SESS. II.—1897.
NEW ZEALAND.

THE GOLDFIELDS OF NEW ZEALAND:

REPORT ON ROADS, WATER-RACES, MINING MACHINERY, AND OTHER WORKS IN CONNECTION WITH MINING.

Presented to both Houses of the General Assembly by Command of His Excellency.

CONTENTS.

	Page
Goldfields, Roads, Water-races, Mining Machinery, and other Works in connection with Mining, Report on, by George Wilson, Inspecting Engineer	1-237
Subsidised Roads and Tracks	1
Roads constructed by Direct Grants	2
Prospecting for Gold	2
Schools of Mines	3-21
Thames School of Mines	3-12
Reefton School of Mines	12-14
Otago School of Mines	14-19
Nelson School of Mines	19-20
Expenditure on Schools	21
Water-races	21-28
Waimea Water-race	21-22
Callaghan's	22
Kumara Water-race	22-23
Waimea-Kumara Water-races	23-24
Mount Ida Water-race	24-27
Summary showing Results of Working the Kumara Water-races for Fourteen Years, from 1st April, 1883, to 31st March, 1897	21
Blackstone Hill Water-race	27
Summary of Water-races—Statement of Profits and Losses on the Working of the Water-races for the last Nineteen Years	28
Gold- and Silver-mining	28-152
Quartz-workings	29-124
List of Companies outside the Colony interested in Mining in New Zealand	29-31
North Island	31-108
Puhipuhi	31-32
Abstract of Special Claims, Whangarei	31
Ohaeawai	32
Great Barrier Island	32-34
Abstract of Special Claims, Great Barrier Island	33
Coromandel District	34-53
Abstract of Special Claims, Coromandel	34-38
Abstract of Special Claims, Kuaotunu	38-39
Port Charles District	40
Cabbage Bay District	40
Kennedy Bay District	40
Paul's Creek District	40
Tokatea District	40-43
Waikoromiko District	43
Kapanga District	43-46
Kauri Block	46-49
Cadman's Gully, Karaka, and Pukemaukuku District	49
Castle Rock District	49
Manaia District	49
Whangapoua District	49
Matarangi District	49
Kuaotunu District	49-52
Opito and Kuaotunu No. 3 District	52
Mahakirau	52

	Page
Quartz-workings (North Island)—*continued.*	
Moewai	52
Hahei	52
Boat Harbour	52
Kauri Gold Estates Company	52
Thames District	53-76
Abstract of Special Claims, Thames	53-59
Mata District	60
Tapu District	60
Waiomo District	60
Puru District	60
Tararu District	60-61
Kuranui District	61-66
Grahamstown District	66
Thames Big Pump	66
Waiotahi District	66-67
Waiokaraka District	67-72
Block XVII. District	72
Shortland District	72
Karaka District	73
Una Hill and Te Papa District	73
Hape Creek District	73-74
Otunui District	74
Matatoki District	74
Kirikiri District	74
Puriri District	74
Neavesville District	74
Tairua River District	75
Ohui District	75
Whangamata District	75
Ohinemuri District	76-97
Abstract of Special Claims, &c., Ohinemuri	76-84
Maratoto District	85
Komata District	85-87
Karangahake District	87-90
Waihi District	90-93
Wharekiraupunga District	93-94
Waitekauri	94-97
Te Aroha District	97-99
Abstract of Special Claims, &c., Te Aroha	98
Waiorongomai District	98-99
Tui District	99
Tauranga County	99
Te Puke District	99
Kaimai Valley and Katikati Districts	99
Accidents in Gold-mines	99-100
List of Machinery supplied	100
Return of Stone crushed, Auckland District	101
Return of Quartz-crushing Machines, Auckland District	102-103
Return of Quartz crushed and Gold obtained, Auckland District	103-106
Comparative Statement showing Increase or Decrease for Years 1896-97 and 1895-96	106
Comparative Statement of Returns for Hauraki Mining District for Years ending 31st March, 1897 and 1896	107

Page

Quartz-workings (North Island)—*continued.*
Waihi Gold-mining Company's Returns .. 108
Middle Island 108–124
Abstract of Licenses for Special Claims, &c. 108–111
Collingwood District 111–112
Lyell District 112
Maruia District 112–113
Reefton District 113–116
Murray Creek District 116–117
Painkiller District 116
Merrijigs 116–117
Grey District 117
Blackball District 117
Ross District 117
Cedar Creek 117
Battery Returns, West Coast Districts ..117–118
Otago District 118–124
Abstract of Special Claims, &c. ..118–120
Macetown District 120–123
Nenthorn 123
Preservation Inlet 123–124
Returns from Quartz-mines for Year ending 31st March, 1897 124
Alluvial Mining 124–136
Nelson District 124–125
Collingwood 124–125
Takaka 125
Motueka 125
Marlborough 125
West Coast 125–130
Westport 125
Bradshaw's Terrace 125
Addison's Flat 125–126
Charleston 126–127
Grey Valley 127
Arahura 127–128
Kumara 128
Waimea 128
Rimu, Back Creek, and Seddon's Terrace .. 129
Ross 129
Dredging 129
Otago District 130–135
Marewhenua 130
Naseby 130–131
Welshman's Gully 131
St. Bathan's 131–132
Vinegar Hill and Cambrian's 132
Matakanui 132
Queenstown and Lake Wakatipu .. 133
Alexandra South 133
Bald Hill Flat 133
Roxburgh 134
Island Block 134
Tuapeka 134
Weatherstone's 134
Waipori 134–135
Waikaia 135
Nokomai 135
Southland District 135–136
Round Hill 135–136
Dredging 136–141
Abstract of Licenses for Dredging-claims in Otago and Southland 136–137
Cardrona River 137
Upper Shotover 138–139
Shotover River, Queenstown 139
Victoria Bridge, Kawarau River 139
Kawarau–Cromwell 139
Clyde 140
Alexandra 140
Ophir 140
Roxburgh, Clutha 140
Miller's Flat, Clutha 140
Island Block, Clutha River 140–141
Lowburn, Clutha River 141
Bowman's Flat, Clutha River 141
Earnscleugh Flat 141
Waipori 141
Statement of Affairs of Mining Companies, as published in accordance with the Mining Companies Acts, 1891 and 1894 142–151
Water-conservation 152–154
Special Conditions and Reservations ..152–154
Precious Stones 154
North Island 154
Middle Island 154
Manganese- and Sulphur-mining 155
Petroleum 155
Coal-mining 155–162
North Island 155
Middle Island 155–156
Collingwood 155

Page

Coal-mining (Middle Island)—*continued.*
Nelson 155
Westport 156
Grey River and Grey Valley 156
Canterbury and Otago 156
Phenomena of Colliery Explosions: Paper by Mr. Donald M. D. Stewart 156–160
Timbering in Coal-mines: Report of a Lecture by Mr. H. W. Halbaum 161–162
Hydraulics: Paper by Mr. Alexander Aitken, Manager, Government Water-races at Kumara 162–170
Notes on Blasting with No. 1 Dynamite, Ammonite, &c., in Chota Nagpur, Bengal, India: Paper by Mr. A. Mervyn Smith 170–171
A New Current Motor 171
The Accumulation of Amalgam on Copper Plates: Paper by Mr. R. T. Bayliss 172–173
Classifying Tailings before Concentration .. 174
Gold-extraction from Refractory Ores: Paper by Mr. Hiram S. Maxim 174
Concerning Tellurides: Paper from *Mining Journal, Railway and Commercial Gazette* 175–176
Cyanide Patent: Paper by Mr. William Skey ..176–177
Patent Rights granted 177–205
Improvement in Cyanide Process, by E. Holland and G. W. Horn 177
Improvements in Recovery of Gold and Silver from their Solutions, by C. Göpner and L. Diehl 178
An Improved Process for the Extraction of Gold and Silver from their Ores, by Kate A. May ..178–179
An Improved Machine for use in the Extraction of Gold from Auriferous Material by the Aid of Chemical Solvents, by J. J. Deeble ..179–180
An Improved Regenerative Process for the Treatment of Argentiferous Sulphide Ores, by E. F. Turner 180–183
A Process for extracting Precious Metals from Refractory Ores by Means of Antimony, and for Recovery of Antimony employed, by James Woolford 183
Improvements in Apparatus for the Recovery of Precious Metals from their Solutions, by H. L. Sulman 183–185
An Improved Process for the Treatment of Metalliferous Ores and Products, by E. A. Ashcroft 185–187
Improvement in the Treatment of Compounds or Ores containing Zinc, by E. A. Ashcroft ..187–189
Improvement in the Treatment of Zinc- and Copper-ores, by W. E. Hughes 189–190
Improvements in the Extraction of Precious Metals from their Ores or from Compounds containing the same, by James Mactear ..190–191
Process of and Apparatus for extracting Gold from its Ores, by J. G. Murphy 191–194
An Improved Process for the Treatment of Zinciferous Ores 195
An Improved Dredge, by G. Poll 195–197
An Improved Machine for Concentrating and Amalgamating the Precious Metals ..197–198
Improvements in Mechanical Ore-separators, by J. W. Carter 198–199
An Improved Machine for breaking or crushing Ore, Rock, and the like, by W. E. Hughes ..199–201
Improvements in Pulverising-mills, by A. V. Young 201–202
Improvements in Stamping Apparatus for crushing Ores and other Analogous Stamping Purposes, by D. B. Morison 202–205
Mine-managers' Examination Papers 205–214
List of Mining Managers, Battery Superintendents, and Engine-drivers who have obtained Certificates under the Mining and Coal-mines Acts of 1886, 1891, and 1894 215–218
Summary of Works constructed 218–221
Concluding Remarks 221
List of Works on Goldfields undertaken wholly by the Mines Department, or by Subsidies to County Councils, Local Bodies, and Prospecting Associations, in progress on the 31st March, 1897 ..222–226
List of Works on Goldfields constructed wholly by the Mines Department, or by Subsidies to County Councils, Local Bodies, and Prospecting Associations, and completed prior to the 31st March, 1897 226–236
Return showing the Value of the Sales of Water, and Expenditure on and Collateral Advantages derived from the Working of the Water-races constructed and maintained by Government, during the Year ending the 31st March, 1897 .. 237

MAP OF THE
NORTH ISLAND
NEW ZEALAND.
SHEWING THE
MINING DISTRICTS.

Scale of Miles.
10 5 0 20 40 60 80

Reference.

Mining Districts ..... *shewn thus* [redacted]
Boundaries of Provincial Districts .... " "
Railways ..... " "

Geo: Wilson
Inspecting Engineer
Mines Department.

HAURAKI MINING DISTRICT.
AUCKLAND MINING DISTRICT.
HAWKE BAY MINING DISTRICT.

Three Kings Is
North Cape
Cape Maria van Diemen
Parengarenga Har.
Rangaunu B.
Doubtless Bay
Whangaroa Harb
Bay of Islands
Ahipara B
MAUNGATAWHIRA RA.
HUKERI RA.
Whangape R.
Hokianga R.
WHAKA TARE RA.
Maungaruru Bluff
PUHIPUHI
Whangaruru B.
Ngunguru R.
WHANGAREI
Whangarei Harb
Miners Hd
Gt Barrier I.
Little Barrier Id
I. Fitzroy
Okupu B
HAURAKI GULF
Kaipara Har
Kawau I.
C. Colville
Port Charles
Cuvier I.
Kennedy B.
Tiritiri
Cabbage B.
KUAOTUNU
COROMANDEL
Mercury B.
Rangitoto I.
Waiheke I.
Firth of Thames
COLVILLE
Tauranga R.
AUCKLAND
TARARU
THAMES
ONUI
Whangamata
Manukau Har
PAEROA
WAIHI
Waihi
Katikati
Waikato R.
PATAROA RANGE
Piako R.
Thames R.
TE AROHA
KATIKATI
Tauranga Harb
BAY OF PLENTY
White I.
C. Runaway
Hicks Bay
East Cape
Waiapu R.
HUIARAU RANGE
Whaingaroa Har
HAKARIMATA RANGE
TE PUKE
Open Bay
Tokomaru Bay
Aotea Har
Kawhia Har
Roto Rua
Roto Iti
Waikato R.
Tarawera L.
Roto Mahana
Tarawera R.
Rangitaiki R.
Whakatane R.
Waioeka R.
HAUTURU RA.
WHAREA RA.
WHAKATANE MTS
TE URIWERA COUNTRY
Tolago Bay
Gable End Foreland
Te Kuiti Pa
Te Reinga Pa
Kaingaroa Plains
Waikare Moana
Poverty Bay
Mokau R.
Taupo L.
WHITE CLIFFS
Waitara R.
NEW PLYMOUTH
Waitara R.
Mohaka R.
Wairoa R.
Mahia Peninsula
Portland I
HAWKE BAY
Tongariro
Ngauruhoe
Ruapehu
C. Egmont
Mt Egmont
NAPIER
Tukituki R.
C. Kidnappers
Patea R.
Waitotara R.
Wanganui R.
Rangitikei R.
Manawatu R.
Porangahau R.
C. Turnagain
Gorge
PUKETOI RANGE
Akitio R.
Castle Pt
C. Farewell
Golden Bay
D'Urville Id
Kapiti I
Porirua Har
Mana I.
Ohariu R.
WELLINGTON
C. Terawhiti
Karori Stream
Port Nicholson
Tasman Bay
COOK STRAIT
Palliser Bay
Flat Pt
C. Palliser
Te Kaukau
MIDDLE ISLAND
C. Campbell
C. H. Pierard. del.
South Latitude
East Longitude
172° 173° 174° 175° 176° 177° 178° 179°
35° 36° 37° 38° 39° 40° 41° 42°

MAP OF THE
MIDDLE ISLAND
NEW ZEALAND.
SHEWING THE
MINING DISTRICTS.

Scale of Miles
10 5 0 20 40 60 80

Reference.

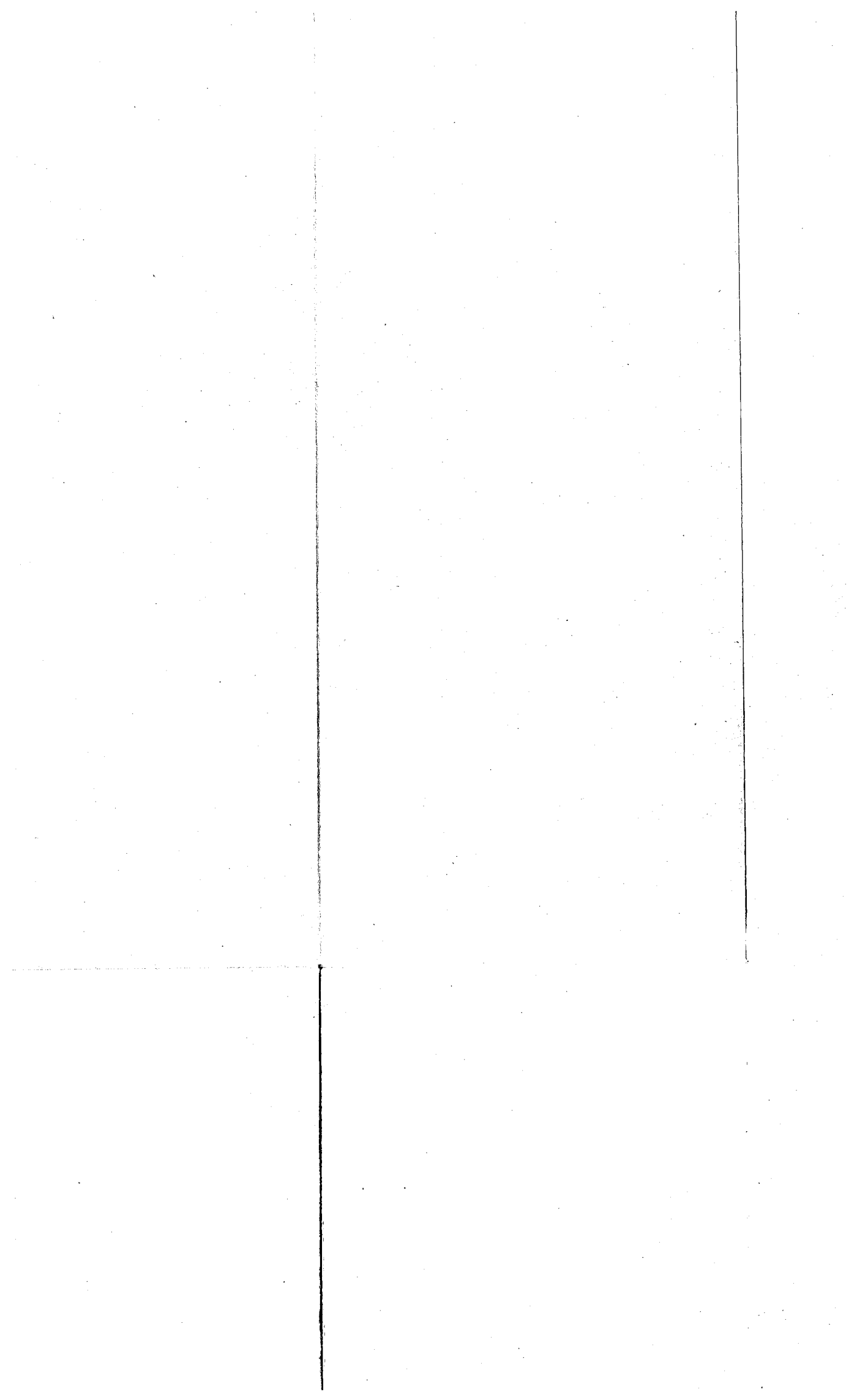
Mining Districts.....shewn thus
Boundaries of Provincial Districts....„ „
Railways.....„ „

Geo. Wilson
Inspecting Engineer.
Mines Department.

C.H. Pierard. del.

168° 169° 170° 171° 172° 173° 174° 175° East Longitude.
166° 167°
41° 42° 43° 44° 45° 46° 47° 48° South Latitude

C. Farewell
W. Wanganui Inlet
Golden Bay
COLLINGWOOD
Stephen I.
D'Urville I
French Pass
Kapiti I
Rocks Pt
Tasman Bay
NELSON
WELLINGTON
MAHAKIPAWA
PICTON
Karamea R.
Karamea Bight
Wangapeka R.
Motueka R.
BELL GROVE
BLENHEIM
Wairau R.
Awatere R.
Cloudy Bay
Port Nicholson
Mokihinui R.
Butler R.
WESTPORT
C. Foulwind
LYELL
Buller R.
Roto di L.
CHARLESTON
Perpendicular Pt
PREEFTON
Clarence R.
L. Tennyson
Kaikoura Peninsula
GREYMOUTH
R. Teremakau
Hapuri L.
KUMARA
STAFFORD
HOKITIKA
RIMU
L. Kaniere
Mikonui R.
GROSS
Conway R.
S. Branch
L. Sumner
Waiau-ua R.
NICK SNOWY RANGE
Hurunui R.
Waimakariri R.
Waipara R.
Ashley R.
Pegasus Bay
Waimakariri R.
CHRISTCHURCH
LYTTELTON
Port Lyttelton
Poerua R.
Abut Rd
OKARITO
Rakaia R.
L. Coleridge
L. Heron
Gillespies Beach
Mt Cook
East Head
Banks Peninsula
Bruce B
Paringa R.
Abbey Rks
Mt Arnold
Hunts R.
Clyde R.
Rangitata R.
L. Ellesmere
Akaroa Harbour
Jacksons B
Cascade Pt
Ashburton R.
Rangitata R.
Pukaki L.
Ohau L.
TIMARU
Mt Aspiring
Big Bay
Martins Bay
Pareora R.
Waihao R.
Milford Sound
Waitaki R.
Bligh Sound
George Sound
CROMWELL
ARROWTOWN
QUEENSTOWN
OAMARU
Kakanui R.
Waianakarua R.
Caswell Sound
Nancy Sound
Thompson Sd
Doubtful Sd
Daggs Sd
MANAPOURI
Monowai L.
Oreti R.
Waiau R.
Mataura R.
Waikaia R.
Angle Br
Clutha R.
ROXBURGH
Teviot R.
Dusky Sd
SOUTHLAND
MATAURA
Waipori
WAIPORI
WETHERSTONE
TAPANUI
LAWRENCE
Waihola L.
Blueskin Bay
Otago Harbour
C. Saunders
DUNEDIN
Taieri R.
Tokomairiro R.
West C.
Chalky Inlet
Preservation Inlet
Ruggedy Pt
Hokonui Hills
Waimea Plains
Mataura R.
INVERCARGILL
Forest Hill
Collins R.
Clutha R.
Nugget Pt
Centre I.
FOVEAUX
STRAIT
OTAGO MINING DIST. (PORTION OF)
Solander I.
Codfish I.
The Bluff
Bluff Har.
Waipapapa Pt
Toetoes Bay
STEWART ISLAND
Paterson Inlet
Port Adventure
Port Pegasus
S.W Cape
OTAGO MINING DISTRICT (PORTION OF)
WESTLAND MINING DIST. (PORTION OF)
PACIFIC OCEAN
SOUTH PACIFIC OCEAN



SESS. II.—1897.
NEW ZEALAND.

THE GOLDFIELDS OF NEW ZEALAND:

REPORT ON ROADS, WATER-RACES, MINING MACHINERY, AND OTHER WORKS IN CONNECTION WITH MINING.

Presented to both Houses of the General Assembly by Command of His Excellency.

Mr. GEORGE WILSON, Inspecting Engineer, to the Hon. A. J. CADMAN, Minister of Mines.

SIR,— Mines Department, Wellington, 29th June, 1897.

I have the honour to submit my annual report, for the year ending the 31st March last, on the progress of the mining industry, and on different works in connection with the same having a tendency to promote a further development of the mineral wealth of the colony.

The subjects are classified under the following heads: "Subsidised Roads and Tracks," "Roads constructed by Direct Grants," "Prospecting Works," "Schools of Mines," "Water-races," "Gold-mining," "Quartz Workings," "Alluvial Mining," "Dredging," "Water-conservation," "Precious Stones," "Manganese and Sulphur Mining," "Petroleum," "Coal-mining, "Hydraulics," "The Cyanide Process of Treatment in connection with Gold-saving," "Milling Gold-ores," "Patents applied for in connection with Gold-mining," "Examination-papers recently used in the Mine-managers' and Battery Superintendents' Examinations," and "Statistical Tables showing the Class and Value of Works constructed."

SUBSIDISED ROADS AND TRACKS.

The following statement will show the expenditure on subsidy principle authorised for the construction of roads and tracks in the different counties for the year ending the 31st March last, and the liabilities on outstanding authorities on that date:—

Name of Local Body.	Expenditure for the Year ending 31st March, 1897.	Liabilities on Authorities on 31st March, 1897.
	£ s. d.	£ s. d.
Matamata Road Board	...	100 0 0
Piako County	...	20 0 0
Bay of Islands County	250 0 0	595 0 0
Coromandel County	1,866 5 0	650 0 0
Te Aroha Town Board	...	75 0 0
Thames County	524 1 9	643 14 8
Thames Borough	92 12 0	707 8 0
Ohinemuri County	1,106 2 1	945 19 3
Tauranga County	100 0 0	150 0 0
Katikati Highway Board	11 13 4	88 6 8
Waimea County	...	50 0 0
Collingwood County	70 0 0	...
Pelorus Road Board	25 0 0	...
Wairau Road Board	183 10 4	16 9 8
Buller County	365 0 0	510 0 0
Inangahua County	250 0 0	...
Grey County	57 11 0	278 9 0
Westland County	70 0 0	300 0 0
Ross Borough Council	...	100 0 0
Tuapeka County	141 3 6	58 16 6
Vincent County	...	..
Southland County	...	50 0 0
Wallace County	29 13 0	...
Contingencies	34 9 3	...
Totals	£5,177 4 3	5,339 3 9

ROADS CONSTRUCTED BY DIRECT GRANTS.

The following statement will show the expenditure and liabilities on authorities issued on roads from direct grants to the several local bodies during the year ending the 31st March, 1897 :—

Name of Local Body.	Expenditure for the Year ending 31st March, 1897.	Liabilities on Authorities on 31st March, 1897.
	£ s. d.	£ s. d.
Tauranga County ...	...	250 0 0
Coromandel County	4,250 0 0	200 0 0
Thames County ...	1,044 13 3	2,725 6 9
Ohinemuri County	891 13 4	2,150 0 0
Piako County ...	924 5 10	1,625 16 11
Pelorus Road Board	...	900 0 0
Collingwood County	560 0 0	1,590 0 0
Wairau Road Board	233 5 0	516 15 0
Waimea County ...	250 0 0	...
Buller County ...	2,901 16 1	2,300 0 0
Inangahua County	1,185 12 6	2,212 8 5
Grey County ...	1,585 0 0	3,375 0 0
Westland County ...	234 8 0	2,865 4 3
Ross Borough Council	100 0 0	...
Lake County ...	130 0 0	2,200 0 0
Southland County	150 0 0	200 0 0
Tuapeka County ...	744 17 5	1,255 2 7
Vincent County ...	450 0 0	1,350 0 0
Land and Survey Department	10,085 4 1	6,829 15 9
Public Works Department ...	1,581 19 3	1,818 0 1
Totals ...	27,302 14 9	34,363 9 9

PROSPECTING FOR GOLD.

The following statement will show the expenditure and liabilities on authorities issued in subsidies to Prospecting Associations and parties of miners recommended by the local bodies in the different counties for the year ending the 31st March last :—

Name of County.	Expenditure for Year ending 31st March, 1897.	Liabilities on Authorities on 31st March, 1897.
	£ s. d.	£ s. d.
Piako County ...	...	94 11 3
Bay of Islands County	103 3 0	200 3 10
Whangarei County ...	...	...
Manukau County ...	52 2 6	22 17 6
Coromandel County ...	121 18 0	410 19 0
Ohinemuri County ...	...	...
Thames County ...	...	128 8 4
Tauranga County ...	35 0 0	16 0 0
Waipa County ...	...	26 0 0
Sounds County ...	39 0 0	...
Waimea County ...	...	34 7 6
Marlborough County ...	13 17 6	36 2 6
Collingwood County ...	...	100 0 0
Grey County ...	47 8 0	20 17 0
Buller County ...	98 4 6	470 1 4
Inangahua County ...	40 4 3	281 2 0
Westland County ...	683 3 1	617 5 8
Selwyn County ...	15 0 0	6 0 0
Tuapeka County ...	36 2 3	53 4 1
Lake County ...	30 0 0	10 0 0
Southland County ...	7 0 0	53 10 0
Vincent County ...	107 9 9	184 10 3
Mackenzie County ...	...	20 0 0
Taieri County ...	...	25 0 0
Bruce County ...	79 13 9	...
Wallace County ...	24 0 0	104 14 0
Totals ...	1,533 6 7	2,915 14 3

SCHOOLS OF MINES.

The beneficial results attendant on the establishment of these schools continue to be felt in the mining centres. Opportunity is afforded enabling advanced students as well as working miners to acquire knowledge of the various subjects necessary to those desiring to follow up the profession of mining engineers and managers, and also of other subjects required in carrying out all successful mining enterprises. The long-felt need of a higher technical education, combined with practical knowledge of everyday work, in connection with the development of the mineral wealth of the colony has in a marked degree been met, and the interest evinced in the classes is shown by the increased number of students attending the principal schools, and by the desire expressed by the miners for the establishment of schools in districts at a distance from the present centres.

The large number of students coming forward clearly shows it to be a recognised fact that, unless those engaged in mining pursuits wish to be left behind, they must avail themselves of the opportunity for acquiring the scientific knowledge now so necessary to all who desire to become leaders in the conduct of mining enterprises. Well-equipped schools at the chief places, in which a continuous course of instruction is carried on, are infinitely preferable to smaller schools, where the time devoted to teaching is intermittent, and less opportunity afforded for obtaining a thorough knowledge of the subjects forming the groundwork of the necessary studies.

THAMES SCHOOL.

The attendance at this school continued to increase during the year, the average being 103, as against 56·5 for the preceding year. The number of assays made—viz., 1,796, as against 1,103 for the preceding year—shows a large increase, whilst seventy-four parcels of ore were treated at the experimental plant, as against forty-five for last year.

There are many advantages consequent on having the school in a central position like the Thames, where all branches of gold-mining are carried on. The scientific treatment of ores by different processes can be readily witnessed, and the Director is in a position to at all times explain matters which otherwise, in the absence of practical illustration, would be more difficult.

The experimental plant in connection with the school is shortly to receive an addition which will place it in a position to be more readily used in treating parcels of ore. The two stamps are to be removed, and a battery of three stamps, suitable either for wet or dry crushing, with a rock-breaker and all the most modern appliances for the scientific treatment of different kinds of ore, is to be erected.

The advantages named in a great measure tend to insure this school maintaining the foremost position in point of attendance and practical results.

Mr. F. B. Allen, M.A., B.Sc., was appointed Director of the school as successor to Mr. James Park, F.G.S., who resigned his appointment during the year. Mr. Allen's position as assistant to Mr. Park enabled him to enter on the duties and follow up the system hitherto adopted in the successful conduct of the school. The following is the report furnished by Mr. Allen on the progress made at the Thames School for the past year:—

I have the honour to report that the year 1896–97 has been an extremely busy and a successful one for the school, which has made exceptional strides, and is now in a flourishing condition.

Consequent on the revival in mining on the peninsula the school has been busily and constantly employed assaying and treating parcels of ore for the public, and has afforded a ready means of ascertaining the value of the numerous new finds which have been made during the past year. Besides this, large numbers of new students, both young men just entering the field of mining and also working miners, have taken advantage of the courses of study at the school, and have been qualifying themselves for the various public examinations, as well as for work in the mines and batteries. The mining students are becoming thoroughly alive to the fact that scientific training will materially assist them in their daily avocations, and enable them, when in charge of works, to develop their mines and carry on the operations connected with the winning of gold to better advantage.

That the amount of public work performed by the school during the past year, as well as the attendance, have practically increased twofold shows that the school has kept pace with the mining revival, and is thoroughly appreciated.

An inspection of the tables accompanying this report will show that the public work and the attendance at the classes rapidly increased from May, 1896, onwards; and, as Mr. James Park, F.G.S., who had so ably directed the school for some seven years, and brought it into an efficient condition, severed his connection with the institution at the end of April, 1896, I was left single-handed to carry on the whole work of the school, just at the time when public assays and battery-work were rapidly increasing, and when new students were entering every week. This entailed very long hours on my part to keep everything in working-order, but after four months an assistant, Mr. P. G. Morgan, M.A., was appointed as Assistant Lecturer and Assayer. This was in September, and since that time he has ably discharged his duties, and has relieved me in great measure from the excessive amount of work entailed by increase in every department of the school.

The average attendance of registered students has increased from 56·5 in 1895–96 to 103 for the year 1896–97, and, as the attendance has continued to progressively increase from the beginning of 1896 up to the present time, it is now far in excess of that of any previous period in the history of the Institution. The assaying classes are, as usual, largely attended, but it is a pleasing and noteworthy fact that in the mining and surveying classes, which are in great part made up of practical miners who attend after their daily work in the mines is over, the increase has also been large. The surveying-class roll shows an increase from twenty-six in 1896 to fifty-three for the first term of 1897, and the mining class an increase from twenty-five to fifty, in each case double that of the preceding year. The school is now taxed to its utmost capacity in finding accommodation for these students.

There has been a corresponding advance in the amount of work performed for the public in the shape of assays and analyses and the treatment of ton parcels of ore by the plant, showing that the school retains the confidence of the mining community as an accurate and reliable institution for the valuation of ores. The following table gives a comparative view of the number of assays performed during the last two years:—

	1895–96.	1896–97.
Number of public assays	743	1,204
Number of assays in connection with ton parcels	360	592
Total	1,103	1,796

This increase to 1,796 in 1896–97 from the already large number of 1,103 in 1895–96 has been largely in consequence of the widespread prospecting which has been going on throughout the peninsula, and in the very nature of things it is reasonable to suppose there will be a falling-off again in the number of assays after a time. When the mining properties are more developed the companies will employ assayers of their own, and already a number of our students have left to take up positions of assayers at various up-country mines.

The plant for the experimental treatment of ton parcels of ore has been, with the exception of one week's stoppage for repairs, continuously employed throughout the year, and during several weeks it was necessary to work double shifts in order to cope with the sometimes sudden influx of several separate tons of ore at one and the same time. During 1896–97 the plant treated seventy-four parcels of ore, of an aggregate weight of 122,941 lb. dry weight, as against forty-five parcels, aggregating 80,457 lb., in 1895–96. Of these seventy-four parcels, a table of which is given below, sixty-two were treated by pan-amalgamation and twelve by the cyanide process, and in the case of seven of the parcels it was necessary to chloridize roast the ore before amalgamation. The percentage saving on the average was, by cyanide, 64·75 per cent., and, by amalgamation, 82·9 per cent. It should be noted that most of the parcels were treated by cyanide at the request of the owners as experimental tests to ascertain to what extent the bullion could be successfully extracted by this process, but the results show that few of the parcels contained gold in a fine enough state of division for successful cyanide treatment direct. In most cases the bullion can be better extracted by amalgamation, followed by cyanide or other treatment of the tailings.

The chief alterations to the plant during the last twelve months have been the erection of a larger percolation-vat in connection with the cyanide process, a second zinc-extractor, and a centrifugal pump for cyanide solutions. The vat is 7 ft. in diameter, is fitted with all necessary appliances, and has proved very suitable to our requirements.

During the year it has been necessary to re-bed the mortar-block, and to make repairs to the amalgamating-pan and the furnace, while the Council now contemplate extensive alterations during the coming year. It is proposed to remove the present two stamps and erect a three-stamp battery instead, on a solid concrete foundation. This will necessitate the laying of a 9 in. main to drive the stamps, and the total cost, including the erection of a separate public assay-room, will amount to something like £800.

Students are, subject to permission granted by the Director, allowed to work with the experimental plant, and many have taken advantage of this, and have derived considerable useful practical experience thereby in the metallurgical treatment of ores.

In order to insure accuracy, as well as to keep the results from becoming public property, I have, during the last year, arranged that all public assays are performed by the Laboratory Assistant after the students have had their instruction in the classes; so that when these assays are made no students are present and the public work goes on without interruption. This was a necessary alteration, and the very large number of assays performed for the public shows that reliance is placed in the methods adopted. Still, it has meant keeping the school working late and early, and the Laboratory Assistant has had an exceptionally busy year. My thanks are due to Mr. George Nicks, Mr. A. Jones, and Mr. F. Woolcock, who have in turn occupied this position creditably to themselves. They have each had their rewards, however, in that the large amount of practical experience gained by them as Laboratory Assistants has enabled each of them to secure a lucrative appointment with mining companies.

The Mines Department has very kindly donated to the school a series of models imported from Germany, illustrative of the action of a plunger pump and man-engine and of the mode of contruction of various kinds of dams and sinking of shafts—all very useful models for practical demonstration of the lectures. The Government, through the courtesy of Sir James Hector and Mr. Alexander McKay, has made a gift of the past Geological Reports, which will form a welcome and valuable addition to the library; while the thanks of the school are due to Mr. George Wilson, Inspecting Engineer of Mines, Mr. T. P. Moody, of Hikurangi, and others for various collections of rocks, coal, and minerals. I myself have made a collection of several hundred samples of auriferous quartz, which, as illustrating the different appearances assumed by the gangue of the precious metals mined on these fields, will, I trust, prove useful to the mining community.

So many students enrolled themselves this present year in the drawing class that it was found necessary to obtain a special instructor for this important subject, and in March, 1897, Mr. John Parr, B.Sc., M.E., mechanical engineer, of Christchurch, was appointed drawing master, and is giving every satisfaction.

The field geology class has been well attended throughout the year. Many trips, some of them necessitating hiring horses, have been made across country to illustrate the relation of the beds one to another, and excursions underground into the mines have also been made to give students the benefit of actual observation of the details of mining operations and the occurrence of mineral deposits. Excursions to one place or another are made weekly, and are invaluable as affording practical illustration of the subjects discussed in the lectures.

My thanks are due to the members of the Council, who have given me their assistance throughout the year, and have shown that, all along, they are greatly interested in all that concerns the wel-

fare of the school. I have much pleasure in acknowledging the services of Mr. P. G. Morgan, M.A., the Assistant Lecturer, and also the valuable work done in the plant by Mr. Richard Vercoe, who has proved himself most reliable and painstaking in the discharge of his duties.

The following is a table of the attendances at th e several classes:—

TABLE of ATTENDANCES for Year ending 31st March, 1897.

Name of Subject.	1896. First Term.	1896. Second Term.	1896. Third Term.	1897. First Term.
Registered Students.				
General and mining geology	9	10	9	15
Mineralogy and blowpipe	10	14	11	15
Land- and mine-surveying	26	39	36	53
Mathematics	13	12	27	17
Mining and applied mechanics	25	35	41	50
Metallurgy of gold and silver	...	...	32	...
Practical chemistry	30	42	40	42
Theoretical chemistry	30	38	38	40
Practical assaying	42	63	64	62
Mechanical drawing	9	10	11	22
Total	194	263	309	316
Saturday science class	23	33	45	29
Total attendance at classes	217	296	354	345
Individual registered students	64	97	114	117
Total individual students	87	130	159	146

The annual examinations were held in December, 1896, the papers being set, as formerly, by examiners in Wellington appointed by the Government, viz.: Mr. H. A. Gordon, F.G.S.; Mr. William Skey, Government Analyst; Mr. Alexander McKay, F.G.S.; and Mr. C. H. Pierard.

Keeping pace with the increase in the attendances at the school, the number of candidates who presented themselves was more than double that of the preceding year. The results of the examination are shown in the following table.

The President's medal for the best aggregate was awarded to Mr. K. M. Barrance, who also won the gold medal for surveying, presented by Mr. Rhodes, of the Kauri Estates Company. Mr. Barrance and Mr. Fleming sat for the School of Mines scholarship examination, but no award was made.

RESULTS OF ANNUAL EXAMINATIONS, 1896.

Subject of Examination.	First Class.	Second Class.	Third Class.	Failed.	Total.
General and mining geology	3	...	3	...	6
Pumping and winding	1	2	2	...	5
Ventilation and explosives	...	4	...	...	4
Mining and applied mechanics	2	2	3	...	7
Theoretical chemistry (senior)	5	2	...	...	7
Theoretical chemistry (junior)	2	1	...	...	3
Practical chemistry (senior)	4	...	...	...	4
Practical chemistry (junior)	...	2	...	...	2
Practical assaying (senior, dry)	12	7	4	2	25
Practical assaying (junior, dry)	3	2	4	...	9
Practical assaying (senior, wet)	9	6	2	1	18
Practical assaying (junior, wet)	3	1	1	...	5
Surveying (land and mine)	...	1	7	...	8
Map-drawing	1	...	4	...	5
Mineralogy	...	3	1	...	4
Metallurgy	1	3	2	...	6
	46	36	33	3	118
Saturday science	2	...	...	...	2
Totals	48	36	33	3	120

The following tables show the separate parcels of ore treated during the past year in the experimental plant and the returns therefrom. The total bullion recovered from the several parcels amounts to about £340:—

TABULATED STATEMENT showing PARCELS of ORE treated at Thames School of Mines Experimental Plant during 1896–97.

Name of Mine and District.	Description of Ore.	Weight of Ore.	Assay-value of Ore per Ton.			Method of Crushing.	Bullion saved.	Value per Ounce.	Percentage saved.		
			Gold.	Silver.	Value.				Gold.	Silver.	Value.
BY PAN-AMALGAMATION.											
		Lb.	Oz. dwt. gr.	Oz. dwt. gr.	£ s. d.		Oz. dwt. gr.	£ s. d.			
A. Kummert, Whangamata ...	Hard rusty-coloured quartz ...	1,200	0 18 21	0 17 16	3 17 0	Dry	1 1 6	1 14 2	88·4	78·9	88·4
Waihi Dredging	Tailings containing roots ...	3,360	0 6 7	1 9 0	1 7 9	...	0 6 16	1 3 7	20·0	11·2	18·75
B. Murray, Kennedy's Bay ...	Rubbly quartz, with ferruginous veins	560	0 10 2	1 11 3	2 3 6	Dry	0 3 1	2 10 1	74·5	15·0	70·3
Tiki, Coromandel	Hard dark quartz	2,050	1 3 22	0 12 9	4 16 9	"	1 6 16	2 16 1	84·8	69·4	83·9
Carnage, Coromandel	Rusty-brown glassy quartz ...	1,800	0 2 5	0 2 12	0 9 1	"	0 3 0	2 2 0	86·7	72·9	86·1
Carnage, Coromandel, second parcel	Rusty quartz...	2,000	0 1 18	0 3 3	0 7 3	"	0 3 8	1 12 2	82·8	73·1	82·3
Moa, Tokatea	Free-milling quartz	830	2 17 23	1 7 18	11 14 4	"	1 8 19	2 16 7½	94·1	80·0	93·9
Young New-Zealander, Waitekauri	Densely mineralised	2,750	1 10 6	2 14 4	6 5 9	"	1 10 22	2 3 2	44·9	22·3	44·0
Westport	Cement sand	60	0 11 7	...	2 4 0	...	...	3 18 0	93·7	...	93·7
Conservative, Thames	Quartz, with much manganese ...	2,100	0 7 13	1 0 5	1 11 11	Dry	0 10 6	2 1 5	73·5	25·9	70·8
Midas, Kuaotunu	Light-brown quartz	2,560	0 2 18	0 3 18	0 11 4	"	0 6 12	1 16 4	90·3	80·0	89·7
Royal Mail, Puru	Banded quartz, with much red oxide of iron	1,050	0 3 4	0 3 3	0 13 0	"	0 2 10	2 5 6	91·3	72·0	90·0
A. Smith, Bluff	Clean white quartz	1,280	0 2 12	0 2 12	0 10 3	"	0 2 16	1 16 9	84·0	85·2	84·2
J. Teddy, Puriri	Compact grey quartz	1,500	0 8 4	0 8 19	1 13 5	"	0 10 0	2 1 5	92·8	75·6	92·5
Maraetai No. 1	Dark slaty country	1,400	...	Nil	...	"	...	Nil	...	...	...
Maraetai No. 2	Slaty country containing loose rubbly dirt	1,600	0 2 6	0 1 6	0 9 1	"	0 1 21	2 12 10	76·2	70·0	76·0
Grace Darling, Waitekauri ...	Rubbly quartz containing iron and manganese oxides	310	0 15 3	3 4 7	3 6 2	"	0 5 15	1 6 10	86·5	40·2	82·5
Waiorongomai No. 2	White glassy quartz	1,200	0 5 1	0 6 23	1 0 9	"	0 4 2	1 18 6	71·1	53·9	70·7
Waiorongomai No. 4	White glassy quartz	1,200	0 2 12	0 15 3	0 11 3	"	0 4 19	0 17 6	72·4	45·4	69·1
Maratoto	Grey quartz, with blue veins ...	2,700	3 13 3	93 1 4	22 15 4	"	78 19 19	0 5 10	94·5	65·7	84·1
Sapphire, Mercury Bay	Hard grey quartz	1,250	0 0 10	0 7 13	0 2 4	"	0 3 22	0 5 5	75·5	88·9	78·6
Proprietary, Taitapu	White splintery quartz ...	225	12 9 13	1 11 13	50 0 11	"	1 7 7	3 9 8	95·1	94·2	95·0
Proprietary No. 2, Taitapu ...	White splintery quartz ...	4,300	3 15 15	0 15 3	15 3 10	"	8 4 14	3 5 11	92·9	94·5	93·0
Proprietary No. 3, Taitapu ...	Hard white quartz	2,500	2 2 22	0 7 18	8 12 4	"	2 15 15	3 7 10	98·0	96·0	98·0
Proprietary No. 3J, Taitapu ...	Earthy and ferruginous ...	106	4 18 7	0 10 2	19 14 0	"	0 4 22	3 10 10	93·4	94·0	93·5
Great Barrier No. 1	Grey quartz, with sulphides ...	1,300	0 5 1	21 4 16	2 17 4	"	6 13 18	...	...	...	...
Great Barrier No. 2	Grey quartz, with sulphides ...	1,400	0 2 6	12 17 8	1 11 6	"	3 8 8	0 2 8	60·2	40·5	46·3
Great Barrier No. 3	Grey quartz, with sulphides ...	1,300	0 5 1	54 12 15	5 15 9	"	20 10 4	0 1 8	33·6	54·0	50·5
Great Barrier No. 4	Grey quartz, with sulphides ...	1,450	0 3 18	39 10 5	4 4 1	"	17 3 3	0 1 11½	45·2	65·9	62·2

Bay View, Kennedy's Bay ...	Rusty-coloured quartz ...	1,900	0	7	13	0	6	7	1	10	8	Dry	0	11	11	2	2	11½	94·1	88·6	93·8
R. R. McGregor, Thames ...	Hard glassy quartz	1,200	1	19	1	35	15	20	10	18	9	"	11	0	0	0	8	2	88·7	47·7	76·2
Leading Wind, Manaia	Mullocky and ferruginous ...	2,400	1	5	5	1	0	4	5	2	7	"	1	14	4	2	7	7	64·4	74·5	64·6
Hauraki Anchor, Thames ...	Earthy red and grey quartz ...	2,000	0	11	8	0	16	9	2	6	9	"	1	3	18	1	14	3	97·8	90·5	97·5
V. Reed, Kawakawa	Flinty grey quartz	2,000	0	1	21	0	5	1	0	7	11	"	0	5	0	1	4	2	85·8	77·5	85·5
Golden Spark*...	Light-grey quartz	2,700	1	14	1	0	16	9	6	17	6	"	2	19	11	2	13	3½	93·9	93·9	93·9
Forest Queen, Tokatea	Grey quartz	1,120	10	10	4	4	12	0	42	8	8	"	7	13	0	2	13	9	96·9	92·0	96·8
Hauraki Anchor, Thames ...	Earthy red and grey quartz ...	2,300	0	3	18	0	3	9	0	15	3	"	0	6	21	2	3	9	95·6	85·8	95·5
Anchor, new leader, Thames ...	Earthy red and grey quartz ...	2,600	0	5	16	0	3	12	1	3	0	"	0	10	6	2	9	9	94·1	84·6	93·8
Great Barrier	White quartz, with blue veins ...	500	1	10	6	83	3	10	14	7	4	"	11	7	0	0	4	0	88·7	56·0	69·8
Great Barrier	White quartz, with blue veins ...	2,100	1	12	12	84	9	12	14	19	10	"	69	16	0	0	3	6	90·4	81·1	85·2
Seven Reefs, Thames	Highly-mineralised quartz ...	1,900	0	2	12	2	1	16	0	13	8	"	1	11	18	0	5	3	68·0	82·1	71·6
Rangatira, Thames	Mullocky clayey ore	1,800	0	6	7	0	11	18	1	6	2	"	0	17	17	0	18	4½	78·5	72·3	77·9
Progress, Castle Rock	Rusty quartz	2,150	4	18	7	2	17	23	19	18	2	"	7	0	20	2	11	10	95·6	85·1	95·4
Whangaruru	Brittle brownish country ...	1,300	0	1	12	0	1	6	0	6	1	"	0	1	9	2	2	9	82·8	81·7	82·6
Temple Bar, Thames	Light-brown and grey ...	1,300	0	3	3	0	4	9	0	12	11	"	0	4	0	1	12	11	88·2	82·4	87·7
Robt. Kelly, Tapu	Bluish quartz, with much andesite country	1,900	5	3	18	2	0	8	20	16	10	"	5	13	13	2	17	7½	92·7	83·3	92·5
Shannon, Tapu	Bluish quartz, with much andesite country	2,900	5	2	2	2	0	8	20	11	10	"	8	12	18	2	17	4	93·0	85·1	92·9
Vulcan, Tararu	Glassy quartz, coloured red with oxides of iron	2,550	0	1	6	0	0	15	0	5	0	"	0	2	0	2	10	6½	87·5	88·0	87·5
Phœnix, Whangamata	Grey splintery quartz	1,000	2	10	9	18	13	1	11	14	1	"	7	16	16	0	11	11	91·5	75·8	89·3
Ryan's, Great Barrier	Rubbly ore, containing white quartz	2,160	1	3	23	70	0	20	11	16	0	"	51	3	8	0	3	7	83·7	75·6	78·8
Cadman, Coromandel	Reddish-brown and rubbly ...	4,500	0	8	19	0	17	13	1	16	8	"	2	8	18	1	6	4½	87·2	82·4	87·0
Fraser, Raukokore	Densely mineralised quartz ...	700	0	1	6	0	1	6	0	5	1	"						Not cleaned up.			
Bell Rock, Thames	Blue and white quartz .	1,900	0	7	13	0	6	7	1	10	9	"	0	10	15	2	4	5	90·4	86·1	90·0
Braund, Wellington	Grey and rusty-coloured ...	380	0	0	20	1	5	5	0	5	7	"	0	3	19	0	4	5	92·2	84·9	88·5
Horne, Tokatea	Small black band in red rubble ...	1,900	2	0	8	0	17	15	8	2	10	"	2	3	0	2	16	8	88·5	85·9	88·2
Shamrock, Coromandel	White crystalline quartz ...	400	0	7	13	0	6	7	1	10	8	"	0	2	2	2	7	2	89·8	75·8	89·7
Kaiser, Thames	Rusty-coloured crystalline quartz	2,060	1	8	23	1	7	17	5	18	3	"	2	7	7	2	2	9	93·2	83·2	93·0
Purdie, Bombay	Splintery blue quartz	2,300	0	5	16	0	3	18	1	3	0	"	0	8	5	2	9	11	86·7	80·4	86·2
Progress, Castle Rock	Blue quartz, showing free gold ...	550	78	7	19	40	11	15	317	2	2	"	28	6	21	2	13	4	97·0	94·9	97·0
Southern Cross 1, Blenheim ...	Rusty friable quartz	3,700	0	6	13	0	3	0	1	6	5	"	0	14	4	2	16	6½	91·8	84·3	91·7
Southern Cross 2, Blenheim ...	Brown friable quartz ...	2,200	0	8	10	0	4	6	1	14	0½	"	0	11	6	2	15	0	92·6	84·7	92·5
Southern Cross 3, Blenheim ...	Bluish-grey splintery quartz ...	2,260	0	3	3	0	1	10	0	12	7	"	0	4	2	2	16	7	90·7	83·8	90·6

* 41 lb. of picked stone from the Golden Spark gave 4 oz. 7 dwt. 3 gr. of bullion extra, and worth £12 17s., an extraction of 98·8 per cent. of the value.

TABULATED STATEMENT showing PARCELS of ORE treated at Thames School of Mines Experimental Plant during 1896–97—*continued*.

