cent. of calcium phosphate is also reported to occur in this district.

(6.) *Oamaru District, North Otago.*—B. C. Aston reports the occurrence of phosphatic nodules in the Oamaru district. See "Phosphate in New Zealand," Bull. No. 1, Chemistry Division, Dep. Agri., 1906, p. 5. The nodules are probably associated with one of the greensands found in the district both above and below the limestone. The results of tests made on phosphatic limestones from Hutchinson's Quarry and Ngapara are noted above.

(7.) *Kaikorai Valley, Dunedin.*—The existence of phosphatic nodules or concretions (so-called coprolites) in the Kaikorai Valley and neighbouring localities has long been known.

(8.) *Burnside, Green Island District, Otago.*—In the greensand overlying the marl at the Milburn Lime and Cement Company's pit small poorly phosphatic concretions are common. The greensand also contains an appreciable quantity of phosphoric anhydride, as noted above.

(9.) *Clarendon, Otago.*—The well-known and important deposits of phosphate of lime at Clarendon have been described by Professor James Park and Dr. A. R. Andrew. See Trans. N.Z. Inst., vol. 35, 1903, pp. 391–402, and vol. 38, 1905, pp. 447–82.

Aluminium Phosphate.

Flaxbourne, Marlborough.—A hydrous phosphate of aluminium with a little ammonium phosphate occurs in a cave near Flaxbourne. See Col. Lab. Rep. No. 27, 1893, pp. 26–27.

Greymouth District.—A specimen of stibnite from Langdon's lode, near Greymouth, in the Canterbury Museum is labelled as having a coating of wavellite.

Green Island, Otago.—B. C. Aston has identified aluminium phosphate as occurring on this island. See "Phosphate in New Zealand," Bull. No. 1, Chemistry Division, Dep. Agri., 1906, p. 5.

Iron Phosphate.

The numerous recorded occurrences of vivianite, the hydrous phosphate of iron, include: Awatere valley, in moa-bones (Hector, in Rep. Geol. Expl. during 1890–91, No. 21, 1892, p. 119); Six-mile Creek, three miles above its junction with the Matakitaki (C. S. Beilby); saddle between Glenhope and Tadmor valleys (C. S. Beilby); Hope Saddle, in large boulders (W. F. Worley); Waiuta, south of Reefton, in a quartz lode (J. McPadden and J. Henderson); Springfield (specimen in Canterbury Museum); Waimate Gorge (specimen in Canterbury Museum): Timaru (James Park, in "The Geology of New Zealand," 1910, p. 402); Waitati, in moa-bones (specimen in Canterbury Museum); Port Chalmers (Park, *op. cit.*, p. 402); Dunedin, at Museum-site (specimen in Museum); North-east Valley,

near Dunedin (Park, *op. cit.*, p. 402); Kingston (P. G. Morgan and J. A. Bartrum, in "List of the Minerals of New Zealand," 1913, p. 31); Invercargill district (Col. Lab. Rep. No. 27, 1893, p. 31); Riverton (Morgan and Bartrum, *op. cit.*, p. 31).

Vivianite also occurs in Campbell Island (Col. Lab. Rep. No. 37, 1904, p. 11; and B. C. Aston, in "The Sub-antarctic Islands of New Zealand," vol. ii, 1909, p. 764).

Miscellaneous Phosphate Occurrences.

B. C. Aston records the presence of titanium phosphate in red earth, Antipodes Island. The same material also contains other phosphates. (See 17th Ann. Rep. Dep. Agri., Chemistry Division, 1909, p. 177; and "The Sub-antarctic Islands of New Zealand," vol. ii, 1909, p. 763.) The same chemist also states that the smooth polished crust formed on Bounty Island granite by sea-birds contains 11·77 per cent. of phosphoric anhydride. (See "The Sub-antarctic Islands of New Zealand," vol. ii, 1909, p. 770.)

Guano-deposits are recorded from caves at Akaroa (Col. Lab. Rep. No. 7, 1872, p. 24); Onetana, Collingwood district (Col. Lab. Rep. No. 24, 1890, p. 42); west coast of South Island (Col. Lab. Rep. No. 12, 1878, p. 49); and also occur on Green Island and White Island, near Dunedin; Snares Island; Bounty Islands; Antipodes Island, &c.

---

10. PROSPECTS OF FINDING STONE SUITABLE FOR HARBOUR-WORKS IN THE OAMARU DISTRICT.

(By J. Allan Thomson, Director of the Dominion Museum.)

Scope of Report.

Pursuant to instructions I visited Oamaru in November, 1914, and at once put myself in communication with Mr. C. A. La Roche, Secretary and Engineer to the Oamaru Harbour Board. I ascertained that harbour improvements were contemplated, in the nature of an extension of the breakwater for 1,750 ft., to terminate in 23 ft. of water at low tide, thus enabling a channel of a minimum depth of 22 ft. to be maintained. For this extension it is estimated that 250,000 tons of stone will be required, of which one-half (125,000 tons) is required to be in heavy blocks: 20-ton blocks are desirable, but if the stone is to be transported by the State railways a restriction to a maximum weight of 12 tons is imposed. The estimated cost of these improvements is given as £123,153 by Mr. Cyrus W. Williams, M.I.C.E., of Lyttelton, the consulting engineer. In his report he states, "the critical point in this scheme is the supply of suitable stone."

The points submitted to me for advice were—firstly, the possibility of utilizing the Harbour Board quarry adjacent to the harbour; and, secondly, the possibility of obtaining suitable stone from certain other specified localities in the Oamaru district. I inspected these various localities and the ground adjacent to the quarry and harbour, and have the honour to submit the following report:—

Suitability and Extent of the various Classes of Stone available.

The following classes of stone are available in the Oamaru district:—

1. *Conglomerates and Sandstones.*

These rocks occur as the basal members of the Oamaru System (under the greensands and limestone) in the interior of the district, but do not outcrop near the coast. I inspected an outcrop near the railway, about a quarter of a mile from the Ngapara Station. The ground at this point is strewn with enormous blocks of fine conglomerate grading down into sandstone. The conglomerates have for the most part a ferruginous cement, which is very variable in consistency, and in no case very strong. There is a band of sandstone outcropping, which has also furnished a large number of the fallen blocks, and which has a hard siliceous cement. This stone would be excellent for the purposes required if it could be obtained in quantity, but it is only 6 ft. thick, being underlain and overlain by poorly consolidated conglomerates and sands. Moreover, the outcrop dies out laterally on each side in a few yards, although the hill-slopes are of such a nature as would yield a prominent escarpment if the rock continued uniform in hardness. The inference is that the siliceous cement which gives the necessary qualities to the stone is irregularly distributed, and quarrying operations at this point could only lead to disappointment. I did not on this occasion examine any other outcrops of similar rocks, as they are too far from the railway to be taken into serious consideration.

2. *Volcanic Rocks, Basalt Lavas or Dolerite Dykes (Bluestones), and Breccias (Rubble Stone).*

These rocks have a wide occurrence in the coastal part of the Oamaru district, being found for the most part immediately below the limestone, and even replacing it more or less completely in places (Target Gully), but there are similar rocks at a lower horizon (below the diatomaceous earth) in the Waiareka valley. Ash-beds (breccias and tuffs) preponderate, and lava-beds are limited in extent, and there are in addition a few dykes known.

The ash-beds are apparently all submarine, and have a calcareous cement. Their volcanic material is more scoriaceous and generally more decomposed than the bluestones, and the rocks depend for their powers of resisting erosion very largely on the nature of the cement. The bluestones are very suitable for the purposes required if they can be obtained in sufficient quantities.

(a.) Basalt Lava (Bluestone), Oamaru Corporation Quarries, Oamaru Creek.—This rock, though of good quality, is so thoroughly jointed that very few blocks of even 5 tons are obtained. The same statement applies to the rock farther up the creek where the new Corporation quarries are to be started.

(b.) Dolerite Dykes, Enfield.—The hills on each side of the Enfield Railway-station consist of dolerite dykes traversing greensand. The dolerite before cooling has picked up a large amount of quartz, and shows numerous inclusions, which will probably improve its resistance to erosion. It is the most suitable stone I have examined for the purposes required.

The geology of the hill on the western side of the station is not altogether clear. On the hill to the east of the station there is one distinct dyke, about 25 ft. thick, dipping 75° in a southerly direction. This dyke can be recognized on the west side of the railway at the northern end of the cliffs. About 15 yards farther south is another dyke of nearly the same thickness, followed to the south again by greensand for another 13 yards. From this point south the cliffs are formed by a massive dolerite, which is doubtless a dyke, but the relations of which are not clear. The doubt is how far this rock continues westwards into the hill before the greensand makes its appearance. Quarrying operations at the northern end of the hill, on the first two dykes mentioned, would be greatly hampered by the amount of greensand (waste) that would be encountered. Since the cliffs overlook the railway, it appears that objection might be taken by the Railway Department to a quarry in the main mass of the dolerite. There is, however, a small bay in the cliff at a point 50 yards north of the water-tank of the railway-station, where, in my opinion, a quarry might be started without damaging the railway if a protecting wall were built to a height of, say, 8 ft. for a length of a chain.