Name of Mine and District.	Description of Ore.	Weight of Ore.	Assay-value of Ore per Ton.			Method of Crushing.	Bullion saved.	Value per Ounce.	Percentage saved.		
			Gold.	Silver.	Value.				Gold.	Silver.	Value.
BY CYANIDE PROCESS.											
		Lb.	Oz. dwt. gr.	Oz. dwt. gr.	£ s. d.		Oz. dwt. gr.	£ s. d.			
A. Kummert, Whangamata ...	Hard rusty-coloured quartz ...	600	0 16 9	0 16 9	3 6 10	Dry	0 11 16	1 5 8	84·5	77·0	84·0
Waihi Dredging	Tailings containing roots ...	3,640	0 7 13	1 7 13	1 12 7	...	2 9 20	0 19 1	93·5	45·8	90·0
Young New-Zealander, Waitekauri	Densely mineralised	1,220	1 10 6	2 14 4	6 5 9	Dry	1 0 5	1 2 4	33·1	31·2	33·0
Waiorongomai No. 2	White glassy quartz	1,950	0 5 1	0 7 13	1 0 10	"	0 7 0	1 13 5	64·3	62·1	64·1
Waiorongomai No. 4	White glassy quartz ...	1,800	0 2 0	0 15 15	0 9 4	"	1 0 0	0 5 2	70·0	68·6	70·0
Sapphire, Mercury Bay	Hard grey quartz	600	0 0 10	0 7 13	0 2 4	"	...	...	90·0	67·2	82·1
Rangatira, Thames	Mullocky clayey ore	560	0 4 9	0 6 7	0 18 0	"	...	...	57·1	40·4	56·6
Captain Farquhar, Whangaruru ...	Brittle brownish country ...	1,000	0 1 6	0 1 6	0 5 1	"	...	...	73·1	83·2	73·7
Temple Bar, Thames	Light-brown and grey. ...	900	0 1 21	0 3 18	0 7 10	"	...	...	85·3	75·6	85·0
Phœnix, Whangamata	Splintery grey quartz, with wavy blue lines	1,100	1 12 8	11 13 2	7 9 8	"	3 14 9	0 8 11½	44·4	46·9	44·8

The following were treated by the cyanide process, and the tailings subsequently treated by pan-amalgamation so as to recover the value left in them:—

Name of Mine and District.	Description of Ore.	Weight of Ore.	Assay-value of Ore per Ton.			Method of Crushing.	Bullion saved.	Value per Ounce.	Percentage saved.		
			Gold.	Silver.	Value.				Gold.	Silver.	Value.
		Lb.	Oz. dwt. gr.	Oz. dwt. gr.	£ s. d.		Oz. dwt. gr.	£ s. d.			
Maratoto	Grey quartz, with blue veins ...	400	3 15 15	87 14 7	22 16 0	Dry					
				By cyanide			12 8 8	0 3 4	44·8	62·0	50·6
				Extra, by pan			0 12 12	2 3 8½	49·8	1·7	33·3
				Total extraction per cent.			...	...	94·6	63·7	83·9
R. R. McGregor, Thames ...	Hard glassy crystalline quartz ...	1,200	1 17 19	35 18 8	10 14 0	Dry					
				By cyanide			7 12 12	0 6 2	46·4	30·8	41·8
				Extra, by pan			3 7 22	0 8 4	28·5	15·7	26·7
				Total extraction per cent.			...	...	74·9	46·5	68·5

Remarks on the Parcels treated.

The tailings from Waihi, which gave a poor extraction on pan treatment, had already been treated in pans before they were received at the school, and the second treatment, made at the request of the owner, showed that little could be extracted from the tailings by pan-amalgamation. A test on about 2 tons of the tailings by the cyanide process showed that 90 per cent. of the value could be extracted by this method.

The parcels of ore sent to the plant this last year have been on the whole unsuitable for cyanide treatment, owing to the condition of the gold particles. Several parcels were treated by cyanide at the request of the owners, but the results were generally not high. The majority of the new finds are thus shown to be unsuited to treatment by this process. Nevertheless, I consider that the cyanide process can be successfully combined with wet-crushing and amalgamation for the economical treatment of many of the ores of the peninsula, and mine-managers would do well to experiment in this direction with a view to obviating the dry-crushing methods.

Syllabus of Instruction.

The following is the syllabus of instruction followed during 1896–97 :—

General and Mining Geology.—(Lecturer, the Director, Mr. F. B. Allen, M.A.B.Sc.)

Physical Geology.—The earth as a planet, its form and motions; geological climate; the atmosphere; ocean; solid crust; the interior of the earth.

Dynamical Geology.—Metamorphism; agencies modifying the crust of the earth—atmospheric, aqueous, chemical; weathering; sedimentation; classification of deposits—mechanical, aqueous, organic, and chemical; denudation and erosion.

Structural Geology.—Stratification; jointage; contortion; faults; conformity; unconformity; dip and strike; cleavage; metamorphic rocks; intrusive sheets, bosses, dykes, fissures; formation of quartz veins, lodes, and metallic deposits; dynamics of lodes; recovery of lost lodes.

Geological Surveying.—The practice of running natural sections; noting dip, strike, and inclination of strata and lodes; mapping geological formations; collection of mineral and rock specimens.

Stratigraphical Geology.—Classification of plants and animals; fossils; blending of species; geological record; the study of characteristic life, and distribution of formations from archæan to recent times, with special reference to the geology of New Zealand.

Mineralogy and Blowpipe Determination.—(Lecturer and Instructor, the Director.)

Systematic Mineralogy.—(1.) Physical properties of minerals, their hardness, specific gravity, &c. (2.) Optical properties—refraction, reflection, polarisation, lustre, phosphorescence. (3.) Chemical properties. (4.) The application of the blowpipe, colour-tests, &c. (5.) Isomorphism, pseudomorphism, and allotropy. (6.) Distribution and paragenesis of minerals. (7.) Classification of minerals—chemical, economic.

Descriptive Mineralogy.—(1.) Non-metallic division—carbon group, &c. (2.) Metallic division—a description of the principal ores of the common metals, and their New Zealand localities and modes of occurrence.

Crystallography.—(1.) The six systems, their axes, typical forms, modified forms, &c. (2.) Holohedral and hemihedral forms. (3.) Reading of faces.

Mathematics.—(Lecturer and Instructor, Mr. P. G. Morgan, M.A.)

Arithmetic (including the simple rules).—Weights and measures (those bearing on mining and assaying), greatest common measure, least common multiple, vulgar fractions, decimal fractions, proportion, problems.

Algebra (Hall and Knight's Algebra).—The meaning and use of the various signs and symbols, the simple rules, greatest common measure, least common multiple, fractions, factors, symmetry, problems containing one unknown, simultaneous equations, quadratic equations, simultaneous equations with more than one unknown, problems involving quadratics and the use of several unknowns, practice in the use of formulæ and their transposition.

Euclid.—The first four books (Todhunter), including the definitions and axioms.

Land- and Mine-surveying.—(Lecturer and Instructor, the Director.)

Adjustments of theodolite, dial, level; chain and steel tapes; traversing with theodolite and dial; connecting survey with standard meridian; ranging lines; division of land; computation of areas by latitudes and departures; reduction of slope measurements; off-sets; chaining, computation of co-ordinates; balancing survey; plotting survey and off-sets; obstacles to alignment.

Mine-surveying.—Different methods of connecting underground with surface meridian; magnetic variation; to reduce magnetic meridian to true meridian; conducting underground traverse with theodolite and dial; correcting magnetic survey by method of back- and fore-sights; holing.

Mathematics.—Equations; logarithms; plane trigonometry; solution of triangles; calculation of last or connecting line; of distance from working-face to nearest point on boundary of lease.

Levelling.—Recording levels; practice with level and staff; grading roads, tramways, and water-races; plotting and striking grades; calculation of contents of earthworks by prismoidal formula; grading with Abney or reflecting level.

Mining, Applied Mechanics, and Hydraulics.—(Lecturer, the Director.)

Mining.—Shafts—selection of site, size; modes of excavation in dry and wet rock, wet sand and swamp; timbering of shafts; ladders; chambers—size, excavation, timbering; levels and

drives—size, excavation, timbering; securing sets on inclines; modes of stoping, height, and timbering of stopes; main passes—size, timbering, division; mullock passes—size, timbering, distance apart.

Pumping and Pit-work.—Pumps and engines used in metal-mining, force-pumps, plunger-pump, draw-lift, fixing pump-pieces, bearers, friction-rollers, V-bobs, balance-bobs, main rods, flat rods, clacks, buckets, bucket-rod, catches, staples, and glands; thickness of pipes; capacity of pumps.

Ventilation.—Atmospheric pressure, vapour density; ventilation of drives and underground workings by natural and artificial means; furnaces, water-blasts, fans; division of air-courses; noxious gases met with in metal and coal-mines, their composition and detection.

Explosives.—Their use in quarries and mines, relative strengths, action, gases evolved, composition; charging bore-holes; firing explosives; quantity to be used.

Hauling and Winding.—Safety-cages; man-engines; strength of rope; strength of timbers.

Water-power.—Turbines, Pelton-wheels, calculation of horse-power and flow of water from boxes and nozzles.

Text-book used: Gordon's "Mining and Engineering," 10s., Government Printer.

Practical Assaying.—(Lecturers and Instructors, the Director and Assistant.)

Dry Assaying.—(1.) The furnaces and appliances used in fire-assaying, with sketches. (2.) The fluxes, their properties and uses. (3.) The reducers and their reducing-powers. (4.) Fuels and other reagents, as salt, iron, sheet and granulated lead, glass-powder, &c. (5.) Preparation of pure silver for parting gold and silver. (6.) Preparation of nitric-acid solutions for parting. (7.) Preliminary assays of ores and bullion, their use and application. (8.) Volatility of gold and silver—The influence of different temperatures in different parts of muffle; also of time in muffle. (9.) The operation in fire-assaying—*a*, powdering the ore; *b*, sampling the dry pulp; *c*, preparing the charge; *d*, fusing the charge, and extracting the lead-button; *e*, cupelling the lead-button; *f*, weighing the bullion; *g*, parting and calculating the value of the bullion. (10.) Probable sources of error in fire-assaying. (11.) Keeping note-books and proper record of results. (12.) The assay of litharge and red-lead. (13.) The assay of gold- and silver-ores—*a*, in clean quartz; *b*, in pyritous quartz; *c*, in concentrates and tailings; *d*, in roasted ores; *e*, by amalgamation assay; *f*, by scorification assay. (14.) The retorting and melting of bullion. (15.) The refining of base bullion. (16.) The assay of bullion—*a*, weighing the assay; *b*, cupelling for base; *c*, adding pure silver for parting; *d*, rolling the "cornet"; *e*, parting the "cornet"; *f*, calculating the value. (17.) The calculation of results obtained in batteries from treatment of gold- and silver-ores. (18.) The assay of galena and cerussite; the valuation of lead, gold, and silver. (19.) The valuation of lead bullion. (20.) The assay of tin-ore (cassiterite).

Text-book: Park's "Laboratory Instructions in Assaying and Practical Chemistry," 7s. 6d.

Wet Assaying.—(21.) Operations—*a*, solution; *b*, crystallization; *c*, precipitation; *d*, filtration; *e*, decantation; *f*, washing; *g*, evaporation; *h*, distillation; *i*, ignition; *j*, sublimation; *k*, fusion; *l*, use of blowpipe; *m*, the use of spirit- and gas-lamps; *n*, the preparation of reagents and tests of purity, &c.; *o*, the preparation of fluxes; *p*, test-papers; *q*, the balance, weights, operations of weighing; *r*, preservation of platinum crucibles. (22.) The assay of iron-ores—*a*, gravimetric; *b*, volumetric. (23.) The assay of copper-ores—*a*, as oxide; *b*, as metal by electrolysis; *c*, volumetric; *d*, colorimetric. (24.) The assay of antimonite. (25.) The assay of bismuth glance. (26.) The assay of cinnabar. (27.) The assay of galena. (28.) The assay of zinc-ores. (29.) The assay of manganese-ores. (30.) The assay of nickel-ores. (31.) The assay of cobalt-ores. (32.) The assay of chromite of iron. (33.) The assay of arsenic-ores. (34.) The assay of silver-ores—*a*, volumetric; *b*, gravimetric. (35.) The valuation of specimens.

Text-book: Park's "Assaying and Practical Chemistry," 7s. 6d.

Practical Chemistry.—(Lecturer and Instructor, Mr. P. G. Morgan, M.A.)

Junior Class.—(1.) Operations (these are the same as for wet assaying). (2.) The separation of the metals into groups. (3.) Qualitative tests for the different metals. (4.) The separation of silver, lead, mercury. (5.) The separation of copper, bismuth, arsenic, and antimony. (6.) The separation of iron and alumina, iron and zinc, iron and manganese, iron and chromium. (7.) The separation of calcium and magnesium. (8.) The separation of barium, strontium, and calcium. (9.) The separation of potassium and sodium. (10.) Qualitative tests for the acid-radicals (inorganic)—*a*, H_2S, HCl, HBr, HI; *b*, HNO_3, $HClO_3$; *c*, HBO_2, H_2CO_3, H_2CrO_4, HF, H_3PO_4, H_4SiO_4, H_2SO_4, H_3AsO_4.

(Lecturer and Instructor, the Director.)

Senior Class.—(1.) The estimation of chlorine. (2.) The estimation of sulphuric acid and sulphur. (3.) The estimation of phosphoric acid. (4.) The analysis of limestones and calcareous freestone. (5.) The analysis of coals, coke, charcoal, and shales. (6.) The analysis of barytes. (7.) The analysis of fluor-spar. (8.) The analysis of scheelite and wolfram. (9.) The analysis of rocks (including estimation of K_2O and Na_2O). (10.) The analysis of fireclays. (11.) The analysis of soils. (12.) The analysis of complex sulphide ores. (13.) The analysis of milk. (14.) The analysis of waters. (15.) The analysis of bone-dust and bone-ash, with estimation of nitrogen. (16.) The analysis of guanos and apatite. (17.) The analysis of superphosphates. (18.) The estimation of alcohol—*a*, by weight; *b*, by volume. (19.) Volumetric analysis: The estimation of—alkaline hydrates; alkaline carbonates, acids, HCl, H_2SO_4, HNO_3, $HC_2H_3O_2$, $H_2C_4H_4O_6$; haloid salts, HCN, KCN, I, As_2O_3, SO_2. ($Na_2S_2O_3+5H_2O$).

Text-book: Park's "Laboratory Instructions in Assaying and Practical Chemistry," 7s. 6d.

Theoretical Chemistry.—(Lecturer, Mr. P. G. Morgan, M.A.)

Principles of Chemistry and Chemical Philosophy.—Atoms, molecules, vapour-density, quantivalence, chemical formulæ.

The Elements.—(1.) Their history, occurrence, preparation, properties, uses. (2.) Compounds of the elements, their history, preparation, properties, uses, &c.

Metallurgy of Gold and Silver.—(Lecturer, the Director.)

(1.) Ore-crushing and -pulverising machinery—*a*, rock-breakers; *b*, stamps; *c*, mills, rolls, &c. (2.) Metallurgy of gold—*a*, amalgamation on copper-plates, in pans, &c.; *b*, chlorination processes and operations; *c*, leaching processes (Cassels', &c.) (3.) Metallurgy of silver—*a*, smelting and amalgamating ores; *b*, smelting—reduction with lead and fluxes; *c*, amalgamation in pans with mercury—use of chemicals; *d*, leaching with solvents—sea-water or brine, ammonia, sodium hyposulphite, alkaline cyanides; *e*, oxidizing and chloridizing roasting.

Text-books: Eissler's "Metallurgy of Gold and Silver;" Gordon's "Mining and Engineering."

Physics.—(Lecturer, the Director.)

Fundamental ideas of matter and energy; conditions of matter; gravitation; mechanical powers; sound; light; heat; magnetism; electricity; chemistry; physiology and health.

Practical Astronomy.—(Lecturer and Instructor, the Director.)

The ecliptic; equinoxes; meridians; longitude; latitude; altitude; declination; right ascension; azimuth; use of Nautical Almanac; polar distance; zenith distance; hour-angle; sidereal time; mean time; solar time; parallax; refraction; retardation; acceleration; convergency of meridian; determination of meridian by star and sun observations, by single altitudes and greatest elongation of circumpolar stars; use of star-charts; calculation of hour-angle, azimuth, and altitude of celestial bodies for any time and place; determination of latitude by meridian altitudes; determination of time by star transits and sun observations.

Mechanical Drawing.—(Instructor, Mr. John Parr, B.Sc., M.E.)

Use of scales; printing and lettering: outline drawing; shading; colouring; drawing to scale from copies and objects, portions of machinery and woodwork, showing plans, elevation, and sections.

Special Classes are held for the instruction of candidates for the Government mine-managers', battery superintendents', and engine-drivers' certificates. First term—First Monday in February to 30th April; second term—9th May to 20th August; third term—9th September to 20th December. Registration of membership—10s. per annum; class fees—5s. per term for each subject taken up.

Scale of Charges for Public Assays and Analyses.

	£	s.	d.
Bullion assays	0	5	0
Assays of quartz, tailings, or concentrates	0	5	0
Examination and determination of rocks and minerals	0	5	0
Assay of lead- and tin-ores, each	0	5	0
" iron- and manganese-ores	0	10	0
" copper- and antimony-ores	0	10	0
" zinc-, mercury-, and bismuth-ores	0	10	0
" gold- and silver-ores, with parting assay	0	5	0
Analysis of limestone and calcareous freestone, complete	1	0	0
Analysis of limestone and calcareous freestone, partial	0	10	0
" coals and fuels, each	0	10	0
" rocks and soils, complete	2	0	0
" rocks and soils, partial	1	0	0
" fireclays and slags	1	0	0
" manures	2	0	0
" waters, complete	3	0	0
" waters, partial	2	0	0
" nickel-, cobalt-, and chrome-ores	0	10	0
" concentrates	1	10	0
" complex sulphide-ores, &c.	1	10	0

Experimental Plant.

Reports of working tests of parcels of gold- and silver-ores, concentrates, and tailings, from 1 to 3 tons:—

(1.) By Cassel cyanide process: Wet- or dry-crushing—*a*, by percolation; *b*, by agitation. (2.) By amalgamated copper-plates. (3.) By amalgamation in pans: Wet- or dry-crushing—*a*, by raw amalgamation in charges; *b*, by Washoe process with chemicals (*a*, hot pan-amalgamation; *b*, after chloridizing roasting.) (4.) Chlorination: Small barrel tests.

Cost of treatment (minimum charge): £5 per parcel not exceeding 1 ton; £3 per ton for tailings.

During the year I have supervised two Government examinations for mining managers and battery superintendents. At the first one, in May, 1896, one Thames student sat for first-class mining manager's certificate and two for the battery superintendent's certificate, and all three were

successful in passing their examinations. In January, 1897, another examination was held, at which eleven Thames students sat for the first-class mining manager's papers and five for those of battery superintendents, but the results have not yet been made known.

A feature of the Thames School is the practical nature of the instruction. The mines being in close proximity to the school afford exceptional opportunities for observing and illustrating the modes of development of mines and the different kinds and modes of occurrence of ore-deposits. An examination is made every week of one of the mines or of the surrounding country, and besides this practical work in mining and geology there is a class for field-work in surveying both above and under ground. Moreover, as the school plant is constantly treating varied and complex ores from all parts of the field, students have regular practical work in assaying and metallurgy, and are enabled in a short time to obtain as much general information concerning ore treatment as they could obtain in a much longer time by actual work in a battery where usually only one process is in operation and only one class of ore treated at a time.

Distribution of Prizes and Certificates.

The annual distribution of prizes and certificates was performed in the school-building on the 9th February, 1897, by the President, Mr. J. McGowan, M.H.R., a large number of students being present.

Governing Body.

At the annual general meeting the following officers and members of the Council were elected for the ensuing year: President, Mr. J. McGowan, M.H.R.; Vice-President, Mr. T. A. Dunlop; members, Messrs. G. S. Clark, J. H. Smith, E. F. Adams, W. Burch, L. Melhose, M. Paul, G. Denby, P. C. Hansen; Treasurer, Mr. J. Hague Smith; Secretary, Mr. A. Bruce.

REEFTON SCHOOL.

The falling-off in the number attending the school, due to the depression that prevailed for some years past, has not continued during the present year, the number of individuals having increased from twenty-five to thirty-three, and the work in the school in the matter of assaying and analysis is also greater, 973 assays and analyses being performed, as against 229 for the previous year. The Boatman's class, which was commenced with eleven members, was not successful, as the attendance fell off to five members, and it was then discontinned. The classes at Brunnerton and at Denniston were not visited by the Directer during the year. The following is Mr. Aitken's report on the progress made at the Reefton School during the year:—

I have the honour to report on the work and progress of the Reefton School of Mines during the past year ending 31st March, 1897, which I am pleased to say has been very successful, and a great improvement on that of the previous year. The classes were attended more regularly by the students, and the number of individuals attending increased from twenty-five to thirty-three. The membership to each class and the average attendance also show an improvement on that of the previous year. I am quite sure that as the district goes ahead the numbers attending the classes will increase; and when the committee are able to furnish the school with better appliances and stock it will induce many more to attend.

Up to the end of 1896 no less than twenty-four students from this school have successfully passed the Government examinations for first-class mine managers, sixteen under the Mining Act and eight under the Coal-mines Act; besides these, a great many have been successfully prepared for the engine-drivers' and other examinations.

In the laboratory we have been exceptionally busy, and, with our limited stock of chemicals and appliances, have been almost unable to overtake the work. During the past year we have performed 973 assays and analyses, as against 229 for the previous year, showing the large increase of 744. In the performance of this work I have to thank two of the students—Mr. J. Sutherland, who has lately received a position under the New Zealand Consolidated Company, and Mr. T. O. Bishop, now attending the Otago University and School of Mines—for their able and willing assistance. In the early part of the year the laboratory was also being used by the assayer for the Consolidated Goldfields of New Zealand, when over 220 fire-assays were made in addition to those made for the school.

The classes and laboratory work in connection with the Reefton School have given me so much work that I have had but little time to attend to the outside schools. Brunnerton and Denniston were therefore not visited during the year; and the class at Boatman's had to be discontinued early, owing to the small average attendance.

The following tabulated statement will show the attendance at the classes during the past year:—

Subject.	Members.	Average Attendance.
Mining and mathematics...	18	12
Surveying	18	12
Assaying and metallurgy...	20	14
Theoretical chemistry	12	8
Practical chemistry	12	8
Boatman's class...	11	5

The total number of individuals attending classes would be thirty-three.

In the surveying class very little practical work could be done, as the school is without the necessary instruments. The practical work in the assaying, metallurgy, and chemistry classes was carried on under difficulties, owing to the poor appliances and insufficient supply of chemicals. The instruction given at the classes has been very much the same as that given in previous years.

Practical Assaying and Metallurgy.—The students were instructed in the wet and dry methods of assaying, use and composition of fluxes, fuels, reagents, &c., smelting, valuing, and refining of gold and silver bullion, amalgamation, retorting, &c.; also in the various methods of extracting gold and silver from their ores, such as battery-work, amalgamation, concentration, cyaniding, and chlorination. This class has been very popular, and the instruction given is of great importance to those who wish to qualify as assayers or battery superintendents. Up to the present there has not been a great demand for assayers here, although some of the students have obtained good positions.

Practical and Theoretical Chemistry.—As in the previous year, these two subjects were taken together, and the classes were fairly well attended. The theoretical chemistry was mostly confined to the non-metallic elements, and the chemistry of gold, silver, and mercury. Instruction was given in the preparation of reagents and salts, testing for acids and metals, separation and detection of metals and mineral substances, besides assays and analyses by gravimetric and volumetric methods.

Land- and Mine-surveying.—This work was nearly all theoretical, owing to the want of instruments. Some practical work was done in levelling, forming, and grading; also in plan-work and drawing working sections. Instruction was given in chaining, tabulation of traverses, calculation of areas, heights, and distances, plotting, levelling, and laying out roads and races. With a good theodolite, level, and staff the attendances to this class would be greatly increased, and proper instruction cannot be given without the instruments.

Mining and Mathematics.—The instruction given includes mining geology, logarithms, plane trigonometry, strength of materials, timbering, pumping, and pit-work, hauling and winding, ventilation, explosives, water-power, &c. This class is mostly attended by miners and those wishing to qualify as mine-managers and engine-drivers. Considering that most of the students live a considerable distance from the school, the attendance has been very good, Many are unable to attend regularly, owing to the different shifts, and therefore they miss some of the work done at the class. This is partly the reason they do not attempt the examination-papers.

Boatman's School.—This school started with eleven members, but after doing a little work the average attendance went down to about five, so that the class had to be discontinued.

Reefton School.—There has been but little done in the way of adding improvements to the school. A new muffle furnace has been erected, and the inside fittings of the laboratory have been altered for the convenience of the classes. The crushing of all the samples is done with pestle and mortar, and the assay sample is finely ground on a bucking-plate and muller. This method is very slow and tedious, and a good crushing and sampling machine is much needed. The stock of chemicals and apparatus is very poor, and we have been unable to test a lot of the work sent. We have only the one balance, which has to be used for both assay and chemical work, so that another is urgently needed, as in many cases very poor material has to be tested, and accurate assays and analyses must be made. The support given to the school has been much better than that of the previous year; but, as the committee had to pay off the back debts, there was little left at their disposal for improvements to the school.

The Laboratory.—In this department a large amount of work has been done, no less than 973 assays and analyses being made, besides experiments, determinations of minerals, &c. This shows an increase of 744 on that of the previous year, which is evidence of the amount of prospecting being done in the district. These tests are made up as follows: Fire-assays, 882; amalgamation tests, 67 (weight of stone, 460 lb.); bullion assays and smeltings, 8; analyses, 2; cyanide tests, 2; tin assays, 3; platinum, 1; scheelite, 2; galena, 3; chrome, 2; copper, 3. Most of the samples tested by amalgamation were quartz containing free gold. The greater number of the fire-assays were quartz samples. There were also a great many cements, gravels, and black sands tested. Many tests were made for the General Exploration Company on the cements and gravels extending along the coast at Charleston and Addison's. On all these samples, which are poor in gold, and where 1 dwt. per ton would pay to work, large assays from 1,000 gr. to 2,000 gr. had to be made in order to obtain correct returns.

There has been a considerable amount of prospecting done throughout the district during the past year, and the want of a small testing plant has been frequently spoken about by prospectors and investors. I consider a small testing plant would be a great boon to this district, and would not only assist the prospector and mining companies, but would give our students practical work in the various processes for the extraction of gold and silver. The plant should be capable of treating up to 2 tons at least by wet- or dry-crushing, concentration, amalgamation, chlorination, or cyaniding. A small roasting-furnace would also be required. Experiments on a practical scale could then be made on quartz samples, cements, tailings, and concentrates, and I am quite sure would be productive of some good to the whole of the West Coast.

Annual Examinations.—The annual examinations for students were held in December, 1896. The papers being set by a Government Board of Examiners, only a few of our students competed, and in the subjects taken show good work. The following are the results:—

Student.	Practical Assaying (Senior).	Practical Assaying (Junior).	Practical Assaying (Junior, Dry).	Pumping and Winding.	Land- and Mine-surveying.
T. O. Bishop ...	97	90	90	...	70
N. Lawn ...	..	...	...	62	...
J. Sutherland ...	95	91	90	..	...
S. Lawn ...	...	...	81	...	...
N. S. Lawn ...	...	...	95	...	...

Governing Body.—At the annual meeting the following committee were elected for the current year: President, Mr. W. Laving; Hon. Secretary, Mr. N. Lawn; Hon. Treasurer, Mr. T. H. Lee; members of committee, Messrs. G. Hufton, J. S. Matthews, Rev. T. Pinfold, and T. Watson.

In conclusion, I must thank the committee for the valuable assistance they have given me in carrying on the work of the school, and I trust that the institution will continue to improve, and show some practical results at the end of the present year.

OTAGO SCHOOL OF MINES.

The attendance at this school has still further increased during the year 1896. The new plant for treatment of ore has been completed, and a number of parcels of quartz were crushed and treated by amalgamation or by the cyanide process.

The following is the report of Professor George H. F. Ulrich, the Director of the school, on the progress made during the past year, the personal notice of students and list of donations to the Mining Museum being omitted:—

I have the honour to submit the following report regarding the attendance, work, and results of annual examinations of the School of Mines during the past session (1896), together with remarks on the practical teaching facilities, and on other points affecting the future progress of the school.

The attendance number of students during the past session was thirty-eight, classed as thirty-two regular students for the full course and six occasional ones for special subjects—principally assaying—only. Of the thirty-two regular students, nineteen were old ones returned for the completion or further prosecution of their studies (as detailed further on), whilst the other thirteen comprised new entries, including one student who had the previous session attended as an occasional one. Ten of the new students entered for the first year's course of the mining division, though several with the intention of going through four years' study, in order to enable them to gain in addition to the diploma of associate in mining that of associate in geology or the certificate of metallurgical chemist and assayer. Two students who had some years before gone through the first year's course of the mining division returned for the completion of their studies, and the thirteenth new student—being the holder of one of the three scholarships in mining established by the Hon. the Minister of Mines (Mr. Cadman), and tenable at the Otago University—entered for the study of the subjects of the geological division with the aim of gaining the B.Sc. degree in geology in the University of New Zealand. As the attendance number of students during the session of 1895 was twenty-seven, of whom only nineteen returned, the loss of eight is explained by three occasional students and of two who had the year before entered as regular students not returning, whilst the other three—viz., John Watt, Ernest Edwards, and John Orkney—had finished their studies and passed the prescribed examinations, as stated in my last year's report. After producing certificates of twelve months' engagement in practical work in mines they have since each been granted the diploma of associate in mining, and, in addition, John Watt and John Orkney the diploma of associate in metallurgy, and Ernest Edwards the certificate of metallurgical chemist and assayer, to which they were entitled.

The attendance of the various classes by the thirty-two regular students was very satisfactory, only a small number having missed any lectures, and those mostly on account of illness.

The ten new students passed through the first year's course with the exception of five—two who did not attend mathematics, one who failed in this subject, one who failed in mining geology, and one who failed in theoretical chemistry.

Thirteen students passed through the second year's course of the mining division, save two who did not attend mineralogy—one who failed and one who did not sit for the examination in this subject. Three others did not take the classes in theoretical and practical physics, but as these, as well as the others who missed classes, have the intention of staying four years they can make up the deficiencies during next session.

Eight students—some of four years' and one of three years' standing—finished their studies during the past session, and are leaving the school, having successfully passed the examinations in all the subjects prescribed for several of the divisions.

With few exceptions, all these students took advantage of learning by the practical instruction and example of Mr. Fitzgerald, battery-work and gold-extraction by amalgamation and the cyanide process in working regularly four-hour shifts alternately from the time the testing of samples for the public was started.

In compliance with applications, Mr. Fitzgerald arranged evening-classes in assaying, which were attended by six occasional students, five of whom came regularly all through the session, whilst the sixth stopped away after about three months' work. As the afternoon classes for the sixteen regular students in the first and second courses of assaying (which need at least three hours each for three afternoons per week, and necessarily require to be held together for want of other free time) were rather crowded, and the five available smelting furnaces proved quite inadequate for continuous steady working of these students, two of them, whose other lectures fortunately permitted it, attended the evening classes also, much to their own convenience and that of the other students of the afternoon classes.

All the new students (eleven) who entered for the first year's course attended the evening class established by the St. John Ambulance Association, and were successful in passing the examination, and thereby gaining certificates of first aid as required by the regulations. On considering that the lecture-hours of the first year's course on any day of the week leave the hour free at which the ambulance class is generally held (which is not the case in the second and third year's courses), it was thought advisable to make attendance at that class part of the first year's course for the future, and prescribe it in the calendar.

The numerical attendance at all the classes, and the results of the recent annual examinations, are shown in the following table :—

Subjects.	Attendance.	Entered for Examination.	Results of Examinations.			
			1st Class.	2nd Class.	3rd Class.	Failures.
General (University)—						
Mathematics	11	11	1	4	5	1
Theoretical mechanics	7	7	...	4	3	...
Theoretical physics	11	12	2	5	5	...
Practical physics	6	6	1	2	3	...
Theoretical chemistry	13	13	2	4	5	2
Practical chemistry	12	12	6	5	1	...
Theoretical biology	3	3	...	1	2	...
Practical biology	3	3	...	3	...	...
Special (School of Mines)—						
Mining, first course	16	16	4	6	6	...
Mining geology	11	10	1	3	5	1
General geology	11	10	4	6	...	...
Palæontology	3	3	...	3	...	...
Mineralogy	11	10	...	4	5	1
Petrography	7	6	...	4	2	...
General metallurgy	6	6	2	4	...	...
Special metallurgy	6	6	3	3	...	...
Theory of assaying	9	9	3	5	1	...
Practical assaying, first course ...	9	9	6	3	...	...
Practical assaying, second course	7	7	5	2	...	...
Blowpipe analysis	12	12	4	8	...	...
Applied mechanics	5	6	3	3	...	...
Surveying, first course	9	9	5	2	2	...
Surveying, second course ...	5	5	5	...	...	...
Model drawing	9	9	7	2	...	...
Practical plane geometry } drawing {	11	11	8	3	...	...
Solid geometry ... } drawing {	4	4	3	1	...	...
Machine drawing	3	3	2	1	...	...
Totals	...	..	77	91	45	5

The twenty-four students who require to make use of the vacation for practical mining-work have by this time most probably all found places in gold- and coal-mines in Otago, on the West Coast (South Island), and in the Thames and Hauraki Districts (North Island). The chances of obtaining employment in the latter mining fields seemed, in fact, so favourable, according to news received by some of the students, that thirteen departed together by steamer for Auckland directly after the results of the annual examinations were published. Owing to the kind intercession of Mr. James Allen, M.H.R., the general manager of the Union Steamship Company (Mr. J. Mills) made a liberal reduction in the cost of a return ticket to Auckland from £7 10s. to £5, and extended the time of return to six months—a generous aid during the pursuance of their studies highly appreciated by the students. The manager of the Huddart-Parker Steamship Company has since also intimated by letter that he will in future treat our travelling students with the same liberality as the Union Steamship Company.

Regarding the number of students likely to attend for next year's session, it may reach sixty in case all the twenty-four old students return and all new applicants for entry are admitted. The number of these latter at present on the books is thirty-two, but additional ones will very probably come forth before the commencement of next session. For the special mining classes of the first year's course—mining geology and general geology—(which are the same for all the five divisions of the school) the enlargement and alterations of the present museum room, as sanctioned by the Council, will probably afford the necessary seating-space for so large a number of students; and, if not, Professor Shand's lecture-room, being free at the hours fixed for these classes, could be made use of, though with some inconvenience in the carrying about of models, specimens, and diagrams. But for three of the classes of the second and third years' courses—viz., assaying, petrography, and surveying—twelve students at the outside (which for assaying means twenty-four, as explained previously) can only be accommodated, and only on provision for the assaying class of five new smelting-furnaces, and for that in petrography of at least four additional petrological microscopes and a second machine for cutting and grinding rock-sections.

With regard to the assaying class last session, Mr. Fitzgerald wrote to me as follows: "I found that the laboratory accommodation was taxed to the utmost. I had sixteen students, two of whom luckily were unable to take the evening class, thus relieving the furnaces to a certain extent. I understand that five new furnaces are to be added, but I would draw attention to the fact that even with the new furnaces we could not accommodate more than twelve students in each course."

For a class of twelve in petrography, and for any larger number than this in mineralogy, an assistant demonstrator would be necessary, for the reason that in these subjects, more especially in petrography, each student requires special individual attention and instruction in microscopic examination and the preparation of rock-sections, and one man cannot possibly do this work and yet cover the ground prescribed in the calendar in the time available during the session. From the foregoing it will be seen that should, of the large number of students to be admitted for next session, more than twelve qualify for entering the session after next any of the above three classes, by passing the annual examination in mathematics and chemistry according to the Council's ruling, and the entry up to twelve goes by priority of application for entry to the school, then those above that number will have to wait for admittance to these classes till the succeeding session. Being free, however, to take other classes included in the curriculum, they can so arrange that their time for study is fully occupied during the interval. From conversation I had with many of the new applicants I found that a number of them are very deficient in necessary preliminary knowledge, and have, I am afraid, little chance of passing in mathematics and chemistry at the end of the first year's course; but, though I pointed this out to them, their intention of joining the school remained unshaken. On consideration of all circumstances, the pressure for entry to the school will most probably be confined to next session; but, should it be repeated to the same extent for the session after next, a limit would have to be placed on the number of admittances, otherwise the resources of the school in accommodation, apparatus, instruments, &c., would be totally inadequate: they would, in fact, require to be more than doubled in order to meet all the necessary demands for proper teaching.

For the purpose of rendering his lectures more interesting and instructive to the students, the lecturer in general geology, Dr. Don, prepared at his own expense about two hundred lantern-slides, illustrating geological features and occurrences in various parts of the world, many of them, as he informed me, being copied from the admirable reports and monographs of the United States Geological Survey. He also followed the same valuable course as last year regarding practical instruction in field geology, by making, with his students, three field excursions, of which he most liberally paid the greater portion of the expenses. The first excursion during one day took in various places of interest on the Otago Peninsula, especially the Blowhole and the limestone quarries of Sandymount, and the interesting occurrence of auriferous volcanic rock at Hooper's Inlet. The second excursion, which occupied five days during the midwinter vacation, was to Catlin's River and Kaitangata. At the former place three days were spent in the study of the fossiliferous beds of Cannibal Bay, Catlin's River, and Owaka, and of the remarkable results of marine erosion on the neighbouring sea-coast. On the return journey a day was devoted to the inspection of the celebrated Kaitangata Coal-mine and the very fine and large mining machinery connected therewith. The third excursion, occupying two days, had for its object the study of interesting geological features around Palmerston, of the Hampden beds enclosing the celebrated Moeraki boulders—gigantic septaries, so far unique in the world—next, of the fossiliferous series of Oamaru and of the Devil's Bridge. Dr. Don, on behalf of himself and the students, expresses thanks to the General Manager of Railways for extending the concession in railway return fares from three days to eight days, so as to allow a longer stay at Catlin's; next, to Mr. W. P. Watson, the general manager of the Kaitangata Company, for permission to inspect the mine; and to Mr. J. Shore, the mining manager, for conducting the party through the workings, and in supplying sections of the workings illustrating the faulting of the coal-measures in that district. Dr. Don and the students are also very grateful to Mr. J. Paterson, the librarian of the Dunedin Athenæum, for permission to occupy his cottage during their stay at Catlin's River.

The resignation of Mr. P. Fitzgerald of his post as lecturer in assaying and metallurgy again deprives this department of the school of an able and energetic teacher, who performed his duties with exactness and conspicuous success. As one of our past students he certainly sets, however, a good example by his self-confidence and enterprise in trying to better his position by entering into private practice as an expert, and taking the principal active part in an undertaking to develop some of the neglected gold resources of this province.

Although the new testing plant has been specially reported on to the mining committee of the Council by Mr. W. Cutten, the lecturer on applied mechanics, under whose supervision it was erected, and also by Mr. Fitzgerald, who conducted its working since its completion, still I may be permitted to add here a few remarks concerning some alterations and additions which I consider would much improve its gold-saving facilities by amalgamation, and next in explanation of the objects of the plant—in fact, its value to the mining public. Regarding the amalgamating appliances in direct connection with the mortar-box at present in use, they consist of two silver-plated and amalgamated copper-plates divided by a very shallow and narrow quicksilver riffle, and at the end of the second plate of a deeper quicksilver riffle from which the crushed material runs on to two blanket strakes. In the working it has now invariably been found that the shallow dividing riffle and the succeeding copper-plate retained but a small percentage of gold, while the deeper quicksilver riffle at the end caught a much larger quantity. This points distinctly to the advisability of interposing between the copper-plates, instead of the present shallow riffle, a so-called deep-drop riffle, say, of 8 in. drop, such as are used in sets of three with great satisfaction in some of the best crushing-mills in Victoria, and in cases quite to the exclusion of copper-plates. The second copper-plate would need to be only a few inches broad, and be followed by a shallow catch-riffle, following which again would come the blanket strake, some 4 ft.–5 ft. larger than at present—an addition much needed for a more satisfactory saving of pyritous material. All these alterations and additions, which I beg strongly to recommend, can easily be effected, and at but a small expense—say, about £3. Regarding the value of the plant to the mining public, it consists, in my opinion, not so much in extracting the highest possible percentage of gold from any parcel of ore sent, but rather in the information imparted to the sender in the report accompanying the gold extracted. For he will find indicated in this report, as deducible from the results of the

various assays, cyanide tests, and observations made in the course of the trial, the most advisable treatment on the large scale for ore of similar character as the parcel sent, which may be by wet-crushing and amalgamation and use of the berdan or the cyanide process for the concentrates or by direct application of the cyanide process—*i.e.*, by dry-crushing and leaching of the crushed stuff by cyanide solution of a certain strength. There seems to be a belief amongst some Otago mining men that the direct use of the cyanide process, as just explained, is advantageous for auriferous quartz of every description, but this is a great mistake. For the ore of most, if not perhaps all, auriferous reefs of Otago occurring in schistose rocks the direct process is quite unsuitable, and causes loss, owing partly to the general great diversity in the size of the gold particles enclosed therein, partly to its mullocky character or admixture of schistose rock. While the finest gold particles may yield to the cyanide solution in a few hours, the larger ones might require up to several days for this action, and consequently there is no limit fixable for the time of satisfactory leaching. And mullocky ore, or such mixed with schist, forms slimes so unctuous and impermeable that hardly any cyanide solution will filter through, even by the use of a strong exhauster. For these reasons senders of ore parcels should not unreservedly demand the use of the direct process for their ore, as was done in some cases, but leave the advisability of its application to the judgment of the operating metallurgist; for, if they do so, it stands to reason that they have to be satisfied with the results of the extraction, however unfavourable these may turn out.

The work done for the public since the date of my last year's report—25th November—by Mr. P. Fitzgerald, and since his departure by Mr. A. Mosley, in assays, analyses, and with the testing plant, and by myself in the determination of minerals and rocks, was as follows:—

Assays and Analyses charged at Fixed Rates.

(Executed by Mr. Fitzgerald.)

December 14, 1895.—Two assays, one of quartz and one of concentrates, for gold; for Mr. R. Allen, Invercargill.

January 14, 1894.—Four assays of four samples of quartz for gold; for Mr. Gilbert, Christchurch.

January 15.—Four assays of four samples of quartz for gold; for Mr. Donald Reid, Dunedin.

March 31.—Assay of sample of quartz for gold; for Mr. R. Brunton, Waipori. Assay of sample of sandstone for gold; for Mr. Gilbert, Christchurch. Two assays of two samples of quartz for gold; for Mr. Reeves, jun., Dunedin. Assay of sample of quartz for gold; for Mr. Donald Reid, jun., Dunedin.

April 2.—Six assays of six samples of quartz for gold; for Mr. R. Lee, Dunedin.

April 9.—Cyanide test of concentrates for gold; for Mr. Donald Reid, jun., Dunedin. Assay of sample of quartz for gold; for Mr. G. H. Oatway, Dunedin.

April 14.—Four assays of four samples of pyritous quartz for gold; for Mr. G. H. Oatway, Dunedin.

April 15.—Assay of sample of concentrates for gold; for Mr. Proctor, Dunedin. Three assays of three samples of quartz for gold; for Mr. R. Lee, Dunedin. Assay of sample of pyritous schist for gold; for Mr. H. R. Wilkinson, Dunedin. Assay of sample of garnet sand for tin; for Mr. Pearce, Dunedin.

April 20.—Assay of concretionary iron-ore for gold; for Mr. Kirk, Dunedin. Assay of sample of sandstone for gold; for Mr. Kirk, Dunedin. Assay of sample of clay for gold; for Mr. Kirk, Dunedin. Assay of sample of marcasite for gold; for Mr. Kirk, Dunedin.

April 21.—Analyses of five samples of coal; for Mr. G. M. Barr. Thirteen assays of thirteen samples of quartz for gold; for Mr. A. Lorie, Dunedin.

April 23.—Assay of sample of quartz for gold; for Mr. R. Allen, Invercargill.

May 15.—Assay of concentrates for gold; for Mr. Proctor, Dunedin.

May 20.—Assay of sample from an alluvial deposit for gold; for Mr. Kirk, Dunedin. Nine assays of nine samples of quartz for gold; for Mr. P. Laing, Dunedin.

May 23,—Two assays of two samples of quartz for gold; for Mr. J. Trent, Christchurch.

May 29.—Two assays of two samples of quartz for gold; for Mr. P. Laing, Dunedin. Six assays of six samples of quartz for gold; for Mr. C. E. Pinder, Dunedin. Two assays of two samples quartz tailings for gold; for Mr. C. E. Pinder, Dunedin. Analysis of samples of shell marl; for Marshall's Pharmacy.

June 2.—Assay of sample of sandstone for gold; for Mr. Macfie, Dunedin. Assay of sample of tailings for gold; for Mr. C. E. Pinder, Dunedin. Assay of sample of tailings for gold; for Mr. L. O. Beal, Dunedin.

June 4.—Four assays of four samples of diorite rock for gold; for Mr. W. C. MacGregor, Dunedin. Assay of sample of quartz for gold; for Mr. Bair, Waitati. Two assays of two samples of quartz for gold; for Mr. A. Lee Smith, jun., Dunedin.

June 6.—Four assays of four samples of quartz for gold; for Mr. P. Laing, Dunedin.

June 8.—Two assays of two samples of sandstone for gold; for Mr. E. Kirk, Dunedin.

June 9.—Four assays of four samples of quartz for gold; for Messrs. Sargood, Son, and Ewen.

June 29.—Assay of sample of pyrite for gold; for Mr. Thomas, Christchurch. Assay of sample of quartz for gold; for Mr. J. A. Chapman, Dunedin.

July 29.—Assay of sample of tailings for gold; for Mr. R. Allen, Invercargill.

August 2.—Assay of sample of quartz for gold; for Mr. Walde, Queenstown. Three assays of three samples of quartz for gold; for Mr. J. Elliott, Roxburgh. Three assays of three samples of quartz for gold; for Mr. J. Begg, Westland. Assay of sample of sedimentary deposit from near the Wairongoa Mineral Springs for gold; for Mr. Thomson, Dunedin. Assay of a sample of quartz for gold; for Mr. G. L. Denniston, Dunedin.

August 3.—Seven assays of seven samples of quartz for gold; for Mr. R. Lee, Dunedin.
August 4.—Four assays of four samples of quartz for gold; for Mr. E. R. Smith, Dunedin.
August 8.—Assay of a sample of arsonpyrite for gold; for Mr. M. Waughorn, Dunedin.
August 10.—Two assays of two samples of quartz for gold; for Mr. E. Trythall, Dunedin. Assay of sample of quartz for gold; for Mr. R. Lee, Dunedin. Assay of sample of black ironsand for gold; for Messrs. Wright, Stephenson, and Co., Dunedin. Two assays of two samples of quartz for gold; for Mr. Simpson, Waitahuna.
August 13.—Three assays of three samples of felspathic dyke rock for gold; for Mr. Reynolds, Round Hill, Southland.
August 20.—Assay of sample of quartz for gold; for Mr. Sheppard, Hindon.
September 4.—Assay of sample of quartz for gold; for Mr. Green, Ophir.
September 22.—Two assays of two samples of quartz for gold; for Mr. R. Lee, Dunedin. Assay of sample of quartz for gold; for Mr. E. Trythall, Dunedin. Three assays of three samples of quartz for gold; for Mr. Robertson, Dunedin. Assay of sample of quartz for gold; for Mr. J. A. Chapman, Dunedin.
October 1.—Four assays of four samples of quartz for gold; for Mr. Crosswell, Napier.
October 9.—Assay of sample of quartz for gold; for Mr. R. Lee, Dunedin.
October 10.—Assay of sample of quartz for gold; for Mr. R. Allen, Invercargill. Assay of sample of quartz for gold; for Mr. Platts, Port Chalmers.
October 20.—Two assays of two samples of quartz for gold; for Mr. R. Lee, Dunedin.
October 23.—Assay of sample of quartz for gold; for Mr. Wilkinson, Dunedin. Two assays of two samples of dyke rock for gold; for Mr. Ward, Ophir.
October 31.—Three assays of three samples of quartz for gold; for Mr. E. Trythall, Dunedin. Assay of sample of quartz for gold; for Mr. G. H. Oatway, Dunedin.

(Executed by Mr. A. Mosley.)

November 6.—Assay of sample of quartz for gold; for Mr. Simpson, Dunedin.
November 14.—Assay of sample of quartz for gold; for Mr. Montella, Dunedin. Assay and analysis of ore for gold, silver, and copper; for Mr. L. Falconer, Kaikora, Hawke's Bay. Assay of quartz for gold; for Mr. G. Tacon, Clyde. Analysis of sample of scheelite for tungstic acid; for Mr. J. Souter, Dunedin.
November 18.—Two assays of two samples of black ironsand for gold; for Mr. P. McSkimming, Benhar.
November 19.—Assay of serpentinous talc schist for gold; for Mr. R. T. Webb, Christchurch. Assay of sample of quartz for gold; for Mr. G. D. Wilson, Kumara Junction.

Parcels of Ore treated by the Testing Plant.

The detailed reports of the treatment and yields of the parcels sent up to date, including results of assays and cyanide tests made in course of the work, were furnished to the Registrar, who forwarded them to the parties interested, but kept a copy of each report for reference. An abstract of the work done up to the present need, therefore, only here be given in order to show the good use mining men have so far made of the plant, and the advisability of its erection:—

(Treated by Mr. P. Fitzgerald.)

7 cwt. quartz by wet-crushing and amalgamation; for Parker and party, Roxburgh.
1½ tons quartz by wet-crushing and amalgamation; for Glover and party, Dunback.
2 tons quartz by wet-crushing and amalgamation; for Stoneburn Quartz Company.
1 ton quartz from Hindon by wet-crushing and amalgamation; for Dr. Macpherson, Dunedin.
5 tons quartz from Saddle Hill reef by wet-crushing and amalgamation; for Mr. J. R. Scott, Dunedin.
9 cwt. quartz by wet-crushing and amalgamation; for Messrs. Pitchers and Wetherall, Lawrence.
18 cwt. quartz by wet-crushing and amalgamation; for Messrs. Fowler Brothers, Nenthorn.
1 ton 1 cwt. quartz by wet-crushing and amalgamation; for Wright and party, Waitahuna.
10 cwt. quartz by dry-crushing and cyanide process; for Glover and party, Dunback.
1 ton quartz by dry-crushing and cyanide process; for Stoneburn Quartz Company.
1 ton quartz from Hindon by dry-crushing and cyanide process; for Dr. Macpherson, Dunedin.
18 cwt. of blanketings by cyanide process: for Mr. A. Lorie, Dunedin.

(Treated by Mr. A. Mosley.)

1½ tons quartz by wet-crushing and amalgamation; for Mr. Green, Ophir.
16 cwt. mixture of quartz and serpentinous talc schist by wet-crushing and amalgamation; for G. D. Wilson and party, Kumara Junction.

Determinations of Mineral and Rock Specimens.

(Made by myself, and not charged for.)

December 10, 1895.—A clayey mineral found on the slope of Flagstaff Hill by Mr. Booth, of Woodhaugh, proved to be halloysite, of no commercial value.
February 20, 1896.—Sample of mineral from Riversdale, forwarded by editor of *Witness*, proved to be common black hornblende with some quartz and feldspar.
February 27.—Supposed precious stone from the Clyde district, sent by Mr. L. O. Beal, was found to be common amethyst, of no commercial value on account of flaws and cracks.

April 5.—White mineral found at Waikouaiti, forwarded by editor of *Witness*, proved to be a hydrous silicate of alumina allied to halloysite.

June 30.—A sample of fine black sand, forwarded by Mr. W. Motherwell, Ophir, was found to consist of titaniferous iron with a small percentage of magnetite. Two rock specimens from same district proved to be argillaceous mica schist coated with manganiferous brown iron-ore.

July 17.—A sample of coal from Fortrose, sent by the editor of *Witness*, resembled pitch-coal, but was found to be so strongly impregnated with pyrite and to be generally so friable as to render it of very little value.

July 25.—Sample of rocky material supposed to contain gold found near Oamaru, and sent by Dr. Garland, proved to be non-auriferous.

August 22.—Sample of rock from Raggedy Ridge, near Ophir, sent by Mr. W. Motherwell, and supposed to be of some value in containing gold and other metals, was found to be rather decomposed quartziferous phyllite mixed with micaceous quartz schist, all impregnated with small crystals of pyrite and magnetite; an assay gave a small trace of gold.

September 1.—Mineral specimens from western spur of Mount Cook, forwarded by D. M. McFarlane, S.M., Hokitika: These specimens contained in a matrix of quartz and tremolite small crystals and granular patches of a red transparent mineral, supposed to resemble the Oriental ruby once found at Rimu, but the mineral proved to be common garnet of no value.

November 3.—Specimen of rock from the Inkerman Mine, Reefton, forwarded by Mr. G. Dixon, was found to be a fine-grained somewhat feldspathic sandstone.

Information and Reports on Various Subjects.

(Furnished by myself without charge.)

December 3.—Information to editor of *Witness* about market price of aluminium.

December 10.—Information by letter to Mr. W. H. Young, miner, Hyde, about prospecting of quartz reefs.

April 4.—Furnished to editor of *Witness* instructions for the preparations of corrosive sublimate and nitrate of quicksilver, to be used for the amalgamation of copper-plates.

July 16.—Prepared for the Council of the Bendigo School of Mines, Victoria, at their request, a detailed description of our crushing and gold-extraction plant.

July 24.—Furnished information in answer to two inquiries—one from Watson Brothers, the other from Mr. A. Selby, Melbourne—regarding the occurrence and best mode of procuring scheelite in this province, to be used for the manufacture of fluorescent screens required for obtaining proper effects by means of the Röntgen X-rays.

NELSON SCHOOL OF MINES.

This is a school where the pupils are taught mineralogy, assaying, and elementary chemistry. The following is Mr. W. F. Worley's report on the progress made during the year:—

I have the honour to report as follows on the work done in connection with the Nelson School of Mines from the 31st March, 1896, to the 31st March, 1897.

Blowpipe Class.

Thirty-six boys joined this class early in April, 1896. Most of these attended well till the end of the year, but after the Christmas vacation, owing to some of the boys having left school and to the rearrangement of classes, the numbers fell off to twenty. The attention of the class was directed mainly to the testing of ores and metals of commercial importance. Each boy, in addition to the ordinary blowpipe outfit, was provided with a small tin pan and some gold-bearing sand with which he practised the art of panning. The boys took great interest in the work of their class, and, for their years, made considerable progress. The class was examined on the 31st March of this year. Small quantities of lead, antimony, bismuth, chrome, copper, and manganese compounds were given to each boy, and one hour was allowed for the testing of these. To prevent mere guesswork, each boy was required to assign his reason for giving a given name to any of the test-powders with which he had been provided. There were thirteen boys present at the examination. Jesse Hill named correctly five of the minerals, and was awarded the first prize—a handsome blowpipe cabinet, presented by J. D. Hornsby, Esq. Six others named correctly four of the minerals, but owing to their thus tying were examined again with fresh tests for the honour of second place. Harold Hounsell proved the best among these, and was awarded second prize—a copy of the "Prospector's Handbook," presented by myself.

Lectures.

A lecture on fire-damp and choke-damp was prepared to illustrate the supposed cause of the Brunner disaster. It is not necessary for me to mention the theoretical parts of this lecture, but a description of the experiments by which it was illustrated might be useful to those who have to do with coal-mines. A large wide-mouthed glass bottle was procured, and graduated into twenty parts. The graduating was done thus: The bottle was placed on a pair of good scales and carefully counterpoised. A 4 oz. weight was then added to the weights, and water poured into the bottle till the scales again balanced. The bottle was then placed upon a level surface, and on each side of the bottle was drawn a short, thin line of red paint, just at the level of the water. This operation was repeated till the whole of the bottle was graduated. To facilitate counting the marks on the bottle each fifth mark was numbered. A tinsmith was then got to make a small Davy lamp, just large enough to pass through the neck of the bottle. The diameter of the Davy lamp was $1\frac{3}{4}$ in. and its depth 8 in. One of the three stout wires used for strengthening the sides of the lamp was pro-

longed to 18 in. to serve as a handle when lowering the lamp into the bottle. A short piece of small wax candle, such as is used on Christmas-trees, supplied the light. The candle-socket was made to fit just tight into the bottom of the lamp, and did not need any fastening. With these pieces of apparatus one was able to show the behaviour of the flame towards mixtures of air and coal-gas. The first experiment was made with one part of gas to nineteen parts of air. The naked flame of a small piece of candle attached to a wire was lowered into this mixture, and the character of the flame noted. The experiment was repeated with the same quantity of gas, but with one part less air, and the ratio of air to gas was thus gradually reduced till the explosive point was reached. This explosive point was found to be between thirteen to fourteen parts of air mixed with one of coal-gas. The quantity of air was then still further reduced till the maximum amount of explosive force was reached. One of gas to nine or ten of air gave the loudest explosion. With these quantities the bottle was half-full of water, the other half of the bottle being taken up by the explosive mixture of air and gas. To get a larger volume of explosive gas two parts of gas were mixed with eighteen parts of air, and the mixture fired with a naked light. A similar mixture of air and gas was then made, and the Davy lamp lowered into it. The gas was seen to inflame within the lamp, but there was no explosion.

To show the effects of a gas explosion upon animal life the bottle was again charged with two of gas to eighteen of air; a mouse was dropped into it, and the gas fired by a naked light. The mouse was singed and stupefied, but not killed, the small amount of carbon dioxide in the bottle not being sufficient to kill it. It was, however, quickly despatched by pouring into the bottle some ready-prepared carbon dioxide, the deadly properties of that gas being thus shown. These experiments have been described in detail, with the hope that some of those who work in coal-mines will perform the experiments for themselves, and thus learn by actual experiment the dangerous nature of the gases with which they have to deal. Many miners have not seen the faintest gas explosion; hence the weakness of their conception of danger, and their neglect of the safeguards provided for them.

Assaying.

Nelson has felt the wave of the mining boom, and during the last twelve months more assaying has been done here than in any previous year. In all 149 assays were made, most of them being fire-assays for gold or silver, but a few of them were wet-assays for copper. Judging from the quality of some of the stones sent for assay, there ought to be a considerable increase in mining in this district before long. The most interesting discovery of the year was the existence of gold in some of the copper-sulphide lodes of the Dun Mountain district. The gold was first discovered in the Monster Lode, at the head of Aniseed Valley; and later on an outcrop of gossan on Mount Claude, lying between there and the Dun Mountain, was also found to carry gold. The assay-value of these lodes is not high, but is sufficiently good to warrant extensive prospecting. Appended is a schedule of the assays from that district:—

Copper-sulphide (Monster Lode)—

	Gold.	Copper.
No. 1 assay	4 dwt. per ton.	Not estimated.
No. 2 "	2 "	"
No. 3 "	8 "	"
No. 4 "	4 "	"
No. 5 "	5 "	"
No. 6 "	4 "	"
No. 7 "	4 "	"
No. 8 "	6 "	4·08 per cent.
No. 9 "	4 "	3·48 "

Copper-carbonate, &c. (Monster Lode)—

	Gold.	Copper.
No. 1 assay	Trace.	25·3 per cent.
No. 2 "	"	24·0 "

Gossan outcrop (Mount Claude)—

	Gold.
No. 1 assay	8 dwt. per ton.
No. 2 "	4 "
No. 3 "	3 "
No. 4 "	4 "
No. 5 "	5 "
No. 6 "	2 "

Miscellaneous Tests.

In addition to the assaying, several pan tests and blowpipe tests were made, a few only of which call for special mention. Some black sand from the Moutere Hills was found to consist largely of grains of chromite. This is an interesting geological discovery, as it proves that the mineral belt was being denuded at the time the materials of which the Moutere Hills are composed were being deposited. Some black sand from the upper part of the Motueka River gave, in addition to iron, reactions for nickel, but the test was not decisive. A visit to the Moutere Hills proved conclusively, by several pan tests, that that formation is gold-bearing, though nothing approaching payable stuff was seen. Some of the sedimentary rock from the district of the Enner Glynn Coal-mine was also found to contain traces of gold. These facts seem to indicate that a lead of payable gold might be found if properly prospected for.

Conclusion.

Owing to so much of my time being taken up with assaying I was unable to hold any classes for adults, though several persons were anxious to join classes. With the limited amount of spare time at my disposal, even the assaying was rather too much for me, and I was obliged to employ labour for the rougher parts of the work. My laboratory is extremely small, and I have not yet been able to afford the laying-on of water. Gas for roasting purposes and small fusions was laid on about the middle of the year, at my own expense. In studying the rocks of this district I am badly in need of a petrological microscope, and hope before the end of the year to receive some assistance in purchasing one.

EXPENDITURE ON SCHOOLS OF MINES.

The following table shows the expenditure by the Government on Schools of Mines since their inauguration, 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 Sums 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	1,219 3 0
1896–97 ...	352 14 11	58 18 6	100	834 12 8	1,346 6 1
Totals ...	3,167 3 5	1,047 0 1	150	12,806 5 8	16,670 9 2

The above statement shows the amount expended on the different Schools of Mines throughout the colony; but, in addition to this, the sum of £6,250 has to be added, as that has been paid to the School of Mines attached to the University of Otago, £1,000 being paid last year towards maintaining the school and erecting additional plant, which makes the total expenditure up to the 31st March last to be £22,920 9s. 2d. This expenditure has extended over a period of twelve years.

WATER-RACES.

Waimea Water-race.

The deviation of this race is so far advanced that the water is now run in the open ditch. There is still a section of low fluming, about 11 chains, to be constructed to receive the water from the ground-race, and when this is completed the whole of the high fluming will be dispensed with. The sound timber available from the old high fluming is used where practicable in the construction of the low fluming connecting with the ditch. The whole of the timber in this fluming is silver-pine, and will last for forty years in good condition. A great saving in the cost of maintenance is now effected, the old fluming having taken a great deal of labour and material to keep it serviceable. On the whole, this may be looked upon as a work of great importance to the miners, as there is now less chance of breakages in the race, and consequent loss of time in carrying on sluicing operations. The amount expended on this work was £1,512 11s. 1d. during the year.

The branch race to Callaghan's has been completed, and water supplied to the miners during the months of February and March. The amount expended was £329 7s. 1d. during the year.

No work has been done on the branch race towards the middle branch, Waimea Creek, as no water can be used from it until the completion of the Waimea Main Tail-race. When this is completed about 80 chains of race will have to be constructed to supply water to the claims which the tail-race will command. This new main tail-race has been driven a total length of 2,100 ft., and the trustees are about to sink a shaft to connect with the surface in the large flat on the middle branch of the Waimea Creek. When the communication is made the tail-race will be paved with wood blocks, and several parties are ready to drive branch tail-races to connect with the claims, so that in a short time it will be available for use.

The Kelly's Terrace drainage-tunnel has been driven 1,200 ft., and, as the country through which the tunnel is being driven is auriferous, it is probable that payable gold may be struck before the intended termination of the tunnel 6,600 ft. from the entrance is reached. It is expected, therefore, that water will shortly be required to work the ground opened by both the tail-race and the drainage-tunnel.

The following statement will show the receipts and cost of maintenance of the Waimea Race for the year ending the 31st March last, together with the approximate quantity of gold obtained by those using water for working claims from that supply :—

Month.	Sales of Water.	Cash received for Sales of Water.	Expenditure.	Outstanding Moneys at the End of each Month.	Number of Men employed.	Approximate Quantity of Gold obtained.	Value of Gold obtained.
1896.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		Oz.	£ s. d.
April	54 14 2	70 18 9	68 13 10	8 10 3	73	130	507 0 0
May	67 2 11	67 8 4	74 9 3	8 10 3	78	168	655 4 0
June	69 19 2	46 9 3	64 17 4	7 15 3	79	170	663 0 0
July	88 17 6	88 2 0	53 14 2	7 15 3	76	222	865 16 0
August	55 0 0	69 4 9	51 19 2	7 15 3	61	155	604 10 0
September	56 8 4	54 12 0	51 5 10	7 15 3	70	160	624 0 0
October	65 11 11	76 0 9	42 14 0	7 15 3	66	185	721 10 0
November	70 18 11	73 7 6	45 14 2	7 15 3	59	210	819 0 0
December..	52 15 0	30 19 6	52 0 11	7 15 3	60	159	620 2 0
1897.							
January	50 11 5	72 0 6	85 19 3	12 7 9	48	138	538 4 0
February	61 13 4	55 15 0	38 19 2	7 15 3	64	186	725 8 0
March	83 6 9	74 4 0	38 19 2	10 12 10	61	250	975 0 0
Totals and average ..	776 19 5	779 2 4	669 6 3	..	66.25 (average)	2,133	8,318 14 0

It will be seen from the foregoing statement that the value of the sales of water for the year amounted to £776 19s. 5d., as against £795 13s. 6d. for the previous year, while the cost of maintenance amounted to £669 6s. 3d., as against £770 3s. 8d. for the former year; thus showing a decrease in the cost of maintenance of £100 17s. 5d., and also a decrease in the value of the sales of water of £18 14s. 1d. from the previous year.

The average number of men employed in claims worked with water from this supply last year was 66·25, and the approximate quantity of gold obtained by them was 2,133 oz., representing a value of £8,318 14s. Deducting the value of the sales of water from the value of the gold obtained, it leaves the average earnings of the men to be £113 16s. 9d. per man per annum, or £2 3s. 9d. per man per week. This cannot be taken as their actual earnings, as the cost of pipes, tools, and timber required in working the claims has also to be taken into consideration. The value of free water given to open up claims and for working poor ground during the year was £100. This free water, however, is necessary, as the ground is becoming more expensive to work every year. The total cost of this water-race and branches up to the end of March last was £136,340 18s. 7d.

Callaghan's Branch Water-race.

This race has been completed at a total cost of £5,948 18s. 8d., and the miners in this district have been supplied with water since the beginning of February. The anticipation formed that this race will become of importance is shown by the returns obtained from the use of the water from this supply:—

Month.	Sales of Water.	Cash received for Sales of Water.	Expenditure.	Outstanding Money at the End of each Month.	Number of Men employed.	Approximate Quantity of Gold.	Value of Gold.
1897.	£ s. d.	£ s. d.	£ s. d.			Oz.	£ s. d
February	13 10 0	13 10 0	10 0 0	..	15	40	156 0 0
March	29 5 0	29 5 0	15 15 0	..	10	70	273 0 0
Total..	42 15 0	42 15 0	25 15 0	..	12.5 (average)	110	429 0 0

It will be seen from the foregoing statement that the value of the sales of water for the past two months amounted to £42 15s., and that the cost of maintenance was £25 15s. The average number of men employed was 12·5, and the approximate quantity of gold obtained by them was 110 oz., representing a value of £429. Deducting the value of the sales of water from the value of the approximate quantity of gold obtained, it leaves £386 5s. as the earnings of the miners, which is equal to an average of £30 18s. a man for two months, or at the rate of £185 8s. each per annum.

Kumara Water-race.

This race still continues highly profitable, although the gold obtained through the use of this water-supply does not come up to past returns. The richer claims are becoming worked out, and, as far as known, the large area of auriferous ground that has been proved is found to require working on the most economical principle in order to remunerate those employed. An extensive area exists that will afford employment for a number of miners for many years to come. Future workings will be more costly, both on account of the limited fall for tailings and also the greater quantity of water required to remove the poorer layers of gravel.

The whole of this race is in good repair, the Kapitea Hill Race, in addition to the ordinary demand, having supplied water required in the construction of No. 4 and also of No. 5 main tail-races, the cost of the water to supply No. 4 being £106 9s. 3d. and for No. 5 free water.

The by-wash of the Loop-line Dam is being raised. This will have the effect of largely increasing the storage-capacity of the reservoir. Another catchwater-race, which can be constructed at a reasonable cost, will further improve the supply for this dam, and the loss from scarcity of water be thereby reduced.

The No. 5 main tail-race is not yet completed. The total length will be 62·76 chains, of which 40·27 chains has been constructed, being securely timbered, boxed, and blocked; and there still

remains 22·49 chains to complete the driving of the tunnel. When this is completed a large quantity of water will be required to work the different claims. The total amount paid by subsidy for this work was £2,463 5s. 9d.

The following statement will show the revenue derived from sales of water, and also the cost of maintenance, for the year ended 31st March, 1897:—

Month.	Sales of Water.	Cash received for Sales of Water.	Expenditure.	Outstanding Moneys at the End of each Month.	Number of Men employed.	Approximate Quantity of Gold obtained.	Value of Gold obtained.
1896.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		Oz.	£ s. d.
April	286 13 4	322 3 1	157 12 10	138 0 2	103	430	1,677 0 0
May	307 0 0	241 0 0	140 1 1	162 11 8	99	460	1,784 0 0
June	166 9 6	246 0 0	150 17 4	132 13 8	98	250	975 0 0
July	387 13 8	376 12 6	159 19 0	143 2 4	98	585	2,281 10 0
August	318 10 7	313 14 0	145 14 10	122 9 11	97	570	2,223 0 0
September	310 7 4	327 16 3	134 17 10	118 5 2	93	505	1,969 10 0
October	356 16 4	406 1 10	149 13 2	128 0 9	92	535	2,086 10 0
November	322 8 10	118 0 0	136 6 6	239 17 5	86	485	1,891 10 0
December	144 13 3	300 0 0	146 2 3	126 0 9	82	220	858 0 0
1897.							
January	319 1 3	260 6 4	149 17 2	160 13 9	83	495	1,930 10 0
February	284 1 3	287 10 0	152 3 10	147 0 7	83	440	1,716 0 0
March	299 1 8	238 13 9	163 9 11	174 2 8	70	480	1,872 0 0
Totals and average ..	3,502 17 0	3,437 17 9	1,786 15 9	..	90·33 (average)	5,455	21,264 10 0

It will be seen from the foregoing statement that the value of the sales of water for the past year amounted to £3,502 17s., as against £4,106 11s. 3d. for the former year, and that the cost of maintenance was £1,786 15s. 9d., as against £1,943 8s. 7d. for the previous year. This shows a decrease in the revenue last year of £603 14s. 3d., and a decrease in the cost of maintenance of £156 12s. 10d. In addition to the sales of water, the value of free water supplied to the claims which did not prove payable to work during the year amounted to £613 0s. 6d. The average number of men employed in claims worked with water from this supply was 90·33, and the approximate quantity of gold obtained by them was 5,455 oz., representing a value of £21,264 10s. Deducting the value of the sales of water from the approximate quantity of gold obtained, it leaves £17,761 13s. as the earnings of the miners, which is equal to an average of £196 12s. 7·4d. a man per annum, or £3 15s. 7½d. per man per week. The total cost of this work up to the end of March last amounts to £41,463 16s., and, deducting the cost of maintenance from the value of the sales of water for the year, it leaves a profit on the working of £1,716 1s. 3d., which is equal to 4·137 per cent. on the total cost of the works. The reason the sales of water amount to so much less than last year is that the price of water was reduced from £2 per sluice-head per week to £1 10s. from the 1st June, 1896, so that there was only two months of the year at the higher price.

[For table showing result of working Kumara Water-race for fourteen years, see page 25.]

Waimea-Kumara Water-race.

The Waimea and Kumara Water-races have been considered as separate races, though this is not the case. The object of showing each separately is to give an idea of the value of each in proportion to the capital expended on the different works in connection with each branch. They may be termed separate water-races, but the supply of water to the Kumara branch is dependent to a great extent on the Waimea branch. If these races were held by different individuals there would be a far greater scarcity of water at Kumara than now occurs, and at the same time there would be more water in the Waimea Race than could be disposed of. However, when the deviation of the Waimea Water-race is completed, and the branch constructed to Goldsborough, the whole of the water in that supply will be utilised at Callaghan's and the middle branch, and it will only be when there is surplus water in the Kawhaka Creek that there will be a full supply in the Kawhaka Race feeding the Loop-line Dam, which stores the water for the Kumara field. The whole of these water-races are under one management, and worked as one concern. The following statement will show the revenue and expenditure on the whole of these works for the year ending the 31st March last:—

Month.	Sales of Water.	Cash received for Sales of Water.	Expenditure.	Outstanding Moneys at the End of each Month.	Number of Men employed.	Approximate Quantity of Gold obtained.	Value of Gold obtained.
1896.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		Oz.	£ s. d.
April	341 7 6	393 1 10	226 6 8	146 10 5	176	560	2,184 0 0
May	374 2 11	308 8 4	214 10 4	171 1 11	177	628	2,439 4 0
June	236 8 8	292 9 3	215 14 8	140 8 11	177	420	1,638 0 0
July	476 11 2	464 14 6	213 13 2	150 17 7	174	807	3,147 6 0
August	373 10 7	382 18 9	197 14 0	130 5 2	158	725	2,827 10 0
September	366 15 8	382 8 3	186 3 8	125 0 5	153	665	2,593 10 0
October	422 8 3	482 2 7	192 7 2	135 16 0	158	720	2,808 0 0
November	393 7 9	191 7 6	182 0 8	247 12 8	145	695	2,710 10 0
December	197 8 3	330 19 6	198 3 2	135 16 0	142	379	1,478 2 0
1897.							
January	369 12 8	332 6 10	235 16 5	173 1 6	131	633	2,468 14 0
February	359 4 7	356 15 0	201 3 0	154 15 10	162	666	2,597 8 0
March	411 13 5	342 2 9	218 4 1	184 15 6	141	800	3,120 0 0
Totals and average ..	4,322 11 5	4,259 15 1	2,481 17 0	..	157·83 (average)	7,698	30,012 4 0

It will be seen from the foregoing statement that the value of the sales of water for the year amounted to £4,322 11s. 5d., while the expenditure for maintenance for the same period was £2,481 17s. For the previous year the value of the sales of water was £4,902 4s. 9d., and the expenditure £2,713 12s. 3d. This shows that there was a decrease in the revenue last year to the extent of £579 13s. 4d., while the cost of maintenance has also decreased to the extent of £231 15s. 3d.

The total value of free water given to the miners to open up new ground and construct new tail-races, and also for working claims which did not prove payable, amounted for the past year to £819 9s. 9d. The number of men employed in claims worked with water from these supplies was 157·83. Deducting the value of the sales of water from the approximate value of the gold obtained from claims worked with water from these supplies, which amounted to 7,698 oz., representing a value of £30,012 4s., it leaves £25,689 12s. 7d. as the average earnings of the miners, which is equal to about £162 16s. per man per annum.

The total cost of the whole of the works, including the extension to Callaghan's, up to the end of March amounts to £184,696 6s. 4d.

The following statement will show the receipts and expenditure for the last twelve years, ending the 31st March last, of the Waimea and also the Kumara Water-races :—

	Waimea Race.			Kumara Race.		
Year.	Sales of Water.	Expenditure on Maintenance.	Net Profit.	Sales of Water.	Expenditure on Maintenance.	Net Profit.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1886	1,790 16 0	1,131 18 1	+ 658 17 11	9,788 16 8	1,459 19 5	8,328 17 3
1887	1,675 19 4	1,116 10 0	+ 559 9 4	6,470 14 4	1,398 18 10	5,071 15 6
1888	1,612 11 3	1,027 17 11	+ 584 13 4	7,169 10 3	982 12 0	6,186 18 3
1889	1,416 6 8	860 2 5	+ 556 4 3	6,716 6 10	1,024 1 9	5,692 5 1
1890	1,240 9 7	795 7 7	+ 445 2 0	3,550 4 8	1,424 13 3	2,125 11 5
1891	1,388 17 5	933 3 3	+ 455 14 2	6,665 12 8	1,766 4 3	4,899 8 5
1892	1,121 16 2	784 13 10	+ 337 2 4	6,645 11 0	1,584 10 11	5,061 0 1
1893	1,015 12 3	858 0 4	+ 157 11 11	5,789 0 9	1,782 11 0	4,006 9 9
1894	828 15 8	919 9 4	− 90 13 8	5,582 4 7	1,919 8 5	3,662 16 2
1895	988 0 7	1,061 9 4	− 73 8 9	4,646 19 9	1,976 17 7	2,670 2 2
1896	795 13 6	770 3 8	+ 25 9 10	4,106 11 3	1,943 8 7	2,163 2 8
1897	776 19 5	669 6 3	+ 107 13 2	3,502 17 0	1,786 15 9	1,716 1 3
Totals ..	14,651 17 10	10,928 2 0	3,723 15 10	70,634 9 9	19,050 1 9	51,584 8 0

This table shows that there has been a net profit derived from the working of the Waimea Race of £3,723 15s. 10d., and £51,584 8s. from the Kumara Race, for the above period.

NUMBER of DAYS WATER was LOST, for Year ending 31st March, 1897, through Holidays and Scarcity of Water.

Month.	Holidays.	No Water for Channel.	No Water for Private Races.
1896.			
April	2	1	...
May	...	1	...
June	...	18	3
July	...	...	...
August	...	8	...
September	...	4	...
October	...	4	...
November	...	...	...
December	2	14	7
1897.			
January...	1	...	...
February	...	...	...
March	...	...	...
Totals	5	50	10

MOUNT IDA WATER-RACE.

This race has been used continuously, in consequence of the open season, the water being stopped only twenty-three days, on account of frost. The supply of water was, however, limited, on account of the exceptionally dry weather throughout the summer months, the race, at its best, only supplying twelve sluice-heads, and sometimes the quantity was reduced to five sluice-heads.

As increased attention is being directed to work the deeper ground by hydraulic sluicing additional water will be in request. This will necessitate widening the race and maintaining additional storage. The Eweburn Reservoir, which would be of vast importance in this respect if

SUMMARY showing the RESULT of WORKING the KUMARA WATER-RACE for Fourteen Years, from 1st April, 1883, to 31st March, 1897.

Water supplied.	Year.	Rate per Sluice-head per Week.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Total Value of Water sold.	Total Value Free for Assistance.	Total Value Free for Deviations.	Total for Construction of No. 3 Channel.	Total Value Water supplied.	Average Number of Sluice-heads supplied Daily.	Expenditure.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		£ s. d.
Water sold ..	1883–84	3 0 0	371 16 5	465 2 1	700 2 6	583 9 7	702 7 6	626 16 3	808 10 5	777 3 9	774 17 11	698 2 6	1,064 0 0	774 6 0	8,346 14 11	..	..	..	..	..	..
Free	1883–84	..	46 2 6	44 5 0	183 11 8	108 19 2	108 0 0	85 7 6	244 7 6	172 18 9	63 12 6	103 9 2	86 5 0	139 3 4	..	1,386 2 1	..	..	..	..	..
			417 18 11	509 7 1	883 14 2	692 8 9	810 7 6	712 3 9	1,052 17 11	950 2 6	838 10 5	801 11 8	1,150 5 0	913 9 4	..	..	..	..	9,732 17 0	46·35	2,153 5 5
Water sold ..	1884–85	3 0 0	580 4 4	937 19 4	667 3 11	906 16 10	882 6 10	997 1 5	919 12 3	1,126 11 10	819 17 3	289 4 2	756 9 2	821 0 10	9,704 8 2	..	..	..	..	..	..
Free	1884–85	..	92 5 0	56 19 7	78 18 9	55 13 9	149 0 10	18 11 3	145 13 4	69 3 9	39 15 0	26 12 6	45 3 9	2 16 8	..	780 14 2	..	..	..	..	..
			672 9 4	994 18 11	746 2 8	962 10 7	1,031 7 8	1,015 12 8	1,065 5 7	1,195 15 7	859 12 3	315 16 8	801 12 11	823 17 6	..	..	..	..	10,485 2 4	49·92	1,656 0 1
Water sold ..	1885–86	2 10 0	665 16 0	796 6 9	893 5 3	745 19 7	773 19 10	943 13 5	953 15 6	997 7 8	697 13 5	686 4 0	708 15 8	935 19 7	9,788 16 8	..	..	..	..	..	..
Free	1885–86	..	24 13 9	9 2 0	..	..	23 15 0	31 3 4	22 1 3	18 11 10	18 7 2	49 1 4	1 5 0	13 2 6	..	221 3 2	..	..	..	..	..
			690 9 9	805 8 9	893 5 3	745 19 7	797 14 10	974 16 9	975 16 9	1,015 19 6	716 0 7	735 5 4	710 0 8	949 2 1	..	..	..	..	10,009 19 10	57·20	1,454 19 5
Water sold ..	1886–87	2 10 0	758 0 4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Water sold ..	1886–87	2 0 0	..	19 10 8	488 3 9	315 7 11	599 5 0	643 7 11	682 8 9	686 7 5	562 0 10	345 12 7	673 0 0	747 9 2	6,470 14 4	..	..	..	..	..	..
Free	1886–87	..	..	776 0 11	242 0 11	40 13 9	120 9 7	83 15 10	74 5 0	45 9 2	32 15 0	46 8 9	49 16 8	36 3 4	..	1,547 18 11	..	..	..	..	..
			758 0 4	795 11 7	730 4 8	356 1 8	719 14 7	727 3 9	706 13 9	731 16 7	594 15 10	392 1 4	722 16 8	783 12 6	..	..	..	..	8,018 13 3	56·19	1,398 18 10
Water sold ..	1887–88	2 0 0	535 5 10	679 7 8	167 10 10	656 4 7	684 16 1	694 5 0	591 12 1	710 0 0	535 10 10	519 15 5	670 17 6	734 4 5	7,169 10 3	..	..	..	..	..	..
Free	1887–88	..	26 11 8	40 19 2	15 13 9	23 10 0	47 7 11	4 11 8	34 16 8	42 10 0	27 10 0	28 6 8	19 11 8	15 17 3	..	347 6 5	..	..	..	..	..
			561 17 6	720 6 10	183 4 7	679 14 7	732 4 0	698 16 8	626 8 9	752 10 0	553 0 10	548 2 1	690 9 2	750 1 8	..	..	..	..	7,516 16 8	53·68	982 12 0
Water sold ..	1888–89	2 0 0	490 6 8	338 7 7	532 1 1	626 19 10	667 8 3	542 8 4	702 12 6	664 1 7	395 12 3	465 2 1	623 18 4	667 8 4	6,716 6 10	..	..	..	..	..	..
Free	1888–89	..	107 17 3	90 18 0	87 1 4	75 1 10	32 10 0	16 9 5	38 1 4	13 0 0	34 9 2	58 6 8	90 10 10	74 13 4	..	492 0 0	227 0 0	..	..	..	..
			598 3 11	429 5 7	619 2 5	702 1 8	699 18 3	558 17 9	740 13 10	667 1 7	430 1 5	523 9 7	714 9 2	742 1 8	..	..	..	..	7,435 6 10	53·10	1,024 1 9
Water sold ..	1889–90	2 0 0	401 13 4	495 16 4	256 16 8	377 16 3	353 4 2	237 7 11	318 10 10	293 8 4	159 18 9	219 15 10	248 19 7	186 16 8	3,550 4 8	..	..	..	..	..	..
Free	1889–90	..	45 15 0	55 3 4	43 0 0	92 15 0	105 15 0	93 1 8	41 10 0	103 18 4	105 13 4	48 17 6	54 8 4	71 5 0	..	396 2 6	465 0 0	..	..	..	..
Free, No. 3 Channel	1889–90	..	..	..	..	..	122 19 1	335 1 3	330 11 8	275 8 0	97 13 4	6 0 0	221 18 1	102 11 5	..	..	..	1,492 2 10	..	..	..
			447 8 4	550 19 8	299 16 8	470 11 3	581 18 3	665 10 10	690 12 6	672 14 8	363 5 5	274 13 4	525 6 0	360 13 1	..	..	..	..	5,903 10 0	42·16	1,424 13 3
Water sold ..	1890–91	2 0 0	300 12 6	355 11 11	368 3 2	423 9 0	622 17 11	666 7 1	720 16 1	701 5 10	578 1 8	546 17 11	691 17 11	689 11 8	6,665 12 8	..	..	..	..	..	..
Free	1890–91	..	113 5 0	119 14 2	70 7 11	71 17 6	82 9 7	110 16 8	93 13 9	106 0 10	57 5 5	113 6 8	133 2 6	130 5 10	..	409 5 5	793 0 5	..	..	..	..
Free, No. 3 Channel	1890–91	..	272 11 11	247 3 6	246 17 10	115 2 11	32 2 2	..	..	..	..	..	..	..	..	..	..	913 18 4	..	..	..
			686 9 5	722 9 7	685 8 11	610 9 5	737 9 8	777 3 9	814 9 10	807 6 8	635 7 1	660 4 7	825 0 5	819 17 6	..	..	..	..	8,781 16 10	62·72	1,766 4 3
Water sold ..	1891–92	2 0 0	616 5 10	655 4 11	542 9 1	179 11 11	426 16 1	769 15 5	784 13 8	642 4 2	469 10 0	291 3 9	543 7 6	724 8 8	6,645 11 0	..	..	..	..	..	..
Free	1891–92	..	143 11 5	191 16 8	44 3 6	..	82 16 11	151 14 7	118 10 1	233 1 8	213 11 3	137 0 10	64 11 8	28 9 2	..	996 4 5	413 3 4	..	..	..	..
			759 17 3	847 1 7	586 12 7	179 11 11	509 13 0	921 10 0	903 3 9	875 5 10	683 1 3	428 4 7	607 19 2	752 17 10	..	..	..	..	8,054 18 9	57·53	1,584 10 11
Water sold ..	1892–93	2 0 0	495 17 1	505 12 11	493 5 10	495 13 6	602 2 8	635 1 3	571 1 8	458 7 1	382 2 1	390 19 2	450 7 6	308 10 0	5,789 0 9	..	..	..	..	..	..
Free	1892–93	..	44 18 9	80 2 6	72 4 2	61 2 1	43 5 10	38 2 6	44 0 10	66 2 6	157 6 8	94 4 2	77 10 10	64 2 6	..	444 15 8	398 7 8	..	..	..	..
			540 15 10	585 15 5	565 10 0	556 15 7	645 8 6	673 3 9	615 2 6	524 9 7	539 8 9	485 3 4	527 18 4	372 12 6	..	..	..	..	6,632 4 1	47·35	1,782 11 0
Water sold ..	1893–94	2 0 0	451 16 5	480 13 7	541 11 11	542 9 6	575 10 5	486 9 2	539 8 4	402 11 11	451 5 5	303 0 10	415 5 5	392 1 8	5,582 4 7	..	..	..	..	..	..
Free	1893–94	..	101 5 2	119 5 7	99 4 6	110 7 1	92 9 10	147 16 2	112 11 0	164 18 5	82 0 4	112 3 10	132 15 10	70 6 10	..	1,306 0 3	39 4 4	..	..	..	..
			553 1 7	599 19 2	640 16 5	652 16 7	668 0 3	634 5 4	651 19 4	567 10 4	533 5 9	415 4 8	548 1 3	462 8 6	..	..	..	..	6,927 9 2	49·48	1,917 8 5
Water sold ..	1894–95	2 0 0	477 1 8	437 17 4	501 3 4	482 1 3	513 7 11	413 0 5	213 19 2	375 7 6	428 8 9	298 2 5	198 7 1	308 2 11	4,646 19 9	..	..	..	..	..	..
Free	1894–95	..	76 11 8	98 12 8	103 1 3	92 17 11	83 5 0	122 17 6	96 4 2	105 6 8	81 11 8	74 14 2	72 17 6	86 12 6	..	1,054 12 8	40 0 0	..	5,741 12 5	41·01	1,976 17 7
			553 13 4	536 10 0	604 4 7	574 19 2	596 12 11	535 17 11	310 3 4	480 14 2	510 0 5	372 16 7	271 4 7	394 15 5	..	..	..	..	..	..	..
Water sold ..	1895–96	2 0 0	277 5 10	379 15 0	349 12 1	322 15 10	345 1 8	354 1 8	351 16 8	336 5 5	331 0 0	315 15 5	336 3 4	406 18 4	4,106 11 3	..	..	..	..	..	..
Free	1895–96	..	95 3 4	96 1 8	139 19 2	81 16 3	76 19 7	77 10 10	110 9 7	114 12 1	67 3 4	92 8 4	90 18 11	86 16 3	..	1,129 19 4	..	..	..	..	..
Free, No. 4 Channel	1895–96	..	..	..	..	..	5 12 6	39 14 2	62 7 6	56 9 2	65 4 7	32 10 0	36 1 3	34 15 10	..	..	..	332 15 0	5,569 5 7	39·78	1,943 8 7
			372 9 2	475 16 8	489 11 3	404 12 1	427 13 9	471 6 8	524 13 9	507 6 8	463 7 11	440 13 9	463 3 6	528 10 5	..	..	..	..	..	..	..
Water sold ..	1896–97	{2 0 0} {1 10 0}	286 13 4	307 0 0	166 9 6	387 13 8	318 10 7	310 7 4	356 16 4	322 8 10	144 13 3	319 1 3	284 1 3	299 1 8	3,502 17 0	..	..	..	..	..	..
Free	1896–97	..	100 5 0	99 4 10	22 18 2	31 1 10	12 19 4	22 16 10	13 18 4	12 11 3	12 18 9	51 18 9	58 16 2	39 19 9	..	479 9 0	..	..	..	..	..
Free, No. 4 Channel	1896–97	..	15 0 0	14 16 8	4 0 10	18 0 0	7 0 0	18 0 0	9 0 0	12 0 0	7 0 0	6 0 0	10 0 0	13 0 0	..	..	..	133 17 6	4,116 3 6	40·41	1,786 15 9
			401 18 4	421 1 6	193 8 6	436 15 6	338 9 11	351 4 2	379 14 8	347 0 1	164 12 0	377 0 0	352 17 5	352 1 5	88,685 12 10	10,991 14 0	2,375 15 9	2,872 13 8	104,925 16 3	..	22,852 7 3

it is found practicable to construct it efficiently, will be fully reported on by the officer appointed to report on water-conservation generally.

The staff required to maintain and look after this and the Blackstone Hill Race consists of the manager and six men.

The following statement will show the revenue derived from the sales of water, the maintenance, and the approximate quantity of gold obtained by the miners using water from this supply for the year ending the 31st March last :—

Date.	Sales of Water.	Cash received.	Maintenance.	Number of Men employed.	Approximate Quantity of Gold obtained.	Value.
1896.	£ s. d.	£ s. d.	£ s. d.		Oz.	£ s. d.
April	133 19 4	136 7 10	85 11 8	73	244	
May	141 2 0	141 2 0	85 5 8	73	390	
June	100 14 10	104 1 1	84 10 8	68	309	
July	90 17 8	90 17 8	87 7 8	58	168	
August	17 16 10	22 9 10	279 5 2	38	97	
September	108 12 5	111 17 11	135 10 8	74	170	
October	175 3 10	176 7 8	104 6 2	79	362	
November	132 19 2	132 19 2	107 14 8	68	410	
December	126 12 4	136 12 4	94 12 8	64	212	
1897.						
January	80 17 11	81 3 2	85 17 2	66	290	
February	91 1 7	91 1 7	79 13 8	63	242	
March	133 13 7	140 10 8	86 19 8	74	263	
Totals	1,333 11 6	1,365 10 11	1,316 15 6	66.5	3,157	12,154 9 0

It will be seen from the foregoing statement that the value of the sales of water last year amounted to £1,333 11s. 6d., as against £1,189 1s. for the previous year, which is an increase of £144 10s. 6d., while the expenditure on maintenance was £1,316 15s. 6d., as against £1,363 4s. for the previous year. The gain on the working last year was £16 16s. The approximate quantity of gold obtained from claims worked with water from this supply was 3,157 oz., representing a value of £12,154 9s.; and the number of men employed in these claims averages about 66·5. Deducting the value of the gold obtained from the value of the sales of water, it leaves £10,820 17s. 6d. as the earnings of the miners, which is equal to about £162 14s. 4d. a man per annum, or about £3 2s. 7d. a man per week.

Blackstone Hill Race.

This race continues to be economically managed, only a small amount being required for maintenance. The branch race from the right-hand branch of Hill's Creek was cleaned out in May, 1896. The dry season had the effect of lessening the ordinary supply of water during the past four months, and the race will have to be trimmed and cleared out next spring.

The following statement will show the revenue derived from sales of water, the cost of maintenance, the number of men employed in working claims by the aid of this race, and the approximate quantity of gold obtained from claims for the year ending the 31st March last :—

Month.	Sales of Water.	Cash received.	Maintenance.	Number of Men employed.	Approximate Quantity of Gold obtained.	Value.
1896.	£ s. d.	£ s. d.	£ s. d.		Oz.	£ s. d.
April	11 15 10	9 15 10	0 11 6	9	..	..
May	11 10 1	11 0 1	0 14 6	10	..	..
June	11 15 10	9 15 10	0 3 0	9	..	..
July	6 13 4	6 13 4	0 3 0	8	..	..
August	6 13 4	1 10 0	0 3 0	8	..	..
September	8 15 10	13 19 2	0 3 0	8	..	..
October	9 15 10	9 15 10	0 3 0	8	..	..
November	9 15 10	9 15 10	0 18 6	9	..	..
December	9 15 10	9 15 10	0 16 6	9	..	..
1897.						
January	9 15 10	9 15 10	1 6 6	9	..	..
February	9 15 10	9 15 10	0 3 0	9	..	..
March	9 15 10	10 5 10	0 3 0	9	..	..
Totals	115 19 3	111 19 3	5 8 6	8·75	183	704 11 0

It will be seen from the foregoing statement that the sales of water for the last year amounted to £115 19s. 3d., as against £136 11s. 7d for the previous year, while the cost of maintenance was £5 8s. 6d., thus leaving a net profit of £110 10s. 9d. on the working of this water-race. The average number of miners employed in claims worked by the aid of this water-race was 8·75, and the approximate quantity of gold obtained by them was 183 oz., representing a value of £704 11s. Deducting the value of the sales of water from the value of the gold obtained, it leaves £588 11s. 9d. as the earnings of the miners, which is equal to about £67 5s. 4d. per man per annum. The total cost of this water-race was £1,036 16s. The net profit on the workings last year gave about 10·6 per cent. interest on the capital invested.

Summary of Water-races.

The following statement will show the profits and losses of working the different water-races constructed and maintained by the Government for the last nineteen years, and also the collateral advantages derived by the utilisation of the water from these races :—

Name of Water-race.	Value of Sales of Water including Value of Gold obtained in Sludge-channel.	Expenditure.	Profit or Loss on Working.	Average Number employed.	Approximate Quantity of Gold obtained.	Value of Gold obtained.	Duty received on Gold obtained.	Total Profit or Loss, with Value of Gold Duty added.	Total Cost of Construction.
Waimea-Kumara Water-race and Sludge-channel.	£ s. d.	£ s. d.	£ s. d.	Men.	Oz.	£ s. d.	£ s.	£ s. d.	£ s. d.
Eighteen years ended 31st March, 1896	143,357 11 2	86,297 8 6	57,060 2 8	328	259,062	975,706 0 3	20,728 0	77,788 2 8	..
Year ended 31st March, 1897	4,322 11 5	2,481 17 0	1,840 14 5	157	7,698	30,012 4 0	..	1,840 14 5	..
Totals	147,680 2 7	88,779 5 6	58,900 17 1	..	266,760	1,005,718 4 3	20,728 0	79,628 17 1	*206,661 4 6
Nelson Creek.									
Thirteen years four months ended 31st July, 1892 ..	17,577 0 7	15,415 7 1	2,161 13 6	52	32,943	126,049 17 0	3,269 16	5,431 9 6	90,722 10 8
Argyle.									
Thirteen years ended 31st March, 1895	5,530 16 10	5,455 7 7	75 9 3	17	8,040	30,738 12 0	804 0	879 9 3	15,151 15 3
Mount Ida.									
Eighteen years ended 31st March, 1896	23,860 9 6	27,205 11 3	†3,345 1 9	90	47,165½	179,699 13 6	3,176 2	†168 19 9	68,607 8 9
Year ended 31st March, 1897	1,333 11 6	1,316 15 6	16 16 0	66	3,157	12,154 9 0	..	16 16 0	..
Totals	25,194 1 0	28,522 6 9	†3,328 5 9	..	50,322½	191,854 2 6	3,176 2	†152 3 9	68,607 8 9
Blackstone Hill.									
Three years ended 31st March, 1896	376 9 8	36 6 6	335 3 2	7	689	2,678 8 6	..	335 3 2	1,036 16 0
Year ended 31st March, 1897	115 19 3	5 8 6	110 10 9	8	183	704 11 0	..	110 10 9	..
Totals	492 8 11	41 15 0	445 13 11	7	872	3,382 19 6	..	445 13 11	1,036 16 0
Grand totals ..	196,474 9 11	138,214 1 11	58,255 8 0	..	358,937½	1,357,743 15 3	27,977 18	86,233 6 0	382,179 15 2

* Including £5,948 18s. 8d. cost of constructing extension to Callaghan's. † Loss on working.

GOLD- AND SILVER-MINING.

The mining boom which commenced in 1895 continued throughout the past year. A large number of areas were taken up within the principal mining districts of the colony, and extensive works undertaken in prospecting and development of the mines. In a great number of cases the claims have been disposed of to English companies. Operations have been commenced and machinery erected to an extent only possible by large expenditure of capital. The demand on the part of investors for legitimate mining properties has not to any great extent been lessened, notwithstanding the shrinkage in the yield compared with last year, and shown in the following statement of the quantity and value of gold entered for exportation :—

Name of District.	Year ended 31st March, 1897.		Year ended 31st March, 1896.		Decrease for 1897.
	Oz.	£	Oz.	£	Oz.
Auckland	93,876	358,231	117,029	450,829	23,153
Marlborough	789	3,070	3,173	12,681	2,384
Nelson	2,534	9,544	3,813	14,007	1,279
West Coast	71,548	286,261	89,721	358,870	18,173
Otago	88,166	358,636	88,954	359,694	788
Totals	256,913	1,015,742	302,690	1,196,081	45,777

In the Auckland District, in the North Island, there was a decrease of 23,153 oz. of gold—from Coromandel County, 12,849 oz.; from Thames County, 5,113 oz.; from Thames Borough, 1,998 oz.; from Piako County, 19 oz.; and from Ohinemuri County, 3,172 oz.

In the South there was an increased yield of gold in the following counties, as follows: Waimea, 96 oz.; Westland, 152 oz.; Kumara Borough, 65 oz.; Taieri, 974 oz.; Waikouaiti, 84 oz.; Lake, 514 oz.; Fiord, 2,703 oz.; Southland, 1,043 oz.; and Stewart Island, 18 oz. Last year there was a decrease in the yield of gold from the following counties: Marlborough, 2,384 oz.; Collingwood, 1,347 oz.; Buller, 2,012 oz.; Inangahua, 14,312 oz.; Grey, 1,258 oz.; Hokitika Borough, 505 oz.; Ross Borough, 303 oz.; Tuapeka, 1,196 oz.; Vincent, 472 oz.; Maniototo, 725 oz.; Waihemo, 1,187 oz.; Waitaki, 22 oz.; Bruce, 119 oz.; Wallace, 1,229 oz.; and Clutha, 4 oz.

The decrease in the yield is not altogether due to the scarcity of the metals, or to the mines being exhausted, but chiefly to the fact that on English companies becoming owners a change in the policy of working was adopted, and dead-work and improvements in machinery carried on in the place of continuous production; to which may be added the scarcity of water during the dry season, a full supply being necessary to almost every kind of mining operations. An immediate increase in the returns cannot be looked for, inasmuch as, in addition to preliminary work, the new appliances adopted and the construction of the water-races will take a considerable time to complete, during which the actual recovery of gold in many of the mines will be almost totally suspended. In the newer mines also, in which discoveries have been made of a promising nature, gold returns cannot be expected until the mines are developed and the necessary machinery and appliances provided, both for the quartz lodes in the North and Middle Islands and the alluvial deposits in the latter Island. In the near future, however, the number of gold-producing mines will be materially increased, and a steady yield maintained.

QUARTZ-MINING.

The great interest evinced in quartz-mining, and the large amount of capital now invested, will mark a new era in the history of the industry in New Zealand. The introduction of capital and consequent change of policy in the development of both new and old mines has brought about a material change. The adoption of improved machinery capable of dealing with large quantities of what is termed low-grade ore will do away in a great measure with the past method of selecting only the richer portions of the reefs for quick returns. In order to maintain the supply to keep the mills employed systematic working of all parts of the mine simultaneously will be carried on, and the mines thereby made to maintain a fair average return. The mines are being opened up, and a stock of ore kept in reserve, so that when development work is going on there will be no difficulty in keeping up the output of a quantity of payable ore for treatment.

During the year a large number of special claims and licensed holdings have been taken up in the principal mining districts throughout the colony. In most cases these have been acquired with the view of submitting them to agents on the outlook to purchase mining properties for the purpose of flotation of companies on the London and other markets. In many instances arrangements have been made and capital subscribed for the development of the quartz reefs, but in a great many cases the land taken up has failed to attract the representatives of capital, and the owners are left with claims they are unable to work for want of funds. In the rush to secure properties land has been acquired where at present there appears very little chance of valuable discoveries being made, and where no indications warranted the preliminary expenditure required to secure a title; many of these areas will in due course be abandoned, and the owners be losers of the money laid out in taking up the land. The investment of capital in mining enterprise, if injudiciously directed, will react on legitimate ventures, and agents should exercise caution, and become possessed of such knowledge as can only be gained from those experienced in the different fields, before recommending the expenditure of capital. In this matter I can reiterate the remarks made by Mr. H. A. Gordon in his report to you of last year: "Nevertheless, although we want foreign capital to develop the quartz-mining industry, it is essential that nothing but legitimate mining enterprises be offered to capitalists, in order that they may receive a fair interest on their outlay. If worthless properties are placed on the London market and taken up it will tend to bring about a depression in mining, and it will take a long time to re-establish confidence. All those who are interested in the welfare of the colony should set their face against offering valueless properties to foreign capitalists."