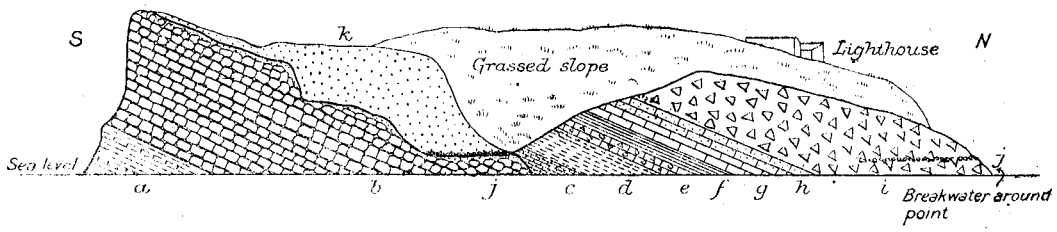
The main mass of the dolerite is not very badly jointed, and it should be possible by the use of a suitable explosive to get a fair proportion of heavy blocks, but there would certainly be a large amount of waste, the disposal of which would be a difficulty unless it could be sold as road-metal or ballast.

(c.) Basalt, Mr. McFall's Farm, Totara.—On the seaward side of the Totara Railway-station there is a small rounded hill covered with fair-sized boulders of a very scoriaceous and rather weathered rock, probably a basalt. Very few of the boulders, however, approach 12 tons in weight, and it is not probable, though it is possible, that many large blocks would be obtained by quarrying. Access to this hill is easy, and the facilities for bestowing spoil are good. In view of the uncertain prospects, however, I cannot recommend the selection of this locality, without at least an experimental quarry being opened.

(d.) Basalt Breccia, Waiareka Valley, One Mile North-west of Alma.—On a hill overlooking the Waiareka valley, on Mr. G. Ruddenklau's property, there is a good outcrop of a hard calcareous breccia, equal in quality to the best stone in the Harbour Board quarry. The outcrops lie on top of the hill and near its base on the east side, the rest of the hill being smooth and well grassed. It is probable, therefore, that the whole hill consists of breccia similar to that showing in the outcrops, but with a weaker cement. While there is no doubt that much of the harder stone could be obtained in large blocks, the uncertainty as to the quality of the greater part of the hill, added to the distance from the railway (two miles and a half by road), makes the selection of this locality for a quarry inadvisable.

(e.) Tachylite Breccia and Pillow Lava, Harbour Board Quarry and Cape Wanbrow.—The Harbour Board quarry alongside the Oamaru Harbour is excavated in a rock that has long been known to geologists as the "tachylite breccia," from the amount of tachylite that it contains. Tachylite is a basic volcanic glass—that is to say, it is a basic lava that has been suddenly cooled to a glass without crystallizing into a basalt. In appearance it resembles dark bottle-glass. The rock consists mainly of tachylite and dull fine-grained basalt cemented by a calcareous cement, which is very uneven in hardness in different parts of the rock-mass. The rock is probably not a true volcanic ash (breccia or tuff), but a pillow lava broken up before cementation. A pillow lava is a submarine lava-flow that has separated into rounded masses or pillows of various sizes, the interstices being filled by marine deposits. The rock at Cape Wanbrow is a pillow lava, of which the pillows consist of basalt in the centre and tachylite on the exterior, pointing to a sudden cooling of the exterior of the pillows by immersion in sea-water, with slower cooling and nearly complete crystallization of the interiors. The spaces between the pillows are filled with calcareous matter, partly actual marine fossils, partly very hard limestone approaching in quality a lithographic stone. Similar pillows may be recognized in parts of the tachylite breccia, especially near its base.

The geological relationships of these two rocks may be seen in the accompanying diagram, which shows the sea-cliffs in section and the hills behind in perspective. The vertical scale is somewhat exaggerated, and the dip of the rocks in consequence appears greater than it really is—viz., 20°. To the south of Cape Wanbrow is a great thickness of soft decomposed tuffs. These are succeeded by the pillow lava, which is about 120 ft. thick. This rock forms the cape, and runs up the cliffs to a height



SECTION NORTH END OF OAMARU CAPE.

(*a.*) Tuffs with Limestone Bands.
(*b.*) Pillow-lava, with Fossiliferous Limestone between the Pillows.
(*c.*) Fine Tuffs, current-bedded.
(*d.*) Tuff Bed, very calcareous.
(*e.*) Limestone Band, with Rounded and Sub-angular Pieces of Volcanic Rock.
(*f.*) Blue Tufaceous Clay.
(*g.*) Limestone.
(*h.*) Tufaceous Limestone.
(*i.*) Broken Pillow-lava.
(*j.*) Raised Beach.
(*k.*) Clay (? Loess).

of nearly 150 ft. Its resistant nature to erosion is shown by the fact that it runs farther out to sea in reefs than any other rock in the cape, and also attains the greatest height in the cliffs. The pillow lava is succeeded by a set of tufaceous beds interstratified with limestone bands, forming Boatman's Harbour. These in turn are succeeded by the tachylite breccia, which forms the cliffs from Boatman's Harbour to Oamaru Harbour. All these rocks are covered on the hill-slopes by a deposit of clay, which is very thin at the lighthouse, but much thicker along the coast-line, and especially so in Boatman's Harbour. A raised beach forms a shelf a little above spring-tide level at various points along the coast.

The tachylite breccia has been quarried close to Oamaru Harbour, and supplied material for the mole on the northern side of the harbour, in the construction of which blocks of a minimum of 1 ton were aimed at. Even with this low minimum it is estimated that 75 per cent. of the material went to waste, and that not a single block of 12 tons was obtained. This is due to the excessive jointing of the rock, but it is probable that too strong explosives were employed in quarrying, and that by using an explosive charge better adapted to its work a small proportion of large stones would be obtained. In view of this experience, however, I cannot recommend the further use of the present quarries, where the amount of waste will always be excessive, and its disposal attended with difficulties, since the quarries are alongside the harbour.

The lower part of the tachylite breccia appears to be more solid than the upper part, and this could be tested for its capacity to supply large blocks by carrying a face round the coast south-eastwards from the present breakwater towards Boatman's Harbour. The waste obtained from this operation, which would include a fair amount of clay, could be tipped straight to sea at a low cost, and would probably not affect the depth of the proposed channel. On this point, however, the advice of an expert in harbour-works should be obtained. I have ascertained that the Marine Department would probably make no objection to this course.

3. *Limestone.*

Apparently the possibility of using the well-known Oamaru limestone has not been considered in connection with the breakwater-extension scheme. This rock is easily quarried, may be obtained in blocks of any desired size, and is adjacent to the railway at many places. Although it is more friable than the tachylite breccia, it is a question whether it would not be cheaper in the end to use it, with occasional repairs, in view of the smaller initial cost. A limestone—harder certainly than the Oamaru limestone—is used at Greymouth for harbour-works with satisfactory results, and the seas are much heavier at that place. It is probable that a mixture of limestone and tachylite-breccia rubble for the base of the breakwater would set, by the action of the sea-water, into a solid mass. In view of the large expenditure that will be incurred if the proposals are given effect to, a preliminary experiment with limestone is certainly to be recommended.

Conclusion.

In view of the magnitude of the proposals, not only is experimental work of some extent desirable, but its omission would be unjustifiable, since thereby a considerable saving may be effected. If it should be found that a mixture of tachylite breccia and limestone, with a protective covering of large limestone blocks, will serve, this will undoubtedly be cheaper than to obtain stone from outside the district. It would be cheaper still to use the tachylite breccia alone; and if it or the above mixture is found suitable, then I strongly recommend that a face should be carved in the tachylite breccia seawards from the harbour. If, as is possible, a large proportion of heavy blocks is obtained, then it will not be necessary to bring much or any limestone.

Should the use of limestone not be found practicable, there is still the possibility of using the tachylite breccia near the harbour, the pillow lava of Cape Wanbrow, or the dolerite of Enfield; and for obvious reasons it is desirable to exhaust the possibilities of these before deciding to obtain outside stone. So far as geological considerations go, these stones are in ample amount and readily accessible for quarrying operations, and their jointing is apparently not too close-set to prevent sufficiently heavy blocks being obtained under suitable quarry methods. On this last point, however, I profess no expert knowledge, and recommend that the Director of the Geological Survey, or some other officer of the Mines Department who has such knowledge, should be asked to make an examination.

---

11. OIL-INDICATIONS IN THE BENMORE DISTRICT, EAST MARLBOROUGH

(By J. Allan Thomson, Director of the Dominion Museum.)

In 1886 A. McKay* described a gas spring in the valley of the Kekerangu River, "just where the terrace on the right bank of the river abuts against the hill-slopes on its southern side." The gas escaped along the junction of the basal Cretaceous sandstones with the older (greywacke) rocks, and the spring was sufficiently strong to burn with a continuous yellowish flame when led through a broken bottle. During two visits to this neighbourhood in 1912 I did not find that any of the present-day settlers were aware of this gas spring.