There are numerous places in which highly-profitable returns on the capital invested for *bonâ fide* mining purposes can be assured, and care must be exercised in placing before investors a true report of the value of any property on which expenditure of capital is invited. In this way only can a distinction be made between those ventures that will be genuine or otherwise. At this early stage of occupation, and until actual work has for some time been carried on, it may be injudicious and invidious to definitely assert in which claims gold or silver is to be found in paying quantities. There are certain localities, especially in the North Island fields, where, in the vicinity of mines with a past history, and within the belts of well-known auriferous country, mining ventures have the greatest chance of success. To the Middle Island fields the same remarks may apply. There are, however, new discoveries taking place at a considerable distance from the localities already famous for gold-producing, and all fresh fields have for the miner sources of attraction, in the hope that the yields from the older gold-bearing reefs may be eclipsed. The prospector, therefore, goes far from the beaten track, and in many instances has obtained evidence of auriferous reefs which promise to become before long a valuable addition to the field of legitimate investment. The treatment of the ores and the recovery of the metals by the most improved methods is still being energetically pursued, and new plants will shortly be brought into operation on the fields of both Islands.

The following list of companies outside the colony connected with New Zealand mining shows the vast interest taken in developing the industry, and before long investment in mining will be in the front rank amongst the other commercial undertakings throughout New Zealand:—

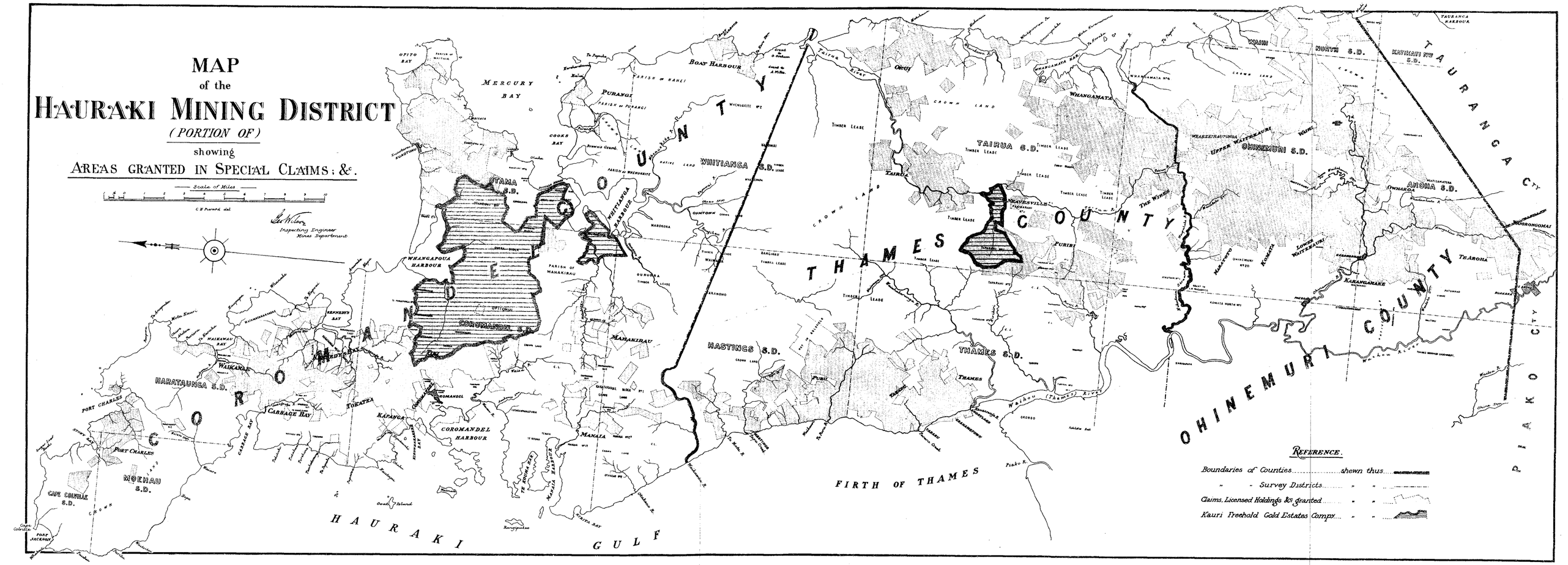
Name.	Locality in which Operations are being carried on.	Share Capital.	British Office.
		£	
Anglo-Continental Gold Syndicate (Limited)	General	100,000	Austinfriars, London.
Aroha Gold-mines	Aroha	100,000	30 and 31, St. Swithin's Lane.
Achilles Goldfields	Otago	100,000	11, Poultry, E.C.
Blagrove's Freehold Gold-mining Company	Coromandel	62,500	97, Dashwood House, E.C.
Blue Spur and Gabriel's Gully Consolidated Gold Company	Otago	130,000	6, Great St. Helen's.
Britannia (Hauraki) Gold-mining Company	Coromandel	100,000	34 and 36, Gresham Street, E.C.
Collingwood Goldfields	Collingwood, Golden Bay	150,000	46, Queen Victoria Street, E.C.
Colville Company	Coromandel	7,500	7, Drapers' Gardens, E.C.
Consolidated Goldfields of New Zealand	Reefton	225,000	30, St. Swithin's Lane.
Coromandel Exploration Syndicate	General	2,000	6, Great St. Helen's.
Cromwell Gold Company	"	100,000	54, Old Broad Street, E.C.
Dolcoath Gold-mining Company (Hauraki Peninsula, New Zealand)	Coromandel	150,000	142 and 143, Palmerston Buildings, E.C.
Dual Syndicate	General	10,000	3, Clement's Lane, E.C.
East Hauraki Gold-mining	Coromandel	100,000	Finsbury House.
Ethel Reef Gold-mining Company	Te Aroha	120,000	Dashwood House, E.C.
Fame and Fortune	Thames	50,000	110, Cannon Street.
Glenrock Consolidated (Limited)	General	225,000	3, Queen Street, E.C.
Gloucester Gold-mining Company	Thames	120,000	Throgmorton House, E.C.
Golden Lead of Hauraki	Coromandel	100,000	Moorgate Court, E.C.
Golden Pah (Hauraki)	"	62,500	97, Dashwood House, E.C.
Goldfields of Hauraki Prospecting Syndicate	General	3,000	53, New Broad Street, E.C.
Goldfields of New Zealand	"	100,000	13, St. Helen's Place, E.C.
Gold Trust of New Zealand	"	100	4, Great Winchester Street, E.C.
Grey Consolidated	Grey	200,000	15 and 16, George Street, S.W.
Hauraki Gold-mining Company	Coromandel	40,000	97, Dashwood House, E.C.
Hauraki Associated Gold Reefs	"	100,000	Winchester House.
Hauraki South Gold-mining Company	"	90,000	7, Great Winchester Street.
Hauraki (Auckland) Goldfields Syndicate	General	10,000	30, Basinghall Street, E.C.
Hauraki East	"	150,000	6 and 7, Grocer's Hall Court, E.C.
Hauraki Golden Bay Mines	"	150,000	8, Old Jewry, E.C.
Hauraki New	Coromandel	150,000	3, Princes Street.
Hikutaia Gold Syndicate	Ohinemuri	15,000	Suffolk House, E.C.
Inkerman Combined Gold-mines	General	200,000	15 and 16, George Street, S.W.
Irene (Hauraki) Gold-mine	Kuaotunu	80,000	Dashwood House.
Island Block Gold-mining Company	Otago	60,000	4, Lombard Court, E.C.
Kapai-Vermont Gold-mining Company	Kuaotunu	150,000	1, St. Helen's Place, E.C.
Kapanga Gold-mining Company	Coromandel	250,000	97, Dashwood House.
Kathleen Crown	"	75,000	Dashwood House.
Kathleen Gold-mine	"	75,000	"
Kauri Freehold Gold Estates	General	250,000	6, Drapers' Gardens.
Key of Komata	Ohinemuri	100,000	34 and 36, Gresham Street, E.C.
Komata Queen	"	75,000	Dashwood House.
Komata Reefs Gold-mining Company	"	50,000	97, Dashwood House.
Kuranui Caledonian Gold-mining Company	Thames	175,000	20, Great Winchester Street.
London and New Zealand Exploration	General	100,000	Broad Street House.
London and New Zealand Finance Corporation	"	102,000	139, Cannon Street, E.C.
Maori Gold	Tairua	130,000	8, Old Jewry.
Maori Syndicate	General	10,000	Austinfriars Passage, E.C.
Maoriland Gold-mines	"	95,000	Dashwood House.
May Queen (Hauraki)	Thames	200,000	22, Austinfriars.
Melville's New Zealand Corporation	General	100,000	20, Great Winchester Street.
Mines Corporation of New Zealand	"	250,000	3, Princes Street.
Mines Corporation of New Zealand Deferred	..	5,000	
Moanataiari Gold-mining Company	Thames	200,000	110, Cannon Street.
Monowai Gold-mines	Waiomo	150,000	28, Renfield Street, Glasgow.
New Alburnia Gold-mining Company	Ohinemuri	180,000	Finsbury House, E.C.
New Hauraki Gold Properties	Thames and Coromandel	100,000	Dashwood House.
New Zealand and General Mining Syndicate	General	25,000	19A, Coleman Street.
New Zealand Crown Mines Company	Ohinemuri	200,000	30, St. Swithin's Lane, E.C.
New Zealand Exploration Company	General	125,200	30, St. Swithin's Lane.
New Zealand Goldfields	"	50,500	23, College Hill, E.C.
New Zealand Gold Share and Finance Company	"	..	3, Newman's Court, Cornhill.
New Zealand Gold Share and Finance Company	"	..	
New Zealand Jubilee Gold-mines	Waitekauri	125,000	20, Great Winchester St., E.C.
New Zealand Consolidated	General	50,000	15, George Street.
New Zealand Mines Trust	"	200,000	11, Abchurch Lane.
New Zealand and Western Australia Syndicate	"	50,000	Portland House.
New Zealand Gold Investment	"	5,000	11, Abchurch Lane.
New Zealand Talisman	Karangahake	150,000	65, New Broad Street.
New Zealand Venture Syndicate	General	5,000	11, Abchurch Lane.
New Zealand and Globe Exploration	"	10,050	4, Great Winchester Street, E.C.
New Zealand Broken Hills Gold mining Company	"	300,000	13, St. Helen's Place, E.C.
New Zealand Corporation	"	100,000	3, Laurence Pountney Hill, E.C.
New Zealand Finance Syndicate	"	10,000	32, Old Jewry, E.C.
New Zealand Joint-stock and General Corporation	"	150,000	Finsbury House.
New Zealand Minerals Company	"	250,000	3, Laurence Pountney Hill, E.C.
New Zealand Pioneers	"	10,000	46, Queen Victoria Street.
Norman Proprietary Gold-mines	Waitekauri	75,000	Bloomfield House, E.C.
North Kapanga Gold-mining Company	Coromandel	60,000	54, Old Broad Street, E.C.
Ohinemuri Syndicate	Owharoa	60,000	11, Abchurch Lane.
Otago Syndicate	General	20,025	30, St. Swithin's Lane.
Peveril Gold-mines	Coromandel	80,000	27, Old Jewry.
Phœnix	General	200,000	3, Queen Street.
Preece's Point Proprietary (Hauraki)	Coromandel	100,000	Dashwood House.
Ravenscliff Mining Company	General	60,000	Winchester House.
Royal Oak of Hauraki	Coromandel	100,000	63 and 64, New Broad Street.

MAP
of the
HAURAKI MINING DISTRICT
(PORTION OF)
showing
AREAS GRANTED IN SPECIAL CLAIMS; &c.

Scale of Miles

C.H. Parnell del.

Inspecting Engineer
Mines Department



REFERENCE.

Boundaries of Counties..... shewn thus.....

" - Survey Districts..... " " .....

Claims, Licensed Holdings &c granted..... " " .....

Kauri Freehold Gold Estates Compy.... " " .....

Name.	Locality in which Operations are being carried on.	Share Capital.	British Office.
		£	
Royal Standard Gold-mines	Wharekiraupunga ..	200,000	43, Threadneedle Street.
Scotty's Hauraki Gold-mining Company	Coromandel	100,000	63 and 64, New Broad Street.
Southern Star Gold-mines	"	75,000	63 and 64, New Broad Street.
Success Gold-mines	"	50,000	Dashwood House.
Taitapu Gold Estates	Nelson	175,000	9, St. Mildred's Court.
Tararu Creek Gold-mining Company	Thames	95,000	Dashwood House.
Thames Hauraki Goldfields	"	300,000	54, Old Broad Street.
Tokatea Consols	Coromandel	100,000	45 and 46, Broad Street Avenue.
Tokatea of Hauraki	"	150,000	63 and 64, New Broad Street.
Triumph Hauraki Gold-mines	"	100,000	Finsbury House.
Union Waihi Gold-mining Company	Waihi	200,000	11, Abchurch Lane.
United New Zealand Exploration	General	250,000	22, Austinfriars.
Victor Waihou Gold-mining Company	Karangahake	170,000	63 and 64, New Broad Street.
Waihi Consolidated Gold-mines	Waihi	200,000	39, Lombard Street.
Waihi Gold-mining Company	"	160,000	11, Abchurch Lane.
Waihi Grand Junction	"	150,000	18, Finsbury Circus.
Waihi Proprietary Company	General	175,000	Bishopsgate Street House, E.C.
Waihi Silverton Extended	Waihi	60,000	23, College Hill, E.C.
Waihi Gladstone	"	100,000	8, Old Jewry.
Waitaia Gold-mines	General	100,000	82, Gordon Street, Glasgow.
Waitekauri Consolidated Gold-mines	Waitekauri	120,000	Swan Chambers, E.C.
Waitekauri Central	"	65,000	63, New Broad Street.
Waitekauri Cross	"	100,000	19A, Coleman Street.
Waitekauri Extended	"	130,000	63 and 64, New Broad Street.
Waitekauri Gold	"	150,000	11, Abchurch Lane.
Waitekauri United	"	150,000	Finsbury House, E.C.
Whangamata Proprietary	Whangamata	200,000	College Hill Chambers.
Woodstock	Karangahake	150,000	6, Drapers' Gardens.

NORTH ISLAND.

PUHIPUHI.

The most northerly field in the Auckland District is at Puhipuhi. The locality of the reefs already discovered is in the vicinity of the Table-land, or flat top of the main range. There is, however, a tract of country between this and Helena Bay which is known to contain quartz reefs, but has hitherto not been sufficiently prospected on account of its rugged and broken nature and the dense bush with which it is covered. In the older worked portion of the field too much has been expended in experimenting with different modes of treatment, whilst exploration of the ground and opening up and prospecting reefs have been neglected. It would be wiser to ascertain what extent of ground is available, and how far the reefs and lodes may contain the metals, and what would be the value per ton, and demonstrate without doubt that sufficient quantities of ore can be readily got at, than to erect machinery and afterwards find that there was not sufficient value in the ore to cover the cost of mining and treatment. The possibilities of the district are very great; the large reefs already discovered and the character of the quartz, which in most cases carries gold and silver, show they are worthy of being thoroughly tested. It only requires a discovery of undoubted payable quartz to give an impetus to the prosecution of prospecting. The mode of treatment suitable will soon follow when the presence of valuable ore in question is determined. The following abstract shows the land held for mining purposes in this district:—

ABSTRACT of LICENSES for SPECIAL CLAIMS issued from the Warden's Office at Whangarei, in the Puhipuhi Mining District, and registered on or before the 31st March, 1897, in the Books of the Mining Registrar at Whangarei.

Date of License.	Area.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
	A. R. P.					
12/2/96	100 0 0	Puhipuhi State Forest	III.	Hukerenui	No. 1 British ..	British Gold- and Silver-mining Co.
12/2/96	100 0 0	Ditto ..	III.	"	No. 2 British ..	"
12/2/96	94 2 12	" ..	III.	"	Plymouth Rock	"
12/2/96	96 0 0	" ..	III.	"	Silver Fleece ..	"
8/7/96	100 0 0	" ..	III.	"	New Puhipuhi ..	New Puhipuhi Gold-mining Co.
8/7/96	100 0 0	" ..	III.	"	North British ..	M. W. Armstrong.
8/7/96	100 0 0	" ..	III., IV.	"	Norma ..	William Carter.
8/7/96	100 0 0	" ..	III.	"	Mikado ..	British Gold- and Silver-mining Co.
8/7/96	100 0 0	" ..	III.	"	Pinafore ..	Edwin Edwards.
8/7/96	100 0 0	" ..	III.	"	Success ..	James Harrison.
8/7/96	100 0 0	" ..	III.	"	Waimarie ..	Waimarie Gold- and Silver-mining Co.
11/9/96	100 0 0	" ..	III.	"	Dr. Jim ..	Dr. Jim Gold- and Silver-mining Co.
11/9/96	100 0 0	" ..	III.	"	Cecil Rhodes ..	"
11/9/96	100 0 0	" ..	III.	"	Success Extended	James Harrison.
21/12/96	100 0 0	" ..	III.	"	North British Ext.	M. W. Armstrong.
23/12/96	100 0 0	" ..	III.	"	North Star ..	William Bailey.
23/12/96	100 0 0	" ..	III.	"	North Star Ext.	"
23/12/96	100 0 0	" ..	III.	"	Uitlander ..	George Edwin Alderton.

The attention directed to taking up land for mining throughout the Hauraki Mining District led to a considerable area being again occupied in this district.

British Gold- and Silver-mining Company's Mine (Area, 600 acres).—Very little mining work was carried on during the year, the whole of the company's attention having been devoted to the erection of the chloridizing roasting-kiln, and transforming the battery for Mr. French's new process. After the battery and kiln were used for a short time operations ceased, and the mine was closed down. The proceeds of Mr. French's treatment cannot be obtained, as he, shortly after making a trial of the plant, left the district. It appears that all the capital of the company was exhausted in prosecuting Mr. French's experiments, and the directors are endeavouring to induce the representatives of capital to find sufficient funds to work the mine.

Dr. Jim Mine (Area, 200 acres).—This mine comprises the Dr. Jim and Cecil Rhodes Claims, and is situated next the British Company's Mine, in the north part of Puhipuhi Forest. About 200 ft. of driving has been done in the mine, as well as surface prospecting. Four men were employed up till the time the claims were protected. As this company has no machinery it is intended to try some of the ore in the British Company's battery before erecting a plant. There are four reefs, from 3 ft. to 8 ft. in width, in the ground carrying sulphide of silver.

Work has also been carried on in the New Puhipuhi, Waimarie, and other claims; sulphide of silver is found in the quartz, but so far it has not been demonstrated to be present in payable quantity.

A considerable amount of attention was directed to the Kauri Mountain, near Whangarei Heads, where gold has been obtained in small quantities in veins and leaders. Another discovery has been made of a large so-called auriferous dyke, said to be from 100 ft. to 150 ft. in height, and from 300 ft. to 400 ft. wide, where it projects into the sea. If gold exists throughout such a large mass of material a very small yield per ton would be payable, as the stuff could be cheaply mined.

Ohaeawai.

A certain amount of machinery was erected for the treatment of the mercury deposits at this place, but no results have been obtained. Prospecting was occasionally carried on, and a gold-bearing leader discovered at Pukepokako, on the road to Kirikiri, but so far there has been no valuable result.

Throughout the Bay of Islands County occasional discoveries of quartz have been made, and on several occasions I have received samples collected by Captain Stephenson, but there appears to be a decided absence or only slight traces of the precious metals in the tests made.

Great Barrier Island.

Great Barrier Island lies about fifty-seven miles north-east of Auckland, being the largest of the belt of islands in and north of the Hauraki Gulf. It is about twenty miles long, is ten miles across at the widest (from Owena to the mainland near Rangianua) and three miles at the nearest part (from Oruawharo to Blind Bay). The country is very rough, from Kaitoke Valley to Harataonga particularly, the Hirakimata (Mount Hobson) Ranges intervening before the Awana Block, known also as the antimony property, is reached. There is plenty of kauri on the island, a large portion of which is the property of the Kauri Timber Company, while manuka and fern render travelling to any point past Kaitoke Creek somewhat difficult. The scenery is splendid, there being a wild grandeur which cannot fail to please. A bullock-track runs as far as the Iona Mine, and a horse-track leads from Blind Bay through nearly all the mining properties, and these will shortly be followed by a road from Blind Bay to Whangaparapara Bay which can be negotiated by vehicles—a thing impossible at present.

The First Discoveries of Gold and Silver.

As may be expected, a good deal of controversy has taken place regarding the question as to who first discovered valuable minerals on the island. It is alleged that as far back as 1857 a miner named James Perry prospected the northern end and discovered antimony and copper and slight traces of silver, but very little attention was paid to the matter at that time. This statement is doubted by many old residents of the island, who state that it is only a few years back since prospecting was properly carried on. Twelve years ago, however, the property now known as the Awana Antimony-mines was prospected by Arthur T. Lee and A. Prescott. Two years later Lee accidentally found stone showing antimony at the head of the Awana Creek, below Hirakimata, on the eastern side. He was subsequently despatched by an Auckland syndicate, of which Messrs. W. F. Buckland and Charles Clayforth were the head, to cut the antimony lode which was supposed to exist on the property. This was done, and some good specimens taken out and forwarded to Auckland. For several years members of the Sanderson family, who have resided on the island, at Tryphena and Blind Bay, for thirty-two years, have prospected various portions, particularly that in which the mines at present being worked are situated. Six years ago Ben and William Sanderson prospected White Cliffs, but it was twelve months before they struck what was considered payable ore. On the property now known as the Original (previously called the Prospectors' Union Jack), on the Great Barrier, Kauri Timber Company's property near Whangaparapara, and on Ryan's freehold good prospects were obtained. The party pegged out the Original, and worked it for two years, putting in two drives and cross-cutting. Some 14 tons of stone were taken out and treated, the return of bullion being considered very satisfactory. Work was continued for a short time, and abandoned on account of the patchy nature of the ground. When the mining boom was at its height attention was again directed to the Great Barrier, and there has been a marked revival in mining during the year. Work was carried on in the original Great Barrier Claim, which was exploited by the Anglo-Continental Syndicate, who held an option over the mine. After several months had been spent in prospecting

and various reefs driven on, this syndicate gave up the option, and the land reverted to the owners. On the inclusion of this island in the Hauraki Mining District, on the 1st September, 1896, the owners of the prospecting licenses secured titles under the Mining Act, and the following special claims were applied for and granted by the Warden at the Thames on the 30th November, 1896 :—

ABSTRACT of LICENSES for SPECIAL CLAIMS, issued from the Warden's Office at Thames, in the Great Barrier Island, and registered on or before the 31st March, 1897, in the Books of the Mining Registrar, Thames.

Date of License.	Area.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
	A. R. P.					
30/11/96	100 0 0	Great Barrier	VII.	Fitzroy ..	Aotea	Aotea Gold- and Silver-mines Co. (N.L.).
30/11/96	100 0 0	"	VII.	"	Aotea No. 2 ..	"
30/11/96	100 0 0	"	III. VII.	Tryphena Fitzroy	Argyle ..	Iona Gold- and Silver-mining Co. (N.L.).
23/12/96	62 0 36	"	VI.	Fitzroy ..	Edgerton ..	Alexander D. Robertson.
30/11/96	100 0 0	"	VI.	"	Fitzroy ..	Great Barrier Gold-mining Co. (N.L.).
30/11/96	100 0 0	"	VI.	"	Great Barrier Extended	Great Barrier Gold- and Silver-mining Co. (N.L.).
30/11/96	100 0 0	"	VII.	"	Great Barrier Excelsior	William Ernest Cossar.
30/11/96	100 0 0	"	VII.	"	Great Barrier Proprietary	Original Great Barrier Gold- and Silver-mining Co.
30/11/96	100 0 0	"	VII.	"	Iona	Iona Gold- and Silver-mining Co. (N.L.).
30/11/96	100 0 0	"	VI.	"	Kaitoke ..	Kaitoke Gold- and Silver-mining Co. (N.L.).
30/11/96	100 0 0	"	VI.	"	Kaitoke No. 2 ..	Kaitoke Gold- and Silver-mining Co. (N.L.).
30/11/96	100 0 0	"	VII.	"	Mount Argentum	Mount Argentum Gold- and Silver-mining Co.
30/11/96	100 0 0	"	VII.	"	Premier of Great Barrier	Original Great Barrier Gold- and Silver-mining Co. (N.L.).

As soon as titles were completed work was vigorously carried on in the following mines :—

Original Great Barrier Mine (Area, 200 acres).—In addition to the prospecting and development work done by the Anglo-Continental, the owners have commenced to drive a level 1,150 ft. to cut the reef at a depth of 120 ft. below the surface. There are four reefs in the ground, varying from 3 ft. to 5 ft. in width, and carrying gold and silver in sulphide form. A drive was also made on No. 1 reef, 80 ft., and another on No. 2 reef, 50 ft. Seven men are employed.

Aotea Mine (Area, 200 acres).—A level has been driven a distance of 90 ft., with a view of cutting the Proprietary reef. Trenching has also been done on the surface.

Iona Mine (Area, 200 acres).—A drive has been put in 150 ft., and a large reef about 42 ft. in width cut into. The quartz is generally of a hard flinty nature, containing gold and silver. Five men are employed.

Kaitoke Mine (Area, 200 acres).—A level has been driven 123 ft., to be extended to cut the Iona reef, near the southern boundary of the claim. Three men are employed.

Great Barrier Mine (Area, 200 acres).—There are a number of reefs running through this ground; only two, however, are at present being worked. Lee's reef has been cut and driven on 100 ft. in the top level, and a cross-cut is being put in to cut it at a depth of 80 ft. under the top level; another cross-cut is also being driven to cut the reef to the eastward of the present workings. Lee's reef is about 18 in. in width, and the ore is of a rich character: 1 ton gave a value of £15, and a parcel of 10 tons has been shipped for treatment at Swansea. The Iona reef runs through this ground, and a cross-cut is being driven to cut it. Twenty-five men are employed in this mine.

Mount Argentum Mine (Area, 200 acres).—A low-level tunnel has been driven 250 ft. to cut a reef about 12 ft. in thickness. Several other smaller veins were cut, in which a trace only of silver was found. Seven men are employed.

Prospecting has also been carried on in the Edgerton, Excelsior, Bonanza, Comstock, and other claims.

Ryan's Freehold (Area, 80 acres).—Mr. A. McKay, Government Geologist, who has recently visited the island, describes this property as follows: "This is the area contiguous to the Great Barrier, on its western boundary, the reef from which passes into Ryan's Freehold at the waterfall, in the bed of the creek. In this the reef has been explored west a distance of 60 ft. The ore-band is continuous, and at the upper level shows a thickness varying from 12 in. to 15 in. or 18 in.; 15 in. may be considered the full average thickness of the lode in this part of its course. The ore is richer here than in the Great Barrier Claim, and magnificent samples might have been collected from the heap when the mine was visited. At that time a winze was being sunk to cut the lode at a further depth of 25 ft. to 30 ft. This has now been done, and it is reported that in the winze the lode shows 30 in. in width, carrying ore quite as rich as may be had from the upper level. A low-level adit is contemplated, which may be made to cut the lode 70 ft. to 80 ft. below the present workings, and at which it is hoped the thickness of the lode will be further increased. Many tests on small samples of the ore have been made, leading to the conclusion that the value of the ore is not less than £36 per ton, and from the character of the ore coming from the mine at the time of my visit the above seems to be a very moderate estimate of what the average yield will be should the ore continue of the same grade. A sample analysed at the Thames School of Mines yielded at the rate of 500 oz. silver to the ton. The country on the foot-wall of the lode within Ryan's Freehold is fairly well decomposed to a kindly-looking 'sandstone,' but this will probably not continue to any great depth,

the foot-wall in the winze being very hard andesite; so that anticipations of the presence of soft country along the western part of the lode are of doubtful realisation. There is ample warrant for the energetic prospecting of this lode in both claims in which it has been traced, and the ore is rich enough to pay for transit to Europe for treatment. Its richness, therefore, to some extent compensates for the smallness of the lode, and in this particular has to be looked at favourably in comparison with the greater mass and poorer ore of the Iona lode."

In order to afford facilities for working the mines in this district a road is being made from Blind Bay to Whanagaparapara.

Attention has again been directed to the reefs containing copper-ore which were formerly worked in the northern part of the island, but very little work was done during the year.

Coromandel District.

The district comprises the northern portion of the peninsula. The country is of a very broken and hilly description, covered chiefly with bush, although in several parts the kauri timber has been removed and clearings effected. In consequence of the continuous rich yields from the Hauraki Mine numbers of claims were taken up, as the subjoined list will show.

A large amount of prospecting has been carried on, and many discoveries of gold-bearing reefs were made. It will, however, take a length of time to develop the mines and to ascertain the value of those discoveries, and no doubt in many cases the claims will be abandoned for want of funds to carry on operations.

Abstract of Licenses for Special Claims and Licensed Holdings issued from the Warden's Office at Coromandel, in the Hauraki Mining District, and registered on or before the 31st March, 1897, in the Books of the Mining Registrar at Coromandel.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
18/5/96	32	0	22	Matamata-harakeke	VI.	Harataunga	Ada	Enoch Richards.
23/12/96	100	0	0	Port Charles	II., III.	"	Airlie Castle ..	Charles Irving.
18/5/96	100	0	0	Kennedy Bay	IX.	"	A.J.C.	A.J.C. Gold-mining Co.
19/2/97	31	3	26	"	"	"	Alabama	John Henry Porter.
25/6/96	86	0	0	Coromandel	VI.	Coromandel	Alameda	F. Swindley and H. C. Bell.
5/11/96	20	0	0	"	V.	"	Albion	Hauraki Mines Lodes (Ltd.).
20/11/95	78	3	37	"	"	"	Albion Extended ..	Hauraki Main Lodes (Ltd.).
29/10/95	30	0	0	Tiki	VI.	"	Alert	Alert Gold-mining Co. (N.L.).
7/10/96	50	0	0	Kennedy Bay	IX.	Harataunga	Alice	Simon Fraser.
18/7/95	88	2	33	Coromandel	VI.	Coromandel	All Nations ..	New Zealand and General Mining Co. (Ltd.).
12/5/96	14	0	16	Tokatea ..	II.	"	Altai Extended ..	T. W. Rhodes.
7/4/96	89	1	23	Matamata-harakeke	VI.	Harataunga	Anglo-Saxon ..	Anglo-Saxon Gold-mining Co. (N.L.).
18/5/96	98	1	0	Cape Colville	II.	Moehau ..	Aster	Frederick Swindley.
18/5/96	99	3	20	Tokatea ..	"	Coromandel	Arawa	S. W. Bedlington.
13/1/97	100	0	0	Matamata-harakeke	IX.	Harataunga	Auriga	Samuel Horace Gordon.
23/12/96	68	1	35	Kennedy Bay	"	"	Austral Gold Reefs of Hauraki	Robert Edward Jamieson.
12/5/96	20	3	8	"	"	"	Avondale	John Bollard and others.
24/4/96	98	3	24	Manaia ..	XIV.	Coromandel	Ballarat	James Edwards.
23/12/96	100	0	0	Matamata-harakeke	VI.	Harataunga	Baron Rothschild ..	J. D. O'Brien.
23/12/96	63	2	0	Ditto ..	"	"	Bay View	Bay View Gold-mining Co. (N.L.).
18/2/96	100	0	0	Coromandel	"	Coromandel	Beatrice	Hauraki Golden Bay Mine (Ltd.).
22/9/96	78	3	24	Matamata-karakeke	"	Harataunga	Belgic	E. C. Smith.
14/4/96	15	3	35	Tokatea ..	I.	Coromandel	Ben Lomond ..	Montgomery Davis.
2/7/95	18	0	30	" ..	II.	"	Bismark Extended ..	J. H. Witherford.
23/12/96	46	2	25	" ..	"	"	Blenheim	J. D. O'Brien.
23/12/96	62	0	0	" ..	I.	"	Blucher	Montgomery Davis. [(Ltd.).
21/8/95	38	1	8	" ..	II.	"	Britannia	The Britannia Hauraki Gold-mining Co.
22/9/96	100	0	0	Cabbage Bay	V.	Harataunga	Britannic	E. E. Smith.
3/2/97	100	0	0	Opitinui ..	VIII.	Coromandel	Bruce	Thomas Handley.
27/8/95	2	0	12	Coromandel	V.	"	Bunker's Hill ..	Bunker's Hill Gold-mining Co. (Ltd.).
27/8/95	1	0	0	"	"	"	Bunker's Hill Extd.	"
24/4/96	96	0	0	Kennedy Bay	IX.	Harataunga	Cabbage Bay ..	Queen Victoria of Hauraki Gold-mining Co.
30/11/96	63	2	0	"	"	"	Cadman	Cadman Gold-mining Co. (N.L.).
30/11/96	85	0	0	Coromandel	VI.	Coromandel	Cadman's Gully No. 1	W. H. Cooper.
1/12/96	11	2	30	"	"	"	Caledonian Surplus	Charles B. Stone.
13/1/97	100	0	0	Kennedy Bay	IX.	Harataunga	Canopus	Henry Reynolds.
1/9/96	13	2	0	Tiki ..	X.	Coromandel	Captain Cook ..	William P. Snell, jun.
22/10/96	100	0	0	Manaia ..	III.	Hastings ..	Caroline	Joseph McRae.
22/9/96	98	2	11	Cabbage Bay	V., VI.	Harataunga	Celtic	E. C. Smith.
25/6/96	98	3	6	Cape Colville	II.	Moehau ..	Charleston ..	Thomas Casey.
7/4/96	97	0	0	Coromandel	VI., VII.	Coromandel	Chelsea Syndicate...	Chelsea Gold-mining Co. (N.L.).
6/2/97	74	0	0	Manaia ..	XIII.	"	Chidwell Hall ..	John McNeil.
23/12/96	54	0	23	Tokatea ..	II.	"	City of Chester ..	J. H. Dalton.
23/12/96	100	0	0	Matamata-harakeke	VII.	Harataunga	City of Dublin ..	Thomas Handley.
23/3/97	6	1	9	Manaia ..	XIII.	Coromandel	City of Lucknow Surplus	Percy A. Vaile.
23/3/97	12	0	0	Tiki ..	VI.	"	Colleen Bawn ..	John Fitzgerald.
13/11/95	63	3	2	" ..	X.	"	Columbia	John Drew Colebrook.
27/8/95	12	1	32	Tokatea ..	II.	"	Conquering Hero ..	Conquering Hero Gold-mining Co. (N.L.).

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Coromandel—*continued*.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
30/11/96	66	0	0	Cabbage Bay	V.	Harataunga	Coolgardie	W. J. Macklow.
19/9/96	92	0	32	Matamata-harakeke	VI.	"	Coptic	E. C. Smith.
7/10/96	62	2	31	Tokatea ..	II.	Coromandel	Corea No. 1 ..	Alfred H. Gentil.
7/10/96	72	1	7	" ..	"	"	Corea No. 2 ..	"
7/10/96	36	0	0	" ..	"	"	Coronet	Coronet Gold-mining Co. (N.L.)
2/11/96	63	2	24	Coromandel	VI.	"	Coromandel Queen..	Coromandel Queen Gold-mining Co.
14/4/96	30	0	0	Tokatea ..	II.	"	Cuirassier	The Cuirassier Gold-mining Co. (N.L.).
1/9/96	14	3	21	" ..	"	"	Cuirassier Surplus ..	Cuirassier Gold-mining Co. (N.L.).
11/8/96	52	2	9	Matamata-harakeke	VI.	Harataunga	Cuvier Light ..	Cuvier Light Gold-mining Co. (N.L.).
13/7/96	100	0	0	Port Charles	I.	"	Defender	William Bourke.
23/12/96	99	3	1	Cape Colville	II.	Moehau ..	De Hirsch.. ..	William J. Allen and Charles Mills.
6/2/97	57	3	0	Tokatea ..	I., II.	Coromandel	Dolcoath	J. Binney and V. G. Gatland.
9/6/96	30	0	0	Coromandel	VI.	"	Doreen	Patrick James Hackett.
7/10/96	100	0	0	Kennedy Bay	VI., IX.	Harataunga	Doric	E. C. Smith.
24/4/96	84	3	3	"	IX.	"	Doris	Doris Gold-mining Co. (N.L.).
27/2/96	50	0	0	Coromandel	VI.	"	Duke of Argyle ..	Duke of Argyle Gold-mining Co. (N.L.).
23/12/96	98	0	0	Tokatea ..	I.	Coromandel	Duke of Wellington	Montgomery Davis.
23/12/96	57	1	16	"	"	"	Duke of Wellington No. 1	William H. Davies.
19/9/96	75	0	14	"	II.	"	El Dorado.. ..	Edward A. Daldy.
27/8/95	14	1	1	Coromandel	VI.	"	Empress	The Empress Gold-mining Co. (N.L.).
23/12/96	99	0	0	Tiki	X.	"	Eruia	Thomas Handley.
15/9/95	19	1	10	"	VI., X.	"	Eureka	Eureka Gold-mines Co. (Ltd.).
27/2/96	69	2	8	Matamata-harakeke	VI.	Harataunga	Evening Star ..	Evening Star Gold-mining Co. (N.L.).
23/12/96	69	2	23	Ditto ..	"	"	Everton	Herbert R. Cooke.
25/6/96	100	0	0	Coromandel	"	Coromandel	Exchequer ..	F. Swindley and H. C. Bell.
23/7/96	34	3	0	"	"	"	Exchequer Extended	"
22/10/96	100	0	0	Tokatea ..	II.	"	Fabulous	Fabulous Gold-mining Co. (N.L.).
13/1/97	94	0	16	Kennedy Bay	IX.	Harataunga	Fern Glen	Joseph Thornes.
23/12/96	74	3	0	Tiki	"	Coromandel	Florence	William Elliot.
1/9/95	14	0	14	"	VI., X.	"	Forest King ..	R. W. Houghton.
28/7/96	47	2	28	Matamata-harakeke	VI.	Harataunga	Fortuna	Criterion Gold-mining Co. (N.L.).
30/11/96	38	3	20	Ditto ..	"	"	Fortuna No. 2 ..	Fortuna No. 2 Gold-mining Co. (N.L.).
10/3/96	30	0	0	Tokatea ..	II.	Coromandel	Four-in-Hand ..	Four-in-Hand Gold-mining Co. (N.L.).
19/9/96	39	3	0	Coromandel	VI.	"	Flower of the Range	William Gray.
27/8/95	30	0	0	Tokatea ..	II.	"	Gay City of Auckland	Napier Gold-mining Co. (N.L.).
12/5/96	29	1	0	Tiki	X., XI.	"	Gem of Hauraki ..	Gem of Hauraki Gold-mining Co. (N.L.).
18/5/96	50	0	0	Coromandel	VI.	"	Gem of the Tiki ..	Gem of the Tiki Gold-mining Co. (N.L.).
17/2/96	100	0	0	Matamata-harakeke	"	Harataunga	Gisborne	City of Gisborne Gold-mining Co. (N.L.).
10/12/95	2	2	8	Tokatea ..	II.	Coromandel	Golden Buffalo Extd.	J. Parker and William Morris.
23/12/96	99	0	0	" ..	"	"	Golden Butterfly ..	Golden Butterfly Gold mining Co. (N.L.).
9/6/96	27	0	11	Kennedy Bay	IX.	Harataunga	Golden Caledonian ..	Golden Caledonian Gold-mining Co. (N.L.).
27/8/95	23	1	13	Manaia ..	XIV.	Coromandel	Golden Crown ..	Golden Hill Extended Gold-mining Co.
7/10/96	100	0	0	Matamata-harakeke	VI.	Harataunga	Golden Fortuna ..	J. W. Barker.
9/6/96	30	0	0	Tiki ..	XI.	Coromandel	Golden Gem ..	Gem of Hauraki Gold-mining Co. (N.L.).
5/3/95	29	1	16	Manaia ..	III.	"	Golden Hill ..	Golden Hill Gold-mining Co. (N.L.).
21/12/95	70	0	0	" ..	II.	"	" ..	"
2/7/95	13	1	33	" ..	III.	Hastings	Golden Hill Extended	Golden Hill Extended Gold-mining Co.
9/6/96	2	3	32	Coromandel	V.	Coromandel	Golden Leaf ..	Patrick James Hackett.
24/1/96	29	2	14	" ..	VI.	"	Golden Mount ..	Specimen Hill Gold-mining Co. (N.L.).
29/5/96	50	0	0	" ..	"	"	" ..	"
6/2/97	50	1	20	Manaia ..	XIV.	"	Golden Mountain ..	Thomas Barron.
6/10/96	18	2	0	Coromandel	V.	"	Golden Pah ..	Golden Pah Hauraki (Limited).
23/12/96	100	0	0	Tokatea ..	III.	"	Golden Pheasant ..	Henry Culpan.
22/9/96	58	2	0	" ..	II., III.	"	Golden Plover No. 2	"
19/9/96	100	0	0	Coromandel	VI.	"	Golden Range ..	William Jones.
30/11/95	100	0	0	Tokatea ..	II.	"	Golden Shore ..	Hugh Davis.
19/8/96	37	0	0	Coromandel	V.	"	Golden Shore Ext.	James Davis.
27/8/95	9	2	12	Tokatea ..	II.	"	Golden Spark ..	Golden Spark Gold-mining Co. (N.L.).
15/9/95	30	0	0	" ..	"	"	Golden Tokatea ..	Golden Tokatea Gold-mining Co. (N.L.).
3/5/95	13	3	35	" ..	"	"	Good Enough ..	Good Enough Gold-mining Co. (N.L.).
28/8/95	28	1	0	" ..	"	"	Good Luck ..	James B. H. Cohen.
23/7/96	99	2	31	" ..	VI.	"	Gordon	F. Swindley and H. C. Bell.
22/3/97	100	0	0	Port Charles	II.	Moehau	Grand Moehau Freehold Syndicate	Fitzgibbon Lough.
22/3/97	93	1	28	"	"	"	Grand Moehau Freehold Syndicate No. 1	"
24/10/96	90	0	0	Kennedy Bay	VIII., IX.	Harataunga	Great Boulder ..	John Hume.
23/12/96	80	3	15	Tokatea ..	II., III.	Coromandel	Great Eastern ..	Charles Irving.
14/9/95	94	0	8	" ..	II.	"	Great Kapanga ..	Great Kapanga Gold-mining Co. (N.L.).
22/3/97	100	0	0	Cabbage Bay	VIII.	Harataunga	Great Kapanga No. 2	A. M. Edmunds.
3/2/97	63	3	22	"	"	"	Great North Kapanga	James J. Craig.
3/2/97	63	0	0	"	"	"	Great North Kapanga Extended	Arthur W. Edmunds.
29/10/95	30	0	0	Tiki ..	VI.	Coromandel	Great Pukewhau ..	Miowera United Gold-mining Co. (N.L.).
1/9/96	30	0	0	Matamata-harakeke	"	Harataunga	Great Rangatira ..	F. Goldsmith.
7/4/96	49	3	0	Manaia ..	XIV.	Coromandel	Great Success ..	George Dunnett.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Coromandel—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
23/12/96	99	2	0	Matamata-harakeke	VI.	Harataunga	Great Waikanae ..	Edward E. Noble.
18/5/96	97	3	33	Tokatea ..	II.	Coromandel	Harataunga ..	Carlos Blasch.
6/10/96	29	0	11	Coromandel	V.	"	Hauraki	Hauraki Gold-mining Co. (Ltd.).
22/10/96	54	2	6	Tokatea ..	II.	"	Hauraki Gem ..	William Morris.
10/12/95	30	0	0	Tiki ..	VI., X.	"	Hauraki Gulf ..	Coromandel Mint Gold Co. (N.L.).
28/5/95	6	0	8	Coromandel	V.	"	Hauraki No. 2 ..	The Hauraki No. 2 Gold-mining Co. (N.L.).
13/1/97	80	2	32	Cape Colville	II.	Cape Colville	Hauraki Peninsula..	W. White and G. Linnet.
3/2/97	71	1	0	Manaia	XIV. III.	Coromandel Hastings ..	Hauraki Queen ..	Thomas Barron.
9/6/96	14	1	25	Coromandel	V.	Coromandel	Hauraki South ..	Hauraki South Gold-mining Co. (Ltd.)
22/9/96	79	3	0	Matamata-harakeke	IV., VI.	Harataunga	Helvetic	E. C. Smith.
19/9/96	91	3	31	Coromandel	VI.	Coromandel	Hidden Treasure ..	William Anderson and others.
11/12/96	30	0	0	Tokatea ..	II.	"	Hinton	Hinton Gold-mining Company (N.L.).
13/1/97	100	0	0	Manaia ..	III.	Hastings ..	Hunt's Golden Ridge	Thomas McLoughlin.
13/1/97	100	0	0	" ..	"	"	Hunt's Golden Ridge Extended	"
14/9/95	38	2	2	Tokatea ..	II.	Coromandel	I'll Try	Donald Sutherland.
22/9/96	100	0	0	Cabbage Bay	IV., V.	Harataunga	Ionic	E. C. Smith.
18/5/96	38	1	0	Tokatea ..	II.	Coromandel	Jatinga	Adolph Kohn.
24/10/96	98	1	0	Port Charles	I.	Harataunga	Jay Gould.. ..	Jay Gould Gold-mining Co. (N.L.).
10/3/96	30	0	0	Tokatea ..	III.	Coromandel	Jocelyn	Jocelyn Gold-mining Co. (N.L.).
23/12/96	58	3	0	Manaia ..	XIV.	"	Johannesburg ..	James Joseph Duross.
7/4/96	39	0	38	Matamata-harakeke	VI.	Harataunga	Just for Luck ..	Morning Star Gold-mining Co. (N.L.).
28/8/95	92	2	35	Coromandel	V.	Coromandel	Kaka	Hauraki Golden Bay Mines (Ltd.)
22/10/96	100	0	0	Tokatea ..	II., III.	"	Kangaroo	William Handley.
4/10/94	99	3	27	Coromandel	I., II.	"	Kapanga	The Kapanga Gold-mining Co. (Ltd.).
23/12/96	100	0	0	Tokatea ..	"	"	Kapanga Reefs ..	Alfred H. Gentil.
23/12/96	55	0	0	Coromandel	I.	"	Kapanga Reefs Ext	"
22/12/96	82	0	12	"	VI.	"	Katie	Katie Gold-mining Co. (Ltd.).
27/2/96	60	1	0	Matamata-harakeke	"	Harataunga	Kennedy Bay ..	Evening Star Gold-mining Co. (N.L.).
30/11/96	65	1	0	Ditto	"	"	Killarney	J. W. Barker.
24/1/96	22	3	36	"	"	"	King of the Ranges	Henry Brett.
13/1/97	88	0	22	"	"	"	Kirkdale	J. H. Dalton.
19/9/96	87	0	0	Cabbage Bay	V.	"	Ladas	Ladas Gold-mining Co. (N.L.).
27/2/96	80	0	0	Manaia ..	XIV.	Coromandel	Leading Wind ..	Leading Wind Gold-mining Co.
6/2/97	100	0	0	" ..	"	"	Leading Wind Extd.	William Over.
22/10/96	94	2	0	Tokatea ..	I.	"	Le Grande ..	James Boswell.
12/5/96	30	0	0	Coromandel	VI.	"	Light Brigade ..	Michael Fitzgerald.
2/7/95	25	3	19	Tokatea ..	II.	"	Londonderry ..	Pevreal Gold-mining Co. (Ltd.).
4/8/96	20	0	0	Matamata-harakeke	VI.	Harataunga	Look-out	Herbert Robins Cook.
18/5/96	100	0	0	Kennedy Bay	IX.	"	Lorna Doone ..	John Gates Parker.
12/11/95	30	0	0	Tokatea ..	II.	Coromandel	Lucy Bell	John D. O'Brien.
27/2/96	50	0	0	Matamata-harakeke	VI.	Harataunga	Madge	Madge Gold-mining Co. (N.L.).
12/5/96	30	0	0	Coromandel	"	Coromandel	Magnet	Magnet Gold-mining Co. (N.L.).
3/2/97	99	0	0	Manaia ..	XIII., XIV.	"	Mahaki	Frederick E. Jackson.
13/1/97	97	2	0	Tiki ..	X.	"	Mahinapua ..	William Anderson.
24/1/96	30	0	0	Cabbage Bay	V.	Harataunga	Maioro	Maioro Gold-mining Co. (N.L.).
23/3/97	11	3	13	Kennedy Bay	IX.	"	Maioro No. 2. ..	William O. Lamb.
1/9/96	30	0	0	Tokatea ..	II.	Coromandel	Marble Arch ..	W. H. Thompson.
19/2/97	90	0	0	Kennedy Bay	X.	Harataunga	Marie	Alexander Alison.
23/2/97	24	2	0	Manaia ..	XIV.	Coromandel	Marlborough ..	J. D. Colebrook.
3/2/97	100	0	0	Kennedy Bay	IX.	Harataunga	Mascotte	A. H. Keesing.
27/2/96	50	0	0	Manaia ..	II.	Hastings ..	Maxim	Oswald R. Younghusband.
8/7/96	95	0	16	Port Charles	I.	Harataunga	McIsaacs	Joseph McIsaacs.
23/12/96	64	0	0	Coromandel	VI.	Coromandel	Mentor	Thomas Tyne.
27/2/96	82	1	20	"	"	"	Miowera	Miowera United Gold-mining Co. (N.L.).
12/5/96	30	0	0	"	"	"	Moehau	G. H. Yorland and P. Hutchinson.
1/9/96	100	0	0	Kennedy Bay	IX.	"	Moehau Queen ..	William A. Ryan.
26/1/97	23	2	24	"	"	"	Moehau Queen Surplus	Edward C. Smith.
24/4/96	100	0	0	"	"	"	Moehau Star ..	Thomas Lawton.
11/8/96	53	0	0	"	IV.	"	Moehau Star Ext. ..	J. W. Barker.
1/9/96	8	0	20	Tiki ..	X.	Coromandel	Mona	A. J. Prescott.
6/2/97	72	2	0	Kennedy Bay	IX.	Harataunga	Monte Carlo ..	Monte Carlo Gold-mining Co. (N.L.).
1/9/96	25	0	8	Matamata-harakeke	VI.	"	Montrose	Albert Robins.
24/4/96	77	3	0	Kennedy Bay	VI., IX.	"	Morning Star ..	Morning Star Gold-mining Co. (N.L.).
24/1/96	15	3	14	Manaia ..	XIV.	Coromandel	Native	Ernest C. Daldy.
18/5/96	82	2	18	Tiki ..	VI., VII., X., XI.	"	Native Chief ..	Native Chief Gold-mining Co. (N.L.).
24/1/96	30	0	0	Coromandel	VI.	"	New Caledonia ..	Specimen Hill Gold-mining Co. (N.L.).
30/7/95	8	2	37	"	II.	"	New City of Auckland	Scotty's Hauraki Gold-mining Co. (Ltd.).
11/2/96	14	2	28	"	VI.	"	New Hauraki ..	New Hauraki Gold Properties (Ltd.).
15/12/96	8	2	0	Tiki ..	XI.	"	Newhaven ..	William J. Smith.
2/7/95	26	0	32	Tokatea ..	II.	"	New Hero	John Mayn.
5/3/95	30	0	0	" ..	"	"	New Kapanga ..	Scotty's Hauraki Gold-mining Co. (Ltd.).
8/7/96	100	0	0	Manaia ..	XIV.	"	New Queen of Beauty	Alexander McNeil, jun.
28/5/95	16	1	28	Coromandel	II.	"	New Tokatea ..	Tokatea Consols Gold-mining Co. (Ltd.).

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Coromandel—*continued*.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
27/8/95	14	0	0	Tokatea ..	II.	Coromandel	New Tokatea Extd.	Tokatea Consols Gold-mining Co. (Ltd.).
22/10/96	100	0	0	" ..	II., III.	"	New Waikoromiko ..	William Elliot.
13/1/97	91	1	24	Matamata-harakeke	VI.	Harataunga	Netherfield ..	L. H. Harrison.
22/9/96	89	2	20	Ditto ..	V., VI.	"	Noric	E. C. Smith.
3/9/95	90	3	0	Coromandel	V.	Coromandel	North Hauraki ..	The Hauraki North Gold-mining Co. (Ltd.).
8/6/96	100	0	0	Tokatea ..	II.	"	Observer	John Henry Porter.
24/1/96	14	0	0	Tiki ..	X.	"	Old Pukewhau ..	The Nestor Gold-mining Co. (N.L.).
24/10/96	100	0	0	Kennedy Bay	IX.	Harataunga	Omiro	S. W. Bedlington.
6/10/96	10	1	0	Matamata-harakeke	VI.	"	Oversight	Alfred H. Gentil.
8/7/96	94	1	0	Cape Colville	I., II.	Moehau ..	Pacific	Carlo Blasch.
19/9/96	100	0	0	Kennedy Bay	IX.	Harataunga	Pactolus	Aitken Carrick.
6/2/97	37	2	28	Tokatea ..	II.	Coromandel	Palmerston ..	Charles Irving.
23/11/95	36	0	32	" ..	"	"	Paul's Creek ..	William James Allen.
19/5/96	7	1	7	Coromandel	V.	"	Pegasus	Frederick Swindley.
25/6/96	36	0	0	" ..	VI.	"	Pegasus Extended ..	"
23/2/97	14	2	0	Manaia ..	XIV.	"	Picton	W. H. J. Ridley.
23/12/96	32	0	32	Tokatea ..	II.	"	Pigmy	The Pigmy Gold-mining Co. (N.L.).
11/8/96	100	0	0	" ..	"	"	Plunger	Plunger Gold-mining Co. (N.L.).
1/9/96	30	0	0	" ..	"	"	Plunger Extended ..	Henry Nesbitt.
24/4/96	100	0	0	Tiki ..	X.	"	Pohutu	William Lorigan.
27/2/96	100	0	0	Tokatea ..	II.	"	Poneke No. 1 ..	Henry C. Bell.
8/7/96	53	1	8	Coromandel	VI.	"	Poneke No. 2 ..	F. Swindley and H. C. Bell.
24/1/96	15	3	5	" ..	II., VI.	"	Poneke No. 3 ..	Henry C. Bell.
24/4/96	100	0	0	Port Charles	I.	Harataunga	Port Charles ..	H. P. Hornibrooke.
7/4/96	49	0	0	Tiki ..	X.	Coromandel	Pride of Hauraki ..	Pride of Hauraki Gold-mining Co. (N.L.).
21/12/95	100	0	0	Manaia ..	II., III.	Hastings ..	Princess May ..	Princess May Gold-mining Co. (N.L.).
21/12/95	82	2	0	" ..	II.	" ..	Princess May South	Hugh Arthur Bishop.
23/7/96	60	0	0	Tiki ..	X.	Coromandel	Progress Castle Rock	Progress Castle Rock Gold-mining Co. (N.L.).
23/2/97	25	3	0	Manaia ..	XIV.	"	Prophecy	John Hague Smith.
15/9/95	29	3	26	Kuaotunu ..	V.	Otama ..	Prospere	Robert C. Greenwood.
1/12/96	17	0	10	Tiki ..	X.	Coromandel	Pukewhau ..	Pukewhau Gold-mining Co. (N.L.).
6/2/97	52	2	22	Tokatea ..	II.	"	Queen of the North ..	Carlo Blasch.
23/7/96	38	3	30	Matamata-harakeke	VI.	Harataunga	Queen Madge ..	Adam B. Miller.
8/7/96	81	0	20	Kennedy Bay	II. and IX.	Coromandel and Harataunga	Rachel	Rachel Gold-mining Co. (N.L.).
3/2/97	100	0	0	..	VIII.	"	Rainbow	Thomas Handley.
24/4/96	100	0	0	Tokatea ..	II. and IX.	Coromandel and Harataunga	Rangatira	Arawata Gold-mining Co. (N.L.).
23/12/96	46	2	25	" ..	II.	Coromandel	Rangatira Surplus ..	William B. Meldrum.
22/10/96	100	0	0	Manaia ..	III.	Hastings ..	Red Castle ..	John P. Ward.
23/12/96	100	0	0	Kennedy Bay	VI., IX.	Harataunga	Remittance ..	Alfred Benham.
22/10/96	100	0	0	Manaia ..	II.	Hastings ..	Restrevor	Thomas Trevor Hull.
23/7/96	100	0	0	Matamata-harakeke	VII.	Harataunga	Rhodes	S. A. R. Mair.
18/5/96	83	1	13	Tokatea ..	II.	Coromandel	Rialto	William Spencer Hampton.
24/10/96	94	2	0	Matamata-harakeke	V., VI.	Harataunga	Royal Albert ..	Oliver Goldsmith.
11/2/96	9	2	10	Tiki ..	X.	Coromandel	Royal Mint ..	Rickley F. Gerdes.
27/2/96	39	1	9	Tokatea ..	II.	"	Royal Oak of Hauraki	Royal Oak of Hauraki (Ltd.).
6/2/97	31	3	38	" ..	"	"	Royal Tar	William Anderson.
6/2/97	98	0	0	Manaia ..	XIII.,XIV.	"	Royal Victor ..	Charles Grosvenor.
6/2/97	21	0	0	" ..	XIV.	"	Royal Victor Extd...	Robert S. Collier.
19/8/96	42	2	24	Tokatea ..	I.	"	Scotia	Montgomery Davis.
2/7/95	29	1	20	Coromandel	II.	"	Scotty's	Scotty's Hauraki Gold-mining Co. (Ltd.).
23/2/97	2	0	30	Tokatea ..	"	"	Scotty's Reef ..	Conquering Hero Gold-mining Co. (N.L.).
23/12/96	100	0	0	Te Papaki ..	VIII.	Harataunga	Scottish Chief ..	Henry James Ross.
12/5/96	30	0	0	Matamata-harakeke	VI.	"	Shotover	Edward E. Noble.
15/12/96	2	3	9	Coromandel	"	Coromandel	Shotover No. 2 ..	T. J. Goldsmith.
1/9/95	13	2	10	Tokatea ..	II.	"	Southern Star ..	Southern Star Gold-mining Co. (Ltd.).
29/10/95	8	0	0	Tiki ..	VI.	"	Specimen Hill ..	Specimen Hill Gold-mining Co. (N.L.).
10/3/96	30	0	0	Tokatea ..	II.	"	Speedwell	James Buchanan and Angus McNeil.
25/6/96	99	2	0	Coromandel	VI.	"	Standard	F. Swindley and H. C. Bell.
2/7/95	30	0	0	Tokatea ..	II.	"	"	Edward Claud Randle.
9/6/96	17	1	33	Coromandel	VI.	"	Standard Extended..	Frederick Swindley.
28/8/95	88	0	0	"	V.	"	Stanley	Hauraki Golden Bay Mine (Ltd.).
4/8/96	7	0	22	Tokatea ..	I.	"	Star	Montgomery Davis.
21/12/95	51	0	20	" ..	II.	"	Star of the East ..	G. Harper and Carlo Blasch.
7/10/96	99	2	26	" ..	VIII.	Harataunga	Star of the North ..	Star of the North Gold-mining Co. (N.L.).
12/11/95	30	0	0	" ..	II.	Coromandel	Star of Tokatea ..	John D. Regan.
19/9/96	60	0	0	" ..	"	"	Star of Tokatea ..	Star of Tokatea Gold-mining Co. (N.L.)
19/9/96	93	2	0	Port Charles	I.	Harataunga	St. Katherine ..	Port Charles Gold-mining Co. (N.L.).
7/7/96	15	0	14	Matamata-harakeke	VI.	"	St. Mark's	T. James McIvor.
11/8/96	65	2	0	Ditto ..	"	"	St. Mark's Extended	"
19/9/96	100	0	0	Tokatea ..	II.	Coromandel	Strathmore No. 2 ..	Albert Cuff.
10/3/96	15	2	6	Coromandel	II., VI.	"	Success	Success Gold-mines (Ltd.).
5/2/95	5	0	25	"	II.	"	Suez Extended ..	New Golconda Gold-mining Co. (N.L.).
18/5/96	100	0	0	Tokatea ..	"	"	Tainui	S. W. Bedlington.
19/9/96	42	0	38	" ..	"	"	Tainui Extended ..	J. M. Brigham, jun.
29/5/96	99	0	16	Port Charles	I.	Harataunga	Takapuna	Enoch Richards.
10/3/96	30	0	0	Tokatea ..	II.	Coromandel	Tandem	Tandem Gold-mining Co. (N.L.).

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Coromandel—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
6/10/96	5	0	0	Tokatea ..	V.	Coromandel	Tandem Surplus ..	S. W. Bedlington.
11/8/96	100	0	0	Coromandel	VI.	"	Tawera	Kenneth Murphy.
1/2/96	75	2	2	Tokatea ..	II.	"	Tokatea of Hauraki	Tokatea of Hauraki (Ltd.).
23/12/96	91	2	11	" ..	III.	"	Tokatea Hinemoa ..	Tokatea Hinemoa Gold-mining Co. (N.L.).
23/12/96	72	0	0	" ..	I., II.	"	Tokatea Reefs ..	Frederick Earl.
7/10/96	60	0	0	" ..	II.	"	Tokatea Star ..	William Morris.
23/3/97	30	0	0	" ..	"	"	Tongariro	Charles M. McFarlane.
3/2/97	33	3	13	" ..	"	"	Trilby	Trilby Gold-mining Co. (N.L.).
30/4/95	30	0	0	" ..	"	"	Triumph	Triumph Gold-mining Co. (Ltd.).
8/6/96	100	0	0	" ..	"	"	Una	William S. Hampson.
25/6/96	98	2	25	Kennedy Bay	II. IX.	Coromandel Harataunga	Vanderbilt ..	Vanderbilt Gold-mining Co. (N.L.).
8/7/96	92	3	2	Cape Colville	II.	Moehau ..	Vanderbilt No. 1 ..	Albert E. Argall.
14/3/93	20	0	10	Tiki ..	X.	Coromandel	Vaughan	The Matawai Gold-mining Co. (N.L.).
6/10/96	2	0	0	Kennedy Bay	IX.	Harataunga	Vizards	James J. Craig.
27/2/96	69	0	0	Matamata-harakeke	VI.	"	Waikanae	Waikanae Gold-mining Co. (Ltd.).
24/4/96	36	3	0	Tiki ..	X.	Coromandel	Waikiti	William Lanigan.
8/7/96	68	1	21	Tokatea ..	II.	"	Waikoromiko ..	Waikoromiko Gold-mining Co. (N.L.).
24/4/96	100	0	0	Tiki ..	X.	"	Wairakei	William Chillingsworth.
3/3/96	30	0	0	Tokatea ..	II., III.	"	Wallaby	Michael Collins.
24/10/96	86	1	0	Coromandel	VI.	"	Watchman ..	Hugh A. Bishop.
19/9/96	67	0	0	Tiki ..	X.	"	Watchman Extended	E. B. Dufaur.
7/4/96	47	1	25	Manaia ..	XIV.	"	Waterfall	Albert Goldwater.
23/7/96	38	2	32	Kennedy Bay	IX.	Harataunga	Warrior	John Bollard and others.
5/2/95	8	1	8	Coromandel	V.	Coromandel	Welcome Find ..	Welcome Find Gold-mining Co. (Ltd.).
6/2/97	48	0	0	Kennedy Bay	IX.	Harataunga	Wealthy Mint ..	Wealthy Mint Gold-mining Co. (.NL.).
23/12/96	97	3	8	Matamata-karakeke	XI.	"	West Derby ..	West Derby Gold-mining Co. (N.L.).
7/10/96	57	2	0	Tokatea ..	I.	Coromandel	West Kapanga ..	Charles Mills.
2/7/95	29	3	32	" ..	II.	"	West Tokatea ..	Harold John Morrisey.
7/10/96	64	0	0	" ..	"	"	Zulu	William Henry Cooper.

Kuaotunu District.

12/11/95	16	2	0	Kuaotunu ..	V.	Otama ..	A1	A1 Gold-mining Co. (N.L.).
9/6/96	11	3	8	" ..	"	" ..	A1 Extended ..	A1 Extended Gold-mining Co. (N.L.).
22/9/96	29	3	0	" ..	"	" ..	Abercorn	Frederick White.
24/4/96	60	0	0	" ..	"	" ..	Ajax	Ajax Gold-mining Co.
7/11/96	100	0	0	" ..	"	" ..	Albatross	Herbert Robins Cook.
4/8/96	30	0	0	" ..	"	" ..	Alpine Fluke ..	Alpine Fluke Gold-mining Co.
25/6/96	66	0	0	" ..	IV.	" ..	Antelope	Jupiter Gold-mining Co. (N.L.).
7/4/96	100	0	0	" ..	II.	" ..	Aorere	Aorere Gold-mining Co. (N.L.).
14/9/95	99	0	0	" ..	V.	" ..	Aorere No. 2 ..	Midas Gold-mining Co. (N.L.).
18/5/96	42	0	0	" ..	"	" ..	Argentine	Ajax Gold-mining Co.
12/11/95	30	0	0	" ..	IV.	" ..	Ascot	Phœnix Gold-mining Co. (N.L.).
19/2/96	32	0	0	Mercury Bay	V., VIII.	" ..	Aurora	Aurora Gold-mining Co. (N.L.).
12/11/95	30	0	0	Kuaotunu ..	V.	" ..	Balfour	Balfour Gold-mining Co. (N.L.).
7/10/96	59	2	0	Mahakirau ..	XIV., XV.	Coromandel	Bolivia	Dennis G. McDonnell.
13/11/95	96	2	20	Mercury Bay	V.	Otama ..	Bona Fide ..	John Owen.
25/9/96	100	0	0	Kuaotunu ..	II.	" ..	Brilliant	Brilliant Gold-mining Co. (N.L.).
12/5/96	24	0	0	" ..	"	" ..	Brilliant Surplus ..	"
2/11/96	50	0	0	Mercury Bay	V.	" ..	Cadman	Albert Cuff.
29/4/96	97	0	0	Kuaotunu ..	III.	" ..	Carbine	Frederick E. Baume.
12/3/96	100	0	0	" ..	V.	" ..	Carnage	Carnage Gold-mining Co. (N.L.).
12/3/96	76	2	20	" ..	III.	" ..	City of London ..	Joseph Francis Knight.
11/2/96	28	3	3	" ..	II.	" ..	Colorado	Alfred Andrew Lockwood.
12/3/96	86	0	0	Mahakirau ..	XV.	Coromandel	Day Dawn.. ..	W. P. Guthridge and A. Hamilton.
12/3/96	87	2	0	Kuaotunu ..	II.	Otama ..	Diadem	Diadem Gold-mining Co. (N.L.).
8/8/96	95	0	0	" ..	III.	" ..	Eastern Star ..	James Coe.
10/3/96	3	1	23	" ..	V.	" ..	Eclipse	David Mahoney.
24/4/96	100	0	0	Whangapoua	I.	" ..	Emma Florence ..	Frederick C. R. Horne.
10/12/95	100	0	0	Kuaotunu ..	II.	" ..	Empire	Empire Gold-mining Co. (N.L.).
22/9/96	100	0	0	" ..	IV.	" ..	Ethel	John Goldsworthy.
8/7/96	100	0	0	" ..	III.	" ..	Flora	Andrew McDougall.
7/4/96	100	0	0	Mahakirau ..	XV.	Coromandel	Flower of Edinburgh	William Nicholson.
21/12/95	50	0	0	Kuaotunu ..	II.	Otama ..	Geraldine	William H. Cooper.
1/10/95	28	2	0	" ..	"	" ..	Gladys	Gladys Gold-mining Co. (N.L.).
6/12/95	71	2	10	" ..	V.	" ..	Golden Anchor ..	Golden Anchor Gold-mining Co. (N.L.).
14/12/96	53	2	0	" ..	III.	" ..	Golden Belt Extended	John Stewart.
13/11/95	49	1	20	" ..	IV.	" ..	Golden City ..	Jupiter Gold-mining Co.
29/5/96	100	0	0	" ..	II.	" ..	Golden King ..	Golden King Gold-mining Co. (N.L.).
21/12/95	96	2	0	" ..	"	" ..	Golden Link ..	Golden Link Gold-mining Co. (N.L.).
7/10/96	39	0	0	Mahakirau ..	XV.	Coromandel	Golden Ripple Ext...	Albert Cuff.
10/3/96	30	0	0	Whitianga ..	XII.	"	Great Britain ..	William Jones Smith.
12/3/96	72	2	0	Mercury Bay	III., VI.	Otama ..	Great Consols ..	John Drew Colebrook.
19/11/89	28	0	12	Kuaotunu ..	V.	" ..	Great Mercury ..	Great Mercury Gold-mining Co. (Ltd.).
24/1/96	30	0	0	" ..	II.	" ..	Great Republic ..	Lincoln Gold-mining Co. (N.L.).
30/7/95	30	0	0	" ..	"	" ..	Great United ..	Great United Gold-mining Co. (N.L.).
12/5/96	5	2	1	" ..	"	" ..	Handsworth ..	Louis Woodcock.
12/3/96	55	2	20	Mahakirau ..	XV.	Coromandel	Homeward Bound ..	The Mahakirau Syndicate (Ltd.).
24/4/96	57	2	0	" ..	"	"	Hooker's Hope ..	John Jesse Odlum.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued for the Warden's Office at Coromandel—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
29/10/95	21	1	16	Kuaotunu ..	V.	Otama ..	Hosie	Robert Workman.
3/11/96	17	3	31	" ..	II.	" ..	Invicta	The Invicta Gold-mining Co. (N.L.).
28/8/95	30	0	0	" ..	"	" ..	Invicta North ..	"
12/3/96	100	0	0	Mahakirau ..	XV.	Coromandel	Iona	Charles Foster Wigley.
19/9/96	98	0	0	" ..	"	"	Iona Extended ..	"
22/9/96	57	2	0	Kuaotunu ..	V.	Otama ..	Irene	Irene Hauraki.
14/9/95	50	0	0	" ..	"	" ..	Irene Extended ..	Samuel Hesketh.
19/9/96	74	2	7	" ..	"	" ..	Jessica	Golden Anchor Gold-mining Co.
12/3/96	76	0	0	Whangapoua	IV.	" ..	Josephine	Vincent Young Gatland.
24/4/96	98	0	0	Mahakirau ..	XV.	Coromandel	Jubilee	Jubilee Gold-mining Company (Ltd.).
23/12/96	49	0	0	" ..	"	"	Jubilee Extended ..	Arthur Young.
24/1/96	21	2	0	Whangapoua	I.	Otama ..	Jumpers	Donald Watson.
24/4/96	84	3	3	Mahakirau ..	XV.	Coromandel	Kia Ora	John Jesse Odlum.
1/5/96	54	3	0	" ..	"	"	Kia Ora Extended ..	Frederick Charles Odlum.
1/10/95	4	0	0	Kuaotunu ..	V.	Otama ..	Kapai-Vermont ..	Kapai-Vermont Gold-mining Co. (Ltd.).
15/5/95	31	3	19	" ..	"	" ..	" ..	"
12/5/96	9	2	0	" ..	II.	" ..	Kuaotunu Extended	Kuaotunu Gold-mining Co. (N.L.).
10/12/95	100	0	0	" ..	V.	" ..	Lady Glasgow ..	George Charles W. Morris.
13/11/95	100	0	0	" ..	II.	" ..	Lucky Hit ..	Kuaotunu Gold-mining Co. (Ltd.).
13/9/95	100	0	0	" ..	"	" ..	Maori Dream ..	Maori Dream Gold-mining Co. (N.L.).
13/11/95	100	0	0	" ..	"	" ..	Maoriland ..	Maoriland Gold-mining Co. (Ltd.).
12/3/96	100	0	0	Mahakirau ..	XV.	Coromandel	Mahakirau ..	Mahakirau Syndicate (Ltd.).
29/5/96	90	3	0	" ..	"	"	Mahakirau East ..	Nathan Alfred Nathan.
12/3/96	100	0	0	" ..	"	"	Mahakirau Extended	The Mahakirau Syndicate (Ltd.).
22/3/97	100	0	0	Opitinui ..	VII.	"	Maiden	Kauri Freehold Gold Estates (Ltd.).
9/6/96	30	0	0	Whangapoua	IV.	Otama ..	Mary Louisa ..	George Loram.
27/8/95	100	0	0	"	I.	" ..	Matarangi ..	Matarangi Gold-mining Co. (N.L.).
7/10/96	70	3	0	Mahakirau ..	XIV.	Coromandel	Mexico	George Dunnett.
4/8/96	10	0	26	Kuaotunu ..	VI.	Otama ..	Midas Extended ..	A. H. Richards.
10/12/95	49	3	10	" ..	II.	" ..	Monarch of All ..	Monarch of All Gold-mining Co. (N.L.).
1/2/96	100	0	0	" ..	"	" ..	Mountain Flower ..	Mountain Flower Gold-mining Co. (N.L.).
1/2/96	100	0	0	" ..	"	" ..	Mount Aurum ..	Mount Aurum Gold-mining Co.
24/4/96	80	0	0	" ..	III.	" ..	Mount Olive ..	Dennis Regan.
24/4/96	93	0	0	" ..	"	" ..	Mount Margaret ..	Frederick E. Baume.
22/9/96	50	0	0	" ..	II.	" ..	National	The National Gold-mining Co. (N.L.).
9/6/96	30	0	0	Whangapoua	IV.	" ..	Ness Side	Albert Robins.
14/12/96	100	0	0	Kuaotunu ..	"	" ..	New Jupiter ..	Cornelius McManus.
14/12/96	78	0	0	" ..	"	" ..	New Jupiter Ext. ..	Michael Fenley.
12/3/96	62	3	16	Mahakirau ..	XV.	Coromandel	New Mahakirau ..	The Mahakirau Syndicate (Ltd.).
4/8/96	23	3	0	Kuaotunu ..	V.	Otama ..	New Mint	Robert Edward Workman.
13/11/95	87	3	10	" ..	IV.	" ..	Nonpareil	Jupiter Gold-mining Co. (N.L.).
1/2/96	50	0	0	Mercury Bay	V.	" ..	Norena	Norena Gold-mining Co. (N.L.).
12/3/96	35	0	32	Kuaotunu ..	"	" ..	Norena Extended ..	"
23/7/96	47	1	0	" ..	II.	" ..	Northern Lead ..	Premier Gold-mining Co.
24/10/93	29	1	35	Matarangi ..	I.	" ..	Ocean View Ext. ..	Matarangi Gold-mining Co. (Ltd.).
18/5/96	39	0	0	Kuaotunu ..	V.	" ..	On Dit	Ewan William Alison.
29/5/96	100	0	0	" ..	III.	" ..	Opito	Frederick E. Baume.
19/9/96	57	0	0	" ..	"	" ..	Opito Surplus ..	"
6/2/96	100	0	0	Mahakirau ..	IV.	Hastings ..	Orange	Edward Thomas Dufaur.
15/10/95	9	3	8	Kuaotunu ..	V.	Otama ..	Orestes	Jupiter Gold-mining Co. (N.L.).
10/12/95	77	0	0	" ..	"	" ..	Oriental	Oriental Gold-mining Co. (N.L.).
7/4/96	83	0	9	Mahakirau ..	XV.	Coromandel	Peep of Day ..	Thomas Henry McGregor.
7/10/96	94	1	35	" ..	XIV.	"	Peru	James McGregor.
5/9/95	20	2	10	Kuaotunu ..	IV., V.	Otama ..	Phœnix	Phœnix Gold-mining Co. (N.L.).
24/1/96	30	0	0	" ..	II.	" ..	Premier	Premier Gold-mining Co. (N.L.).
11/8/96	71	3	30	" ..	"	" ..	Prince Alfred ..	Lincoln Gold-mining Co. (N.L.).
6/2/96	69	0	15	" ..	V.	" ..	Prospect	Prospect Gold-mining Co. (N.L.).
24/4/96	100	0	0	" ..	III.	" ..	Queen of Beauty ..	Henry Pierce Hornibrook.
21/12/95	37	3	10	" ..	IV.	" ..	Ring Dove.. ..	Jupiter Gold-mining Co. (N.L.).
26/1/95	16	3	20	" ..	"	" ..	Roebuck	"
16/7/96	27	0	0	" ..	II.	" ..	Shakespeare No. 2 ..	Andrew Grey.
23/12/96	78	0	0	Mahakirau ..	XV.	Coromandel	Silver Veil ..	James B. Dick.
11/8/96	63	1	0	Kuaotunu ..	II.	Otama ..	Sink to Rise ..	Thomas White.
19/9/96	96	2	0	" ..	II., III.	" ..	Sons of Freedom ..	Kenneth Murphy.
19/9/96	96	2	0	" ..	II.	" ..	Sons of Freedom No. 2	Michael McSheffrey.
13/11/95	100	0	0	Mercury Bay	V.	" ..	Southern Lead ..	William Joseph Young.
29/5/96	100	0	0	Kuaotunu ..	II.	" ..	Superb	Frederick E. Baume.
28/8/95	29	3	32	" ..	V.	" ..	Syndicate	Jupiter Gold-mining Co. (N.L.).
12/3/96	81	0	0	Mahakirau ..	IV.	Hastings ..	Three Castles ..	Three Castles Gold-mining Co. (N.L.).
1/10/95	6	1	12	Kuaotunu ..	V.	Otama ..	Try Fluke Extended	Mariposa Gold-mining Co. (Ltd.).
18/5/96	100	0	0	" ..	"	" ..	Try Fluke	"
13/11/95	47	0	0	" ..	"	" ..	Try Fluke No. 2 ..	Jupiter Gold-mining Co. (N.L.).
6/2/96	100	0	0	Mahakirau ..	IV.	Hastings ..	Union Flag ..	Charles Edward McCormick.
24/4/96	100	0	0	Kuaotunu ..	III.	Otama ..	Venus	John Stewart.
23/8/96	100	0	0	" ..	II.	" ..	Vulcan	Vulcan Gold-mining Co.
24/4/96	85	2	0	" ..	V.	" ..	Waitaia	Waitaia Gold-mines (Ltd.).
4/8/96	16	2	23	" ..	"	" ..	Alpine Fluke ..	Alpine Fluke Gold-mining Co. (N.L.).
24/4/96	94	0	0	" ..	II.	" ..	Wheal Bassett ..	David Ritchie.
1/5/96	55	0	0	Whangapoua	I.	" ..	Wild Wave ..	D. N. Watson and B. M. Murray.

Port Charles District.

Jay Gould Mine (Area, 100 acres).—Situated at Big Sandy Bay. Three drives have been put in —No. 1, driven 76 ft., on Kensington's reef, a small vein about 4 in. in width, in which small prospects of gold can be got; No. 2 drive is a cross-cut which is being put in to cut McIsaac's reef; No. 3 level has been driven 64 ft. to cut No. 2 reef, which varies from 10 in. to 18 in. in width, and also gives small prospects of gold. Four men are employed.

A small amount of prospecting work was done on the De Hirsch Claim, of 99 acres 3 roods, but no gold has been reported.

The Takapuna, Golden Gate, Vanderbilt, Grand Moehau Freehold Syndicate, Pacific, and McIsaac's have been also taken up, but no returns have been made.

Cabbage Bay District.

White Star Consolidated Mine (Area, 750 acres 1 rood 31 perches).—This mine comprises the following claims: Doric, Ionic, Coptic, Celtic, Britannic, Noric, Helvetic, and Belgic. Seven or eight prospecting drives have been put in, chiefly near the surface, and several compact quartz reefs cut in andesite country. Small leaders were also cut in the slate formation. A low level has been commenced to cut the reef, which occurs in the Belgic and Coptic Claims at a depth of 120 ft. below the surface. Twenty-four men are employed.

Golden Caledonia Mine (Area, 27 acres).—As many as nine reefs occur in this ground, varying from 6 in. to 8 ft., but only in two of them has gold in small prospects been got. Three men are employed.

Ladas Mine (Area, 87 acres).—Surface trenching was done for 110 chains, and seven different reefs cut, varying from 6 in. to 3 ft. 6 in. A cross-cut was put in 200 ft. below the surface, and a reef cut at 94 ft. Another drive is put in 50 ft., but no reef cut. Four men are employed.

Queen Victoria Mine (Area, 100 acres).—A small parcel of 2 tons of oxidized pug and 100 lb. of hard quartz was crushed at the Moanataiari Battery, Thames, for 3 oz. of gold, value £2 15s. 6d. per ounce. The following is the work done at the mine during the year: About 205 ft. of driving, 300 ft. of trenching, 30 ft. of old drive cleaned out and repaired. There are several leaders, and three of them gold-bearing. Four men are employed.

Criterion, late Fortuna Mine (Area, 47 acres 2 roods 28 perches).—This mine is situated at Waikanae, and the reef, which last year yielded quartz worth 10 oz. 3 dwt. to the ton, has again been worked. A parcel of 8 tons 3 cwt. of quartz was crushed, for 104 oz. 2 dwt. of gold, and 5 tons of quartz from No. 2 reef yielded 9 oz. 15 dwt. of gold. As there are several other gold-bearing reefs in the ground the prospects are considered favourable, and a battery is to be erected convenient to the mine. Six men are employed.

The City of Gisborne, Jersey, Cuvier Light, and Elvira have been prospected and reefs and leaders of quartz discovered, but no returns of gold have been made.

Fortuna No. 2 (Area, 38 acres).—A considerable amount of prospecting work has been done. Six different cross-cuts were put in, and in the quartz cut prospects of gold are got, but not of a rich character. Four men are employed.

The Moehau Nos. 1, 2, 3, and 4, Killarney, Golden Fortuna, Baron Rothschild, Netherfield, Great Waikanae, and Everton have also been prospected, but no results furnished.

Kennedy Bay District.

The A.J.C. Special Claim, of 100 acres, is situated at the Omoho Creek, Kennedy Bay. About 200 ft. of driving has been done, and three reefs discovered, each of which yields prospects of gold. Four men are employed.

Lorna Doone Mine (Area, 100 acres).—A considerable amount of work has been done in prospecting the reefs in this mine. Eight reefs are known, varying from 2 ft. to 5 ft., and one large reef 40 ft. in width. Gold is found in No. 3 reef and in the 40 ft. reef by pounding the stone and using the dish, but so far none of the reefs are valuable. A cross-cut is being put in to cut No. 3 reef at a further depth of 60 ft. Five men are employed.

Work was also carried on in the Bay View, in which several reefs, varying from 1 ft. to 4 ft., have been discovered. A parcel of 6½ tons yielded 19 oz. 8 dwt. of gold.

The Madge, Look-out, Evening Star, Anglo-Saxon, and Maioro have been prospected, and in each quartz reefs were found.

In the Kennedy Bay, Vanderbilt, West Derby, and Rangipuhi no discoveries have been made.

Paul's Creek District.

Conquest Mine (Area, 30 acres).—Considerable prospecting was done near the surface, but the ground opened proved to be of a loose disturbed character. A low level is now being driven to test the firm country underneath.

Golden Lead Mine (Area, 127 acres).—About 300 ft. of cross-cut driving has been done, and several reefs cut; value not known. Five men are employed.

The Duke of Wellington, Kapanga Reefs, and Corea Claims have also been prospected.

Tokatea District.

Royal Oak and Tokatea Mines.—These mines are adjacent, and situated on the Tokatea Range. A large reef runs along the range in a northerly direction near the ridge, and the principal workings are on the eastern slope, the reefs worked being offshoots of the main reef, and running nearly at right angles to it. An interesting feature, and one that renders the deeper workings in these mines a matter of the utmost general importance, is that the reefs have been worked from the surface downwards in andesite rock; but at the lower levels the rock is changed to slate or sedimentary

rock. The chief gold-production from the Hauraki Mining District has been from those reefs existing in the andesite, and in few instances have reefs in slate formation hitherto proved payable. Therefore, as it is now proved that the veins of quartz have an uninterrupted continuance downwards in both rocks, and that they are gold-producing to a depth of 100 ft. below the adit, it augurs well for the continuance of the reefs down into the slate formation in all the other portions of the Hauraki Goldfield, and gives hopes of success in deep-level mining throughout.

Captain Hodge has furnished me with the following report on those mines which are under his control:—

Royal Oak of Hauraki (Limited).—This company has an area of 39 acres 1 rood 9 perches. The number of persons employed by the company is forty. The total expenditure since registration to the 31st December has been £8,221 0s. 1d. The greatest depth reached below the surface in this company's property is 930 ft. The number of levels in which work has and is being conducted is four—No. 3 level, 385 ft. below surface; No. 5, 442 ft.; No. 6, 693 ft.; and No. 7, 869 ft. The shaft is also sunk below No. 7 level about 70 ft. The reefs being developed are known as the No. 1 tribute leader, in the Oak section, which averages 1 ft. wide; the Main Tokatea reef, averaging from 12 in. to 5 ft. wide; while the trunk reef of the district varies from 50 ft. to 80 ft. wide from wall to wall. The company has crushed since registration 36 tons of quartz, yielding 350 oz. 19 dwt. of melted bullion, and realising £884 19s. 9d. It is the intention of this company to thoroughly develop the Oak section of the property, and, in conjunction with the adjacent company—the Tokatea—by the aid of that company's machinery and motive-power, to develop the Main Tokatea reef, that paid so many dividends, and of which this company owns a section.

Tokatea of Hauraki (Limited).—This company owns an area of 75 acres 2 roods 2 perches. The greatest depth reached from the surface or crown of the hill to this date is over 1,000 ft., on the line of the famous Main Tokatea reef, which reef contributed largely to pay the old Tokatea Company in dividends between £60,000 and £70,000. I may say it is satisfactory to find this reef carrying strong dabs of gold in the stone all along the bottom of the 100 ft. level, below No. 7. The company has now in progress the sinking of the shaft below this for a new level, and in the upper series of the old workings, whenever the reef contributed occasional blotches of gold, it was invariably discovered to be near the rich shoot. Bearing in mind that the sea-level is 1,500 ft. below the crown of the hill, the future of this company below the present workings should be a good one. The company owns two portable engines, which will develop 30-horse power, air-compressor, air-winch, and Tangye pump, and also fifteen heads of stamps and two berdans. A parcel of 21 tons of quartz has been crushed, for a yield of 77 oz. 18 dwt. 2 gr., which realised £222 14s. 1d. Thirty-five persons are employed. It is contemplated very shortly to amalgamate this property with the Royal Oak. With this done, by the aid of the Tokatea plant for pumping, winding, and stamping, the Royal Oak can work their shaft dry, and give this famous reef a thorough good development in the virgin ground. Judging from the indications at the deepest point reached in the mine, and guided also by the experience of miners who developed this reef in the upper workings, it is very evident that this Tokatea main reef will yield large quantities of gold in the deeper workings. I may say both this company and the Royal Oak are giving the large trunk reef a thorough good development from the level to No. 3, and, although their efforts have not yet been successful, any day might discover a section of it to yield payable ores, in which case a reef of this magnitude would contribute a large reserve of ore immediately. Provision has been made for fuel to develop the property for more than twelve months in advance; in the meantime water-power is being conserved for developing the mines on a permanent basis; and the amalgamation is being urged forward, in order that the two companies may jointly contribute to work the two mines on a basis with water as a motive-power. The ultimate success of this property and the Royal Oak, by their combined efforts, judging from all the indications surrounding their mines, ought to again bring these mines into prominence as good payable properties.

Triumph Mine (Area, 30 acres).—The levels opened last year were further extended. The adit-level, which is 320 ft. below the surface, is now in 552 ft., and when continued will intersect the No. 1 and No. 2 reefs. Driving and stoping have been done on those reefs, and a quantity of quartz is now ready for the battery. No great expedition was observed in the erection of this plant, and it is not yet completed; therefore no quartz has been crushed. Forty men were employed.

Golden Tokatea Mine (Area, 30 acres).—A considerable amount of driving was done on two small reefs, the Morgan reef, 1 ft. in thickness, and the Hibernian reef, 6 in. About 10 tons of low-grade quartz has been taken from the Morgan reef, and a few pounds of picked stone showing gold, but no crushing has been done. Four men were employed.

Harbour View (Area, 38 acres 3 roods 28 perches).—Very little work has been done, and no quartz crushed.

Tokatea Consols, formerly New Tokatea Mine (Area, 30 acres).—This mine is owned by the Tokatea Consols Gold-mines (Limited). A considerable amount of development was carried out, levels being driven both from the east and west sides of the range. The reef at the east side is from 1 ft. to 4 ft. wide, and on the west side 6 in. to 1 ft. No quartz was crushed. Thirteen men were employed.

East Hauraki Mine (Area, 29 acres 3 roods 32 perches).—The reefs on this ground are of small size, varying from 6 in. to 18 in. A low level has been driven 400 ft. to intersect the principal reefs. A connection was made by rising on Dunn's reef to the Comstock level. The quartz (about 60 tons) has not been crushed, and no gold has been obtained. Ten men were employed.

Prospecting work has also been carried on in the Alexandra, Star of Tokatea, Coromandel Queen, East Tokatea, North, Pigmy, and Good Luck.

Stirling Castle Claim.—This claim was worked by the owner, chiefly on small veins; 5 cwt. of quartz yielded 20 oz. of gold, value, £58.

Napier Claim.—A crushing of 14 tons yielded 100 oz. 5 dwt.

Buffalo Mine (Area, 10 acres 1 rood).—This land comprises Montgomery's freehold, in the old Buffalo Settlement, and is situated on the range towards the head of Courthouse Creek. During the year 350 ft. were driven on the main reef, and a leader of gold-bearing quartz was found on the foot-wall side of the reef, but no quartz was crushed. Four men were employed.

Good Enough (Area, 13 acres 3 roods).—About 300 ft. of driving has been done by the company, but no quartz was crushed. Two men were employed.

Southern Star Mine.—The Southern Star Gold-mines (Limited), of London, are the owners. A considerable amount of prospecting work was done on the ground, of which Mr. Pearce, the mine-manager, gives the following account:—

The Queen's reef is situated on the east end of the property. The reef dips west into the Southern Star Mine. The intermediate level on Queen's reef has been extended 61 ft. by two men, with very good prospects of gold. The country-rock here looks very promising. Driving on Queen's reef, south end, the low level has been extended by four men 168 ft., with very promising results. There will be over 100 ft. of backs to the surface to be stoped out. Driving on same reef, north end, the low level has been extended by four men 110 ft. We have met with fair results whilst driving. The main cross-cut from Queen's reef level will meet the intermediate level on the west side of the property, so that the mine will be able to be worked to greater advantage. This has been extended, by six men, 65 ft. The country-rock is very heavily mineralised. The Queen's No. 2 leader, south end, has been extended by four men 24 ft. in the last two weeks. The cross-cut for No. 3 leader, and also Pearce's No. 1 reef, has been extended by two men. A cross-cut has been driven 168 ft., driving on No. 3 leader 70 ft., and also a branch leader 50 ft. We passed through other leaders, most of them carrying low-grade ore. The No. 1 cross-cut for No. 1 reef (Pearce's) has been extended by four men 271 ft. The country-rock here is very heavy, and requires to be well timbered. The intermediate cross-cut for Pearce's No. 1 reef has been extended 199 ft. to the reef, by four men. Six men have driven along the line of reef 163 ft. In the cross-cut the country-rock was very short and tight. The intermediate level will meet the west cross-cut on the other side of the hill, so that the quartz can be conveyed by this route to the battery. The rise from intermediate level to surface has been extended, by four men, 49 ft. on the reef. The Southern Star general low level has been extended, by four men, 299 ft. Here the country-rock is very patchy, with hard bars, making progress slow. The total length driven on this level is 1,705 ft. Mining timbers have been cut out of the bush from trees growing on the mine property to the following extent: Cribbing timbers, 269; props, 392; slabs, 3,169; caps, 372; toms, 120; and sleepers, 298. Roads have been made on the mine to the extent of about 7 chains. A road to the machinery site of about 15 chains has been made, at a cost of £140. Two rooms have been erected on the mine, to be utilised as office and store-room. Two men are employed in the smithy, and the miners are under the supervision of a shift boss. There have been no accidents during the past year.

Success Mine.—This mine has been energetically worked during the year. The battery of ten stamps was conveyed to the ground and erected in close proximity to the low-level adit.

The following particulars with respect to this and the New Hauraki Gold Properties Mines have been supplied by Captain Hodge, the general manager:—

Success Gold-mines (Limited).—The nominal capital is £50,000. The area owned by the company is 15 acres 2 roods 6 perches. The total expenditure since registration to the 31st December last is £10,809 14s. 2d. The number of persons employed has averaged forty-three. The greatest depth reached in this company's operations is 260 ft. below the surface. The developments have been conducted at various depths by means of seven levels. The reefs on the property vary in size from 6 in. to 3 ft. wide, and are composed of quartz, much associated with iron-pyrites. The reefs are intersected by floors of pyrites considerably oxidized. The company have done a considerable amount of development on the property, and have crushed 493 tons of quartz, which gave 209 oz. of melted bullion, realising £600 5s. 10d. In James's level, on the line of James's reef, running east and west, a cross-course was encountered having a dip westerly. The same cross-course was intersected in the deep level at a point near where the deep level intersected James's reef. All east of this cross-course the rock is composed of a compressed hard andesite from which large quantities of gold have been raised from the surface to about 30ft. below No. 3 Success level. On the western side of this cross-course referred to the rock is a moderately hard andesite. This also has produced a fair quantity of gold. The lines of development now proposed by the company is to sink below this level both in the decomposed and hard andesite rocks. The reef-formation maintains its uniform size in the deep level, and it is highly probable the reef will again be fed by similar floors of pyrites, as the rock so far as reached is very largely charged with it. If this is so (which there is no reason to doubt) there will be good chances of discovering fresh runs of the precious metal. The other developments of the company are conducted in following up the line where good runs of gold have been raised in the upper series or sections of the property. The company owns a ten-head battery, with four berdans, worked by a portable boiler of 20 nominal horse-power and a horizontal engine, 14 in. diameter cylinder, with a Pelton wheel to work the battery when water is available. A large chamber has been cut on the ground at the site for sinking a shaft, and machinery is on order to conduct sinking by compressed air. Judging from the well-defined walls of the reef going below the deep level and the character of rock, deeper working promises well to discover a permanent and payable reef in undisturbed ground below this level. Between this deep level and James's level the reef pinched by a horizontal hard-class rock, say diorite. It is satisfactory that below this to the level the reef gradually has increased in size, is assuming its uniform formation, and the walls are getting well-defined; to say the least, the development below this level is a very important matter for the future of the company.

New Hauraki Gold Properties (Limited).—This property comprises an area of 182 acres 2 roods 28 perches, 14½ acres of which is a licensed holding, the other portion being freehold

property. The deepest point worked on this property is 274 ft. below the surface. Operations have been conducted with seven levels at various depths and on different reefs, each varying in size from 6 in. to 18 ft. The average number of persons employed on this property is thirty-two. In the 14½-acre section of this property a prospecting level is being driven in virgin ground. The total distance driven here is now 314 ft. For some time past the rock driven through in this level has been a hard diorite. It is hoped to be through this rock shortly, judging from the more moderate andesite rock outcropping on the surface in advance of this level. From the South Tokatea tunnel the company is developing a reef northerly on the supposed No. 1 Success reef, and, inasmuch as this drivage is towards the gold-bearing belt, there is ground for expecting to discover good runs of gold characteristic to the Success reefs at this depth. Northerly from this development a new prospecting cross-cut is also being developed, in the hopes of intersecting the same No. 1 Success reef. The rock so far as driven in (24 ft.) is a true decomposed andesite rock, and, inasmuch as loose colours of gold can be raised around the surface in this section of the ground, there is reason to expect cutting a productive reef. A new reef is being developed in the freehold property, in which occasional colours of gold are being met, and, speaking from the character of the reef so far as developed, it is hoped by the deepest level just being initiated on this reef to discover a payable reef. The company is also developing an east and west reef, varying in size from 3 ft. to 17 ft. wide, known as No. 1, No. 2, and No. 3 level cross-cuts. In the No. 1 and No. 2 levels large bodies of ore have been driven on, but so far of too low grade to pay for working. By following up the development of this reef, however, there is no reason to suppose but what payable sections of it will be discovered, as its development is practically all in virgin ground. The company is also working a hand rock-drill in the lower sections of its property, with a view to test the rock at different points. The area of this property and the various number of reefs traversing through it, and considering the prospects of gold traced in various parts of the property and surface prospecting, with further developments should discover some sections payable. The company has expended £7,727 14s. 5d. in the colony since registration to the 31st December last.

Waikoromiko District.

In the under-mentioned mines a large amount of prospecting work was done, but no yield of gold has been reported. Machinery for crushing is not yet erected in the neighbourhood, but it is expected that a mill will be shortly erected by the Hauraki Associated Reefs Company, which will give a chance for public crushing from the mines—Rialto, Fabulous, Cuirassier, Golden Butterfly, Plunger, Jocelyn, Tandem, Trilby, Tokatea, Hinemoa, and City of Chester.

Whangapoua Mine (Area, 100 acres).—This mine is situated at Waitekauri Block, Whangapoua, and joins the Waikoromiko claims. The reef is from 2 in. to 2 ft. 6 in. in width, and produces specimens. As the country is at present inaccessible for carting quartz, 4½ tons only were sent to the mill, but this, with 150 lb. of specimens, produced 720 oz. of gold; value, £2,180 7s. Two men were employed.

Forest Queen Mine.—A small crushing of 19 cwt. of quartz yielded 8 oz. 10 dwt. of gold; value, £25 10s. Five men were employed.

Four-in-Hand Mine (Area, 30 acres).—This mine is situated in the Waikoromiko district. A considerable amount of work was done during the year. The reef, which is from 4 ft. to 6 ft. in width, was driven on for 200 ft., and a rise 60 ft. put through to the surface. As this mine is far removed from a battery the bulk of the quartz was not crushed, but 400 lb. of specimens were treated, for a yield of gold value £900. Seven men were employed.

Kapanga District.