In 1912 Messrs. Boyd Brothers, Blue Mountain Run, Ure River, conducted me to a strong gas spring in the valley of a small creek draining from the Blue Mountain, and joining the Ure River about a quarter of a mile above their homestead. This spring had been ignited at least three months previously, and had been burning since, with a flame about a foot high. It issued from a small hole in dry ground, and had so heated the surrounding rocks and mud that it proved impossible to put the

* Rep. Geol. Expl. during 1885, No. 17, 1886, pp. 86–87.

flame out for more than a few seconds at a time. Consequently no sample of gas could be obtained in the time then at my disposal. The spring came through a landslip, apparently in Cretaceous rocks. During May of this year I again visited this district, with a view to the inspection of the bird-life, and explored more particularly the Isolated Hill Creek, which rises in a large area of bush between the mountains Benmore, Whernside, and the Isolated Hill, and runs through a narrow limestone gorge between Benmore and the Isolated Hill, to join the Ure River about a mile above Messrs. Boyds' homestead. In this limestone gorge there are several small "sulphur" springs, while in a smaller limestone gorge in the right branch of the creek, about three miles from the Ure River, a seepage of oil occurs right in the bottom of the creek. The amount of oil issuing is apparently not great, but the supply is sufficiently constant to keep the surface of water continually irridescent in a small rapid. A little farther up this valley a pool of standing water covered with oil was discovered a few yards to the side of the creek. A sample of the oil was collected and submitted to the Dominion Analyst, who reported as follows:—

"Mineral oil from surface of standing pool alongside right branch of Isolated Hill Creek, Ure River, Marlborough: The sample is an oil, distilling between 250°-390° C. (thermometer in vapour). The benzene and lighter oils usually associated with petroleum were absent. The distillate may be divided as follows:—

	Per Cent.
"250°–300° C. Burning-oil	28·5
300°–390° C. Lubricating-oil	66·0
Residue (pitch)	5·5
	100·0

"Paraffin not more than 0·5 per cent.

"J. S. Maclaurin, Dominion Analyst."

It is probable that the oil originally contained benzene and lighter oils, which have been lost by evaporation.

The oil-seepage of the Isolated Hill Creek lies near the line joining the gas springs of the Kekerangu River and the Ure River, and there can be little doubt that all these occurrences are related in origin. The source must be looked for in some member of the Cretaceous strata which underlie the Amuri limestone of that district. The sequence of beds in this part of Marlborough consists of—

(1.) An underlying series of greywackes and argillites of great but unknown thickness;
(2.) Conglomerates, sandstones, and dark mudstones of Cretaceous age;
(3.) The Amuri limestone and flint series, apparently ranging in age from Cretaceous to Miocene;
(4.) Light-coloured mudstones (Grey Marls) of Miocene age;
(5.) The Great Marlborough Conglomerate.

The Cretaceous rocks are about 12,000 ft. thick at Coverham, in the Clarence Valley, to the south-west, and apparently thin very rapidly as the coast is approached; but complete sections are not here accessible. They consist chiefly of black mudstones and hard sandstones at Coverham, but the mudstones are lighter and more micaceous in the Isolated Hill Creek, while bands of soft glauconitic sandstone are found near the saddle of the pack-track between Coverham and Kekerangu. A single boulder of a loose sulphur sandstone was observed in the Isolated Hill Creek, but the outcrop of this rock was not observed. If it occurred in mass it would make an excellent rock to serve as an oil-reservoir.

The Amuri limestone and flint series follows conformably on the Cretaceous mudstones, and is nearly 3,000 ft. thick opposite Coverham, in the Chalk Range, the flint-beds occupying about 1,000 ft. at the base of the series. The flint-beds become much thinner to the north-east, and are little over 400 ft. in the Isolated Hill Creek, and still less on the south side of Benmore; but it is not known whether the total thickness of the series becomes less in this direction, as part of the upper beds is cut off by faults. The succeeding beds—viz., the Grey Marls and the Great Marlborough Conglomerate—do not outcrop in the area in which the oil-indications occur.

The disposition of the beds is fairly regular in the middle Clarence valley, where the Cretaceous rocks and succeeding beds up to the conglomerate dip at fairly steep angles to the north-west, and outcrop in long strips running north-east and south-west. The conglomerates are bounded on the north-west side by the greywacke series, and are separated from it by a great reversed fault. To the north-east of the middle Clarence valley the beds change in strike, and sweep round in a half-circle across the line of the valley, while the great Clarence fault appears to branch, and several subordinate faults also appear. The complex structure thus produced has not yet been thoroughly investigated, and must await the production of a geological map before it can be satisfactorily described. All that need be stated here is that within the half-circle of the Chalk Range, Brian Boru, the Isolated Hill, and Benmore, along which the Amuri limestone outcrops (dipping outwards), there is a down-faulted block, extending from Whernside to near the forks of the Isolated Hill Creek, which has brought down the Amuri limestone to so low a position that it appears in the bed of the right bank of the Isolated Hill Creek at least 1,000 ft. below the base of the flint-beds on the spur of Benmore, less than half a mile to the north-east. It is in the gorge cut through the limestone of this down-faulted block that the oil-seepages above described occur. How great a thickness of limestone in a vertical direction here exists cannot be at present estimated.

It is obvious that the indications of oil-bearing country here described do not warrant the expenditure of any money in boring at present. The district is pre-eminently one in which a geological survey should precede the oil-prospector. The country is mountainous and traversed by many gorges, so that geological exposures are very good. There is no present prospect of any other mineral wealth than oil being discovered, but the oil-indications are sufficiently pronounced to warrant at least a reconnaissance geological survey.

12. NOTES ON THE GEOLOGY OF THE WARWICK VALLEY.

(By J. Henderson, Mining Geologist.)

In April, 1914, the writer spent ten days in the Upper Matakitaki–Warwick district, but the weather was so persistently bad that it was found possible to cover only the roads and tracks. Cox and McKay are the only geologists who have published any account of the geology of this district. The former in 1883 made a reconnaissance survey of the region between Tophouse and the Bog Saddle, and his report* still furnishes the best account of the area now considered. McKay in 1894–95 visited this locality to investigate the probable source and value of the gold-deposits, but his remarks on the geology are of a most general nature.†

At Upper Matakitaki acidic igneous rocks form the high spur between the Glenroy and Matakitaki, while hard conglomerate, striking N. 20° E. and dipping 45° to the eastward, outcrops near the river. Along the road to the Maruia Plains, near the Glenroy Bridge, sandstones, grits, and fine conglomerates, quite as well consolidated, outcrop; and interbedded with them is a 2 ft. seam of excellent coal, which dips eastward at 70°. Analyses of this coal show the following results :—

Fixed carbon	61·98‡	56·25§
Hydrocarbons	32·07	35·66
Water	3·96	1·34
Ash	1·99	6·75
	100·00	100·00

The road now crosses to the west side of the Warbeck valley, and accordingly shows no more outcrops. The Warbeck, although very much smaller than the Glenroy, drains a valley fully as wide and decidedly more mature-looking. The road-cuttings along the ascent to the Warbeck–Warwick saddle show at first crushed and shaken conglomerate and sandstone beds, and, farther on, granite in a similar condition. The conglomerates and sandstones here exposed differ markedly in composition and degree of consolidation from those at the Glenroy Bridge and Upper Matakitaki. Crossing the saddle, the road descends to the Warwick along the eastern side of the valley. The rocks exposed are conglomerates, sandstones, and shales, with carbonaceous layers, which strike a little east of north, and dip very steeply to the eastward. In many places the carbonaceous shales and sandstones are crushed, and along such a zone, a little more than a mile from the saddle, petroleum escapes in small quantity. A film of oil may be detected in a trickle which here crosses the road; but better indications may be seen in a small creek which, flowing parallel with the road, and at a distance of 10 chains from it, may be reached by crossing a cleared spur to the southward. From time to time along the road down the the Warwick outcrops of conglomerates, sandstones, and shales, often with fine leaf-impressions, occur. These dip eastward, seldom at an angle less than 60°, and have a general meridional strike. A similar section is exposed along the lower valley of the Rappahannock, while in the lower Warwick massive sandstones predominate. Across the Maruia Plains the road shows occasional outcrops of sandstone dipping nearly vertically. A recently cut water-race, tapping Station Creek, affords an excellent highway for several miles up that river. Close above the point where this race enters the plain a fault makes itself manifest in the crushed sandstone outcropping along the bank of the stream. Farther eastward conglomerates are continuously exposed for more than two miles. They dip to the eastward at about 50°.

On physiographical and geological evidence it is clear that a powerful fault striking nearly north-north-east traverses the valleys of the Warwick and Warbeck, separating the granites and hornfels of mounts Mantell and Rutland from the Tertiary deposits of the valleys. Subsidiary parallel faults occur in the younger rocks, and it is along one of these that the oil above mentioned finds access to the surface. A considerable area of possibly oil-bearing strata lies to the eastward, but the writer's explorations did not extend sufficiently far to show more than that the rocks in that direction were less disturbed and had gentler dips. A detailed survey will determine if conditions for the occurrence of oil-reservoirs in this area are favourable.

The succession of Tertiary beds in the Westport and North Westland divisions has been worked out in detail, and is as follows :—

Pliocene to Miocene	Pliocene conglomerates and sandstones.
	Blue Bottom beds.
	Claystones, limestones, sandstones, and conglomerates.
Eocene or earlier	Kaiata beds.
	Brunner beds.
	Paparoa beds.

In the Upper Buller district there is a full Miocene sequence, and some of the Eocene beds are probably also represented. In the area examined by the writer the hard conglomerates and sandstones near the Glenroy Bridge belong either to the Brunner beds or to the lowest layers of the Miocene. The soft blue sandstones and conglomerates of the Warwick valley resemble in a remarkable degree the Pliocene conglomerates and sandstones of the Inangahua and Grey valleys. Like them, they contain numerous impure lignitic bands and thick seams of brown coal. Again, although this may be a fortuitous circumstance, the oil at Kotuku, in the Grey basin, escapes from the same series of beds.