Kapanga Mine (Area, 99 acres 3 roods 27 perches).—This mine, the oldest held by an English company in the Auckland District, is still being vigorously worked. The return of gold for the year was 531 oz., obtained from 843 tons of quartz. The workings in the mine are of very great extent, and carried on from two shafts, the Kapanga shaft, 1,007 ft. in depth, and the Corby shaft, 185 ft. Gold occurs in many places, although no extent of rich specimen stone has been obtained. There is, however, always, when working on reefs in this mine, a chance of unearthing one of those patches of specimens similar to the rich finds obtained in the past. This company deserves success on account of the large amount of capital it has invested, for the untiring perseverance displayed in opening the mine at such a depth, and also for carrying on operations without having obtained adequate returns of gold for several years past. It is also intended to use the diamond drill in boring, with the view of sinking the main shaft to a greater depth should indications prove satisfactory. Mr. W. H. Argall, general manager, and Mr. H. Battens, mine-manager, give the following account of the mine:—

Tutwork measurements (exclusive of stopes): Engine-shaft has been sunk 207 ft.; drives on reefs and branches, 540 ft.; risings, 569 ft.; levels cleared and retimbered, 320 ft. Corby section: Shaft retimbered, 80 ft.; shaft sunk, 65 ft.; drives cleared and repaired, 200 ft.; drives on reefs and branches, 190 ft. Stopes: In this connection 740 tons of quartz has been treated, but a large proportion of it was of very low grade. During the year Larnach's engine-shaft has been sunk 207 ft., its size being 11 ft. by 8 ft. within timbers. For the entire distance it has been securely timbered with 10 in. by 8 in. timber, and all the necessary centre-pieces, cage- and ladder-roads, have also been constructed, with the requisite sollars and bye-launders. We have also fixed a 10 in. bucket-lift, and a 12 in. plunger-pole at the 600 ft. level, with a 13 in. rising main. We found it advisable to do this in order to counteract the weight of main rods, and it will also enable us to sink as low as the engine's capabilities will allow without incurring any further expense. The shaft having been sunk to the required depth, preparations were made at once for opening out at the 1,000 ft. level. A chamber 24 ft. by 10 ft. by 8 ft. within timber has been cut, and the ground

properly secured; also the second cage-road put in. The shafting and poppet-legs, cage- and ladder-roads, are now completed; also the necessary pitwork. From the top of the poppet-legs to the bottom of the shaft the distance measures 1,075 ft. At this level we started a cross-cut south-east, and during the first 18 ft. we intersected a small reef 6 in. wide, composed of solid quartz heavily charged with mineral and arsenic, slightly deviating from the direction of the cross-cut; in fact, the deviation was so little that we continued on the line of reef, which has now advanced 125 ft. This is, in all probability, a "dropper" from the reef cut in the shaft at the 940 ft. By continuing this drive we shall test the character of the reef, and ere long intersect the main portion of the reef. During the progress of this drive the reef has varied considerably, sometimes opening out to 14 in., but the average width would not be more than 6 in. It has carried good quartz for the whole distance, and is highly charged with arsenical pyrites. At about 96 ft. from the shaft we intersected another reef, bearing north-east and south-west, about 12 in. thick. This has been driven on for a distance of 17 ft. It is encased in a splendid class of sandstone, and is of such a character as should produce gold in quantity, though at present the ore obtained is not payable. At the same level we started a cross-cut south-west, which has been carried for 290 ft. A small leader about 5 in. wide was cut in the first 18 ft., which, though fine in quality and highly mineralised, showed no gold. At a further distance of 170 ft. two small veins were cut, both of which, though small, were excellent in character. We have here a much larger body of water to contend with than in the upper levels. Of course, the main object in advancing this cross-cut is to intersect our two old and tried reefs—Kapanga and Scotty. At the 940 ft. level, after cutting a chamber, we drove in an eastern direction on the line of reef, which has been continued both east and west for a distance of 89 ft. and 99 ft. respectively. The reef has varied in width from 2 ft. to 20 in., and in both directions has carried small deposits of gold for the whole distance, and occasionally very rich pieces have been taken out. A bar or band of iron-pyrites, 2 ft. thick, has very much interfered with the extraction of the gold. At the junction of the bar with the reef gold was made. In relation to this mineral band, we were prompted to forward a sample to the local assayer, with the following results: Nos. 1 and 2, from the west drive, assayed—No. 1, traces of gold; No. 2, 6 oz. 8 dwt. 13 gr. of gold and 1 oz. 17 dwt. 20 gr. of silver; value per ton, £25 17s. 9d. Nos. 3 and 4, from the east drive, assayed—No. 3, traces of gold; No. 4, 1 oz. 2 dwt. 16 gr. of gold and 10 dwt. 2 gr. of silver; value per ton, £4 11s. 8d. This band has accompanied the reef for the whole distance driven, and is 12 in. to 18 in. thick, of almost solid mineral. In the rise mentioned below another similar band has been met with, 8 in. thick, and has run with the reef right up to the rise. This band is a medium for the gold, and wherever it junctions with a reef rich deposits are found. We have put up a rise on the reef in the east drive for a distance of 42 ft., which is looking well, and showing strong blotches of gold. It was imperative that this rise should be put up to the 900 ft., in order to secure ventilation; besides which, by so doing, a large block for stoping was at our command. A certain amount of stoping has been done. The reef is 20 in. thick, carrying a little gold, but it is heavily charged with mineral. Having completed the rise, we continued the east drive, but a slide coming in disordered the reef, and for a time we lost it; but by further driving we recovered it in an improved condition, but still accompanied by the band of iron-pyrites, which we consider an excellent indication. In the 900 ft. level a cross-cut east has been driven 42 ft. About 20 ft. in we cut a small vein, 4 in. thick, carrying a good class of quartz, and in 20 ft. more we intersected a 4 in. leader showing payable ore. This leader we have driven on for 42 ft.; it soon increased to 6 in., and subsequently to 10 in., gold having been seen for the whole distance; and there is every indication to warrant favourable expectations. During this driving we intersected a reef running at right angles to the former one, which, though presenting a fine body of stone, did not betray payable ore. At this level we have initiated a cross-cut north-east, with the intention of picking up the reef cut through 16 ft. below the level, and which, where intersected, was found to be gold-bearing, a few specimens being taken out at the time. This cross-cut has advanced 36 ft. There is every encouragement to hasten and develop work at this level—in fact, from this point to the 1,000 ft. level every foot of ground should be prospected, as the country is one network of reefs, leaders, and veins, mostly gold-bearing, though in small quantities. The rise at the 800 ft. level has been stopped, and we have started to cross-cut west from the 700 ft. level to intersect this rise. We shall thereby obtain additional ventilation, and from the point of intersection continue the rise through to the 600 ft. This cross-cut has been advanced 110 ft. In the first 15 ft. we intersected a leader, 8 in. thick, carrying a body of highly-mineralised quartz. The next few feet of driving led us into the dyke, which we encountered in the shaft below the 600 ft. This somewhat retarded progress, but in the following 15 ft. we got clear, and cut into a composition of pug and mullock, which gave place to a more congenial class of country, with a good stream of water running from the face—probably owing to the nearness of a reef. Driving north above the 500 ft. level on Kapanga reef has been extended a further distance of 132 ft. The reef has averaged 8 in., composed of favourable quartz and pug, while the country-rock has considerably improved, and is carrying streaks of jasper, which is considered a good indication. This drive will lead us under the runs of gold to the north of the present face, and we are endeavouring to hasten this work as much as possible. The stope at the back of the drive has produced ore of low grade. The 420 ft. level (main drive south on Kapanga) has been advanced 115 ft. and repaired for 87 ft. The reef has varied during the drivage from 6 in. to 18 in. and at times has been much disturbed, owing, no doubt, to the broken and mixed character of the country-rock. An increased body of water has been encountered, and, from indications at the 300 ft. level, we are of opinion that this increase is coming from that level. The ore from the reef has been of low grade; but with a better class of country coming in, and a more uniform reef, we are anticipating an improvement in the quality of the ore. The rising above 420 ft., on Scotty's reef, has been holed through to the intermediate proper. The reef has been from 8 in. to 18 in.

thick, and the ore from the reef, as well as that from the stopes north of the rise, has been of rather low grade; but recently the reef has widened out in the stopes, and is now 4 ft. thick, carrying a good hanging-wall, and altogether presenting a much more favourable appearance. The rising above intermediate on Scotty's hanging-wall has been extended 102 ft., for a greater portion of which distance the country has been first class. The reef, 7 in. thick, opening out recently to 2 ft., has carried gold for a considerable distance. We have commenced stoping north, and have obtained fair crushing-dirt. In the 300 ft. level the winze which was started and continued for about 40 ft. with such promise is at present suspended, pending the completion of repairs to main drive at this level. In the Corby section the engine-shaft has been sunk a further distance of 39 ft., making a total depth of 185 ft. At present this work is stopped, so that we may push on the cross-cut at the bottom of the shaft to intersect the Kapanga reef. The No. 1 drive on reef has been advanced 91 ft. The width of the reef has averaged 11 in., with good walls, and is really a fine body of quartz. We fully intended to continue this drive, but a strong volume of water issuing from the face compelled us to suspend the work. We shall resume as soon as water will allow to get under Cotter's winze, as gold has been carried along there. The rise above this drive has advanced 40 ft., where we intersected a reef 12 in. wide, running about north and south (a superior body of stone, which we have driven on for a distance of 79 ft., and it has maintained its character throughout), the indications of which are favourable in every way for producing gold. A cross-cut has been started in the No. 1 level, and has advanced 51 ft. The object of this is to intersect Scotty's below the Golden Point Tunnel, where rich gold was found in former years, but in the absence of machinery to cope with the water the workings were abandoned. We are expecting to strike the reef in about 40 ft. The drive south of Cotter's winze, on line of reef, is still being carried on, and the reef, though small, continues to show gold, which at times is rich. We feel sure the ground all round the Corby section would pay well to be thoroughly worked and developed, but we would not depend so much on the shallow or surface levels as we would in depth, for while in the former you here and there get small pieces of flaky gold, in the latter you are more likely to get it in greater abundance in the quartz, and more continuous. In drawing this report to a close, we would like to remark that, in connection with the boring operations about to be started, we have been comparing notes in relation to the last operation, and are both of opinion that, by commencing with a large bore—say, 7 in.—we are likely to make better progress than before, as we can more easily reduce to 2 in., if necessary, than we could increase from 4 in. to 7 in. Permit us further to say that we are in favour of further testing, not because we are discouraged or disappointed with the present results of the lower levels, but rather because these very results are indicative to us of a much better class of country for the production of rich metal.

Scotty's Mine.—This mine has been continuously worked during the year, and extensive developments carried out. Captain Hodge, the general manager of the company, gives the following report on the mine and workings:—

This company's property is adjacent to the famous Kapanga Mine: the reefs traversing the same are the Scotty's and the Kapanga, as well as parallel ones. The company have conducted considerable developments since their initiation. A permanent shaft has been sunk to a depth of 325 ft. The principal workings now being conducted are at the 355 ft., on the line of the reef known as Breuer's reef, and the sinking of a winze below that level. Nearly five hundred pounds' worth of gold was broken out from the 355 ft. level on the 26th January last by a few shifts working. Seeing this, it is only reasonable to suppose that by deepening the shaft and following this line of reef considerable quantities would be won. Another very important development in relation to this property is the discovery of a reef near the battery. This is practically one of the well-known New Hero reefs, in the adjacent property. The Scotty's company is now engaged sinking a prospecting winze below the creek-level on this reef. The reef is running approximately north-westerly, and its dip is easterly. In the reef, which averaged 1 ft. wide, we have seen strong dabs of gold. The company is now recommended to sink a trial shaft on the site of this winze, and this development will be one of great interest, the quartz being of the same character as that found in the Hauraki lode and in Scotty's ground, never having before been worked except at one point, say, a few feet below the clay or surface. The area of the company's property is 38 acres 1 rood 2 perches. The total expenditure locally up to the 31st December last has been £12,506 1s. 8d. The total quantity of quartz crushed since its initiation up to date has been 122 tons, which gave 256 oz. 17 dwt., realising £749 17s. A good winding-engine is erected on the property, poppet-heads, two patent cages, and a plunger-lift for pumping to the 300 ft. The company have nine heads of stamps and three berdans, worked by an overshot water-wheel. The average number of persons employed is thirty-six. This company, having in view the development of the mine from the main shaft in depth, as also the sinking of a prospecting shaft near the battery, is now ordering two 25 nominal horse-power Cornish boilers, and a pumping-engine with air-compressors and plant. The future of the company, when the developments mentioned have been carried out, should be a profitable one.

Britannia Mine (Area, 40 acres).—This mine is owned by the Britannia (Hauraki) Gold-mining Company (Limited), of London. During the year the shaft has been sunk a further depth of 100 ft., and is now 220 ft. from level of the creek. A chamber was opened at this level, and a cross-cut driven 140 ft. No reef has yet been cut in the shaft, but the Flying Cloud and Junction reefs were formerly worked in this ground. The present machinery is a 10-horse-power steam-winch for winding and also for baling water, and a Tangye vertical boiler. From four to sixteen men were employed. The manager has recommended the purchase of new machinery, to consist of a pair of winding-engines about 35-horse power, and horizontal pumping-engine of 80-horse power, capable of working a 12 in. set of Cornish pumps.

Blagrove's Freehold (Area, 128 acres).—The main shaft has been sunk a further distance of 55 ft., and is now 255 ft. in depth. A chamber was excavated at the 200 ft. level, and cross-cutting done. Several reefs were cut. The engine is found to be insufficient for pumping and winding, and a second 65-horse-power steam-engine is being erected to do the pumping, the other engine to do winding only. Thirty men were employed.

Prospecting work has been carried on in the Great Kapanga, Conquering Hero, Coromandel, Dolcoath, New Hero, and Hauraki Gem.

Kauri Block.

Great activity has been displayed in carrying on mining operations in this portion of the goldfield. Upwards of sixteen engine-shafts are used. Captain Hodge has furnished the following reports on those mines in this district over which he has full control: —

Hauraki Main Lodes Company (Limited).—This company started work in November last under very favourable auspices, being in the same auriferous zone as, and adjacent to, the Hauraki and Golden Pah Mines, and embracing several of the various reefs that traverse those properties. The property consists of two claims—viz., the Albion Special Claim, of 20 acres; and the Albion Extended, 78 acres 3 roods 37 perches: total, 98 acres 3 roods 37 perches—and is situated on the foreshore eastward from the Coromandel Harbour. An engine-shaft has been sunk to a depth of 145 ft., the size being 11 ft. by 7 ft. within timber, and all timbered in a substantial manner with frame set timber 8 in. by 8 in., and cased 9 in. by 2 in. The rock penetrated in sinking this far for the most part has been favourable decomposed andesite rock, which contributes in this locality to the production of very rich gold-bearing reefs; in fact, the indications as far as strata is concerned augur well for a good property after thoroughly developing the reefs. It is proposed at the 150 ft. to open a chamber and resume sinking immediately for the 200 ft. level, and at this stage to proceed with the development of two levels—the 150 ft. and the 200 ft. The present shaft is being sunk by a temporary plant—a small portable boiler, Tangye pump, and steam-winch. A very substantial poppet-head is now in course of being built, for which concrete loadings are completed around the shaft to receive the same. In the meantime a pumping-engine, with a pair of 10 in. cylinder winding-engines, with adequate foundations and buildings, are about to be erected for the thorough development of the property. The company has crushed 4 tons of quartz and 24 lb. of concentrated black sand, which gave a result of 4 oz. 9 dwt. of retorted gold. This was raised in excavating for the engine-shaft on the bed-rock, or between the bed-rock and the machine mud. The average number of persons employed on this property is thirty. Speaking of this property, its position and facilities for working with a permanent plant erected ought to prove, if indications go for anything, that it is a very valuable one.

Hauraki Gold-mining Company (Limited).—This property contains an area of 28 acres 3 roods 11 perches. The developments are conducted with two shafts, the main shaft being 315 ft. and the Iona shaft 170 ft. From the main shaft there are five main levels—viz., the adit-level, 100 ft., 160 ft., 220 ft., and 300 ft. The company own a battery with fifteen heads of stamps and nine berdans, driven by steam-power, the bullion being extracted by amalgamation. The quartz crushed for the year ending 31st March has been 4,437 tons, yielding 24,656 oz. 7 dwt. of bullion; while the average number of persons employed during the year has been 180. There are twelve reefs or veins traversing the property. The principal ones developed have been—No. 2, bearing north-west, with an underlay north-east; average width, 10 in.: No. 3, bearing north and south, underlay east; width, 8 in.: No. 6, bearing north and south, underlay west; width, 3 in.: Cross reef No. 1, bearing north and south, underlay west; average width, 3 in.: Cross reef No. 2, running north and south, underlay west; average width, 3 in.: Castle Rock reef, bearing east and west, dip north; average width, 12 in.: Iona reef, bearing north and south, dip east; average width, 10 in.: New Year's reef, bearing north and south, dip north-east; average width, 12 in. The principal reef and the richest has been the No. 2, generally known as "Legg's reef." The Cross reef No. 1 and the Iona and New Year's reefs have also contributed largely to the company's returns. The mines are being worked very profitably at the present moment, are kept continually drained to the bottom, and are being thoroughly developed, and everything kept in regular order. For the further extensive development of the property in depth foundations are being excavated for new pumping-engines, their capacity being two 18 in. diameter cylinders, high pressure, and estimated to sink the mine 1,500 ft. with a 12 in. diameter lift of pumps. The Castle Rock reef is estimated at a depth of near the 600 ft. to be in the same character rock which has produced the greatest portion of gold in the various reefs, and may be looked upon as a very important reef for development, outside of the various other reefs, which, of course, will be followed up and developed as the mine is being sunk. There is every probability of the mine continuing to pay good profits. The Union Beach section of the company's property embraces a portion of the Coromandel Harbour. On this property the shaft is sunk 180 ft. This is now being drained by the Hauraki Company. Foundations are nearly completed for the erection of 10 in. cylinder winding-engines. These engines, with two 25 nominal horse-power boilers, are being landed in Auckland. The company propose to develop this property from the bottom of old workings on the line of reefs below the 180 ft., where rich gold was raised in the early history of the working of this ground by sinking shafts. Motive-power for sinking these shafts is being provided by an air-compressor engine, air-winch, and air Tangye pump, conducted by pipes and air-receivers from the site of the shaft and the surface to the proposed sites of the shafts underground. The result of these workings, if successful (and there is every reason to believe they will be), will then henceforth be conducted permanently by raising a new shaft to the surface, and henceforth adopting a permanent basis for following continued workings in depth. I attribute the success of working the Hauraki Mine and regularity of the returns to the simultaneous working of the various reefs at different levels. Since the company's initiation there was driven nearly

4,000 ft. of cross-cutting, while at the same time the drivages on the lines of reefs have been about the same distance—4,000 ft. The dividends paid by the company to the 27th September, 1896, have been £112,000. The expenditure in the colony for the year ending the 31st December last was £22,987 17s. 3d., while the total expenditure since the company's registration to that date was £42,714 7s. 11d.

Golden Pah (Hauraki), Limited.—This company has a nominal capital of £62,500. The total expenditure since registration to the 31st December last has been £1,087 locally. The area of the property is 18 acres 3 roods. A permanent shaft is in course of being sunk, now down 100 ft. from the surface. An adit-level from the road is constructed 400 ft. in length. The company has also a second adit-level 100 ft. in length. Two tons of quartz has been raised from the Jewellers' leader, which yielded 3 oz. 19 dwt. bullion. The average number of men employed by the company is thirty-four. A very substantial poppet-head has been erected at the Pah shaft. The shaft itself has been very securely timbered with frame sets from the brace to the bottom. The size of the shaft is 7 ft. by 11 ft. within timber. The excavation for machinery is in a forward state for a permanent plant, both for pumping and winding purposes. Smith's and carpenter's workshops, mine office, and material-house are completed. A very substantial engine-pool or reservoir has been constructed to contain water to supply the boilers for the permanent plant. The machinery to arrive shortly consists of one 22 in. by 48 in. horizontal high-pressure pumping-engine, with balance-bobs, bridles, caps, bolts, shaftings, crank, main gudgeon, plummer-blocks, caps, brasses, and all complete; one pair of 10 in. by 15 in. winding-engines, with slot-link, reversing gear, drums for winding, foot-brakes, clutch-gear, and all their equipments complete; and two steel Cornish boilers, each 22 ft. 6 in. long by 5 ft. 6 in. diameter, with fittings and all complete, supplied with donkey-pump, 4 in. steam and 2½ in. ram for feeding boilers, exhaust-pipes, horizontal condenser, and all intermediate gear complete. A temporary plant is being constructed to carry on sinking the main shaft pending the arrival and erection of the permanent plant. This company proposes to cross-cut from the 180 ft. level cross-cut from the Union Beach shaft to come under the Golden Pah shaft; in so doing reefs will be cut through, and 100 ft. vertical will be available below the 80 ft. level from the Pah shaft, on the Golden Pah leader, the Jewellers' leader, and other leaders. The result of working these leaders when fully laid open is expected to yield fair quantities of gold. At present nearly the whole of the miners are engaged in preparing for the reception of the new plant. From a mining point of view, there is every reason to suppose this property will be a good gold-producer.

Kathleen Gold-mine (Limited).—This company adjoins the Hauraki to the east, on the sections where the Hauraki Company's principal workings are conducted. The area of land held consists of 56 acres and 2 perches under Land Transfer title, freehold. The situation of the property is unique, as it embraces the junction of two well-known auriferous belts, in which are traversing in all directions a considerable number of reefs. The number of persons employed by this company averages forty-two. An engine-shaft has been sunk in a site to command the working of all the reefs therefrom to the best advantage. The shaft is now down below the surface 240 ft., all timbered with frame sets 11 in. by 7 in. At a depth of 200 ft. two cross-cuts have been driven north and south. The cross-cut southerly has been extended a distance of 80 ft. In this cross-cut a reef was intersected, known as Carlyon's reef, and has been opened on north 27 ft. and south-west 28 ft., the average size of the reef being 9 in. Visible gold has been met with in this drivage, and, from its appearance, on being fully developed throughout the property, should yield payable gold. The 200 ft. level cross-cut north has been extended from the shaft 100 ft. The andesite rock passed through in this drivage has been very largely charged with iron-pyrites, and is in every respect characteristic to the rock that produced the gold in the reefs found therein in the famous Hauraki Mine. In this cross-cut we intersected a large reef, at its intersection 6 ft. wide, carrying two well-defined walls, running nearly east and west and dipping north. We have seen colours of gold in the quartz occasionally. The quartz formation in this reef is almost identical in character to the Hauraki main reef, carrying considerable quantities of iron-pyrites, and very heavily charged with water. We have opened on the line of this reef north-easterly and south-westerly 40 ft., the average size of the reef for this length being about 4 ft. This continuation of the cross-cut north is going in the direction of the Hauraki North and Golconda series of reefs, and, speaking from the character of the rocks being penetrated and the large volume of water we have to contend with, it points to a good future for the company in this direction. The cross-cut southerly will also cut a large number of reefs, which on being cut and opened up on their line will make junctions or intersections with other reefs that cross them; so that, putting the prospects of the company together, there is a great probability of a successful mine before the company. The pumping-engine is one of Tangye's combined coupled horizontal steam-engines, having high-pressure cylinder, diameter 16 in.; low-pressure cylinder, 24 in.; stroke, 30 in.; fly-wheel, 13 ft.; width of face, 22 in.; the engines being coupled together. The whole is complete, and erected upon concrete foundations. The pumping-engines were set to work on the 13th February last. The winding-engines consist of one of Tangye's couple-geared winding-engines, with two drums, having steam cylinders 10 in. diameter by 22 in. stroke, with engine-bed, crank-shaft, cross-head guides, and all complete, built upon concrete foundations, and housed with buildings. These were set to work on the 24th December last. To work the engines two Tangye steam Cornish boilers, each 25 nominal horse-power, are built in and connected with the engines complete. Poppet-heads have been erected over the shaft, with patent cages drawn by Bulivant's patent steel-wire ropes. The cages work by patent safety detaching-hooks, all complete. The pit-work consists of one 13 in. plunger-lift, with 14 in. pumps from the 200 ft. level to surface, the main rods being 10 in. square. Everything is in working-order, and doing a considerable amount of pumping. Carpenter's and smith's workshops, magazine for explosives, changing-house for the miners, company's office, and a road from the main road to the shaft are all completed and in working-order. Shafts have been sunk 336 ft.—viz., main shaft (Hartridge's), 240 ft.; puddling

shafts, 96 ft. Levels have been driven 100 ft. on the line of reefs. Cross-cuts have been driven 264 ft. The cost to the company for sawn and mining timber for the above developments is very nearly £1,000. The total expenditure of this company since registration to the 31st December last was £9,125, the nominal capital being £75,000. As far as the future of this company is concerned, any blast on the line of reefs (and the same remark will apply to the cross-cuts) might discover a rich property.

Bunker's Hill Mine (Area, 3 acres and 12 perches).—This mine adjoins the Hauraki Mine to the northward. The shaft was sunk to a depth of 285 ft., and No. 2 level opened at 270 ft. The cross-cut at this level was driven 364 ft., and two reefs were intersected, as well as several leaders. No. 1 reef averages 18 in. in width—a compact body of quartz, in which dabs of gold are seen. 94 ft. of driving was done on this reef. No. 2 reef is of a puggy character, 1 ft. in width, on which no work is done. No. 1 leader is 2 in. in thickness, and was driven on 30 ft. A considerable quantity of quartz has been raised from the drives and in stoping on No. 1 reef, but no crushing was done during the year. Seventeen men were employed.

Hauraki No. 2 (Area, 6 acres).—A shaft has been sunk 208 ft., and a level opened at 200 ft. This was in hard rock for 90 ft., and no reef is cut as yet. The winding is done by a steam-winch, and a Tangye pump raises about 1,300 gallons of water per hour. Ten men were employed.

New Golconda Mine (Area, 5 acres).—The shaft was continued to a depth of 140 ft., and a chamber formed at 130 ft. Driving has been done in cross-cuts 266 ft. in a north-east direction, and 75 ft. to the north-west. Several leaders, from a few inches to 15 in. in thickness, were cut and about 200 ft. of driving done on these reefs, and, although some of the quartz looks promising, no gold has been seen. Winding is done by a steam-winch, and a Tangye pump raises 3,000 gallons per hour. Twelve men were employed.

Zealandia Mine (Area, 24 acres).—The shaft has been sunk to a depth of 157 ft. The manager, Mr. Richard Harrison, gives the following description of the workings:—

Since taking charge of the Zealandia on the 15th June, 1896, I have sunk the shaft from 90 ft. to 157 ft. The shaft is 11 ft. 6 in. by 4 ft. 6 in. in the clear. At 150 ft. a chamber 11 ft. 6 in. by 8 ft. and 10 ft. high was cut out. We have driven a main drive from the chamber 234 ft. going south-east and 200 ft. going north-east. We have cut several leaders in these drives from 2 in. to 3 ft. thick, and have driven upon some of them. No. 1 leader is a fine-looking body of ore about 9 in. through. We have driven 30 ft. upon this leader, going north-east (towards the Hauraki). The country-rock is of a good description for gold, being a nice-looking bluish sandstone. No. 2 leader is a splendid-looking body of stone 3 ft. thick. We have driven 40 ft. upon it, also going north-east. The country is like No. 1 leader. We have driven 9 ft. upon this leader, going south-west. We have also driven 16 ft. upon another leader, but so far we have not been fortunate enough to get gold.

Welcome Find Mine (Area, 8 acres 1 rood 8 perches).—Work in this mine has been continuously carried on during the year. The main shaft was sunk a further 60 ft., and is now 190 ft. in depth, the No. 2 level being opened at 170 ft. from the surface. There are four reefs intersected, varying from 2 in. to 6 ft. in width, the quartz being of a hard and white crystallized character. About 750 ft. of driving, mostly cross-cutting, has been done, 120 fathoms of reef stoped out, and 56 ft. in rising and sinking on reef. Of general quartz, 54 tons was crushed, for a yield of 227 oz. 10 dwt. of gold, and a parcel of 270 lb. of specimens yielded 304 oz.; being a total of 531 oz. 10 dwt. of gold; value, £2 16s. 6d. per ounce. The company having no battery, the quartz had to be crushed at the Thames. Fifteen men were employed.

Hauraki North Mine (Area, 142 acres).—The shaft was sunk 50 ft., and is now 150 ft. in depth. 205 ft. of driving was done, and a winze sunk 40 ft. on the reef. The reef is nearly vertical, and has a width of 2 ft. The machinery used is one 8-horse-power Tangye tubular boiler and a steam-winch for winding, and a No. 4 Tangye is in use for pumping. The crushing machinery consists of a Robinson ore-crusher (equal to three stamps of 7 cwt. each), one stonebreaker, one Robinson's concentrator, and two berdans. The quantity of quartz crushed was 120 tons, which yielded 291 oz. of gold; value, £3 per ounce. Sixteen wages-men were employed.

Hauraki South Mine (Area, 17 acres 1 rood 25 perches).—This mine is now owned by the Hauraki South Gold-mining Company (Limited), of London. Very little work was done during the year, but towards the end of March a commencement was made in excavating preparatory to sinking a shaft, in pursuance of the new scheme of development. The shaft is to be 13 ft. 8 in. by 6 ft. clear of timber, the frames 8 in. by 8 in., with 9 in. by 3 in. sheathing, and will be divided into three compartments. A temporary winding plant consisting of a 10-horse-power boiler with winch is used. It is intended to sink 200 ft. before opening out.

Wynyardton Mine (Area, 8 acres).—The shaft has been sunk to a depth of 90 ft. No. 1 level was opened at 85 ft., and two cross-cuts put in and a small leader of quartz cut. Six men were employed.

Kathleen Crown (Limited) Mine.—Captain Argall has furnished the following account of the work done: The area of this English-owned mine is 95 acres, and is joined on the north by Blagrove's Freehold and on the south by the Kathleen. During the year a temporary steam plant was erected, with which sinking operations were carried on; but recently a pumping-engine has arrived from England, and is now erected; also the usual buildings—viz., blacksmith's and carpenter's workshops and offices. Considerable anxiety, and no little difficulty, was experienced in obtaining good foundations for the poppet-legs to rest upon; the ground being so unreliable, it was found absolutely necessary to lay down solid concrete beds. The legs are fine sticks, 60 ft. high. The shaft has been sunk 185 ft. and securely timbered, cage-roads and ladder-ways put in; also new pit-work. A new and powerful winding-engine is *en route* from England, and when erected the mine will be fully equipped. During the period of the present ownership a considerable amount of prospecting has been done, with the result that several reefs

have been discovered, showing gold in the dish. It is the intention of the manager to sink the shaft to the depth of 200 ft., and then open out on the reefs found on the surface and in the several drives, and it is anticipated that rich discoveries will be made during the coming year.

Preece's Point Mine (Area, 200 acres).—This mine is owned by the Preece's Point Proprietary (Hauraki), Limited, an English company. During the year the engine-shaft has been sunk 215 ft.; three chambers have been cut, one at each of the levels—viz., 70 ft., 150 ft., and 200 ft.; 550 ft. of cross-cutting has been accomplished; besides 200 ft. driven on line of reef. Old levels have been cleared and retimbered for 650 ft. The following machinery has been erected: A pumping-engine capable of pumping from 1,000 ft., and a winding-engine equal to winding 600 ft. per minute from a depth of 1,500 ft. New poppet-heads, 60 ft. high, have been erected, with all the latest appliances; also patent safety-cages, with detaching-hook for overwinding. Fifty men were employed.

The Golden Shore Foreshore Claim, of 100 acres, and the Golden Shore Extended have been taken up on both sides of Preece's Point.

Cadman's Gully, Karaka, and Pukemaukuku District.

A considerable amount of prospecting was done on Aitkin's Freehold, and 50 tons of quartz was crushed, for 33 oz. 15 dwt. of gold, but, in consequence of litigation in connection with the title, work was suspended. Eight men were employed.

Katie Mine (Area, 89 acres).—Prospecting work was carried on during the year, but no quartz was crushed.

The Empress ground has also been occasionally worked, but no quartz has been crushed.

The Pegasus, Gordon, Standard, Poneke No. 2, Exchequer, Alameda, All Nations, Flower of the Range, and Coromandel Queen Claims have been prospected.

In the following mines in the Tiki district a large amount of prospecting work was carried on, and numerous leaders cut, but so far no returns of gold have been made for the year: Matawai, Pride of Hauraki, Gem of Hauraki, Specimen Hill, Gem of the Tiki, Nestor, Pukewhau, Alert, Native Chief, and Coromandel Mint.

Coromandel Freehold Proprietary Company (Area, 536 acres).—The land owned by the company is that block in the Tiki district known as Mrs. McIntosh's. A rush took place to this part in 1879, and arrangements were made between the miners and the owners so that the ground could be worked, the land at that time not being included in the goldfield. A number of claims were taken up and a battery erected, but after a few years the district was abandoned, although considerable quantities of gold were obtained from Blackmore's and other claims. The present owners have had a staff of men engaged in opening up old levels and in prospecting work generally, and, as numerous gold-bearing reefs and leaders are known to exist, there is a hope that in a short time payable quartz may be found. Ten men were employed.

Castle Rock District.

Progress Castle Rock (Area, 60 acres).—This mine has not been continuously worked during the year. The old levels were secured and a winze sunk on the reef, from which a small block was stoped out. A parcel of 1 ton 5 cwt. of quartz was crushed at the Thames School of Mines, for a yield of 35 oz. of gold. Five men were employed.

The Vaughan, Wakiti, Gem of Hauraki, Golden Gem, Mahinapua, and Wairakei Claims have also been taken up.

Manaia District.

Golden Hill Extended Mine (Area, 36 acres).—Operations have not been carried on in a very extensive manner. A small battery of two stamps, capable of crushing 2 tons per day, was erected, and 17 tons of quartz crushed, for 3 oz. 3 dwt. of gold; value, £11 2s. 7d. These returns have been disappointing, hence the desultory manner in which work was carried on. Four men were employed.

Prospecting has also been carried on in the Golden Hill, Leading Wind, Princess May, and other claims in the district, but so far the results have been disappointing.

Whangapoua District.

The land is chiefly Kauri Timber Company's freehold, and held by the Kauri Gold Estates Company. A large number of men have been employed in prospecting on this and other freehold lands, but no returns of gold have been made. This company is carrying on work in Owera and Otunguru districts.

The Maiden Claim at Whangapoua is held from the Kauri Timber Company, and the owners had a parcel of 53 tons of quartz treated, for 16 oz. 11 dwt. of gold; value, £46 4s.

Matarangi District.

The Wild Wave, Ocean View, Jumper, Matarangi, and the Ness Side Claims have been prospected, but there is no report of any valuable discoveries.

Kuaotunu District.

Kapai-Vermont Mine.—This mine has been steadily worked during the year. 3,179 tons of quartz crushed yielded 3,332 oz. 5 dwt.; value, £7,151 18s. 10d., or at the rate of £2 3s. 1d. per ton, being a decrease of 2,876 oz. 15 dwt. compared with the previous year's yield. The principal works carried on were driving a distance of 500 ft. on the reef at the No. 2 or low level and putting up a rise 108 ft. to connect with No. 1 level. 272 fathoms of reef were stoped over No. 2 and 571 fathoms above No. 1 level. The mill used for crushing is an Otis ball-mill, which reduces 13½ tons per day

Continuous crushing was not carried on, the mill being kept running only 237 days, of twenty-four hours each, during the year. The ore is dried in five kilns, each capable of holding 80 tons of quartz. There is, however, a revolving furnace in course of erection, which is to be used in place of the kilns for drying the ore. The cost of mining the quartz is 18s. 7d. per ton, and of milling and cyanide treatment 16s. 1d. per ton. Twenty-four men were employed at the mine and eleven at the mill. This mine is under offer to an English company, but negotiations were not completed at the 31st March. The manager, Mr. J. R. S. Wilson, says, "For future works I have recommended to sink to a depth of 200 ft. or 300 ft. to prove the value of the lode below the present workings, and if found to be payable, then to start a main shaft on our eastern boundary, and sink to cut the underlie of the reef. The pumping and winding would only be to our present low level, and quartz could be conveyed to the mill on our present tram-line. The crushing machinery recommended is a Krupp mill to work in conjunction with the present plant, and eight vats and sumps in addition to the eight vats of 22-ton capacity used at present."

Jupiter Mine (Area, 300 acres).—This property is situated to the southward of the Kapai-Vermont, and has been prospected by a tunnel 600 ft. near the south boundary of that mine. The rock was of a hard nature for some distance, but has lately been of a more kindly character, 100 ft. must yet be driven to intersect the line of the main Try Fluke reef. In surface drives and trenches several small veins have been discovered. The object of this company at present is to prospect the property and locate the reefs. Eight men were employed.

Mariposa, formerly Try Fluke Mine.—This mine consists of an area of 106 acres, and has been transferred from the Try Fluke Gold-mining Company to the Mariposa (English) Gold-mining Company. In consequence of the change of ownership development works have chiefly been carried on, and the yield of gold is less than that for the previous year. The mine is now well opened up, sufficient quartz being in sight to keep a much larger number of stamps at work. Fifty-two men were employed. Mr. John Goldsworthy, the mine-manager, gives the following description of the mine-workings and machinery used in the treatment of the ore:—

The mine is opened out at four levels; the depths from the surface are: No. 1 level, 100 ft.; No. 2, 200 ft.; No. 3, 320 ft.; No. 4, 440 ft. The No. 1, or Try Fluke, reef has been driven on and worked to a considerable extent in the levels above mentioned. No. 3 lode has also been worked at No. 2 and No. 3 levels, and has produced a large quantity of payable ore. No. 1, or Try Fluke, reef varies in size from 1 ft. to 20 ft. in thickness, and has been worked at Nos. 1, 2, and 3 levels, producing a large quantity of payable ore. The machinery used for crushing is as follows: One fifteen-stamp mill and two berdans, driven by a 20-horse-power steam-engine. The weight of each stamp is 9 cwt. The cyanide plant consists of four vats (capacity, 20 tons each), two sumps, one dissolver, and one solution storage-vat. This plant is capable of treating 25 tons per day. The ore is treated by the wet process, and is crushed in the usual way by stampers. The whole of the crushed ore passes over copper-plates, and the principal portion of the coarsest gold is saved by quicksilver amalgamation on plates and berdans. The whole of the tailings are caught and saved in pits outside of the mill. The tailings are drained fairly dry, and then trucked into the vats and treated with cyanide solution. The extraction is satisfactory; there is very seldom more than from 16 gr. to 24 gr. of gold per ton left in the tailings after treatment. The mill has not been running full time. We have, however, put through 5,305 tons of ore, for a return of 1,865 oz. of gold; value, £4,150 0s. 1d. Battery returns, 1,050 oz.; cyanide, 815 oz. The mill at the present time is only working one shift, and is used more as a plant to test the value of the ore in the various levels. The object of the new company is to thoroughly open up the mine by driving on the reefs at the various levels. There is over 1,200 ft. to drive on the main reef, and also on No. 2 lode, with backs varying in depth from 140 ft. to 160 ft. from No. 3 level. At No. 4 level we have still about 1,800 ft. to drive on the No. 1 and No. 2 reefs, with backs of 140 ft. untouched for the whole distance. Development works are now being pushed on, and contracts are let for driving on the No. 1 and No. 2 reefs at the various levels. At No. 3 level, Fluke section, we are driving, rising, and sinking on the No. 1 and No. 2 lodes. We are also driving a cross-cut east of any of the lodes at present being worked, for the purpose of prospecting the eastern portion of the company's property. We are also driving south in the Venus section of the mine, on the Red Mercury and Try Fluke lodes. In Mariposa section drives north and south are being driven on the main reef. At No. 4 level the main drive on the reef has been driven about 560 ft., and a rise put up to No. 3 level. We are also sinking a winze on No. 2 reef from No. 3 level; the depth is 100 ft., and we expect to hole through to No. 4 level in a short time. The cost per ton for mining ore, not including development work, is about 8s.; cost per ton for crushing, 5s.; cost per ton for cyanide treatment, including labour, 4s. 11½d. The object of the company is to open up the mine, with a view to working on a large scale, with increased crushing-power. Plans are now being made for a forty-stamper mill, with all the latest improvements, which will shortly be erected.

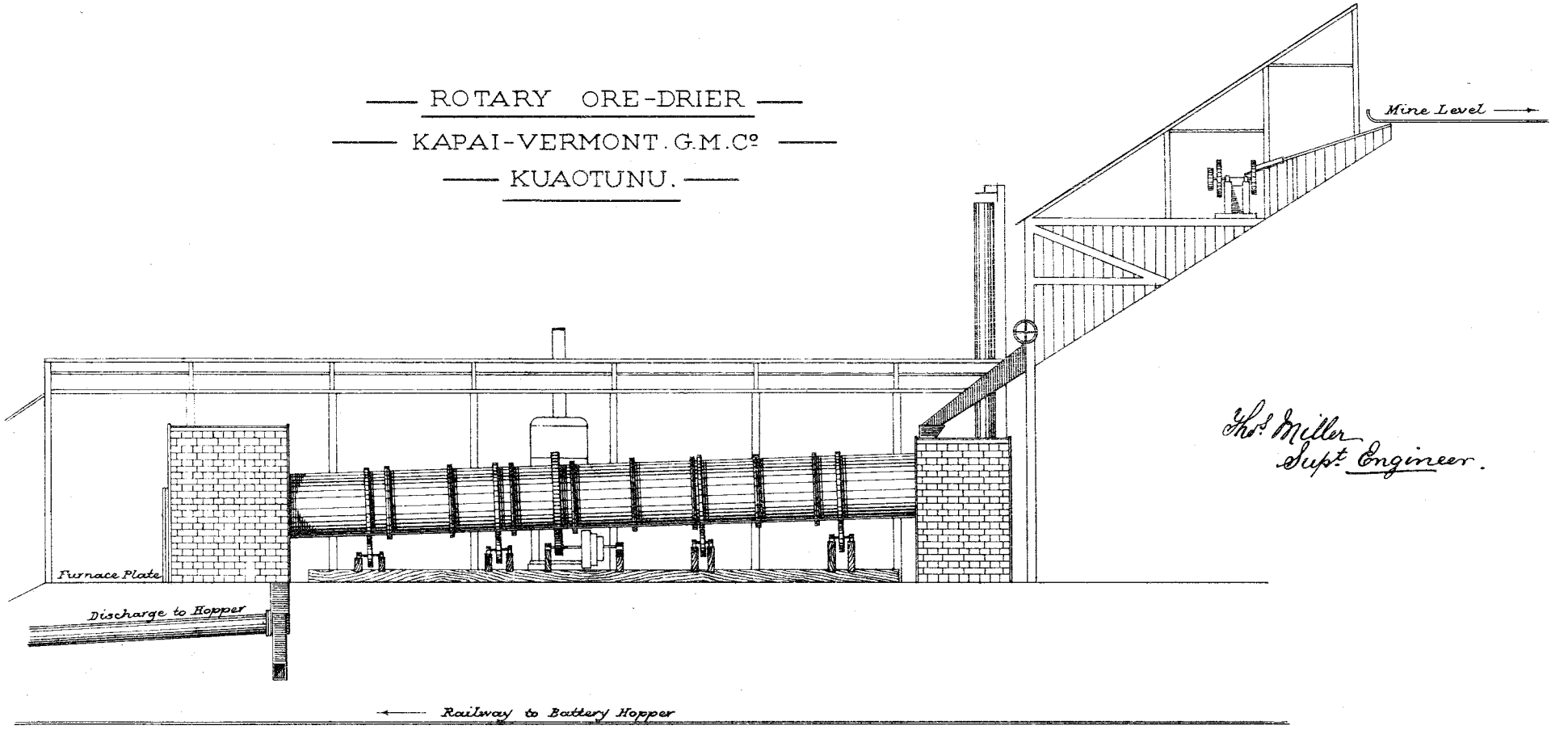
Great Mercury Mine (Area, 28 acres 12 roods).—This mine is situated on the spur lying to the northward of the Mariposa, late Try Fluke, and between that mine and the Irene. The ground is well opened up, and operations were carried on for a portion of the year only, protection having been granted for the claim. About 3,772 tons was crushed, for a yield of 1,579 oz. 7 dwt.; value, £1,328 6s. 4d. Twenty men were employed.

Irene Mine (Area, 57 acres).—This mine is now held by the Irene (Hauraki) Gold-mine (Limited), London. The mine is opened by three cross-cuts—No. 1, 290 ft. long, 190 ft. below top of hill; No. 2, 150 ft., 220 ft. below top of hill; and No. 3, 250 ft., 297 ft. below top of hill. A lower level cross-cut has been driven 230 ft. 443 ft. below top of hill. Driving was done on the reef at No. 1 level 150 ft., at No. 2 450 ft., and on the intermediate level 175 ft. The main reef averages from 3 ft. to 4 ft., and dips slightly to the eastward. There are other reefs in the ground, but sufficient work has not been done on them to show their general characteristics. The mill consists of ten stamps, 950 lb. each, and five berdans, with a cyanide plant of one 20-ton leaching-

ROTARY ORE-DRIER

KAPAI-VERMONT. G.M.Cº

KUAOTUNU.



Thos. Miller
Supt. Engineer.

vat, sumps, &c. The motive-power for the mill is supplied from a 30-horse-power horizontal steam-engine with steel tubular boiler. The mill was run about two weeks during the year. At the time the property was held by the former owners 45 tons of quartz was treated, and, together with 100 tons of tailings, yielded 82 oz. of bullion. Since the property was acquired by the present company development only has been carried on, no ore being treated. Up to the 31st December last five men were employed; since that time twelve men.

Invicta Mine (Area, 18 acres).—A considerable amount of prospecting work has been done on the surface portion of the mine by driving cross-cuts. In the workings on the main reef, which varies from 3 in. to 3 ft., 37 tons of quartz was taken out and crushed, for a yield of 190 oz. 2 dwt. of gold; value, £370 9s. 10d. Three men were employed.

Juno Mine (Area, 28 acres).—A low level has been driven at a depth of 160 ft. below the surface workings. A rise was put up on the reef for a distance of 35 ft. The reef is from 6 in. to 2 ft. 6 in. in thickness. 22½ tons of quartz crushed yielded 87 oz. of gold. Five men were employed.

Gladys Mine (Area, 29 acres 2 roods).—This mine is adjacent to the Irene, to the westward. A considerable amount of driving has been done on the land, and several reefs cut, No. 1 reef being about 2 ft. in thickness. Mr. John Goldsworthy, jun., the mine-manager, gives the following description of the workings:—

Three levels are opened. Depths from the surface: No. 1 level, 60 ft.; No. 2, 100 ft.; No. 3, 90 ft. There are two well-defined reefs traversing the ground, besides other smaller leaders. The No. 1 reef varies in size from 1 ft. to 2 ft. (course, about north and south), is a well-defined lode, carries a little gold throughout, and is in a good class of country. The No. 2 reef, near the eastern boundary, is also a well-defined reef from 2 ft. to 3 ft. through; course, about north and south. The ore from both these reefs is clean free-milling ore. The mine has been developed by means of tunnels, winzes, &c. On the eastern side of the ground, near the Irene boundary, a tunnel has been driven through the hill a distance of over 500 ft. From the centre of this tunnel we have driven south a distance of 170 ft. on a leader, and have also put up a rise at the end of this drive to the surface, a distance of 70 ft. On the No. 2 reef we have sunk a winze to water-level, a distance of 25 ft. On the western side of the ground, near the Juno boundary, we have driven in No. 1 level (north and south on No. 1 reef) a distance of 140 ft., and from this level have sunk a winze a distance of 60 ft. We are now driving a lower level to intersect this reef, which will give us over 100 ft. of backs, and will connect with the winze above mentioned. The assay-value of this ore is £2 per ton. Besides these workings, we have done a considerable amount of prospecting by means of trenches, surface drives, &c., and have cut several smaller leaders, from which a little gold can be got by dish-testing. The average number of wages-men employed for the year is four.

Handsworth Mine (Area, 5 acres 2 roods).—This mine is situated to the northward of the Irene. The reef which has been worked on was cut in a tunnel driven a few feet above the level of the flat. A parcel of 35 tons of quartz was crushed at the Thames, for a return of 94 oz. of gold. Three men were employed.

A considerable amount of prospecting has been done in the following claims, and quartz reefs discovered, but beyond a few colours by pounding and washing no further results have been reported to me: Midas, Ajax, Golden King, Great United, Balfour, Mount Aurum, Alpine Fluke, Diadem, Phœnix, National, Aurora, Golden Link, Norena, Empire, Brilliant, Antelope, Heather Bell, and Vulcan.

Aorere Mine (Area, 100 acres).—A considerable amount of driving has been done on the reef, from which the tributers obtained gold to the value of £129 8s. 9d. in the previous year. No quartz has been crushed during the year. Four men were employed.

Lincoln Mine (Area, 126 acres).—A considerable extent of driving was done near the surface, and several reefs cut, which are said to give prospects of gold by mortar tests. The surface level was driven through blue clay, and when the supposed reef was met with it did not reach the bottom of the drive, but formed a roof for 40 ft. It is highly probable that this mass of quartz is the result of thermal action; hence the soft clay underneath the surface deposit. Three men were employed.

Kuaotunu Mine (Area, 100 acres).—A prospecting tunnel has been driven 540 ft., and a number of small stringers cut, but no large reef was met with. Four men were employed.

Maori Dream Mine (Area, 100 acres).—The chief work during the year has been in opening up the mine. Three levels are now open, two of which will give 200 ft. of backs on the reef, which varies from 1 ft. to 19 ft. in thickness. The lowest level will also give 369 ft. of backs on the reef. Upwards of 600 ft. was driven on reefs, and the manager, Mr. A. H. Richards, informs me that the prospects of the mine are excellent, and that good returns will be obtained as soon as the proposed machinery for treatment of the quartz is erected. Eight men were employed.

Maoriland Mine (Area, 100 acres).—This mine is now owned by the Maoriland Gold-mines (Limited), of London. The chief work carried on was in development of the No. 1 reef, varying from 6 in. to 5 ft.; No. 2 reef, 18 in.; and No. 3 reef, 5 ft. in thickness. The adit-level tunnel, when driven in 600 ft., will give from 400 ft. to 500 ft. of backs on the reefs, and the depth from this tunnel to sea-level is 85 ft. Five men were employed.

Carnage Mine (Area, 100 acres).—Three reefs of 4 ft. in thickness each and one reef 7 ft. in thickness have been discovered, and about 250 ft. of driving was done. The quartz does not appear to be of great value. A parcel of 2 tons crushed at the Thames School of Mines yielded 9 dwt. 14 gr. of gold. Four men were employed.

Prospect Mine (Area, 100 acres).—The work carried on during the year was sinking a winze on the reef from No. 1 level and extending the No. 2 level 120 ft. This is now within 60 ft. of the bottom of the winze. A network of quartz veins, varying from 1 in. to 7 ft., has been cut in the eastern cross-cut, one of which, about 18 in. thick, consisting of rubbly quartz, prospects fairly well. Six men were employed.

Waitaia Mine (Area, 85 acres 2 roods).—This mine is situated near the top of the range dividing the Kuaotunu and Waitaia watersheds. The land being precipitous gives facilities for opening the mine from surface drives: No. 1, a surface level, 36 ft.; No. 2 level, 320 ft.; No. 3, 380 ft.; No. 4, cross-cut, 280 ft.; No. 5, cross-cut, 309 ft. The principal work done during the year was extending the drive on No. 3 reef at No. 4 level 180 ft., extending the drive on Barrett's reef 60 ft. at No. 2 level, rising on Barrett's reef 40 ft., driving on No. 5 reef 23 ft., driving on No. 4 reef 8 ft., rising on No. 3 reef from No. 4 level 50 ft., and driving No. 5 cross-cut 309 ft. When this cross-cut has reached the reef the country will be drained and the mine well opened up. The different reefs vary from 2 in. to 6 ft. in thickness. 8 lb. of picked stone yielded 6 oz. 10 dwt. of gold. The number of men employed was nine. The present owners are in treaty with an English company for the purchase of the mine, and no machinery has been erected pending completion of negotiations.

Golden Anchor Mine (Area, 146 acres and 17 perches).—There are nine gold-bearing reefs, varying from 1 ft. to 15 ft. in thickness, and generally of a flinty character, already discovered in the ground. About 237 ft. of driving has been done on the different reefs, and a cross-cut 328 ft. has also been driven to prove the value of the reefs at a depth of 300 ft. from the top of the hill. Seven men were employed.

New Mint Mine (Area, 27 acres).—Work was commenced on the ground in August last. Quartz was discovered in surface trenches, and good mortar prospects of fine gold obtained from No. 2 reef. A cross-cut is being driven to cut this reef at a depth of 100 ft. from the surface. 196 ft. must be driven before the reef is reached. Four men are employed.

Premier Mine (Area, 77 acres).—A considerable amount of surface trenching and cross-cutting was done and four reefs cut in the low level, 100 ft. below surface. A drive was put in on No. 2 reef for 20 ft., on No. 3 reef 47 ft., and on No. 4 reef 63 ft. The reefs vary from 2 in. to 4 ft. in width. Four men were employed.

Superb Mine (Area, 100 acres).—Four reefs have been discovered on this property, one of the reefs apparently being hard conglomerate quartz about 3 ft. in thickness. Three men were employed.

A1 Mine (Area, 105 acres).—This claim has been amalgamated with the Oriental Mine, and a considerable amount of prospecting work has been done. Three cross-cuts were driven: No. 1, 50 ft.; No. 2, 235 ft.; and No. 3, 66 ft. Several quartz veins were cut, from 1 ft. to 3 ft. in thickness, and 28 tons of quartz was crushed, for a yield of 6 oz. of gold. A fresh cross-cut has lately been put in, intended to reach a reef from which good dish prospects were obtained on the surface. About 70 ft. of driving will cut the reef. Four men were employed.

Wheal Bassett Mine (Area, 94 acres).—There are five reefs opened in this mine on No. 1 reef, which is 3 ft. in thickness, and the quartz of a promising character. Prospects of gold are obtained by pounding the stone in a mortar; in No. 5 reef also a few colours of gold are obtained by pounding. The quartz formation is 8 ft. in width, white, and of a friable character. Five men were employed.