In a small stream draining from the southern end of Mount Mantell, and joining the Warwick a few chains above the oil-seepage above described, a quartzose vein carrying tungsten outcrops. The occurrence lies about half a mile west of the Warbeck–Warwick saddle, and within the metamorphic aureole of the granite. The vein stands vertically beside a pegmatite dyke, and contains irregularly

* "On the District between the Maruia and Buller Rivers," Rep. Geol. Expl. during 1883–84, No. 16, 1884, pp. 1–10.
† "Geology of the South-west Part of Nelson and the Northern Part of the Westland District," Mines Report, 1895, C.–13, p. 5, &c. ‡ Colonial Museum and Laboratory, 18th Ann. Rep., 1883, p. 42. § Colonial Laboratory, 40th Ann. Rep., 1907, p. 57.

PLAN
Showing Claims and Workings in the
BLACKWATER
GROUP OF MINES
BLOCK XIII, WAITAHU S.D.

Scale
CHAINS 10 5 0 10 20 CHAINS
FEET 1000 500 1000 FEET

P. G. MORGAN.
DIRECTOR.

LONGITUDINAL SECTION

Blackwater North Adit
Blackwater N. Shaft (Sinking commenced)
Prohibition Crosscut
North Tunnel
Tram
Creek
Cr.
N. Tunnel
No 1 Level
No 2 Level
No 3 Level
No 4 Level
No 5 Level
No 6
No 7
Alluvial
Adit (Joker)
Low Level Adit
Approx boundary of Ore-shoot
Intersection of Dyke
Fault
Claim boundary
Approximate boundary of Ore-shoot
About 600 ft. above Sea-level

Very rich leader worked here
: Str. N. 50° E

◎ Trig. M.

BATTERY S. C.
Treatment Plant
Incline
Ore Bin
Diabase Dyke
SNOWY RIVER
Old Snowy Creek Adit
Old Snowy Creek Battery
BLACKWATER SOUTH
Blackwater South Adit

Greek Creek
BLACKWATER MINES
Cuarany Creek
PROHIBITION
40 chs to N bdy
North Drive 300
North Drive 730
No 2 Level
Prohibition Crosscut
No 1 Tunnel from Greek Creek
No 1 Level
No 2 Level
No 3 Level
No 4 Level
No 5 Level
No 6 Shaft
No 2 (Adit Level)
Low Level Adit
MILLS & FRY
BLACKWATER NORTH
Blackwater North Shaft (Sinking commenced)
SCOTT'S S.C.
Waiuta P.O
BLACKWATER-WAIUTA RD
LORD READING
40 chs to N bdy
Macdonald's Drive
24' Reef
20' W.F

Compiled and drawn by G.E. Harris

distributed sulphides. With these wolfram is associated, but in discouragingly small amount.* Some prospecting-work has been carried out, but much more will be necessary before the value of the deposit can be estimated.

---

13. NOTES ON THE GEOLOGY OF THE WEBER DISTRICT.

(By J. Henderson, Mining Geologist.)

While on his way to Gisborne last February the writer took the opportunity of spending a day or two at Weber and Herbertville, in order to compare the rocks there exposed with those of the Poverty Bay district. This region has been examined in a general way by several geologists, and a complete bibliography, prepared by Dr. J. A. Thomson, was published in last year's annual report. The geological formations exposed in the district are in ascending order: (1) Early Secondary; (2) Late Secondary; (3) Late Tertiary; (4) Quaternary. Both groups of Secondary rocks are strongly folded, but the Tertiaries, although often steeply tilted, have not been plicated. This is a condition which seems to prevail throughout New Zealand in respect to the Tertiary formations, and sufficient data have now accumulated to permit of the generalization that during and since Tertiary times crustal stresses have found relief, as a rule, by radial dislocations and not by foldings.

The whole district is one of physiographic youth. An elevation of several hundreds of feet during Quaternary times initiated a new erosion cycle, which has now reached a stage at which the main streams flow nearly at grade in narrow channels deeply entrenched below their ancient valley-floors. The interfluvial blocks have not yet been maturely sculptured, and for this reason the tendency is for the arterial roads to follow the ridges and upland plateaux. There is evidence of a later and considerable depression, but the most recent movement has been one of uplift. This brought about the elevation to the extent of perhaps 20 ft. of the estuarine deposits of the drowned valleys.

Structurally the region consists of earthblocks separated by belts of dislocation and differentially elevated. Along the Dannevirke–Herbertville Road the three principal fault-zones noted by the writer occur respectively near the Mangatoro valley, Weber, and Wimbledon. The strikes of these zones, as far as could be determined, are between north and north-north-east. The Mangatoro fault may be studied on the Waitahora Road, where, at a distance of three miles from the junction with the main road, soft Tertiary sandstone butts against weathered greywackes and argillites. These rocks, which are much contorted, probably belong to the Trias-Jura, but may be Lower Cretaceous. The scarp of these old rocks is an important feature for several miles southward along the western side of the Mangatoro valley. Northward it is not so prominent, and the writer passing by coach to and from Weber saw nothing on the main road to indicate the point of crossing of the fault.

The township of Weber is situated on the old flood-plain of the Akitio, and dropping down to the river the road is cut in gently inclined calcareous claystone, probably of Tertiary age. Across the bridge on the Herbertville Road are chalky limestones of totally different appearance and vertical attitude. With them are associated glauconitic sandstones, and the formation is considered to belong to the Cretaceous. The width of exposure is under a mile, the beds on the plateau across the Akitio being masked by alternating layers of Tertiary sandstone and claystone, which exhibit steep dips and variable strikes for more than a mile. Down the river the chalky limestones and glauconitic sandstones shortly disappear, giving place to disturbed Tertiary strata. Down Wainui valley from the plateau Cretaceous rocks make their appearance before the stream is reached, and continue to about half a mile beyond Wimbledon, thus forming an exposure at least four miles in width. The beds are much contorted, and are traversed by several powerful faults. A mile below Wimbledon Tertiary rocks make their appearance, and continue to the coast and to Cape Turnagain, which shows a high cliff of claystone capped by a layer of hard shell limestone.

---

14. PATEA IRONSAND.

(By W. Gibson, Assistant Geologist.)

Acting under instructions, I left the Te Wera camp on the 28th September, 1914, in order to visit Patea for the purpose of collecting samples of ironsand from various parts of that district, and also of furnishing a report on the possibilities connected with the ironsand-deposits themselves. Five days were spent in the district, and the coast-line was traversed for a distance of five miles west of the Patea River mouth, and for two miles to the east.

To the west of Patea perpendicular cliffs 60 ft. in height, and extending beyond Kakaramea, five miles distant, form the barrier against which the spring tides beat. The cliffs afford no access to the beach beyond Schnapper Point, which is three-quarters of a mile west of the Patea breakwater, and is impassable even at low tide. Sand-dunes, more or less dark in colour owing to the presence of ironsand, but now partly covered by vegetation, extend at intervals on top of the cliffs from Patea to Kakaramea, and in some places reach a quarter of a mile inland. On the cliff-edges the ironsand in the dunes has been transformed to a ferric hydrate, and some iron having found its way by solution or mechanically into the underlying sandy beds, these latter are cemented to an average depth of about 6 ft.

The accessible part of the beach, extending from the breakwater to Schnapper Point, is approached from Taranaki Road, a continuation of Egmont Road, the main street of Patea. At low water the width of beach exposed may be as much as 70 yards. Ironsand is present along the whole length of beach, but the thickness and quality of the deposits vary from time to time, owing to the action of the sea.

East of the Patea River for about 15 chains the coast, in contrast to that west of Patea, is low, and presents a somewhat wide blacksand beach to the ocean. Then cliffs, passable only at or near

*Two samples analysed in the Dominion Laboratory in 1912 (see 46th Ann. Rep., 1913, p. 24) contained 10·50 and 9·90 per cent. of tungstic trioxide; these results indicate much better material than that seen by the writer.

low water, extend for 350 yards along the sea-front. The narrow strip of beach seen at low water is cumbered with large blocks of sandstone detached from the cliffs. For a mile and a half to the eastward there is a low coast, fronted by a blacksand beach about 70 yards wide when the tide is out. Although containing much material of good quality, the ironsand-deposits at and immediately above high-water mark will be difficult and expensive to work, owing to the presence of much timber carried down by the Patea River. The dunes that extend inland, in places reaching half a mile from the shore, contain much ironsand, which in general appears to be of better quality than that of the dunes on the western side of the Patea River.

Samples of the ironsand (sixteen in all) were taken at various points that seemed representative of different stages of concentration. The areas of the beaches and sandhills mentioned above form the basis of the calculations made in order to obtain a rough approximation of the iron oxide available for smelting purposes. Deposits that seemed to contain more than 25 per cent. by volume of quartz, sand, or shell-fragments have not been taken into account. There is, in fact, an immense amount of low-grade material which will be available when a sufficiently cheap method of concentration has been evolved. As regards the sea-beaches, the amount present is liable to addition or subtraction, according to the action of the sea, and doubtless if the present deposits on them were removed they would sooner or later be renewed.

The following figures, which are on a conservative basis, give the results of the measurement made :—

	Tons.
Dunes between Patea River and Kakaramea	2,486,000
Beach for three-quarters of a mile west of breakwater (including area between high-water mark and cliff)	265,000
Beach for two miles east of Patea River mouth	92,000
Dunes between Taranaki Road and Patea River	1,276,000
Dunes for one mile east of Patea River	1,255,000
Total	5,374,000

The control of the sands examined is vested in the Patea Harbour Board, which has given an option over them for a period of six months, dating from May, 1915.

The surrounding district, unfortunately, does not contain the limestone and coal required for smelting operations. Limestone can be obtained by sea from several points, the nearest of which are the Golden Bay district, Nelson, and the Mokau River. In the latter case there is some uncertainty about the quality. Good limestone occurs at Te Kuiti and other places in the interior of the North Island, but the cost of railage at ordinary rates will be very heavy. Suitable coal or coke for smelting can be procured from the west coast of the South Island.

It is claimed that by means of magnetic separation the somewhat objectionable titanium oxide, generally present to the extent of from 5 to 10 per cent. in the ironsand, can be largely eliminated. The removal of this constituent, however, in the manner suggested is probably accompanied by an appreciable loss of iron.[a]

The degree of success attending the operations of the experimental works lately erected at Moturoa, near New Plymouth, for the treatment of ironsand by a patented process will probably be a determining factor in the formation of a company to operate on the Patea sands.

Owing to analyses of the samples taken by the writer not yet being available, the following are quoted from Dominion Laboratory reports :—

		1.	2.
*Ferrous oxide (FeO)		27·60	40·68
*Ferric oxide (Fe_2O_3)		51·32	36·05
Manganous oxide (MnO)		0·48	0·35
Titanium dioxide (TiO_2)		9·60	9·20
Alumina (Al_2O_3)		1·04	4·00
Lime (CaO)		1·25	1·80
Magnesia (MgO)		2·60	2·77
Silica (SiO_2)		5·30	3·90
†Phosphoric anhydride (P_2O_5)		0·25	0·09
‡Sulphuric anhydride (SO_3)		0·04	0·01
Vanadium pentoxide (V_2O_5)		0·32	n.d.
Water lost at 100° C.		0·20	0·25
		100·00	99·10
*Equivalent to metallic iron	(per cent.)	57·39	56·87
† ,, phosphorus	,,	0·11	0·39
‡ ,, sulphur	,,	0·016	0·004

(1.) Ironsand from Patea, forwarded by A. D. Bayfeild. Dom. Lab. Rep. No. 47, 1914, p. 26.
(2.) Ironsand from New Plymouth beach, forwarded by E. M. Smith. Dom. Lab. Rep. No. 36, 1903, p. 10.

The following analyses represent ironsand from Manutahi, near Patea, No. 1 being from beach, and No. 2 from drive, forwarded by A. D. Bayfeild. (See Dom. Lab. Rep. No. 47, 1914, p. 26.)

		1.	2.
*Metallic iron	(per cent.)	28.33	20·50
Titanium dioxide (TiO_2)	,,	4·20	2·40
Vanadium pentoxide (V_2O_5)	,,	0·13	0·34
*Equivalent to magnetic iron oxide (Fe_3O_4) ..	,,	39·11	28·29

[a] See, in this connection, analyses of ironsand and of tailing after treatment in magnetic separator quoted in Dom. Lab. Rep. No. 43, 1910, p. 13.

APPENDIX D.

STATE COAL-MINES

(REPORT ON THE WORKING OF), FOR THE YEAR ENDED 31ST MARCH, 1915.

Prepared in accordance with the requirements of Section 118 of the Coal-mines Act, 1908.

The MANAGER, State Coal-mines, to the UNDER-SECRETARY, Mines Department, Wellington.

SIR,— New Zealand State Coal-mines Office, Greymouth, 11th June, 1915.

I beg to submit the annual report of the New Zealand State Coal-mines for the year ended 31st March, 1915.

The gross output of the mines was 226,149 tons, which, after allowing for mine consumption and waste and with the addition of stocks from last year, left 215,458 tons for disposal, and when compared with the figures of last year shows an increase of 27,870 tons.

The Point Elizabeth Mine produced 117,261 tons of marketable coal, an increase of 6,860 tons on last year's figures.

The following table shows the quantity disposed of, after allowing for stocks on hand and afloat at beginning and end of year :—

To whom.	Screened.	Unscreened.	Bunker.	Small.	Totals.
	Tons.	Tons.	Tons.	Tons.	Tons.
Depots	23,142	13,776	..	9,354	46,272
Railways	10,626	8,880	..	..	19,506
Other Government Departments	580	927	484	632	2,623
Private consumers	10,309	5,068	18,082	14,743	48,202
Totals	44,657	28,651	18,566	24,729	116,603

The Liverpool Mine produced 86,066 tons of marketable coal, an increase of 63,896 tons. The following table shows the quantity disposed of, after allowing for stocks on hand and afloat at beginning and end of year :—

To whom.	Screened.	Unscreened.	Bunker.	Small.	Totals.
	Tons.	Tons.	Tons.	Tons.	Tons.
Depots	17,076	1,373	..	24,205	42,654
Railways	11,274	57	..	..	11,331
Other Government Departments ..	575	145	592	47	1,359
Private consumers	1,991	4,763	1,182	20,837	28,773
Totals	30,916	6,338	1,774	45,089	84,117

This mine is now in full working-order, and the increase in its output should be substantial for the next few years.

The Seddonville Mine was closed down in May. The following table shows the quantity disposed of for that period :—

To whom.	Screened.	Unscreened.	Bunker.	Small.	Totals.
	Tons.	Tons.	Tons.	Tons.	Tons.
Depots	..	..	..	202	202
Railways	1,526	..	..	..	1,526
Private consumers	22	744	19	1,919	2,704
Totals	1,548	744	19	2,121	4,432

Point Elizabeth Colliery.

Coal-winning.

The gross output from the colliery since its inception in June, 1904, amounted to 1,946,585 tons.

The average number of men and boys employed in and about the mine during the year were 233 men and 20 boys, made up of 92 coal-miners, 84 adult underground employees, and 3 boys; and on the surface 57 adults and 17 boys.

The time worked averaged 4·7 days per week.

The miners' average earnings for the days worked were—in No. 1 Section, 17s. 9·74d., and in No. 2 Section, 16s. 6·55d., or a mean average of 17s. 1·83d. per shift.

Underground Development.

With the exception of a small area which is being developed in what is known as the bottom seam in the No. 2 Section of this colliery, the bulk of the output was obtained from pillar-extraction.

During the year much difficulty has been encountered at this colliery through spontaneous combustion. The first fire originated in the dip workings of the No. 2 Section, in consequence of which that section was rendered idle for twenty-nine days before the fire was effectively dealt with. This was done by building stoppings to exclude the air from the fire area. The stoppings required were numerous, owing to the method of working not being suitable for mines liable to spontaneous combustion.

The second fire originated in the old workings of the crosscut dip in the No. 1 Section, which is separated from the main-dip workings by a fault. In this case the section was rendered idle for only five days. The fire was kept in check by pumping water into the vicinity, thus enabling the stoppings to be built for sealing off the fire area.

As the fire in this case originated in the old workings where access was impossible, it was deemed advisable for the safety of other parts of the mine to flood the section and sacrifice the small quantity of coal which remained to be worked in that dip area. The flooding was effective, the water rising much higher than the level of the fire.

Exploratory Work.

In connection with this colliery much exploratory work has to be done in the way of boring different parts of the reserve, and it is to be regretted that such operations have not been very successful. As there is no development-work going on at this colliery and the present workings are rapidly approaching exhaustion, unless some other suitable area is available and capable of being operated by the present plant the approximate life of this colliery may be estimated at two years.

Accidents.

Accidents of a minor character occurred during the year, but there were none of a serious nature.

Plant.

The plant and machinery in and about the colliery have been maintained in good condition. One hour only was lost during the year, due to a breakdown of the screening plant.

General.

In the conduct of the workings of this colliery and the different branches connected therewith it has been the aim of the management to keep down the cost of production and other expenditure to the lowest, consistent with safety and efficiency; but in connection with this colliery there are items of cost which for some time cannot be reduced, whether the mine is kept working full time or otherwise, the principal item being that of pumping. The same power and attention is still required for this work with a daily output of 500 tons as was hitherto required when dealing with a much larger output, consequently the tonnage cost under this head is high.

Liverpool Colliery.

The mine worked on 253 days 4 hours, an average of 4·87 days per week. The balance of the possible working-time—viz., 313 days—is accounted for as follows: Pay Saturdays, 22; union holidays, 14; want of shipping, 16 days 4 hours; bar unworkable, 7 days.

The average number of men and boys employed in and about the mine in connection with coal-winning were 181 men and 13 boys, made up as follows: Coal-miners, 87; other adult underground employees, 62; on the surface, 32 adults and 13 boys. In addition to those employed in connection with coal-winning there were employed on property and development work 23 men and 2 boys.

Underground Development.

The principal work under this head during the year was confined to developing the areas in the vicinity of the Nos. 1, 2, and 3 Sections of this colliery, and, with the exception of a moderate area which has been proved in the No. 3 Section, the development of the others have been very unsatisfactory.

In the No. 1 Section, which is situated near the terminus of the upper inclined haulage road, there are employed twenty pairs of miners on one shift only. This section, which was looked upon as the principal one, has, owing to faulting and pinching-out of the seam, not a great future before it. The development of this section was to a large extent dependent upon the area eastward from the present opening. The winning-places, however, in this direction have for some considerable time been stopped, owing to the pinching-out of the seam. Recent exploratory work has proved there is nothing to warrant any further expenditure in that direction. The area remaining to be worked in this section is therefore somewhat limited.

The No. 2 Section, which is situated near the same terminus, has also opened up very unsatisfactorily. The seam in this section is very steeply inclined, the average dip being 47 degrees. Stone bands also occur in the seam, in consequence of which the main winning-places and several others are stopped. The number of miners in this section is limited to six pairs, there not being at any time sufficient area for further development to enable more to be employed, and for these reasons it will be impossible to extract the pillars and fill the coal in a marketable condition. The time is therefore not far distant when operations in this section will be abandoned.