Opito and Kuaotunu No. 3 District.

A number of claims have been taken up, but no returns of gold have been received.

Mahakirau District.

A number of claims have been taken up in this district, and extensive prospecting work carried on, but no return of gold has been received.

Moewai District.

Areas taken up and prospecting done, but no return.

Hahei District.

No record has been given of any discovery in the land taken up.

Boat Harbour District.

Very little work has been done here, and no valuable discovery has been reported.

Kauri Gold Estates Company.

This company now owns the following blocks of land, taken over from the Kauri Timber Company for mining purposes: Otanguru, 4,092 acres; Owera, 4,502 acres; Wairoa, 444 acres; Opitonui, 8,837 acres; Waitekauri, 4,190 acres; Te Ranga, 467 acres; Hikutawatawa, 1,650 acres; Kaeaeu, 88 acres; Hurungoherehere, 533 acres; Moewai, 882 acres; Weiti No. 1, 2,315 acres; Whakau, 933 acres; Kaimarama, 1,600 acres; Willis's, 1,797 acres; Graham's, 1,650 acres; Taparahi No. 1, 3,078 acres; Matakitaki, 1,010 acres; Ngarahutunoa, 210 acres; Maungatapu, 32 acres; Opera, 20 acres; and Whangapoua, 62 acres. On the company obtaining possession of these lands active prospecting operations were at once commenced, a staff of about a hundred men having been employed. Operations were resumed in opening up the Lanigan's Mine at Whangapoua, the Owera, and also the Otanguru Mines, and machinery for pumping is being imported to sink one or two shafts in the Whangapoua district. The company secured the valuable services of Mr. A. Montgomery, formerly director of the Thames School of Mines, and latterly Chief Inspector of Mines for Tasmania. The large area of land held, and the many localities where the rock is of a promising and "kindly" character, favourable for gold-bearing reefs, indicate that mining operations will prove of a successful nature, especially as, since the opening of the Coromandel Goldfield, rich parcels of gold-bearing quartz have from time to time been obtained from several of the above-mentioned blocks of land.

General Remarks.

The Hauraki Mine has still continued the chief gold-producer in this district, although there has been a considerable falling-off in the yield of gold. It will, however, be some time before the lower levels in this mine, the Kapanga, Success, Scotty's, Tokatea, and other mines can be opened up in such a manner as to produce continuous yields, and unless other rich shoots of ore are met with in the meantime an immediate increase cannot be looked for in this quarter.

In the Kuaotunu district, at the Kapai-Vermont, Try Fluke (now Mariposa), and Great Mercury Mines, more attention has been given to mine-development than making the most with the present machinery of the ore immediately in sight. As those mines are now held by English owners, whose policy is to explore the mines thoroughly, and erect suitable plants for treating large quantities of ore, no great addition to the returns can be expected from Kuaotunu until after the new machinery is in operation.

During the year 18,748 tons 5 cwt. 48 lb. of quartz was treated in Coromandel County, for a yield of 35,846 oz. 10 dwt. of gold, and 100 tons of tailings treated by cyanide yielded 40 oz.; the whole valued at £100,911 0s. 10d.; whilst 1,329 men were employed in connection with the mines.

THAMES DISTRICT.

The Thames portion of the Hauraki district lies to the southward of Coromandel, and the country is of an extremely rugged and broken character. A large number of mining properties are situate within this district, including the Thames–Hauraki Goldfields (Limited) Deep Levels Drainage-shaft, the famous Caledonian, Moanataiari, Prince Imperial, Waiotahi, and other well-known mines, which are within the boundaries of the Thames Borough. The development of the mining industry in this portion of the Hauraki district is exemplified by the following list of mining properties taken up :—

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Thames, in the Hauraki Mining District, and registered on or before the 31st March, 1897, in the Books of the Mining Registrar at Thames.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
23/7/96	100	0	0	Tairua ..	IX. / "	Thames / Tairua	Ace	William S. Styak.
21/11/95	21	3	32	Thames ..	IV., V.	Thames ..	Adelaide ..	The Adelaide Gold-mining Co. (N.L.).
23/12/96	99	0	0	Waiomo ..	II.	" ..	Adeline	Simon Fraser.
11/3/96	58	2	10	Tairua ..	IX.	Tairua ..	Ajax	Finlay McLiver.
14/12/96	61	3	5	Waiomo ..	II.	Thames ..	Ake Ake ..	Ake Ake Gold-mining Co. (N.L.).
14/12/96	100	0	0	Whangamata	VIII., XII.	Tairua ..	Alameda ..	Henry James Ross.
2/11/96	100	0	0	Waiomo ..	I., II. / XIV., XV.	Thames / Hastings	Alaska	James Hickey.
20/3/96	13	2	37	Tapu ..	XII.	" ..	Albert Park ..	R. Kelly, F. Shaw, and F. Duthie.
3/2/97	100	0	0	Gum Town ..	IV.	Whitianga	Albion	Walter Calloway.
6/4/96	71	2	18	Thames ..	"	Thames ..	Alburnia East ..	The Alburnia East Gold-mining Co.
27/2/96	68	1	0	" ..	"	" ..	" ..	The Seven Reefs Gold-mining Co.
25/6/96	98	0	0	Waiomo ..	XIV.	Hastings ..	Alma " ..	Benjamin Henry Bishop.
27/2/96	82	0	3	Thames ..	V.	Thames ..	Alpine	Francis Angus White.
25/6/96	98	2	7	Puriri ..	XIII.	" ..	Amazon	Golden Centre Gold-mining Co.
13/11/95	96	2	0	Thames ..	V.	" ..	Anchor	Adolph Kohn.
29/10/96	21	2	0	Tairua ..	II.	Tairua ..	Annie	William Long.
24/4/96	99	0	24	Puriri ..	XIII.	" ..	Apakura ..	W. J. Nevill.
5/3/96	5	0	0	Tapu ..	XI.	Hastings ..	Argentum ..	Neil McPhee, Charles Baddeley, James Blair, and Campbell Thompson.
21/12/95	100	0	0	Waiomo ..	I.	Thames ..	Argosy	Argosy Gold-mining Co. (N.L.).
26/2/96	77	2	0	" ..	"	" ..	Argosy Extended ..	"
25/6/96	100	0	0	" ..	"	" ..	Arundel ..	Ernest C. Beale.
14/12/96	100	0	0	Tairua ..	III.	Tairua ..	Athenian ..	James Welman.
3/2/97	64	2	0	Waiomo ..	XIV.	Hastings ..	Athens	Charles White Cave.
23/12/96	99	2	22	Puriri ..	XIII.	Thames ..	Auraria	George Greenaway.
23/12/96	90	1	8	Whangamata	XV.	Tairua ..	Aurelia	Thomas John Mountain.
23/12/96	100	0	0	" ..	XIV., XV.	" ..	Aztec	John Morrison.
15/2/97	54	2	0	Tapu ..	XI.	Hastings ..	Band	John Ward.
23/7/96	100	0	0	" ..	"	" ..	Band of Hope ..	Patrick Ryan and others.
19/9/96	100	0	0	Tararu ..	II.	Thames ..	Bankers ..	Simon Fraser.
13/8/96	29	0	0	" ..	"	" ..	Bankers Extended	Henry Edward Cotton.
14/12/96	100	0	0	Whangamata	XI.	Tairua ..	Bank of New Zealand	William Grey Nicholls.
23/12/96	77	2	0	Ohui ..	XIV.	Whitianga	Beatrice	Herbert Gentles.
18/2/97	16	1	23	Tararu ..	II.	Thames ..	Beehive	John Hague Smith.
6/12/95	79	3	0	Thames ..	V.	" ..	Bell Rock ..	The Bell Rock Gold-mining Co. (N.L.).
27/2/96	100	0	0	Tararu ..	I.	" ..	Bendigo ..	The Bendigo Gold-mining Co.
24/4/96	98	3	2	Waiomo ..	XV.	Hastings ..	Big Reef ..	Arthur Wright.
23/12/96	69	1	0	Puriri ..	XIII.	Tairua ..	Black Watch ..	James Coe.
3/2/97	44	1	11	Whangamata	XI., XV.	" ..	Bluefire Extended	Cholwell Dean Pitt.
19/8/96	92	2	0	Tapu ..	XI.	Hastings ..	Bohemian ..	A. M. McMahon.
6/4/96	85	3	20	Thames ..	IV.	Thames ..	Bonanza ..	Louis Melhose.
22/9/96	76	0	0	Ohui ..	"	Tairua ..	Bonanza No. 1 ..	George Bigg Withers.
18/5/96	51	1	20	Waiomo ..	XV.	Hastings ..	Boss	Ernest Mansfield.
2/11/96	43	0	0	" ..	"	" ..	Boss Extended ..	Richard J. Dunn.
20/8/96	100	0	0	Tairua ..	XIV.	Tairua ..	Brazilian ..	Albert Cuff.
21/11/95	28	0	12	Tapu ..	XI.	Hastings ..	Briton	Samuel Stephens.
22/9/96	100	0	0	Tairua ..	II.	Tairua ..	British Tar ..	Roderick Ross McGregor.
17/1/95	28	0	15	Waiomo ..	XIV.	Hastings ..	Broken Hill ..	Broken Hill Gold-mining Co. (Ltd.).

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Thames—*continued*.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
11/3/96	100	0	0	Tairua ..	VI.	Tairua ..	Broken Hills ..	Broken Hills Gold-mining Co. (Ltd.).
25/4/96	98	2	0	" ..	"	" ..	Broken Hills Ext.	Charles Rhodes and others.
29/5/96	100	0	0	" ..	"	" ..	Broken Hills No. 2	Broken Hills No. 2 Gold-mining Co.
29/5/96	69	3	24	" ..	"	" ..	Broken Hills No. 3	Broken Hills Gold-mining Co. (Ltd.).
29/5/96	70	3	26	" ..	"	" ..	Broken Hills No. 4	"
19/9/96	98	0	0	" ..	II.	" ..	Broken Hills Proprietary	H. E. Partridge.
23/12/96	63	3	24	" ..	"	" ..	Broken Hills North	William Goldsworthy.
23/12/96	72	3	20	Waiomo ..	XV.	Hastings ..	Bronte's	Arthur Wright.
13/1/97	36	0	0	Whangamata	"	Tairua ..	Bryndwr ..	Benjamin H. Bishop.
3/2/97	72	0	0	"	"	" ..	Calabash ..	William Forrest.
16/5/89	8	3	12	Thames ..	IV.	Thames ..	Caledonian ..	The Kurunui Gold-mining Co. (Ltd.).
20/8/96	100	0	0	Whangamata	XIV.	Tairua ..	Callao	Albert Cuff.
9/8/88	15	2	17	Thames ..	IV.	Thames ..	Cambria ..	Anglo-Continental Gold Syndicate (Ltd.).
29/5/96	60	1	25	Puriri ..	XIII.	" ..	Captain Cook ..	Richard John Hastings.
23/12/96	100	0	0	Waiomo ..	XIV.	Hastings ..	Carbine	Ernest Ford.
3/5/95	64	2	0	Thames ..	IV.	Thames ..	Cardigan ..	The Cardigan Gold-mining Co. (Ltd.).
18/12/96	3	2	0	" ..	"	" ..	Cardigan Extended	Samuel Hetherington.
6/2/96	8	1	0¼	Ohui ..	"	Tairua ..	Carnation ..	Henry Becker.
23/7/96	100	0	0	Whangamata	III.	Ohinemuri	Cascade	Henry William Moore.
19/12/95	20	1	16	Thames ..	IV.	Thames ..	Caspian	Caspian Gold-mining Co. (N.L.).
19/9/95	30	0	0	Puriri ..	XIII.	Tairua ..	Central	Jules George Wilson.
19/9/96	77	0	21	Waiomo ..	XIV.	Hastings ..	Champion ..	Champion Gold-mining Co. (N.L.).
3/3/96	69	0	0	Kirikiri ..	IX.	Tairua ..	Chester	Malcolm Fleming.
6/2/96	11	2	20	Tararu ..	II.	Thames ..	Chicago	William Duncan Pearce.
29/5/96	100	0	0	Whangamata	XV.	Tairua ..	Cinderella ..	Joseph Stacy.
14/9/95	99	2	23	Tararu ..	I.	Thames ..	City of Auckland ..	City of Auckland Gold-mining Co.(Ltd.).
8/2/96	100	0	0	The Wires ..	II.	Ohinemuri	City of Dublin ..	The Acropolis Gold-mining Co. (Ltd.).
14/11/96	67	0	27	Thames ..	V.	Thames ..	City of London ..	City of London Gold-mining Co. (N.L.).
23/12/96	100	0	0	The Wires ..	II.	Ohinemuri	City of Stettin ..	Albert Kummert.
6/2/96	18	2	20	Thames ..	IV.	Thames ..	City of Winchester	Frederick Bennett.
8/6/96	100	0	0	Waiomo ..	XIV.	Hastings ..	Clarendon ..	Thomas Millet and another.
25/6/96	51	0	0	Ohui ..	IV.	Tairua ..	Clontaif	Annie Ward.
22/9/96	50	0	0	Tapu ..	XI.	Hastings ..	Club	Club Gold-mining Co. (N.L.).
11/4/95	16	0	0	Thames ..	IV.	Thames ..	Clunes	The Clunes Gold-mining Co. (N.L.).
29/5/96	95	0	0	Tararu ..	I.	" ..	Collingwood ..	William Burton.
4/3/96	98	2	14	Tairua ..	IX., X.	Tairua ..	Colossus	George S. Budge.
8/2/96	100	0	0	The Wires ..	II.	Ohinemuri	Colonial	Alexander Pond and John Russell Gray.
14/12/96	100	0	0	Tairua ..	XIV.	Tairua ..	Columbia ..	James Darrow.
2/11/96	45	2	15	Tapu ..	XI.	Hastings ..	Comet	Comet Gold-mining Co. (N.L.).
13/11/95	96	3	9	Waiomo ..	XV.	" ..	Comstock ..	The Comstock Gold-mining Co. (Ltd.).
7/10/96	100	0	0	Tairua ..	VI.	Tairua ..	Comstock No. 1 ..	A. M. Meyers and H. E. Partridge.
7/10/96	100	0	0	" ..	"	" ..	Comstock No. 2 ..	"
7/10/96	100	0	0	" ..	II., VI.	" ..	Comstock No. 3 ..	"
18/5/96	100	0	0	Waiomo ..	XIV., XV.	Hastings ..	Conqueror ..	Broken Hill Gold-mining Co.
8/2/96	100	0	0	Thames ..	IV.	Thames ..	Conservative ..	The Conservative Gold-mining Co.
12/3/96	86	3	12	Tairua ..	IX.	Tairua ..	Consolation ..	John Morrow.
27/8/96	100	0	0	Whangamata	XV.	" ..	Cornhill	Frederick H. Whalley.
6/4/96	69	1	7	Thames ..	IV.	Thames ..	Creek	Tararu Creek Gold-mining Co.
23/12/96	100	0	0	Whangamata	XI.	Tairua ..	Crown of Whangamata ..	Richard Gooch.
23/12/96	84	0	30	Ohui ..	IV.	" ..	Croydon	Edward O'Connor.
26/11/96	23	0	26	Whangamata	XV.	" ..	Cub	Robert Stevenson.
23/12/96	100	0	0	Ohui ..	IV.	" ..	Cultowa	James Marshall Lennox.
4/10/95	64	2	10	Thames ..	IV., V.	Thames ..	Cumberland ..	John Bowler.
1/2/96	28	0	0	" ..	"	" ..	Cumberland Ext. ..	Karaka Queen Gold-mining Co.
27/2/96	100	0	0	Waiomo ..	II.	" ..	Daphne	Joseph Barber and T. Millett.
21/1/97	7	3	15	Thames ..	IV., V.	" ..	Darwin	Darwin Gold-mining Co. (N.L.).
8/8/95	8	2	8	" ..	IV.	" ..	Day Dawn ..	John Dennerley.
16/1/96	20	2	32	Tairua ..	IX.	Tairua ..	" ..	The Day Dawn Gold-mining Co. (N.L.).
25/6/96	63	3	20	Puriri ..	IX., XIII.	" ..	Day Dawn Ext. ..	James Coe.
14/9/95	90	0	0	Thames ..	IV.	Thames ..	Deep Levels Consolidated	The Thames Hauraki Goldfields (Ltd.).
16/7/96	3	0	50	Tairua ..	II.	Tairua ..	Despised ..	William Bloomfield.
27/2/96	62	0	0	Whangamata	III.	Ohinemuri	Dictator ..	Robert Comer.
11/3/96	31	3	11	Waiomo ..	XV.	Hastings ..	Digger's Dream ..	Jeffrey Murdock.
7/5/96	21	0	26	Thames ..	IV.	Thames ..	Dixon's	G. H. White.
1/10/96	11	3	15	" ..	"	" ..	Dixon's Reef ..	John Thomas Baker.
5/3/96	29	2	25	Tapu ..	XI.	Hastings ..	Domain	R. Kelly, F. Earl, and F. Duthie.
23/7/96	99	0	0	Tairua ..	IX. / "	Thames / Tairua	Domino	James Henry Fleming.
6/4/96	100	0	0	Tararu ..	II.	Thames ..	Dream	James A. Pond.
8/2/96	100	0	0	The Wires ..	"	Ohinemuri	Dynamo ..	The Acropolis Gold-mining Co. (Ltd.).
23/12/96	100	0	0	Thames ..	V.	Thames ..	Duplex	European Gold-mining Co. (Ltd.).
24/4/96	46	0	20	" ..	"	" ..	Duplex Extended ..	Robert Orr Young.
2/11/96	70	0	5	The Wires ..	I.	Ohinemuri	Eagle	William Long.
5/3/96	30	0	0	Ohui ..	IV.	Tairua ..	Eaglehawk ..	J. P. Ward.
2/11/96	96	3	12	Waiomo ..	I.	Thames ..	"	Eaglehawk Gold-mining Co. (N.L.).
27/8/96	12	0	26	" ..	II.	" ..	Eclipse	W. H. Buckley and James Onion.
23/12/96	98	2	0	Puriri ..	XIII.	" ..	Eclipse No. 1 ..	John Manners Morran.
21/11/95	22	2	0	Ohui ..	IV.	Tairua ..	Egmont ..	John Patrick Ward.
11/4/95	9	1	20	Thames ..	"	Thames ..	Eileen	Ernest Davis.
27/8/96	39	3	37	Whangamata	III.	Ohinemuri	Electric ..	Henry H. Metcalfe.
4/3/96	100	0	0	Boat Harbour	VIA.	Tairua ..	Electric Light ..	Robert Henry Abbott.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Thames—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
20/3/96	27	1	3	Thames ..	IV.	Thames ..	Ellerslie.. ..	John Churton.
23/12/96	100	0	0	Whangamata	XII., XVI.	Ohinemuri	Ellie	William Simpson.
3/2/97	71	0	0	Waiomo ..	XV.	Hastings ..	Emerald ..	Gerald Butler Beere.
12/8/96	100	0	0	Puriri ..	XIII. " IV. I.	Thames Tairua Waihou Ohinemuri	Energetic ..	Thomas Scanlan.
5/3/96	30	0	0	Ohui ..	IV.	Tairua ..	Esmerald ..	J. P. Ward.
6/4/96	50	0	0	Thames ..	V.	Thames ..	European ..	The European Gold-mining Co.
18/6/96	30	0	0	Puriri ..	XIII.	Tairua ..	Fair Alice ..	The Apakura Syndicate (Ltd.).
11/4/95	11	1	13	Thames ..	IV.	Thames ..	Fame and Fortune Mine Extended ..	The Whitehead and Sultan Gold-mines (Ltd.).
25/10/95	100	0	0	" ..	"	" ..	Favourite ..	John Watson Walker.
3/3/96	45	0	0	Kirikiri ..	IX.	Tairua ..	Filly	Malcolm Fleming.
26/2/96	88	1	29	Whangamata	XV.	" ..	Flemington ..	Flemington Gold-mining Co.
27/8/96	98	1	4	"	"	" ..	Flemington No. 2	Wilfred G. Rathbone.
6/2/96	24	1	28	Ohui ..	IV.	" ..	Florence May ..	George Clarkson, jun.
17/8/95	61	0	0	Thames ..	"	Thames ..	Fortuna ..	Arthur Thomas Bate.
28/2/95	6	1	10	" ..	"	" ..	Freedom ..	The Freedom Gold-mining Co. (N.L.).
29/5/96	92	0	0	Puriri ..	XIII.	" ..	Frenchman ..	John Hague Smith.
8/2/96	100	0	0	The Wires ..	II.	Ohinemuri	Friendship ..	A. Pond and J. R. Gray.
23/12/96	98	0	35	" ..	I., II.	" ..	Gagool	Christopher G. Walker.
23/12/96	74	2	0	Tairua ..	II.	Tairua ..	Galatea	F. Ross McGregor and Henry Culpan.
6/2/96	30	0	0	Tapu ..	XI.	Hastings ..	Gem and Crown ..	The Monowai Gold-mines (Ltd.).
23/12/96	67	3	10	Ohui ..	IV.	Tairua ..	Georgetown ..	Edward O'Connor.
23/12/96	100	0	0	The Wires ..	II., III.	Ohinemuri	Gipsy King ..	Christopher G. Walker.
14/12/96	100	0	0	Whangamata	XII.	Tairua ..	Globe	Peter John L. Smith.
6/12/95	87	0	0	Thames ..	V.	Thames ..	Gloucester ..	The Gloucester Gold-mining Co.
24/4/96	5	2	18	Waiomo ..	I.	" ..	Golden Argosy ..	The Argosy Gold-mining Co.
20/3/96	2	2	20	Tairua ..	IX.	Tairua ..	Golden Arrow ..	Lachlan McLiver.
28/7/96	100	0	0	Tapu ..	XI.	Hastings ..	Golden Band ..	The Golden Band Gold-mining Co.
21/1/97	30	0	0	Tairua ..	IX.	Tairua ..	Golden Belt ..	Finlay McLiver.
23/12/96	80	2	0	Whangamata	XV.	" ..	Golden Castle ..	Edward H. Whitaker.
29/5/96	100	0	0	Puriri ..	XIII.	Thames ..	Golden Centre ..	Golden Centre Gold-mining Co.
6/4/96	97	0	9	" ..	"	" ..	Golden Chariot ..	John Teddy.
25/4/96	97	1	20	Whangamata	III.	Ohinemuri	Golden Falls ..	Henry W. Moore.
23/5/95	19	3	16	Waiomo ..	XIV.	Hastings ..	Golden Fleece ..	John W. Ryan.
23/12/96	100	0	0	Puriri ..	XIII.	Tairua ..	Golden Harp ..	King of Omahu Gold-mining Co. (N.L.).
21/12/95	100	0	0	Ohui ..	IV.	" ..	Golden Hill ..	J. C. P. Seaver.
21/5/96	30	0	0	" ..	"	" ..	" ..	John P. Ward.
21/5/96	30	0	0	" ..	"	" ..	Golden Hill Ext..	"
5/9/95	21	0	20	Tapu ..	XII.	Hastings ..	Golden Horn ..	Golden Horn Gold-mining Co. (Ltd.).
25/6/96	43	0	32	Whangamata	XV. III.	Tairua Ohinemuri	Golden Mount Ext.	Robert Butler Lusk.
27/8/96	97	2	0	Tairua ..	II.	Tairua ..	Golden Orb ..	James Marsland.
3/2/97	27	3	16	Whangamata	XIV., XV.	" ..	Golden Pinnacle ..	John Wilson.
27/8/96	100	0	0	Tairua ..	II.	" ..	Golden Planet ..	Golden Planet Gold-mining Co. (N.L.).
7/10/96	43	1	14	Tapu ..	XI.	Hastings ..	Golden Point Ext.	W. S. Styak.
23/12/96	100	0	0	Tairua ..	III.	Tairua ..	Golden Rays ..	William Clarke.
30/11/96	100	0	0	Tapu ..	XI.	Hastings ..	Golden Ripple ..	J. W. Rickit.
30/11/96	100	0	0	Tapu ..	"	" ..	Golden Spur ..	Patrick Regan.
8/6/96	100	0	0	Tararu ..	I.	Thames ..	Golden Star ..	Thomas Millett.
22/9/96	100	0	0	" ..	"	" ..	Golden Star Extended No. 1	Louis von Rotter.
19/8/96	46	3	35	Whangamata	XV.	Tairua ..	Golden Three Reefs	Thomas Percy Vuglar.
28/7/96	100	0	0	"	III.	Ohinemuri	Golden Wave ..	John D'Arcy Connelly.
2/11/96	37	0	35	"	"	"	Golden Wave No. 2	George Millar Cameron.
10/9/96	7	3	0	"	"	"	Golden Wave No. 3	"
25/4/96	100	0	0	Puriri ..	XIII. IV.	Thames Waihou	Good Hope ..	David Simpson.
19/9/96	71	2	29	Whangamata	III.	Ohinemuri	Grand Coup ..	Tamihana Gold-mining Co. (N.L.).
23/12/96	84	3	8	Puriri ..	XIII.	Tairua ..	Grandmaster ..	John Leydon.
23/12/96	100	0	0	Tairua ..	III.	" ..	Great Boulder ..	Herbert Gentles.
2/11/96	50	3	15	Tararu ..	II.	Thames ..	Grosvenor	Ernest C. Beale.
22/9/96	84	2	9	Tapu ..	XI.	Hastings ..	Guiding Star ..	Peter Norbury.
19/9/96	100	0	0	Waiomo ..	I.	Thames ..	Happy Thought ..	Golden Opportunity Gold-mining Co.
14/12/96	100	0	0	Whangamata	XV.	Tairua ..	Happy Valley ..	Frederick Wilson Abbott.
21/12/95	100	0	0	Boat Harbour	VI., VIA.	" ..	Harbour Light ..	Robert Ingles.
21/11/95	30	0	0	Ohui ..	IV.	" ..	Harp of Tara ..	Harp of Tara Gold-mining Co.
25/6/96	84	0	12	Tapu ..	XI.	Hastings ..	Hawke's Bay ..	Michael McMahon.
16/3/96	94	2	16	Whangamata	XV.	Tairua ..	Herald	The Herald Gold-mining Co. (N.L.).
23/12/96	100	0	0	"	"	" ..	Heriot	William Francis McWilliams.
25/7/94	30	0	0	Puriri ..	XIII.	Thames ..	Hit-or-Miss ..	Hit-or-Miss Gold-mining Co. (Ltd.).
25/4/96	100	0	0	Thames ..	V.	" ..	Hilton	Ernest C. Beale.
23/12/96	75	0	0	Tapu ..	XI.	Hastings ..	Hope Extended ..	John Muir.
3/3/96	82	0	0	Kirikiri ..	IX.	Tairua ..	Horseshoe ..	Malcolm Fleming.
11/3/96	87	3	35	Whangamata	XV.	" ..	Inca No. 1 ..	Inca Gold-mining Co. (N.L.).
15/2/97	100	0	0	Puriri ..	XIII.	Thames ..	Inverness ..	E. Thomas Dufaur and James Russell.
19/8/96	100	0	0	Whangamata	XV. III.	Tairua Ohinemuri	Iolanthe Extended	Iolanthe Gold-mining Co. (N.L.).
19/9/96	85	1	21	The Wires ..	II., III.	"	Iona	James Corbett.
25/6/96	74	3	34	" ..	II.	"	Irene	J. A. Pond and J. R. Gray.
20/8/96	100	0	0	Waiomo ..	I.	Thames ..	Isle of France ..	Robert Worth.
23/7/96	100	0	0	Kirikiri ..	IX. "	" Tairua	Ivan	James Henry Fleming.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Thames—*continued*.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
23/1/90	2	2	11	Thames ..	IV.	Thames ..	Joker	The Whitehead Sultan Gold-mining Co. (Ltd.).
4/10/95	99	1	0	Puriri ..	XIII.	" ..	"	Jules George Wilson.
27/8/96	35	3	36	Whangamata	II., III.	Ohinemuri	Junction Whangamata No. 1	Joseph Bishop.
19/8/96	99	3	12	"	"	"	Junction Whangamata No. 2	Christopher G. Walker.
3/2/97	48	3	6	"	"	"	Junction Whangamata No. 3	Cholwell Dean Pitt.
23/5/95	19	2	34	Waiomo ..	XIV.	Hastings ..	Just-in-Time ..	George Crocker.
27/8/96	100	0	0	Whangamata	XV.	Tairua ..	Kaipara	F. H. Whalley.
11/7/95	49	3	25	Tararu ..	I., IV.	Thames ..	Kaiser	The Kaiser Gold-mining Co. (N.L.).
6/2/96	26	1	0	" ..	II.	" ..	Kapai Vulcan ..	James Loughlin.
23/12/96	34	0	0	Tairua ..	VI.	Tairua ..	Kathleen ..	New Year Gold-mining Co. (N.L.).
13/11/95	84	3	20	Thames ..	IV.	Thames ..	Karaka Mines ..	C. A. Harris.
5/3/96	4	0	32	Ohui ..	"	Tairua ..	Kauri	The Maori Dream Gold-mining Co.
25/6/96	100	0	0	Thames ..	V.	Thames ..	Kedge	Adolph Kohn.
2/11/96	100	0	0	Waiomo ..	I	" ..	Kelvin	James Baggott and S. Montgomery.
6/4/96	100	0	0	Ohui ..	IV.	Tairua ..	Kingfisher ..	H. P. Hornibrooke.
14/12/96	100	0	0	Omahu ..	XIII.	Thames ..	King of Omahu ..	King of Omahu Gold-mining Co. (N.L.).
26/2/96	100	0	0	Thames ..	IV.	" ..	King Solomon ..	George Crocker.
29/5/96	36	3	24	" ..	"	" ..	King Solomon Ext.	King Solomon Gold-mining Co.
27/2/96	66	3	0	Whangamata	III.	Ohinemuri	King of Whangamata	The King of Whangamata Gold-mining Co.
18/5/96	73	1	18	" ..	"	"	Kingsley Hall ..	John Robert Martin.
23/7/96	100	0	0	Kirikiri ..	VI., IX. / V., IX.	Thames / Tairua	Kirikiri No. 1 ..	Charles McLean and J. H. Fleming.
2/4/91	13	1	37	Thames ..	IV.	Thames ..	Kuranui No. 2 ..	The Kuranui Caledonian Gold-mining Co. (Ltd.).
16/5/89	14	3	10	" ..	"	" ..	Kuranui No. 3 ..	Kuranui Gold-mining Co. (Ltd.).
23/12/96	95	0	0	Whangamata	XI., XV.	Tairua ..	Kruger	William Grey Nicholls.
29/5/96	100	0	0	Waiomo ..	XV.	Hastings ..	Kurera	Eric Manley Clark.
2/11/96	39	0	0	" ..	"	" ..	Kurera Extended	Edward Weston Andrews.
21/12/95	30	0	0	Ohui ..	IV.	Tairua ..	Last Chance ..	J. C. B. P. Seaver.
29/5/96	73	0	0	Whangamata	XV.	" ..	Leap Year ..	Robert David Sweetapple.
4/3/96	94	0	23	Tairua ..	IX.	" ..	Light of Asia ..	George S. Budge.
18/12/96	21	0	9	Puriri ..	XIII.	" ..	Lion	John Morrison.
20/8/96	100	0	0	Whangamata	XIV.	" ..	Lima	Albert Cuff.
21/12/95	50	0	0	Thames ..	V.	Thames ..	Limerick ..	John Childerhouse.
6/12/95	88	2	16	" ..	"	" ..	Lincoln	Sarah Bawden.
21/12/95	27	3	22	Tapu ..	XI.	Hastings ..	Little Jessie ..	Robert Paterson.
24/10/95	3	2	32	Thames ..	V.	Thames ..	Little Willie ..	The Gloucester Gold-mining Co. (Ltd.).
25/9/96	86	0	20	Waiomo ..	II.	" ..	Lomas	James Darrow.
27/8/96	100	0	0	Whangamata	XV.	Tairua ..	Lombard ..	Frederick H. Whalley.
19/8/96	96	1	0	"	"	" ..	London	York Gold-mining Co.
14/6/89	27	3	35	Thames ..	IV.	Thames ..	Lone Hand ..	The May Queen Hauraki (Ltd.).
26/2/96	100	0	0	Whangamata	XV.	Tairua ..	Luck at Last ..	Whangamata Proprietary (Ltd.).
26/2/96	100	0	0	"	"	" ..	Luck at Last Ext.	"
6/4/96	98	2	0	Ohui ..	XIV.	Whitianga	Lux Mundi ..	R. H. Abbott.
3/2/97	100	0	0	Waiomo ..	I.	Thames ..	Lysander ..	William Shaw.
20/3/96	16	3	17 6/10	Thames ..	IV.	" ..	Magazine ..	Magazine Gold-mining Co.
31/7/96	27	0	16	" ..	"	" ..	Magazine West ..	"
19/6/95	100	0	0	Tupu ..	XI.	Hastings ..	Mahara	Mahara Royal (Ltd.).
27/8/96	100	0	0	Whangamata	XV.	Tairua ..	Manurangi ..	Frederick H. Whalley.
3/3/96	26	2	22	Tairua ..	XX.	" ..	Main Lead Ext. ..	Frederick John Tiffin.
21/12/95	100	0	0	Boat Harbour	VI., VIA.	" ..	Malua	Donald McLeod.
21/11/95	16	2	0	Ohui ..	IV.	" ..	Manaia	Annie Ward.
21/12/95	100	0	0	Thames ..	V.	Thames ..	Manchester ..	William McCullough.
2/8/94	15	0	0	Ohui ..	IV.	Tairua ..	Maori Dream ..	The Maori Dream Gold-mine (Ltd.).
23/12/96	45	3	10	" ..	"	" ..	Maori Dream Gold-mine (Ltd.)	"
21/12/95	100	0	0	" ..	"	" ..	Maori Dream Proprietary	Henry David Abbott.
2/8/94	15	0	0	" ..	"	" ..	Maori Land ..	T. P. P. Seaver.
21/11/95	20	0	24	Waiomo ..	I.	Thames ..	Mararoa ..	The Golden Opportunity Gold-mining Co.
2/7/96	30	0	0	" ..	"	" ..	Mararoa No. 2 ..	"
25/6/96	100	0	0	Whangamata	III.	Ohinemuri	Marco Polo ..	Marco Polo Gold-mining Co.
2/11/96	100	0	0	"	"	"	Marquita ..	George Dunnett.
6/2/96	5	0	36	Ohui ..	IV.	Tairua ..	Marigold ..	Arthur O. Field.
19/8/96	100	0	0	Mata ..	VII.	Hastings ..	Marquis of Salisbury	Marquis of Salisbury Gold-mining Co.
23/12/96	93	1	10	Ohui ..	XIV. / IV.	Whitianga / Tairua	Mary Hill ..	James Henry Fleming.
19/9/96	98	0	0	Tairua ..	VI.	" ..	Mary Kate ..	John Guest Ralph.
6/12/95	57	3	32	Thames ..	V.	Thames ..	Mascotte ..	John Childerhouse.
19/8/96	36	1	14	Mata ..	VII.	Hastings ..	Mata Prospectors	Daniel McCafferty.
17/12/96	100	0	0	" ..	"	" ..	Mata Reefs ..	Mata Reefs Gold-mining Co. (N.L.).
23/7/96	100	0	0	Tairua ..	II.	Tairua ..	Mataura ..	Tairua Prosp't'g Gold-mining Co. (N.L.).
13/8/96	16	2	0	" ..	"	" ..	Mataura Extended	"
27/8/94	73	1	18	Thames ..	IV.	Thames ..	May Queen ..	May Queen Hauraki (Ltd.).
17/10/95	43	3	0	" ..	IV., V.	" ..	May Queen Ext. ..	May Queen Ext. Gold-mining Co. (N.L.).
10/10/95	5	2	10	" ..	IV.	" ..	May Queen No. 2	"
20/3/96	27	3	34	" ..	V.	" ..	McIsaacs ..	McIsaacs Gold-mining Co.
19/9/96	68	3	30	" ..	"	" ..	McIsaacs South ..	Ernest C. Beale.
6/4/96	100	0	0	Gum Town ..	XIV.	Whitianga	Merry England ..	George McNeil.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Thames—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
23/12/96	100	0	0	Puriri ..	XIII.	Thames	Melbourne Cup ..	John Churton.
					"	Tairua		
23/12/96	97	0	0	Tairua ..	II.	" ..	Micawber ..	Joseph Barber and Robert Kelly.
29/5/96	86	3	28	Whangamata	XV.	" ..	Mikado ..	Benjamin H. Bishop.
23/12/96	59	0	0	"	III.	Ohinemuri	Minnesota ..	Wentworth Gold-mining Co. (N.L.).
27/2/96	77	0	29	"	XV.	Tairua ..	Moa	Moa Gold-mining Co. (Ltd.).
10/11/96	94	3	26	Thames ..	IV.	Thames ..	Moanataiari ..	Moanataiari Gold-mining Co. (Ltd.).
24/10/95	12	0	39	" ..	IX.	" ..	Moanataiari North	Moanataiari North Gold-mining Co.
5/3/96	27	2	0	" ..	IV.	" ..	Moanataiari Ext.	Moanataiari Ext. Gold-mining Co.
9/3/95	57	3	39	Waiomo ..	XV.	Hastings ..	Monowai ..	Monowai Gold-mines (Ltd.).
21/11/95	30	0	0	Ohui ..	IV.	Tairua ..	Mont D'Or ..	Annie Ward.
6/4/96	100	0	0	" ..	"	" ..	Montezuma ..	John James Dixon.
18/12/96	30	0	0	" ..	"	" ..	Montezuma Ext.	James Henry Fleming.
25/6/96	100	0	0	" ..	"	" ..	Moonstone ..	Robert Port.
14/12/96	90	0	0	" ..	"	" ..	Moonstone Ext. ..	William T. Davies.
19/8/96	74	0	31	Waiomo ..	III.	Thames ..	Morion	Morion Puru Gold-mining Co.
14/12/96	87	0	0	Tairua ..	IX.	Tairua ..	Morning Dawn ..	Stephen Catran.
2/8/94	15	0	0	Ohui ..	IV.	" ..	Morning Light ..	Maori Dream Gold-mine (Ltd.).
23/12/96	100	0	0	Whangamata	III.	Ohinemuri	Mount Lyell ..	John Kneebone.
19/9/96	92	2	28	Puriri ..	XIII.	Tairua ..	Mount Omahu ..	Henry Edward Partridge.
22/6/96	80	0	0	Tararu ..	I., II.	Thames ..	Mount Taylor ..	Thomas Millett and Ernest C. Beale.
21/11/95	11	3	0	Ohui ..	IV.	Tairua ..	My Daisy ..	John Patrick Ward.
25/6/96	100	0	0	The Wires ..	II.	Ohinemuri	My Sweetheart ..	My Sweetheart Gold-mining Co.
27/8/96	100	0	0	Tairua ..	"	Tairua ..	Myra	John Jesse Odlum
13/1/97	85	1	37	The Wires ..	I.	Ohinemuri	Nancy	William T. J. Bell.
19/8/96	100	0	0	Whangamata	XI.	Tairua ..	National Bank ..	James H. Fleming.
29/10/96	16	3	25	"	XV.	" ..	Nellie	The Nellie Gold-mining Co. (N.L.).
4/10/95	54	2	0	Thames ..	IV.	Thames ..	New Alburnia ..	New Alburnia Gold-mining Co. (Ltd.).
3/2/97	91	2	20	Waiomo ..	XV.	Hastings ..	New Boss ..	Boss Gold-mining Co. (N.L.).
24/4/96	43	1	39	Thames ..	IV.	Thames ..	New Caledonia ..	Henry Lowe.
19/9/96	100	0	0	Puriri ..	I.	Ohinemuri	Newhaven ..	Henry E. Partridge.
					XIII.	Tairua		
16/7/96	28	2	12	Thames ..	IV.	Thames ..	New Mount Zeehan	John Guest Ralph.
3/2/97	96	1	0	Waiomo ..	XV.	Hastings ..	New Pactolus ..	Gerald Butler Beere.
28/7/96	97	3	7	Boat Harbour	VI.	Tairua ..	New Tairua ..	Thomas P. Seaver.
26/2/96	36	3	37	Tararu ..	II.	Thames ..	New Tararu ..	Mihaka of Tararu Gold-mining Co.
19/9/96	100	0	0	Whangamata	XIV.	Tairua ..	Newton ..	Charles C. Newton.
27/8/96	100	0	0	"	III.	Ohinemuri	New Wentworth ..	Wentworth Gold-mining Co. (N.L.).
6/4/96	52	0	5	Thames ..	IV.	Thames ..	New Whau ..	The New Whau Gold-mining Co.
14/12/96	100	0	0	Whangamata	XI.	Tairua ..	New Zealand Reefs	James Henry Fleming.
19/2/97	59	0	27	Puriri ..	XIII.	Thames	Never Miss ..	Robert Worth.
					"	Tairua		
25/6/96	77	0	0	Ohui ..	IV.	"	Ngatipa ..	J. P. Ward.
11/3/96	100	0	0	Mata ..	VII., XII.	Hastings ..	Nikau Valley ..	Mata Reefs Gold-mining Co.
8/6/96	49	2	14	" ..	II., VI.	" ..	Nikau Valley Ext.	Edward McDonnell.
5/12/95	16	2	0	Ohui ..	IV.	Tairua ..	Nil Desperandum	Nil Desperandum Gold-mining Co.
6/2/96	30	0	0	" ..	"	" ..	Nil Desperandum Extended	John P. Ward.
6/2/96	30	0	0	" ..	"	" ..	Nil Desperandum No. 2	John Patrick Ward.
1/10/96	21	0	0	Thames ..	"	Thames ..	Nonpareil ..	Nonpareil Gold-mining Co. (N.L.).
23/12/96	100	0	0	Ohui ..	"	Tairua ..	Normantown ..	Edward O'Connor.
16/3/96	50	0	0	Thames ..	"	Thames ..	No Surrender ..	King Solomon Gold-mining Co. (N.L.).
16/7/96	29	0	35	" ..	"	" ..	" ..	"
2/11/96	59	0	0	" ..	IV., V.	" ..	Occidental ..	Occidental Gold-mining Co. (N.L.).
8/2/96	100	0	0	The Wires ..	II.	Ohinemuri	Ohinemuri ..	A. Pond and J. R. Gray.
5/12/95	15	3	10	Ohui ..	IV.	Tairua ..	Ohui	The Maori Dream Gold-mine (Ltd.).
25/6/96	51	1	17	" ..	"	" ..	"	Ohui Gold-mining Co. (N.L.).
22/9/96	30	0	0	" ..	"	" ..	Ohui Extended ..	William Henry Cooper.
24/9/96	100	0	0	Thames ..	"	Thames ..	Old Southern Reefs Ext. (Foreshore)	Frederick Clarence Dean.
30/11/96	100	0	0	Omahu ..	I.	Ohinemuri	Omahu	James H. Fleming.
27/8/96	100	0	0	Whangamata	XV.	Tairua ..	Omahu Ponsonby	Frederick H. Whalley.
11/3/96	36	3	28	Thames ..	V.	Thames ..	Only Chance ..	Thomas Boyle.
24/4/96	93	3	10	Waiomo ..	I., II.	" ..	Orion	The Orion Gold-mining Co.
24/4/96	97	2	23	" ..	"	" ..	Orion Extended ..	"
21/3/89	15	0	0	Thames ..	IV.	" ..	Orlando	The Orlando Gold-mining Co. (Ltd.).
3/2/97	100	0	0	Tararu ..	II., IV.	" ..	Orizaba	George Bertram Hutton.
6/4/96	52	2	24	Waiomo ..	XV.	Hastings ..	Pakeha	Thomas S. Morpeth.
17/8/95	100	0	0	Tairua ..	IX.	Tairua ..	Pakirarahi ..	James Mackay, jun.
21/12/95	97	1	11	" ..	"	" ..	Pakirarahi No. 1 South	George Frederick Bell.
21/12/95	91	0	0	" ..	"	" ..	Pakirarahi No. 2 South	"
5/3/96	10	1	0	Waiomo ..	XV.	Hastings ..	Park	T. A. Dunlop.
11/3/96	62	3	37	Tairua ..	IX.	Tairua ..	Perseverance ..	John Moore.
6/2/96	25	0	20	" ..	"	" ..	Perseverance Ext.	John Morrow.
29/5/96	100	0	0	Whangamata	XV.	" ..	Peruvian ..	Leonard A. Cuff.
1/10/96	21	3	24	"	"	" ..	Peruvian Extended	Albert Cuff.
29/5/96	36	2	26	"	III.	Ohinemuri	Phœnix Extended	Newell Butler Lusk.
19/9/96	81	1	11	"	XIV., XV.	Tairua	Phœnician ..	James Corbett.
					II., III.	Ohinemuri		
25/4/96	100	0	0	Puriri ..	XIII.	Thames	Pikau	Robert Cannell.
					"	Tairua		
3/3/96	100	0	0	The Wires ..	II.	Ohinemuri	Pinnacle ..	Edward Hounsfield Barber.
14/12/96	33	0	38	Tairua ..	"	Tairua ..	Planet	Charles Kay.
3/2/97	93	0	0	Waiomo ..	XIV., XV.	Hastings ..	Polydorus ..	Gerald Butler Beere.
23/12/96	99	3	14	Puriri ..	XIII.	Tairua ..	President ..	Albert Spencer.
23/12/96	54	1	0	Tairua ..	III.	" ..	Pride of Tairua ..	Frederick Earl.
23/12/96	43	2	0	" ..	"	" ..	Pride of Tairua Ext.	Duncan E. Clerk.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Thames—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
28/7/96	69	0	9	Thames ..	IV.	Thames ..	Primrose Hill ..	Tararu Ext. Gold-mining Co. (N.L.).
17/10/95	100	0	0	Tairua ..	III.	Tairua ..	Prince Charlie ..	Charles McLean.
28/7/96	100	0	0	Whangamata	XV.	" ..	Ptolemaic ..	The Ptolemy Gold-mining Co. (N.L.).
27/8/96	19	1	11	" ..	"	" ..	Ptolemaic Ext. ..	"
28/7/96	100	0	0	" ..	"	" ..	Ptolemy ..	"
26/2/96	100	0	0	The Wires ..	II., III.	Ohinemuri	Pukewhau ..	H.M. Shepherd, B. Anderson, and others.
29/5/96	30	0	2	" ..	"	"	Pukewhau Ext. ..	Benjamin Anderson.
27/2/96	100	0	0	Puriri ..	XIII. / "	Tairua / Thames	Puriri	The Puriri Gold-mining Co. (N.L.).
27/2/96	42	1	0	Waiomo ..	XV.	Hastings ..	Puru	William Clark.
22/3/88	47	0	0	Thames ..	IV.	Thames ..	Queen of Beauty Ex.	Thames Hauraki Goldfields (Ltd.).
14/12/96	100	0	0	Whangamata	XI.	Tairua ..	Queen Eva ..	E. C. Martin.
2/11/96	100	0	0	Omahu ..	I.	Ohinemuri	Queen of Omahu ..	Joseph Henry Bond.
14/12/96	100	0	0	Puriri ..	XIII. / IV. / I.	Thames / Waihou / Ohinemuri	Queen of May ..	William Henry Birch.
27/2/96	100	0	0	Whangamata	XV.	Tairua ..	Queen of Whangamata	Charles Judd Saunders.
14/12/96	100	0	0	"	XI.	" ..	Queenie	Charles John Sanderson.
26/2/96	53	3	20	Waiomo ..	XIV.	Hastings ..	Rangatira ..	William Jones Smith.
12/11/96	7	3	31	Whangamata	XII.	Tairua ..	Rand Extended ..	William H. Cooper.
23/7/96	90	0	0	"	III.	Ohinemuri	Rapid	Henry William Moore.
1/2/96	100	0	0	The Wires ..	II.	"	Remuera ..	George Makgill.
19/8/96	100	0	0	Waiomo ..	XIV.	Hastings ..	Renown ..	Renown Gold-mining Co. (N.L.).
27/8/96	23	2	0	" ..	"	" ..	" ..	Alfred Howe.
15/11/96	5	0	1	Thames ..	IV.	Thames ..	Richmond Hill ..	Tararu Extended Gold-mining Co.
19/9/96	100	0	0	The Wires ..	II.	Ohinemuri	Rita	Henry Fletcher.
23/12/96	100	0	0	Tairua ..	VI.	Tairua ..	Rob Roy ..	William Elliot.
29/10/96	18	2	0	" ..	"	"	Rob Roy Extended	Thomas Charter.
5/3/91	3	0	22	Waiomo ..	II.	Thames ..	Rose	Frank Merricks.
6/2/96	30	0	0	Ohui ..	IV.	Tairua ..	Roseberry ..	Henry Brett.
26/2/96	49	3	8	Whangamata	III.	Ohinemuri	Rothschild's ..	John McWilliams.
26/2/96	100	0	0	"	"	"	Rothschild's Ext.	Edward McWilliams.
25/6/96	100	0	0	"	XV.	Tairua ..	Rotomahana ..	David Ramsay.
19/9/96	100	0	0	"	"	" ..	Rotomahana No. 1	John Bancroft.
19/9/96	100	0	0	"	"	" ..	Rotomahana No. 2	"
19/9/96	80	0	0	"	"	" ..	Rotomahana No. 3	"
23/12/96	74	0	4	Tapu ..	"	Hastings ..	Royal	Christopher Atwell Harris.
11/3/96	32	0	5 6/10	Waiomo ..	I.	Thames ..	Royal Mail ..	Albert Bruce.
6/4/96	96	3	0	" ..	II.	" ..	Royal Sovereign ..	Royal Sovereign Gold-mining Co.
6/4/96	70	2	36	Thames ..	V.	" ..	Ruahine ..	Charles Kingswell.
28/7/96	100	0	0	Waiomo ..	I.	" ..	Rupert	James George Wilson.
13/11/95	93	2	0	" ..	II.	" ..	Russell	Puru Consolidated Gold-mining Co.
6/12/95	100	0	0	" ..	"	" ..	Russell Extended	"
6/12/95	98	2	0	" ..	"	Hastings ..	Salisbury ..	"
19/9/96	54	0	6	Tararu ..	"	Thames ..	Scandinavian ..	Scandinavian Gold-mining Co.
6/4/96	100	0	0	Waiomo ..	"	" ..	Scottish Chief ..	George Robson.
13/8/96	16	0	0	" ..	"	" ..	Scottish Chief Ext.	Joseph Barber.
23/12/96	31	0	0	Ohui ..	IV.	Tairua ..	Sea View ..	William Henry Cooper.
16/1/96	21	1	29	Thames ..	V.	Thames ..	Shamrock ..	Robert Thompson.
8/8/95	28	1	0	Tapu ..	XI.	Hastings ..	Shannon ..	R. Kelly, Frank Earl, and F. Duthie.
6/2/96	14	3	36	Ohui ..	IV.	Tairua ..	Shelly Beach ..	George Clarkson, jun.
2/11/96	99	0	0	Tapu ..	XI.	Hastings ..	Sheridan ..	Sheridan Gold-mining Co.
27/2/96	78	2	0	" ..	"	" ..	Sheridan No. 2 ..	Hastings Gold-mining Co. (N.L.).
14/12/96	100	0	0	Whangamata	"	Tairua ..	Shooting Star ..	Robert Newman Buttle.
6/4/96	58	3	20	Thames ..	V.	Thames ..	Shotover No. 2 ..	Henry Brett.
18/5/96	100	0	0	Waiomo ..	I.	" ..	Silas	Robert Compton Speer.
2/11/96	73	3	0	" ..	"	" ..	Silas Extended ..	James George Wilson.
14/12/96	92	2	6	Puriri ..	IX., XIII.	Tairua ..	Sir George ..	Charles R. Thorne.
19/8/96	100	0	0	Whangamata	XI.	" ..	Smiler	Samuel Collier.
23/12/96	100	0	0	"	III.	Ohinemuri	Sophia	John Morrison.
13/8/96	0	1	10	Thames ..	IV.	Thames ..	Southern Reefs ..	William Burton.
19/8/96	100	0	0	Whangamata	XI.	Tairua ..	Spotted Cat ..	John W. Ryan.
21/11/95	12	2	34	Waiomo ..	"	Hastings ..	Square and Compass	The Crown Royal Gold-mining Co.
19/8/96	87	2	12	Whangamata	XV., XIV.	Tairua ..	St. Albans ..	John Jesse Odlum.
25/6/96	100	0	0	"	XIV., XV.	" ..	St. Albans Ext. ..	J. C. McKinney.
19/8/96	51	1	5	"	XV.	" ..	St. Albans Consols	Henry E. Paltridge.
23/7/96	100	0	0	"	"	" ..	Standard ..	Arthur W. Smith.
19/11/95	30	0	0	Thames ..	IV.	Thames ..	Star of England ..	Frederick Bennett.
25/6/96	100	0	0	Ohui ..	"	Tairua ..	Star of England ..	Alfred Lockwood and others.
7/5/96	16	2	0	Thames ..	"	Thames ..	Star of England Extended	Charles Manuel.
23/12/96	98	0	0	Ohui ..	"	Tairua ..	Star of New Zealand	Arthur E. Langley.
3/2/97	51	1	31	" ..	XIV.	Whitianga	Stars and Stripes	John Kneebone.
13/1/97	40	2	0	Tairua ..	VI.	Tairua ..	Star of Tairua ..	Benjamin Anderson.
23/12/96	58	3	0	Tararu ..	I.	Tararu ..	Star of Tararu ..	Frederick Bennett, sen.
23/12/96	16	2	0	The Wires ..	II.	Ohinemuri	Stettin Extended	Albert Kummert.
4/10/95	75	0	0	Thames ..	IV.	Thames ..	St. Hippo ..	The May Queen Hauraki (Ltd.).
14/12/96	87	0	0	Ohui ..	"	Tairua ..	St. John ..	Robert Allen.
22/9/96	100	0	0	Tairua ..	II.	" ..	Stoneyhurst ..	John Churton.
29/5/96	41	0	1	Puriri ..	XIII.	Thames ..	Success	Richard John Hastings.
22/9/96	100	0	0	Waiomo ..	I.	" ..	Sunlight ..	Sunlight Gold-mining Co. (N.L.).
23/12/96	66	0	0	Whangamata	III.	Tairua ..	Sunray	William Clarke.
23/12/96	52	3	22	"	XI.	" ..	Sweet Auburn ..	Frederick William Abbott.
18/5/96	90	0	11	"	XV.	" ..	Sybil	Sybil Gold-mining Co. (N.L.).
29/5/96	75	0	32	"	"	" ..	Sybil Extended ..	Charles Kingswell.
6/12/95	60	0	0	Ohui ..	IV.	" ..	Sybiline ..	Harp of Tara Gold-mining Co.
6/2/96	30	0	0	Tapu ..	XI.	Hastings ..	Sylvia Park ..	R. Kelly, F. Earl, and F. Duthie.
22/9/96	100	0	0	Tairua ..	III.	Tairua ..	Tairua Consols ..	Tairua Consols Gold-mining Co.
23/12/96	96	0	0	" ..	VI.	" ..	Tairua Bunkers ..	John Guest Ralph.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS, issued from the Warden's Office at Thames—*continued*.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
23/12/96	24	0	0	Tapu ..	XI.	Hastings ..	Tapu Gold-dredging Co.	George Wiggins.
19/6/95	90	0	12	Thames ..	IV.	Thames ..	Tararu ..	Tararu Creek Gold-mining Co. (Ltd.).
6/4/96	69	1	7	" ..	"	" ..	Tararu Extended	A. M. McMahon.
23/12/96	100	0	0	Whangamata	II., III.	Ohinemuri	Taunton ..	Christopher George Walker.
25/6/96	55	1	35	The Wires ..	II.	"	Telegraph ..	My Sweetheart Gold-mining Co.
27/2/96	65	0	5 6/10	Waiomo ..	I.	Thames ..	Temple Bar ..	Temple Bar Gold-mining Co.
6/4/96	51	0	0	Thames ..	IV.	" ..	Thames ..	Samuel S. Mackay.
23/7/96	56	2	0	" ..	"	" ..	Thames Hauraki Extended	Queen of Beauty Gold-mining Co.
10/9/96	7	3	30	Waiomo ..	II.	" ..	Three Cheers ..	Alexander Whitley.
19/8/96	100	0	0	Whangamata	XV., III.	Tairua, Ohinemuri	Three Star ..	Three Star Gold-mining Co. (N.L.).
5/2/97	63	0	0	Thames ..	IV.	Thames ..	Tidal Wave ..	Charles David Wright.
23/12/96	70	1	19	Waiomo ..	XV.	Hastings ..	Topaz	Gerald Butler Beere.
29/5/96	100	0	0	" ..	XIV.	" ..	Toulouse ..	Thomas Francis Cahill.
2/11/96	84	0	0	" ..	"	" ..	Toulouse Extended	"
24/4/96	12	0	30	Whangamata	XV.	Tairua ..	Triangle ..	Frederick W. Abbott.
18/5/96	94	0	0	Waiomo ..	"	Hastings ..	Trojan	James Mays.
21/12/95	54	1	0	Tapu ..	XI.	" ..	True Briton ..	Frederick M. King.
4/3/96	68	2	27	Tairua ..	IX., X.	Tairua ..	True Ring ..	George Symons Budge.
3/2/97	100	0	0	Whangamata	XIV., XV.	" ..	Trump	William Benjamin Jackson.
23/12/96	100	0	0	Ohui ..	IV.	" ..	Ulow Queen ..	William Taylor Davies.
11/3/96	100	0	0	Waiomo ..	XIV.	Hastings ..	Ulysses No. 1 ..	The Ulysses Gold-mining Co.
11/3/96	100	0	0	" ..	XV.	" ..	Ulysses No. 2 ..	"
11/3/96	99	0	0	" ..	"	" ..	Ulysses No. 3 ..	"
3/2/97	100	0	0	" ..	"	" ..	Ulysses Extended	James Kernick.
26/2/96	48	2	20	" ..	"	" ..	Ulysses No. 3 Ext.	Percy Spencer.
25/6/96	56	2	36	Whangamata	"	Tairua ..	Union	Wairoa Gold-mining Co. (N.L.).
18/6/96	28	0	20	Thames ..	IV.	Thames ..	Union Bank ..	James Barclay Blakie.
23/12/96	99	2	35	Ohui ..	XIV.	Whitianga	Union Jack ..	James Henry Fleming.
13/11/95	74	2	0	Waiomo ..	II.	Hastings ..	Uranus	Puru Consolidated Gold-mining Co. (Ltd.).
3/3/96	100	0	0	" ..	"	Thames ..	Uranus Extended	"
5/2/95	7	0	0	Tairua ..	IX.	Tairua ..	Venus	James Mackay, jun.
23/12/96	97	0	16	The Wires ..	I.	Ohinemuri	Veronica ..	Cyril Foster Bell.
19/9/95	41	3	10	Thames ..	IV.	Thames ..	Victoria ..	The Victoria Gold-mining Co.
23/12/96	40	0	0	Whangamata	III.	Tairua ..	Vicnero ..	William Clarke.
2/11/96	34	0	0	Waiomo ..	XIV.	Hastings ..	Virgin	James Baggott and S. Montgomery.
23/3/96	96	3	0	The Wires ..	VI.	Ohinemuri	Volunteer ..	J. P. P. Seaver.
23/12/96	79	2	38	Puriri ..	XIII.	Tairua ..	Von Tempskey ..	James Coe.
27/2/96	100	0	0	Tararu ..	II.	Thames ..	Vulcan Extended	Henry Lomas Smith.
23/3/97	65	3	20	Waiomo ..	XI.	Hastings ..	Waiomo ..	William Reid Bloomfield.
13/9/95	12	0	0	" ..	XIV.	" ..	Waiomo Special Dredging Claim	John Murray, John Kennedy, George Crosby, J. H. Fleming, and others.
6/2/96	100	0	0	" ..	XV., II.	" , Thames	Waimea ..	Thomas Morrin.
20/3/96	17	1	0	" ..	XV., II.	Hastings, Thames	Waimea Extended	John Hague Smith.
2/11/96	100	0	0	" ..	XIV.	Hastings ..	Waingohia ..	John Murphy and J. B. Fairs.
5/9/95	22	3	30	Thames ..	IV.	Thames ..	Waiotahi ..	The Waiotahi Gold-mining Co. (Ltd.).
1/2/96	100	0	0	Waiomo ..	XV.	Hastings ..	Waipuru ..	The Waipuru Gold-mining Co.
27/8/96	27	2	29	" ..	XIV.	" ..	Waipuru Extended	James Kernick.
19/8/96	100	0	0	Whangamata	XV.	Tairua ..	Wairoa	Wairoa Gold-mining Co. (N.L.).
21/11/95	30	0	0	Thames ..	IV.	Thames ..	Waitangi ..	Arthur Pittar.
6/4/96	95	3	0	Ohui ..	"	Tairua ..	Wakamarina ..	James Whiting.
21/11/95	15	0	0	" ..	"	" ..	Wakatu ..	John Cordingly Colbeck.
13/8/96	13	1	8	Puriri ..	XIII.	" ..	Wallace	William Eddowes.
15/2/97	96	0	0	" ..	"	Thames ..	Wandoline ..	Edmond T. Dufaur and James Russell.
26/2/96	77	3	24	Tararu ..	I., II., IV., V.	" ..	Waratah ..	Charles Kingswell.
27/8/96	100	0	0	Whangamata	XV.	Tairua ..	Warkworth ..	Frederick H. Whalley.
2/11/96	100	0	0	"	III.	Ohinemuri	Waterwitch ..	George Dunnett.
19/9/96	100	0	0	Waiomo ..	II.	Thames ..	Wenona ..	Wenona Gold-mining Co. (N.L.).
27/2/96	92	0	0	Tapu ..	XI.	Hastings ..	Wellington Park ..	R. Kelly, F. Earl, and F. Duthie.
6/12/88	6	1	0	Thames ..	IV.	Thames ..	West Coast ..	John Northey.
2/11/96	81	0	10	Mata ..	VII., IX.	Hastings ..	Weymouth ..	Hugh Thomas Torrens.
27/2/96	100	0	0	..	XV., III.	Tairua, Ohinemuri	Whangamata ..	Henry Lomas Smith.
19/9/96	100	0	0	Whangamata	XI.	Tairua ..	Whangamata Consolidated	William Elliott.
19/9/96	92	2	28	"	XII.	" ..	Whangamata Peninsula	Claude Lorraine Kerry.
27/8/96	91	1	34	"	XI.	" ..	Whangamata Reefs	Charles Short.
14/12/96	54	2	0	"	"	" ..	Whangamata Reefs Ext.	"
23/12/96	100	0	0	"	XIV.	" ..	Whangamata Reserve No. 1	James Baggott.
23/12/96	100	0	0	"	"	" ..	Whangamata Reserve No. 2	"
23/12/96	100	0	0	"	"	" ..	Whangamata Reserve No. 3	"
6/4/96	94	0	17	"	XV.	" ..	Wharekawa ..	Frederick W. Abbott.
29/10/96	9	0	15	Puriri ..	XIII.	" ..	Why Not ..	Robert Worth.
29/5/96	100	0	0	Tairua ..	II.	" ..	Winder	Andrew M. McMahon.
23/12/96	50	1	28	" ..	"	" ..	Winder Extended	Albert Gold-mining Co. (N.L.).
8/6/96	100	0	0	Waiomo ..	XIV.	Hastings ..	Windsor Castle ..	T. Millitt and E. J. G. F. Greville.
27/8/96	16	2	30	" ..	"	"	Windsor Castle No. 3	Ernest C. Beale.
19/8/96	60	3	1	The Wires ..	III.	Ohinemuri	Wires	M. J. Gannon and J. Barber.
5/12/95	26	3	0	Thames ..	V.	Thames ..	Young Australian	McIsaacs Gold-mining Co.
14/12/96	96	2	0	Whangamata	XV.	Tairua ..	Zone	Zone Gold-mining Co. (N.L.).