The No. 3 Section, situated near the bins, has developed fairly well, proving a moderate area. This section is worked on two shifts employing fourteen pairs of miners on each shift. Although it is not profitable to work two shifts unless special circumstances warrant it, in this case, however, two shifts are employed, owing to a fault cutting off all winning-places in a northerly direction, thereby restricting the output. This displacement has been driven through in the main heading and the companion headings, and a commencement has been made to develop the outlying area. When opening up this seam provision was made only for a temporary haulage-road; the output has therefore been restricted. In order to cope with the present output with a minimum of labour, and at the same time enable the output to be increased until the new haulage-road which is now in the course of being driven is completed, an endless-rope haulage was installed during the period this section was temporarily stopped, pending the arrival of permitted explosives for use in the mine.

Exploratory Work.

The development-work at this colliery not being satisfactory, a vigorous prospecting campaign has been carried out in a systematic manner by means of boring in close proximity to the haulage-road, also prospecting other parts of the reserve by practical miners. The result of such work has been satisfactory. Boring operations were carried out on the eastern side of the main haulage at the upper end. In all seven bores were put down, the approximate positions of which are shown on the accompanying plan. With the exception of one bore near Tararu Creek all were successful.

A moderate area of this seam having been proved, arrangements will be made at an early date to develop the seam.

A sample of the coal from the bores has been analysed by the Dominion Analyst, the result of which is as follows:—

Fixed carbon	59·36
Volatile hydrocarbons	34·29
Water	0·88
Ash	5·47
	100·00
Total sulphur	0·28 per cent.

From the above analysis it will be seen that for gas-production, blacksmith, steam, and household purposes this coal should command a ready sale.

On the western side of the haulage-road the seam has been located (the outcrop of which is 20 ft. thick) and traced for a considerable distance. Further work is necessary before anything definite can be stated.

Workmen's Dwellings.

During the year the Department has erected four four-roomed, three three-roomed, and two two-roomed cottages for families, also twenty huts for single men. A boardinghouse was also purchased, which is centrally situated for workmen employed at the upper sections of this colliery.

At the present time the accommodation for workmen appears to be adequate. With reference to the cottage hospital, bath-houses, and electric tramway mentioned in the last annual report, this work is suspended in the meantime.

Surface Works.

The whole of the surface works and machinery which have been laid out on a permanent scale at this colliery have been maintained in efficient working order.

The following new buildings have been erected during the year: (*a*) Colliery office; (*b*) store for mine requisites; (*c*) surgery; (*d*) workshops; (*e*) lamp-room; (*f*) magazine for storage of explosives.

Accidents.

There have been a number of minor accidents during the year, and one which may be classed as serious, but no fatality.

Future Developments.

The principal works projected under this head are as follows: (*a*) Development of the area through the fault in the No. 3 Section near the storage-bins; (*b*) development of the seam recently proved by boring near the upper terminus of the main haulage-road.

In order to determine whether a profitable block of coal exists or not, that could be economically worked and dealt with by the present haulage, it will be necessary to thoroughly test the field by bores prior to the more expensive operation of driving tunnels.

In concluding my report, permit me to state that the officers in all departments have discharged their duties in a most satisfactory manner, and the Consulting Engineer has rendered valuable assistance in connection with the rapidly extending works.

I have, &c.,
I. A. James, Manager.

Balance-sheet of the New Zealand State Coal-mines.

Statement of Liabilities and Assets at 31st March, 1915.

Liabilities.	£ s. d.	£ s. d.
Debenture loan	175,000 0 0	
Loan under Appropriation Act, 1912	50,000 0 0	
Inscribed stock	2,601 0 7	
		227,601 0 7
Debenture sinking fund	13,200 0 0	
Reserve fund	5,884 11 2	
		19,084 11 2
Accrued interest	4,282 4 6	
Sundry creditors	13,498 8 10	
		17,780 13 4

Assets.	£ s. d.	£ s. d.	£ s. d.
Point Elizabeth Colliery and Development Property Account—			
Outlay during the year	73 14 10		
Depreciation	73 14 10		
		..	
Machinery, plant, ropes, and rolling-stock—			
Cost at 31st March, 1914	17,068 13 4		
Additional outlay during the year	309 8 5		
	17,378 1 9		
Depreciation	8,842 10 7		
		8,535 11 2	
Buildings at mine—			
Cost at 31st March, 1914	1,883 2 8		
Additions during the year	16 8 1		
	1,899 10 9		
Depreciation	477 16 6		
		1,421 14 3	
Cottages—			
Cost at 31st March, 1914	1,855 9 7		
Depreciation	340 11 0		
		1,514 18 7	
Stores (stock on hand)	2,546 11 9		
Coal (stock on hand at mine and wharf)	1,129 6 0		
Coal (stock on hand, afloat)	1,168 8 10		
		4,844 6 7	
			16,316 10 7
Point Elizabeth (Liverpool) Colliery and Development Property Account—			
Cost at 31st March, 1914	95,243 17 2		
Additions during the year	5,389 13 10		
	100,633 11 0		
Depreciation	5,091 19 10		
		95,541 11 2	
Machinery, plant, ropes, and rolling-stock—			
Cost at 31st March, 1914	46,167 11 0		
Additions during the year	4,400 4 7		
	50,567 15 7		
Depreciation	2,557 11 6		
		48,010 4 1	
Buildings at mine—			
Cost at 31st March, 1914	2,473 5 3		
Additions during the year	1,278 16 1		
	3,752 1 4		
Depreciation	189 3 4		
		3,562 18 0	
Cottages at mine	173 1 1		
Additions	3,051 19 5		
	3,225 0 6		
Depreciation	161 7 4	3,063 13 2	
Coal (stock on hand at mine and wharf)	3,364 3 6		
Coal (stock on hand, afloat)	915 1 4		
		4,279 4 10	
			154,457 11 3

BALANCE-SHEET OF THE NEW ZEALAND STATE COAL-MINES—*continued.*

Statement of Liabilities and Assets at 31st March, 1915—continued.

Liabilities	*Assets.*	£ s. d.	£ s. d.	£ s.
	Seddonville Colliery—			
	Machinery, plant, ropes, and rolling-stock—			
	Cost at 31st March, 1914	3,684 5 6		
	Less sales	541 11 0		
		3,142 14 6		
	Depreciation	3,142 14 6		
			..	
	Buildings at mine—			
	Cost at 31st March, 1914	233 4 10		
	Less sales	7 0 0		
		226 4 10		
	Depreciation	226 4 10		
			..	
	Cottages—			
	Cost at 31st March, 1914	119 16 11		
	Depreciation	119 16 11		
			..	
	Stores (stock on hand)	..	..	134 5 7
	Briquette plant—			
	Cost at 31st March, 1914	2,002 13 8		
	Less plant sold	185 0 0		
		1,817 13 8		
	Depreciation	1,817 13 8		
			..	
	Hulks Property Account—			
	Cost at 31st March, 1914	2,487 13 4		
	Less sale of hulk	1,600 0 0		
		887 13 4		
	Depreciation	121 13 9		
			765 19 7	
	Wellington Depot Property Account—			
	Cost at 31st March, 1914	1,713 18 10		
	Additions during the year	2,099 2 6		
		3,813 1 4		
	Depreciation	290 7 6		
		3,522 13 10		
	Stocks on hand	1,218 16 8		
			4,741 10 6	
				5,507 10 1

BALANCE-SHEET OF THE NEW ZEALAND STATE COAL-MINES—*continued.*

Statement of Liabilities and Assets at 31st March, 1915—continued.

Liabilities	£ s. d.	*Assets.*	£ s. d.	£ s. d.	£ s. d.
		Christchurch Depot Property Account—			
		Cost at 31st March, 1914	4,722 3 3		
		Additions during the year	14 18 0		
			4,737 1 3		
		Depreciation	349 2 7		
				4,387 18 8	
		Stock on hand		874 10 5	
					5,262 9 1
		Wanganui Depot Property Account—			
		Cost at 31st March, 1914	1,564 1 8		
		Additions during the year	4 17 6		
			1,568 19 2		
		Depreciation	107 2 9		
				1,461 16 5	
		Stock on hand		1,860 11 9	
					3,322 8 2
		Dunedin Depot Property Account—			
		Cost at 31st March, 1914	1,199 12 8		
		Less sales	**300 0 0**		
			899 12 8		
		Depreciation	100 7 10		
				799 4 10	
		Stock on hand		917 8 5	
					1,716 13 3
		Wellington Office Furniture Account—			
		Cost at 31st March, 1914	74 3 1		
		Less sales	17 5 0		
				56 18 1	
		Depreciation		9 9 8	
					47 8 5
		Sundry debtors		12,169 15 1	
		Suspense Account, premiums, deposits, &c.		584 5 10	
		Loan flotation charges		2,081 0 0	
					14,835 0 11
		Cash in hand and in Public Account on 31st March, 1915		25,636 7 1	
		Less vouchers outstanding		230 12 0	
					25,405 15 1
		General Profit and Loss Account—			
		Balance, 31st March, 1914		23,307 18 9	
		Loss for year		14,152 13 11	
					37,460 12 8
	£264,466 5 1				£264,466 5 1

Mines Department, Wellington, 11th September, 1915.
LOUIS H. EILERS, F.R.A., N.Z., Accountant.

W. D. S. MACDONALD,
Minister of Mines.

Examined and found correct.
ROBERT J. COLLINS, Controller and Auditor-General.

Statement of General Profit and Loss Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Point Elizabeth Colliery Trade Expenses Account ..	52,732 10 3		By Point Elizabeth Colliery Working Account—Gross profit ..	51,263 11 11	
Liverpool Colliery " " ..	52,929 19 0		Liverpool Colliery " " ..	45,063 10 10	
Seddonville Colliery " " ..	5,804 13 2		Seddonville Colliery " " ..	1,822 17 10	
Wellington Depot " " ..	10,943 17 7		Wellington Depot Trading Account—Gross profit ..	11,939 8 9	
Christchurch Depot " " ..	6,210 2 4		Christchurch Depot " " ..	6,474 8 10	
Wanganui Depot " " ..	2,703 9 2		Wanganui Depot " " ..	2,525 8 10	
Dunedin Depot " " ..	2,058 18 9		Dunedin Depot " " ..	1,943 1 6	
		133,383 10 3			121,032 8 6
Wellington office furniture depreciation	9 9 8		Point Elizabeth Colliery rents	128 7 3	
Briquette-works depreciation, &c.	2,089 13 6		Liverpool " "	169 3 9	
		2,099 3 2			297 11 0
			Balance: Loss for year	..	14,152 13 11
		£135,482 13 5			£135,482 13 5
Balance down		14,152 13 11			
Balance brought forward from last year		23,307 18 9			
		£37,460 12 8			

Statement of Point Elizabeth Colliery Working Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Stock of coal on hand at 31st March, 1914	1,518 18 8		By Sales of coal	97,394 4 11	
Stock of timber on hand at 31st March, 1914	61 8 4		Sales of timber	254 4 3	
		1,580 7 0	Sales of stores	1,808 0 5	
Coal-winning—					99,456 9 7
Wages	40,285 14 4		Stock of coal on hand at 31st March, 1915—		
Materials used	2,971 5 7		At mine and wharf	1,129 6 0	
Stores used	2,071 4 11		Afloat	1,168 8 10	
		45,328 4 10			2,297 14 10
Timber cut	124 5 9				
Stores sold	1,586 5 5				
		1,710 11 2			
Special rate	1,132 7 6				
Royalty	739 2 0				
		1,871 9 6			
Balance: Gross profit at mine	..	51,263 11 11			
		£101,754 4 5			£101,754 4 5

Statement of Point Elizabeth Colliery Profit and Loss Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Management and office salaries	1,905 19 6		By Balance of Working Account—		
Interest and exchange	3,025 3 4		Gross profits at mine	51,263 11 11	
Travelling-expenses	108 3 7		Rents	128 7 3	
Printing and stationery	55 19 8				51,391 19 2
Repairs and maintenance	1,164 19 3		Balance: Loss		1,340 11 1
Telegrams and postages	70 10 2				
Railway haulage	9,724 15 9				
Insurances	13 8 2				
Compensation for accidents and fund	1,420 8 7				
Railway freights	39 4 1				
General expenses	127 4 7				
Marine freights	23,027 8 7				
Hulks Working Account (proportion)	1,834 18 9				
Wharfages, &c.	469 17 10				
Audit fees	9 15 6				
Depreciation: Mine, buildings, plant, and machinery	9,734 12 11				
		52,732 10 3			
		£52,732 10 3			£52,732 10 3

Statement of Point Elizabeth (Liverpool) Colliery Working Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Stock of coal on hand at 31st March, 1914		1,796 18 8	By Sales of coal	76,148 11 8	
Coal-winning—			Sales of timber	46 19 10	
Wages	29,983 6 5				76,195 11 6
Materials used	1,370 17 3		Stock of coal on hand at 31st March, 1915—		
Stores used	1,405 8 6		At mine and wharf	3,364 3 6	
		32,759 12 2	Afloat	915 1 4	
Timber cut		21 6 8			4,279 4 10
Special rate		833 8 0			
Balance: Gross profit at mine		45,063 10 10			
		£80,474 16 4			£80,474 16 4

Statement of Point Elizabeth (Liverpool) Colliery Profit and Loss Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Management and office salaries	1,449 2 8		By Gross profits at mine	45,063 10 10	
Interest and exchange	4,882 5 6		Rents	169 3 9	
Travelling-expenses	114 5 0				45,232 14 7
Printing and stationery	45 15 7		Balance: Loss		7,697 4 5
Repairs and maintenance	280 13 7				
Telegrams and postages	49 12 2				
Railway haulage	9,249 2 10				
Compensation for accidents and fund	594 16 4				
Railway freights	862 8 5				
General expenses	102 14 6				
Marine freights	25,238 11 9				
Hulks Working Account (proportion)	930 10 4				
Wharfages, &c.	603 3 3				
Audit fees	6 14 6				
Loan-flotation charge (first instalment)	520 0 7				
Depreciation: Mine, buildings, plant, and machinery	8,000 2 0				
		52,929 19 0			
		£52,929 19 0			£52,929 19 0

Statement of Seddonville Colliery Working Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Stock of coal on hand at 31st March, 1914		540 2 3	By Sales of coal		3,220 19 0
Coal-winning—					
Wages	792 19 2				
Materials used	14 15 6				
Stores used	50 4 3				
		857 18 11			
Balance: Gross profits at mine		1,822 17 10			
		£3,220 19 0			£3,220 19 0

Statement of Seddonville Colliery Profit and Loss Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.
To Management and office salaries	203 6 8		By Balance of Working Account—	
Interest and exchange	585 1 8		Gross profits at mine	1,822 17 10
Travelling-expenses	51 7 4		Balance : Loss for year	3,981 15 4
Printing and stationery	1 15 10			
Telegrams and postages	3 0 0			
Repairs and maintenance	6 15 0			
Railway haulage	581 15 1			
Compensation for accidents and fund	17 12 8			
General expenses	24 12 0			
Marine freights	561 2 2			
Wharfages, &c.	2 6 6			
Dismantling	277 2 0			
Depreciation : Mine, buildings, plant, and machinery ..	3,488 16 3			
		5,804 13 2		
		£5,804 13 2		£5,804 13 2

Wellington Depot Trading Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Stocks on hand at 31st March, 1914	..	3,291 10 2	By Sales of coal	49,450 14 1	
Purchases of coal	34,551 13 1		Sales of firewood, coke, &c.	1,264 18 7	
Purchases of firewood, coke, &c.	1,276 4 9				50,715 12 8
		35,827 17 10	Stocks on hand at 31st March, 1915—		
Cartage to depot	..	875 12 7	Coal	775 12 8	
Balance : Gross profits	..	11,939 8 9	Firewood, &c.	443 4 0	
					1,218 16 8
		£51,934 9 4			£51,934 9 4

Wellington Depot Profit and Loss Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.
To Wages	3,257 14 5		By Balance of Trading Account	11,939 8 9
Salaries	1,078 15 6			
Rents	848 0 0			
Rates	146 0 8			
Interest	179 18 1			
Travelling-expenses	24 13 9			
Repairs and maintenance	322 13 1			
Telegrams and postages	18 0 0			
Printing and stationery	133 6 7			
Insurances	15 11 0			
Cartage	3,549 1 4			
Sacks	133 5 11			
Freights, wharfages, &c.	774 5 6			
General expenses	64 13 9			
Alterations	50 0 0			
Audit fees	27 3 4			
Bad debts written off	30 7 2			
Depreciation	290 7 6			
		10,943 17 7		
Balance: Net profit		995 11 2		
		£11,939 8 9		£11,939 8 9

Christchurch Depot Trading Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Stocks on hand, 31st March, 1914		1,920 2 4	By Sales of coal	41,498 1 0	
Purchases of coal	30,142 4 5		Sales of firewood, coke, &c.	1,048 16 5	
Purchases of firewood, coke, &c.	595 5 6				42,546 17 5
		30,737 9 11	Stocks on hand at 31st March, 1915—		
Haulage to depot		4,289 6 9	Coal	694 9 3	
Gross profit		6,474 8 10	Firewood, coke, &c.	180 1 2	
					874 10 5
		£43,421 7 10			£43,421 7 10

Christchurch Depot Profit and Loss Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Wages	1,826 1 7		By Balance of Trading Account	6,474 8 10	
Salaries	880 11 8				
Rents	89 10 0				
Interest and exchange	215 17 7				
Repairs and maintenance	162 15 9				
Telegrams and postages	14 5 0				
Printing and stationery	26 19 1				
Insurances	11 16 6				
Travelling-expenses	37 18 0				
Cartage	2,005 19 8				
Sacks	91 8 3				
Freights	410 7 6				
General expenses	30 19 2				
Audit fees	56 10 0				
Depreciation	349 2 7				
		6,210 2 4			
Balance: Net profit		264 6 6			
		£6,474 8 10			£6,474 8 10

Wanganui Depot Trading Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Stocks on hand at 31st March, 1914		1,685 8 2	By Sales of coal	11,489 18 6	
Purchases of coal	8,672 2 10		Sales of firewood, coke, &c.	1,007 19 6	
Purchases of firewood, coke, &c.	728 0 4				12,497 18 0
		9,400 3 2	Stocks on hand at 31st March, 1915—		
Haulage to depot		747 9 7	Coal	1,530 2 0	
Gross profit		2,525 8 10	Firewood, coke, &c.	330 9 9	
					1,860 11 9
		£14,358 9 9			£14,358 9 9

Wanganui Depot Profit and Loss Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.
To Wages	665 19 10		By Balance of Trading Account	2,525 8 10
Salaries	505 0 0		Balance: Loss	178 0 4
Rents	111 5 0			
Interest and exchange	66 11 4			
Repairs and maintenance	64 18 11			
Telegrams and postages	15 12 11			
Printing and stationery	38 9 6			
Travelling-expenses	15 19 8			
Insurance	6 10 8			
Cartage	849 11 3			
Sacks	69 16 8			
Freights, &c.	117 8 10			
General expenses	52 15 2			
Audit fees	18 6 8			
Depreciation	107 2 9			
		2,703 9 2		
		£2,703 9 2		£2,703 9 2

Dunedin Depot Trading Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.	£ s. d.
To Stocks on hand at 31st March, 1914		919 4 9	By Sales of coal	11,603 1 8	
Purchases of coal	8,553 2 8		Sales of firewood, coke, &c.	76 19 3	
Purchases of firewood, coke, &c.	52 11 3				11,680 0 11
		8,605 13 11	Stocks on hand at 31st March, 1915—		
Wharfages, &c.	957 0 10		Coal	876 7 2	
Cartage to depot	172 8 4		Firewood, coke, &c.	41 1 3	
		1,129 9 2			917 8 5
Balance: Gross profit		1,943 1 6			
		£12,597 9 4			£12,597 9 4

Dunedin Depot Profit and Loss Account for the Year ended 31st March, 1915.

Dr.	£ s. d.	£ s. d.	*Cr.*	£ s. d.
To Wages	537 3 2		By Balance of Trading Account	1,943 1 6
Salaries	371 17 4		Balance: Loss	115 17 3
Rents	200 0 0			
Rates	25 16 9			
Interest	62 2 8			
Repairs and maintenance	64 9 3			
Telegrams and postages	4 0 0			
Printing and stationery	29 10 8			
Insurances	2 6 10			
Travelling-expenses, &c.	1 9 7			
Cartage	608 12 5			
Freights, &c.	3 3 7			
General expenses	20 12 5			
Sacks	18 6 3			
Audit fees	9 0 0			
Depreciation	100 7 10			
		2,058 18 9		
		£2,058 18 9		£2,058 18 9

Statement of the Receipts and Expenditure of the New Zealand State Coal-mines for the Year ended 31st March, 1915.

Receipts.	£ s. d.	£ s. d.
To Cash in hand and in Public Account at 31st March, 1914		30,250 16 7
Proceeds of sale of coal	213,066 9 0	
Proceeds of sale of hulk	1,600 0 0	
		214,666 9 0
Recoveries	6,315 8 0	
Refunds	9 15 8	
		6,325 3 8
		£251,242 9 3

Expenditure.	£ s. d.	£ s. d.
By Point Elizabeth Colliery—		
Property and development	105 4 6	
Machinery, plant, and rolling-stock	383 8 1	
Buildings	15 9 4	
Stores and materials	9,182 18 10	
Wages	41,716 6 3	
Timber	290 17 6	
Special rate	1,006 8 6	
Royalty	392 10 6	
		53,093 3 6
Liverpool Colliery—		
Property and development	5,537 14	
Machinery, plant, and rolling-stock	4,154 6 4	
Buildings	1,509 19 0	
Cottages	2,625 2 4	
Stores and materials	1,244 10 3	
Wages	30,659 19 0	
Special rate	164 19 9	
		45,896 11 3
Seddonville Colliery—		
Stores and materials	102 16 7	
Wages	1,762 19 7	
		1,865 16 2
Hulks, working	2,575 2 2	
Wellington Depot, property	2,193 2 6	
" " working	12,663 2 9	
Christchurch Depot, property	14 18 0	
" " working	10,617 14 11	
Wanganui Depot, working	4,291 3 2	
Dunedin Depot "	3,232 8 9	
		35,587 12 3
Management and office salaries	3,775 8 8	
Rents	51 0 0	
Interest and exchange	10,644 17 8	
Marine freights	48,507 16 9	
Travelling-expenses	290 3 5	
Printing and stationery	104 6 6	
Telegrams and postages	123 2 4	
Repairs and maintenance	1,144 2 1	
Railway haulage	20,228 4 11	
Insurances	13 8 2	
Compensation for accidents and fund	1,863 6 10	
General expenses	293 2 9	
Wharfages, &c.	1,157 3 5	
Railway freights	1,013 17 3	
Refunds	10 10 3	
Audit fees	23 0 0	
Deposit Contract Account	150 0 0	
		89,393 11 0
Cash in hand and in Public Account at 31st March, 1915	25,636 7 1	
Less vouchers passed	230 12 0	
		25,405 15 1
		£251,242 9 3

Mines Department, Wellington, 11th September, 1915.
LOUIS H. EILERS, F.R.A., N.Z., Accountant.

W. D. S. MACDONALD,
Minister of Mines.

Examined and found correct.
ROBERT J. COLLINS, Controller and Auditor-General.

Approximate Cost of Paper.—Preparation, not given; printing (1,200 copies, including diagrams, plans, and specifications), £150.

By Authority: JOHN MACKAY, Government Printer, Wellington.—1915.

Price 3s.

MINES DEPARTMENT
NEW ZEALAND

NEW ZEALAND STATE COLLIERIES

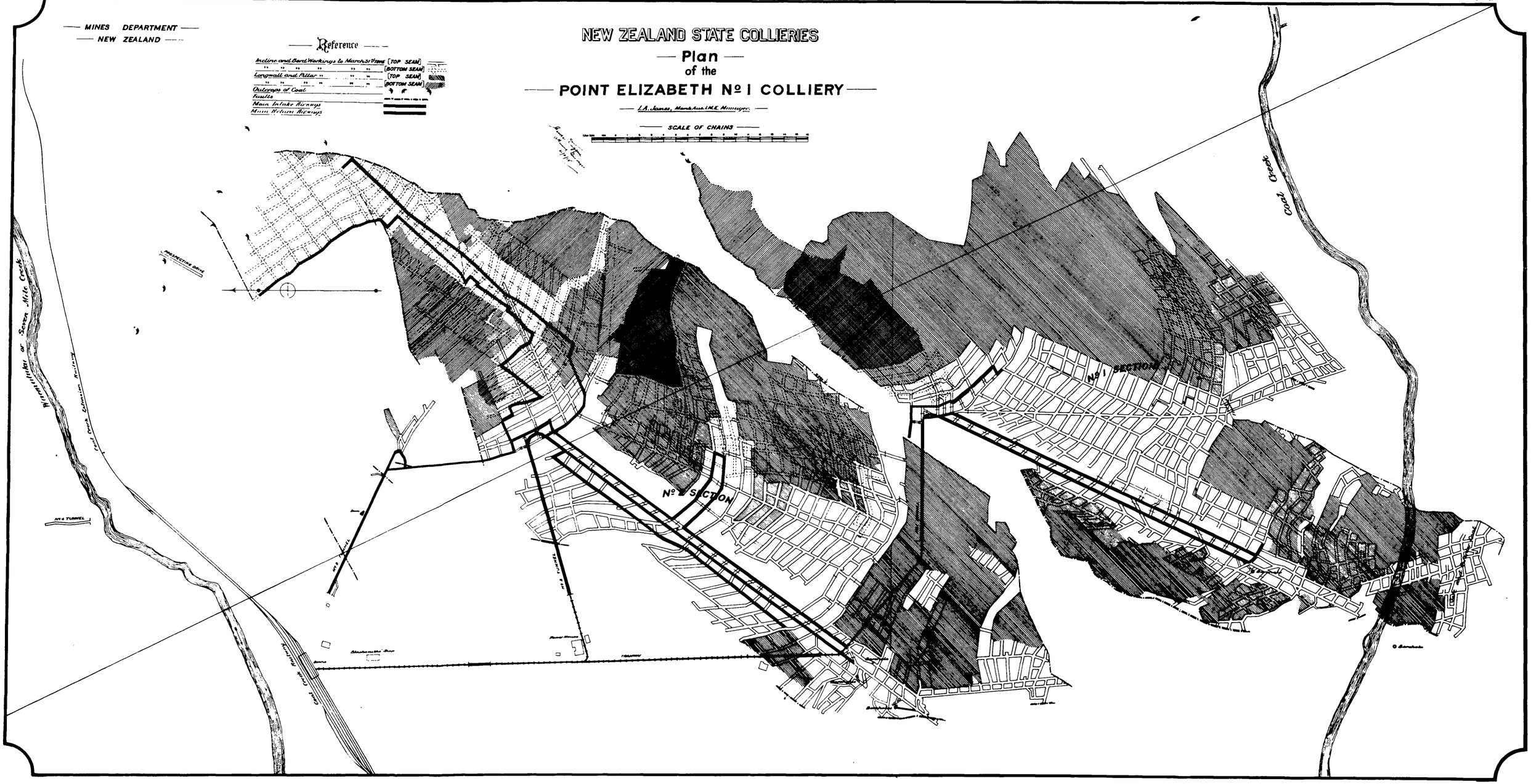
Plan of the POINT ELIZABETH No 1 COLLIERY

L.A. James, Mem. Aus. I.M.E. Manager.

Reference

- Incline and Bord Workings to March 31st 1906 [TOP SEAM]
- " " " " " " [BOTTOM SEAM]
- Longwall and Pillar " " [TOP SEAM]
- " " " " " " [BOTTOM SEAM]
- Outcrops of Coal.
- Faults
- Main Intake Airways
- Main Return Airways

SCALE OF CHAINS



NEW ZEALAND STATE COLLIERIES

PLAN OF THE LIVERPOOL COLLIERY

I.A. James. M.Aust.I.M.E. Manager.