Mata District.

Mata Reefs Mine (Area, 176 acres).—This mine is situated near the junction of the Gentle Annie and Mata Creeks. The northern, or Mata, section includes the Mata and Jay Gould Claims. It is intended to reopen the workings on the hill, where gold was obtained several years ago. In the southern section, known as the "Nikau Valley," there is a large reef of 20 ft. in width, from which good dish prospects are obtained. Several other reefs and leaders have been discovered, but not yet prospected. There is water-power available for driving machinery, and many facilities for working this property.

Kelly's Claim (Area, 38 acres).—The work carried on in this claim has been sluicing the surface, with a view of discovering the reef from which the gold found in the creek was derived, but the efforts in that direction have not yet been successful, and no return of gold has been made. Three men were employed.

The Marquis of Salisbury, Mata Prospectors, Canadian, Clematis, and Parnell Claims have been taken up, and more or less prospecting work carried on.

Tapu District.

Golden Point Mine (Area, 120 acres).—The shaft was sunk to a depth of 210 ft., and a level opened in the cross-cut towards the line of reef. A number of stringers, showing visible gold, were cut, and a rise put up to the old workings. So far the returns have not been very great. A crushing of 4 tons of quartz yielded 1 oz. 4 dwt. gold; value, £3 per ounce. Thirteen men were employed.

Sheridan Mine (Area, 100 acres).—The main adit has been extended to a distance of 800 ft., and 150 ft. will yet have to be driven to cut the main reef at 400 ft. below the surface. A considerable amount of stoping was carried on by a party who held an option on the mine, and 199 tons crushed yielded 197 oz.; value, £591. Eight wages-men were employed.

Golden Horn Mine (Area, 21 acres and 20 perches).—This mine is situated to the southward of Tapu Creek, and about a mile from the sea. Prospecting work has been carried on, and a low level driven 370 ft., and four reefs cut from 3 ft. to 8 ft. in thickness, in which a little gold is got by pounding and dish prospecting. A crushing of 14 tons yielded 2 oz. 14 dwt.; value, £8 2s. Four men were employed.

Comet Mine (Area, 45 acres 2 roods 15 perches).—The principal work carried on during the year was in extending the low-level cross-cut. The shoot of gold worked in the early days of mining at Tapu Creek yielded 1,800 oz., and this cross-cut is being put in in hopes of cutting the same leader at a greater depth. Four men were employed.

A considerable amount of prospecting has been carried on in the following mines: Royal Extended, Sylvia Park, Royal, Shannon, Golden Band, Square and Compass, and Mahara. It is the intention of the Mahara Company to erect a battery of ten stamps in the vicinity of Rogers's farm. The battery will prove a boon to the claimholders in this part of the district, as affording them a means of testing the value of their reefs.

Waiomo District.

Monowai Mine (Area, 87 acres 3 roods 29 perches).—During the year 50 tons of quartz was crushed, yielding 29 oz. 12 dwt.; value, £95 14s. 4d. The method of treatment introduced by Mr. A. G. French was after some time dispensed with, and the mine and mill both were at a standstill, no further quantity of quartz being crushed. The property is now owned by the Monowai Gold-mines (Limited), an English company, and the manager, Mr. A. S. Gabbs, is carrying on three drives for the purpose of developing the reefs.

Renown Mine (Area, 100 acres).—A drive has been put in for a distance of 190 ft. to cut a large reef which outcrops, showing a width of 20 ft. Four men were employed.

Rangatira Mine (Area, 53 acres 3 roods 20 perches).—This mine is situated near the beach. A drive has been put in for a distance of 378 ft., and a reef cut about 8 ft. in thickness. A crushing of 10 tons of quartz yielded 2 oz. 19 dwt.; value, £8 17s. Four men were employed.

A considerable amount of work has been done in prospecting the large reefs formerly discovered in the Mount Morgan, Broken Hill, Comstock, and Mount Zeehan. A number of claims have been taken up in an easterly direction—namely, the Polydorus, Emerald, Topaz, Bronte's, Pactolus, and others—but so far there is no record of any valuable discovery.

Puru District.

Prospecting work has been carried on in the Waipuru, Sunlight, Orion, Ulysses, Wonona, New Boss, and also in the Big Reef, in which a large body of quartz has been discovered. In the Puru Main Lodes, Rimutaka, Digger's Dream, Pakeha, Waimea, and Morion work has also from time to time been carried on, and this portion of the district proved to contain large reefs of low-grade quartz.

Puru Consolidated.—This claim comprises the Russell, 93 acres 2 roods; Uranus, 100 acres; Russell Extended, 100 acres; and Salisbury, 98 acres 2 roods. A considerable amount of work has been carried on in the development of the Rimu reef. A drive has been put in at No. 2 level, which will give a block for stoping, with backs over 70 ft. in height. It is the intention of the owners to erect crushing machinery on the ground. A small parcel, consisting of 2 tons of quartz, was crushed, for a return of 3 oz. 16 dwt.; value, £10 10s. Seven men were employed.

Tararu District.

Tararu Creek Mine (Area, 159 acres).—This mine is being steadily developed. The No. 1 level, 306 ft. below surface; No. 2, 376 ft.; No. 3, 582 ft.; No. 4, 609 ft.; and No. 5, or low adit-level, 638 ft. below surface, have each been further advanced, and stoping has been carried on.

2,521 tons of quartz was crushed, for a yield of 795 oz. 16 dwt. bullion, valued at £2,386 16s. 8d.; and 1,000 tons of tailings treated by the cyanide process, for a yield of 1,215 oz. 10 dwt., value £797 10s. 6d.: total value, £3,184 7s. 2d. The low-level adit near the battery has been driven 332 ft., and is now 1,782 ft. in length. It is intended to connect this as early as possible with the level above in order to effect communication with the more distant portions of the mine, and obviate the necessity of carting the quartz from the other levels, which is found to be very expensive. The mill consists of twenty head of stamps used for wet-crushing and amalgamation, whilst three vats (two each of 25 tons and one of 50 tons capacity) are used for the cyanide process. Sixty men were employed. Mr. W. H. Argall, the general manager of the company, gives the following description of the mine-workings and of the machinery employed for treatment of the ore :—

Since the present company started operations the following work has been accomplished: At the battery, or main-adit, level a distance of 1,450 ft. of cross-cutting has been put in repair, and a further distance of 610 ft. has been driven on the line of reef. The lode where last passed through showed a width of 36 ft. at 638 ft. from the surface. I may mention that this adit or tunnel is being made large enough to admit of a horse or small locomotive being used, and when completed will be the main outlet for the whole of the mine. The principal work at present being carried on is at the Dunedin level, which is 119 ft. above the main adit. A cross-cut of 283 ft. has been put in, and both the City of Dunedin and the Star of California reefs have been intersected. On the City of Dunedin lode 1,188 ft. has been driven, and 66 fathoms of stoping done. The reef varies from 2 ft. to 16 ft. in thickness, the ore being of a free-milling nature. On the Star of California reef 73 ft. has been driven, the lode showing a width of 3 ft. The Wild Missouri, or No. 4, drive is 70 ft. above the Dunedin low level. A considerable amount of work has been done in this drive. 1,021 ft. of cross-cutting is now opened up, together with 1,723 ft. driven on the line of reef (Californian reef). A block 200 ft. in length and 180 ft. in height has been stoped out. The reef varies from 1 ft. to 8 ft. in thickness, and may be considered of a complex character. On the Day Dawn line of reef two levels have been opened up. In No. 1, 249 ft. have been driven; No. 2, which tests the reef at a depth of 330 ft. from the surface, has been carried along a total distance of 507 ft., 307 ft. of which are on the line of reef. On this line 196 fathoms of stoping has been done, the lode all through varying from 2 ft. to 7 ft. in width. This ore is also of a complex nature. The battery consists of forty head of stampers, driven by an overshot water-wheel. At present only twenty head of these are in use. The mode of treatment of the ore is by wet-crushing and passing over amalgamating plates and blankets. The blanketings are then ground in berdans, of which there are six in use. The tailings are caught in buddles, and afterwards subjected to cyanide treatment. The cyanide plant consists of three steel vats, with necessary sumps, extractors, dissolving-tank, and solution-pump, capable of treating 100 tons per week. At the different levels there are fully 30,000 tons of ore in sight.

City of Auckland Mine (Area, 100 acres).—This mine comprises portion of the land formerly known as the Sylvia Mine. The old adit has been cleared for a length of 1,100 ft., and a shaft is being sunk to test the reef at a greater depth. Seven men were employed.

Kaiser Mine (Area, 49 acres).—This mine is also a portion of the old Sylvia property. Prospecting operations were carried out on various reefs, but no gold was struck until the beginning of February last. The new reef, when cut, was 2 ft. 6 in. in width for the first 35 ft., and was composed of clean free-milling ore; for the next 20 ft. the reef is highly mineralised, containing galena, iron-pyrites, copper-pyrites, and zinc-blende. The quartz is sometimes rubbly and at other times solid. Two parcels of ore were treated—18 cwt. at the School of Mines, for bullion of the value of £5 15s.; and 15 cwt. by Fraser and Sons, Auckland, for a value of £6 7s. 10d. Six men were employed.

Vulcan Extended Mine (Area, 186 acres).—This land is situated at Upper Tararu, and includes the ground known as the Vulcan, which was worked by a company in the year 1870. A battery was on the ground when formerly occupied, and a large quantity of quartz crushed, which yielded profitable returns. The mine is now being prospected by the Thames Exploration Syndicate, which holds an option on the property. There are several known lines of reef traversing the land, all gold-bearing. Six men are employed in driving a prospecting tunnel and cross-cutting near the surface. A parcel of 1 ton of quartz was crushed at the Thames School of Mines, for a return of 4 oz. 11 dwt.; value, £11 17s.

Argosy Mine (Area, 183 acres).—This mine is situated on the ridge to the northward of Tararu Creek. A considerable amount of prospecting has been done, and four cross-cuts driven—No. 1, 95 ft.; No. 2, 40 ft.; No. 3, 140 ft.; and No. 4, 40 ft. Several gold-bearing reefs have been cut, averaging 2 ft. in thickness. The prospects are encouraging, and would warrant more exhaustive exploration. Eight men were employed.

Prospecting operations were also carried on in the Golden Opportunity, Bonanza, Waratah, Temple Bar, Scottish Chief, Vulcan, Tararu Extended, Ake Ake, Conservative, Nuhaka, Clunes, Star of Tararu, Mount Taylor, and Lomas.

Scandinavian Mine.—This mine was worked for a considerable part of the year by the Scandinavian Company. A crushing of 145 tons of quartz yielded 55 oz. 1 dwt. of gold; value, £154 2s. 9d. Negotiations are in progress to dispose of this mine to an English company. Seven men were employed.

Kuranui District.

Kuranui Mine (Area, 15 acres).—A considerable amount of work was done in driving at the 70 ft. level, and prospecting on the Oddfellows and other reefs. A parcel of 20 tons crushed yielded gold valued at £4 14s. 5d. Four wages-men were employed.

The Magazine and several other claims have been prospected.

Kuranui-Caledonian.—This mine comprises the Hazelbank and Comer's Kuranui. A tramway has been constructed from the Caledonian shaft to the battery formerly owned by Mr. Comer, and

379 tons of quartz crushed yielded 599 oz. 19 dwt. melted gold, valued at £1,629 14s. 2d. During the year the shaft has been repaired, and is now in good order down to the bottom, No. 4 level (474 ft.). This level has also been cleaned up and repaired to the Big Pump shaft. The drive on the course of No. 1 reef is also being cleaned out, and it is intended to push this drive on and connect with the Moanataiari new shaft. This will give splendid ventilation, and allow works to be carried on to more advantage. The most of the quartz crushed was won from No. 1 level, on reefs known as Darby's, Cross reef, and Kelly's. The battery consists of twenty heads of stampers driven by a Pelton wheel 6 ft. in diameter. Seventy men are employed in the mine and battery.

Moanataiari Mine.—This mine is one of the oldest on the Thames Goldfield. It was opened in 1868, and has been worked continuously ever since. At the time the mine was first opened the area of ground held was only a few acres in extent, but as time went on all the small adjacent claims were purchased by the proprietors of this mine, until the area now held is 95 acres, the whole of which is on the richest belt of this goldfield. A large amount of gold has been obtained from this mine, and dividends amounting to nearly £200,000 have been paid to the shareholders; but this gives a very faint idea of the value of the property, inasmuch as that if the assay-value of the whole of the ore treated from this mine—some of it was opened twenty-nine years ago—had been ascertained it would be found that, owing to the primitive appliances used in the early days, not more than 40 per cent. of the value of the gold the ore contained had been recovered. Although rich bonanzas of auriferous ore have been found from time to time in this mine, a very large amount of dead-work had to be undertaken in the construction of adits, levels, shafts, and winzes to open it up and get the workings properly ventilated, and when rich shoots of ore were worked, the shares rose on many occasions to high prices, and rapidly exchanged hands. The principal object in working the mine was to keep all hands working on the rich shoots, so that large dividends could be paid. A reserve fund was never thought of, to undertake fresh dead-work to open out fresh blocks of ore calls had to be made, and new shareholders, who had purchased shares at high prices with the expectation that the mine would steadily continue a large dividend-paying concern, were not in a position to meet the calls, and this has led to the company being reorganized at three different periods. The last reorganization of the company took place in November, 1896, when the mine and plant were purchased by an English company, with a working capital of £30,000, and which has since been increased to £50,000. This company's head office is in London, and is represented in the colony by its attorney, Mr. Henry A. Gordon, general manager of the Anglo-Continental Gold Syndicate (Limited), the late Inspecting Engineer of the Mines Department. The mine is being well opened up, a large amount of development having been done during the year. No. 2 shaft has been sunk a further depth of 246 ft., making the total depth from the surface 400 ft. The main adit, or Moanataiari Tunnel, was extended, and has now reached a distance of 3,170 ft. from the entrance. In driving the various cross-cuts 950 ft. has been completed, and 2,084 ft. of driving on reefs and leaders; in rising and sinking on reefs 550 ft. has been done. The total quantity of quartz crushed during the year was: For the owners, 5,073 tons, value £1 1s. per ton; and for tributers, 375 tons, value £1 11s. per ton: total value, £5,907 18s. The whole of the crushing plant has been dismantled, in order that a new and improved plant may be substituted. The mine will be so well opened that on completion the new battery can be fully employed. The prospects of the mine are very favourable. The extent of reefs explored and ready for stoping out will, when worked, yield profitable returns, as pockets of rich quartz similar in character to the bonanzas taken out in the past are almost certain to be met with. The increased quantity of quartz that in future will be required to supply the new mill will necessitate taking out blocks of reef that were left because apparently not payable. The average value of the whole when rich pockets are included will give a satisfactory yield. It is highly probable that exploration of greater depths near the Main Slide and under where the heavy deposits of gold were obtained from No. 9 reef will result in the discovery of a continuation of rich patches. The extension of the main tunnel will also enable the well-known rich reefs and leaders to be opened at greater depth than could have been undertaken in the past, and add in a great measure to the extent available for working. The return of gold for next year cannot (unless a very rich pocket is met with) be expected to come up to the yield for 1896, as during the greater part of 1897, until the new mill is ready, no quartz can be treated. Eighty-five wages-men and twelve tributers were employed. The following account of the mine, the new works carried out, and the improved crushing-mill has been furnished by Mr. H. A. Gordon, the resident general manager, and gives a correct description of the whole:—

At the time the present company took over the property the mine was in a very bad condition. All the known shoots of payable ore on the upper levels had been taken out, and the levels, adits, and shafts allowed to fall into a very bad state of repair. The main adit, known as the Moanataiari Tunnel, which was constructed for a distance of 3,070 ft., had to be retimbered and new roadways laid down before workings could be proceeded with in other portions of the mine, this adit being the main highway to get the ore conveyed from all portions of the mine to the crushing-battery. The main adit has been extended for a distance of 100 ft., and a cross-cut constructed from it for 150 ft., where it cut the Reuben Parr reef. This reef has now been driven on for a distance of 110 ft., and will require a further extension of the level of 550 ft. to get under the rich shoot of ore which was found in opening up the level 200 ft. above this, which is termed the 100 ft. level. The total distance to drive on this reef from the present face on the main-adit level to the eastward boundary of the property is 1,200 ft. The whole of this reef where the rich shoot of ore was cut through on the 100 ft. level is intact to the surface, the main-adit level at this point being 550 ft. under the outcrop. This lode has been opened up for a distance of 700 ft. on the 100 ft. level, and also for the same distance on the Point Russell level, ready for stoping as soon as the new mill, which is at present in course of construction, is completed. Among other important works undertaken is the development of the Golden Age reef, one of the principal lodes which traverses the whole of the property. This has been opened out

for a distance of 750 ft., and also for a distance of 100 ft. on the Point Russell level, all ready for stoping, with 200 ft. of available backs. It will also soon be cut at the main-adit level, which, from its course and underlie, will join with the Reuben Parr reef at this depth. A cross-cut has also been constructed from the Golden Age reef, on the 100 ft. level, for a distance of 600 ft., and the Waiotahi lode cut, but very little driving has yet been done on this lode to ascertain its value. In the western section of the mine, which comprises the seaward side of the Great Moanataiari Fault, a new shaft 12 ft. by 5 ft. 6 in. in the clear has been sunk on the south side of the Moanataiari Creek, and is now down to a depth of 400 ft. Two levels have been opened out from this shaft, one at 150 ft. below the main-adit level and another at about 90 ft. lower depth. These levels correspond with the old levels constructed many years ago from No. 1 shaft sunk on the northern side of the main adit. All the old levels have been cleaned out and repaired, ready to stope out the different blocks of ore which were left in the early days on the Caledonian reefs, Nos. 1, 2, and 9. A cross-cut has also been constructed from the main adit to the new shaft, where a chamber is constructed, and where all the ore from the deep levels will be landed and conveyed through the main-adit level to the battery. The new shaft will be sunk another 100 ft., and levels opened out on the Caledonian reefs, which will give about 140 ft. of backs on all these reefs, as no work has been done in any of them below the levels at present opened out. Another important work now in course of construction is a cross-cut from the new shaft at a depth of 250 ft. below the main adit to cut the Waiotahi reef, which is now driven on for a distance of about 160 ft., leaving yet 570 ft. to construct before it will intersect the lode underneath the place where the rich bonanza of ore was found in the Cambria Mine. This will give about 125 ft. of backs on this lode before the reef passes into the Cambria ground, the length available of the reef at this place being about 600 ft.

The whole of the work in this mine is entirely confined to prospecting and development. The object of the company is to thoroughly open up every portion of the mine, so that a large and continuous supply may be got to keep the new crushing-mill, when erected, going. In order to carry out the development works expeditiously, a large air-compressing plant has been erected, capable of working four rock-drills at one time. A new double-cylinder steam winding-engine has been erected at the shaft, the cylinders being 12 in. in diameter, fitted up with winding-drums 7 ft. in diameter, with powerful brakes and a winding-indicator, the steam being supplied from a new multitubular boiler; all of which were manufactured by Messrs. Price Brothers, of Thames. The crushing-mill formerly used by the old company, consisting of forty heads of stamps, two pans, and twenty-one berdans, has been dismantled and removed, and in lieu thereof a new plant is in course of construction by Messrs. Price Brothers, of Thames. A large portion of the old battery building had to be taken down, but this is to be re-erected at the rear of the mill building, where a cyanide plant is to be placed. The new battery consists of sixty heads of the heaviest stamps yet used in the colony; each stamp when new weighs 1,050 lb. These are to be driven at a speed of ninety-five blows per minute, and will be capable of crushing about 4 tons each stamp per day. The stems are made of mild steel, 3½ in. in diameter and 15 ft. in length, and fitted with steel reversible tappets or discs, made on the most modern design, and are held to the stem with three side cotter-keys in each tappet. The mortar-boxes are made on the Homestake pattern, being fitted with copper-plates coated with silver in the feeding-side of each mortar, which has a projecting lip on the inside to prevent any of the ore, as it is fed into the mortars, falling on the plates to damage their surface. The opening in front of the mortars is 4 ft. 8 in. long by 18 in. in height, on the face of which will be placed a wire screen fitted with a wooden frame, and held close to the face of mortar by long taper keys. Each mortar has a base 5 ft. 3 in. in length by 2 ft. in width, the metal in the bottom being 9 in. thick. Inside the bottom of mortar dies of hard steel are placed underneath where every stamp drops, the shoes of the stamps being also made of hard steel. The mortar-blocks are of heart of kauri, each block being 5 ft. 6 in. by 2 ft. 3 in. and 18 ft. long set on end, the bottom of which rests on a ground-sill, bedded in a thick layer of concrete resting on a solid and stable foundation. Considerable difficulty was experienced in obtaining a solid-rock foundation, but wherever this was not reached two rows of heart of kauri piles were closely driven down to a solid foundation, and a thick bed of concrete placed on the top of the piles, on which the mortar-sills rest. The mortar-blocks are all down 9 ft. below the surface of the floor of the building, and filled in with concrete. On each side of the concrete foundation concrete walls are built up to within 10 in. of the level of the top of the mortar-boxes, to support the sills of the trestles connected with the battery framing, and on the top of which the plummer-blocks rest, which carry the cam-shaft. Each battery of five heads is driven separately by a belt, a driving pulley being on one end of the cam-shaft and a corresponding pulley on the counter-shaft, which runs along the whole length of six batteries of five stamps each. The plummer-blocks to carry this shaft rest on the sills of the trestles at the back or feeding side of the battery, a belt-tightener being provided for each belt. Directly over the centre of the battery there is a gauntree fixed about 5 ft. higher than the upper end of the stems of the stamps, on which a traveller runs from one end of each battery of thirty heads, carrying all the appliances for lifting any of the stamps out of or into the mortars when repairs are required, and it is also strong enough to lift the mortar-boxes into or out of the position. The ore-bins are placed at a sufficient height above the mortars to admit of an automatic Challenge ore-feeder being used for each five-stamp battery. The ore-bins, instead of being constructed with the bottom sloping towards the battery, are flat, and run along the whole length of every thirty heads of stamps, and have a holding-capacity of about 400 tons of ore. The object of having the bins constructed in this manner is to admit of them holding a larger supply of ore, to insure the battery being kept continuously running in the event of the supply from the mine being intermittent. The level of the main adit above sea-level would not admit of the mill being constructed entirely on a gravitation system. The ore could not be delivered at a sufficient height to

admit of the grizzly and rock-breakers being placed above the ore-bins. These are placed in a wing of the main building, between each battery of thirty heads of stamps, the distance between these batteries being 28 ft. The ore as brought from the mine is dumped on to the grizzlies, and what does not pass through the bars goes down to the rock-breakers, and, after being operated on by them, passes into the same hopper where the fine material going through between the bars of the grizzly falls; and in the bottom of these hoppers there are ore-gates, underneath which side-tipping trucks are placed, and, when filled, are hoisted up in cages to a platform on a level with the top of the ore-bins by a hydraulic lift, two lines of rails being placed on the top of the bins on which the trucks run to empty the ore where required. There are two rock-breakers, 16 in. by 10 in. face, of the Blake Marsden type; these are driven by a separate Pelton water-wheel. Each battery of five stamps is fitted with an incline table 5 ft. 6 in. wide and 10 ft. long, covered with copper-plate electroplated, and coated with quicksilver, and the pulp from the tables passes on to two concentrators of the improved Frue design; and if the gangue, after passing over these concentrators, proves sufficiently rich it will be lifted by elevators into vats, and treated with a cyanide solution. The concentrates will also be treated either with or without roasting by cyanide solutions, as may be found the most economical. The plant of twenty-one berdans which was in the old mill is to be re-erected, and will be used if found desirable, and the cyanide plant which will be erected at first will consist of three leaching-vats 20 ft. in diameter and 5 ft. in depth, three sumps 15 ft. in diameter and 5 ft. in depth, one solution-tank, one dissolving-tank and air-pump and vacuum boiler, a centrifugal solution-pump, and two zinc-extractors, with all the necessary appliances of a fully-equipped cyanide plant. The building and everything is so arranged that additional vats can be added as required. The whole of this mill, with all the machinery, is to be driven by Pelton wheels, being supplied with water from the county main. A Pelton wheel is to be provided for each battery of thirty heads of stamps, one for driving the concentrates, and another for the berdans, elevators, and pumps. In order to provide for the mill being kept continuously at work, a steam-engine is being erected for use when a sufficient supply of water is not available, or as an auxiliary power whenever required. The engine is one of Davey, Paxman, and Company's right-hand tandem compound horizontal engines, the high-pressure cylinder being 17½ in. in diameter and the low-pressure 20 in. in diameter, provided with automatic expansion gear, special governor and jet-condenser, and air-pump with indiarubber valves. This engine has a stroke of 2 ft. 8 in., and will run at a speed of seventy-five revolutions per minute. It will be capable of giving about 240 indicated horse-power. The engine will be set on a concrete foundation, constructed between the two batteries of thirty heads of stamps. An intermediate shaft will be provided to couple on to the counter-shafts for driving the batteries, and by this means can be connected whenever auxiliary power is required. The steam for the engine is to be supplied by two of Babcock and Wilcox patent water-tube boilers, the steam-drums being 23 ft. long by 3 ft. in diameter, and will be worked up to the pressure of 120 lb. per square inch.

Moanataiari Extended Mine (Area, 27 acres).—Driving on several reefs was carried on in the surface levels, and 15 tons of quartz when crushed yielded 3 oz. 2 dwt. of gold; value, £8 3s. 6d. Six men were employed.

Freedom Mine (Area, 6 acres and 7 perches).—A small party of owners work this ground, but no quartz was crushed.

Orlando Mine (Area, 15 acres).—Operations were carried on by the Orlando Gold-mining Company. One hundred tons of quartz was crushed, yielding 35 oz. of gold; value, £92 3s. 6d. Six men were employed.

New Whau Mine (Area, 47 acres).—Operations were confined to clearing out the Middle Star old adit-level and some of the upper levels, and sinking a winze on a reef to a depth of 80 ft. No quartz was crushed. Nine men were employed.

Moanataiari North (Area, 12 acres 2 roods).—A parcel of 15 tons of quartz yielded 1 oz. 5 dwt. Two men were employed.

New Alburnia Mine (Area, 54 acres 2 roods).—This mine was taken over in October last by the New Alburnia Gold-mining Company, Limited (an English company), previous to which time the old colonial company carried on operations. The following extracts from the report of Mr. Robert James, the general manager, to the London directors will show the nature of the works, and gives a correct description of the mine:—

The property has a splendid reputation. For many years the ground was worked under the old Cornish system of tribute—*i.e.*, a party of miners would take a portion of ground and undertake to pay the company a royalty in the form of a percentage of the mill proceeds of gold or bullion, the company, as a matter of course, being protected and their interests watched by their own agents. I have spoken to a number of miners who in times past did very well out of their tribute work on Alburnia ground, and they all have at the present time a great opinion of the property, and entertain a very high opinion of its future capabilities. It will be asked, "Is it not possible at the present time to procure men to take up ground under tribute?" It is not, for many reasons, the most important of which is that the whole of the property has been honeycombed with previous shallow surface-workings, and a tributer would require to expend a considerable sum of money ere reaching a point that would admit of him exploring virgin ground. The reef—one of many traversing the property—which seems to have produced most gold in the period referred to is the one known as Dixon's, although a large quantity of gold seems to have been obtained from the Sons of Freedom, Star of the South, and Success reefs. There is not the slightest doubt but that the property has been a very highly productive one, and the record of its returns rather under than over estimated. In October, upon my taking over the management for the London company, the workings consisted of a shaft 365 ft. in depth. From this shaft four levels were driven; the three upper levels were practically closed with *débris*, and the only work being carried on was from the No. 4 or bottom level. Here the ends were being driven east and west—the east drive was in about 200 ft. and the west 170 ft.

Taking into consideration the fact that the mine above this level was not only choked by *débris* but practically worked out, there was no other alternative but to sink the shaft deeper, at the same time continuing the ends and sending up a few rises and prospecting stopes from the back of the drive, not only for the purpose of finding payable stone, but for purpose of ventilation. In this work we have been fortunate; not only have we made the necessary connections for the proper ventilation of the mine, but we have taken out some hundreds of tons of stone of a payable character which has been passed through the mill. The stuff taken from the east and west drivages was dumped into the hoppers at surface, and transported by aërial road to the battery. Much of this stuff was of very low grade, but improved in value as we proceeded; but having this cheap means of transportation, coupled with the economical advantage of water-power, the cost of sending it to the stampers was not increased a particle, it being quite as cheap to deposit it at the mill as at the shaft dumps. The work performed at the mine for a considerable period before being purchased by the English company was of a desultory character, possibly from want of working funds, but certainly for the want of a settled policy. The main object of all exploratory work for years past seems to have been the discovery of rich patches which could be worked out quickly, producing phenomenal returns, and resulting in a wild scramble to get shares in order to participate in the general dividend; then, when the faith and adventurism of the shareholders had become exhausted, at the departure of the patch, another tribute would be let, or the company would undertake to do a little dead-work prior to further explorations. This may have suited the times; it most certainly suited the average shareholders, who throughout the whole mining history of the peninsula have shown a great aversity to providing funds, or, more properly speaking, working capital, for the systematic and thorough exploration of mining ground. We are now thoroughly developing and exploring the property. The contract for the sinking of 100 ft. main shaft commencing from No. 4 level, a depth of 365 ft., was commenced on the 16th November and completed on the last day of February. This work (taking into consideration the fact that we used the shaft continually for the hoisting of dirt for the battery) has been rapidly performed. The dimensions of shaft are 10 ft. 6 in. by 4 ft., and it is securely timbered and divided for the operations of two cages. Upon first taking over the property it was not deemed wise to reopen the old portion of the mine above the bottom level, but subsequent discoveries of small leaders, carrying considerable gold, and tending upwards, led us to attempt the task of opening and securing the upper portion of the mine. This we have succeeded in doing, the advantages accruing through same being of the greatest importance, principally the opening-up of an old winze sunk 110 ft. deep upon the foot-wall of a reef at a point several hundred feet west of No. 4 level. We are now on the eve of the completion of sinking the shaft to a depth of 465 ft., and before cutting chambers, &c., are going to start a drive south to connect with the bottom of this winze and an old level. This work is intended not only for ventilation and communication, but to intersect a reef which in former days, and before the present cheap transportation was possible, was thought too poor or of too low a grade for extraction. Our plant at the present time may be classed as obsolete—that is, as far as the battery and amalgamation tables are concerned; but the Denny pans and berdans are capable of doing excellent service, their results being very satisfactory. With the plant, old as it is, we have been enabled to give the mine a thoroughly good practicable test—such a test as could not be possibly obtained under any other conditions. We hope in the near future to open up sufficient ore bodies to warrant the erection of a first-class modern plant with all the latest improvements. The low-grade ores of this mine are difficult to treat, the stone being highly mineralised, containing a large percentage of iron-pyrites, with small quantities of copper-pyrites, galena, and zinc-blende. The ores cannot be directly treated with cyanide, but from a number of experimental tests made by Mr. Allen, of the Thames School of Mines, and Mr. Henry Allom, a gentleman who has had a unique experience in the use of cyanide, we have concluded that after the ores have passed completely through the mill and before being exposed to the air the tailings can be successfully treated with potassium-cyanide. Although our ores are low grade, we possess the great advantages of cheap transportation and water-power, and are enabled to work them at an average cost of 3s. 6d. per ton. As a matter of fact, during stoping and general explorations we occasionally find small bunches of rich stone which materially assists the average value of the stone passed through the mill. The general character of the stone is also improving, as will be perceived from the monthly returns. Although our mining plant is not everything that could be desired, it is still equal to doing much more good service. The shaft since the completion of the last contract is now down to a depth of 465 ft., securely timbered throughout, contains a man-way, and is operated by two patent safety-cages, which are changed alternately, as, owing to the destructive nature of the water, it becomes necessary to look closely after all steel and iron material. As a matter of fact, since the property was taken over by the London company we have had nothing to face back upon to keep the battery employed but old ground. This has led to the reopening of the old portions of the mine, and thorough ventilation, and before long we shall have several good exits to the surface. It may therefore be said with truth that the future history of the mine will commence with the opening-up of the No. 5 or 465 ft. level. The amount of quartz worked and the yield of gold therefrom was as follows: November, 1896—235 tons ordinary quartz, 57 oz. 15 dwt. melted gold; December, 1896—285 tons ordinary quartz, 100 oz. melted gold; January, 1897—365 tons ordinary quartz, 144 oz. 2 dwt. melted gold; February, 1897—215 tons ordinary quartz, 107 oz. melted gold; March, 1897—304 tons ordinary quartz, 150 oz. 10 dwt. melted gold. The total number of tons worked to end of March was 1,404; and the total return of bullion 559 oz. 7 dwt., value £1,482 5s. 6d. It will be seen that the general character and value of the stone has gradually improved. The following are the particulars of the working on reefs: 1896—Driving, 292 ft. east, 180 ft. west; sinking, 49 ft. 1897—Driving, 226 ft.; sinking, 51 ft. This work is exclusive of stoping and all dead-work. Twenty men are employed.

Darwin Mine (Area, 8 acres).—This mine is situated at Punga Flat. There are not less than nine reefs and leaders in the ground, varying from a few inches to 2 ft. in width. The claim has been worked by different parties during the past twenty-eight years, and, as it lies at an altitude of 1,500 ft., it is highly probable that gold will be traced to greater depths in low levels. Twenty loads (30 tons) of quartz were crushed, for 56 oz. 10 dwt. of gold; value, £158 17s. Five men were employed.

Prospecting operations have also been carried on in the Alburnia East, Caspian, City of London, Just-in-Time, and European Claims.

Grahamstown District.

Victoria Mine (Area, 41 acres 3 roods 10 perches).—The chief workings during the year were conducted from the shaft formerly known as the Prince Imperial. The reef averages 1 ft. in thickness, and yields some rich pockets of picked stone; 2,089 tons of quartz was crushed, for 2,174 oz. 3 dwt. of gold, valued at £6,149 17s. 3d.; tailings sold valued at £18 19s. 6d.; and for tributers 20 tons for 3 oz. 15 dwt., value £10 4s. 3d: total, £6,179 1s. The shaft is furnished with safety-cages, and the winding machinery is driven by a semi-portable engine, Robey make, 18-horse power. Forty-two men were employed.

Cardigan Mine (Area, 64 acres 2 roods).—Prospecting work was carried on from the Saxon shaft, and a parcel of 16 tons 10 cwt. of quartz yielded 3 oz. 5 dwt. The company is now sinking a shaft opposite the Thames *Star* office. Six men were employed.

Drainage.

Drainage of the deep levels is carried on by the Thames Drainage Board, the Big Pump shaft being used. The working manager reports that the consumption of coal for the year ending 31st December last was 2,459 tons. The following extracts from the annual statement of accounts show the financial position of the Board, and also the contributions from the different companies assessed:—

Receipts.

	Arrears.	Assessment.	Rebate.	Cash received.	£ s. d.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
To cash balance as per last balance-sheet					192 14 3
May Queen Gold-mining Company		1,620 0 0	202 10 0	1,417 10 0	
Waiotahi		645 0 0	80 12 0	564 8 0	
Moanataiari		354 8 0	44 6 0	310 2 0	
Victoria		349 13 0	43 13 0	306 0 0	
Cambria		302 8 0	37 16 0	264 12 0	
Hazelbank		233 2 0	29 2 8	203 19 4	
Cardigan		180 0 0	22 10 0	157 10 0	
Kuranui-Caledonian		142 11 0	17 16 4	124 14 8	
Kuranui		90 0 0	11 5 0	78 15 0	
Thames-Hauraki		60 0 0	7 10 0	52 10 0	
Kuranui No. 2		52 0 0	6 10 0	45 10 0	
		4,029 2 0	503 11 0	3,525 11 0	3,525 11 0
Queen of Beauty Claim	360 0 0	60 0 0	295 0 0	125 0 0	
Thames Borough Council	20 0 0	120 0 0		130 0 0	
Thames County Council	40 0 0	240 0 0		260 0 0	
	420 0 0	4,449 2 0	798 11 0	4,040 11 0	515 0 0
Coal supplied companies					102 13 7
					£4,335 18 10

Expenditure.

	£ s. d.
Painting and renovating building	46 13 9
Coal	1,640 12 11
Wages	1,123 0 8
Foundry-work and ironmongery	261 14 4
Cartage	220 16 1
Water-supply, timber, and gas	125 10 0
Board fees and travelling-expenses	193 4 0
Salaries, insurance, advertising, &c.	136 15 10
Miscellaneous	38 9 6
Balance	549 1 9
	£4,335 18 10

At the meeting Mr. Radford asked how the cost of coal compared with previous years. The chairman said the matter had been gone into from time to time, and it had been found that the figures came out in favour of New Zealand coal. As a matter of fact, only local coal had been used for the past two years, which in itself was sufficient proof.

A test was made recently of coal from Westport, Hikurangi, and Ngunguru, with the following result: Westport, 6 tons per day of 24 hours, at 19s., £5 14s.; Hikurangi, 7½ tons per day of 24 hours, at 11s. 9d., £4 8s. 1d.; Ngunguru, 6½ tons per day of 24 hours, at 12s. 5d., £4 0s. 9d. By this you will perceive that Ngunguru is the cheapest coal for our purposes, and, in addition, it is also the easiest on the fire-bars.

Waiotahi District.

Waiotahi Mine (Area, 22 acres 3 roods 30 perches).—This mine still continues to be a dividend-paying one. The nature of the work carried on is of the same character and in like manner as has

been the case for the past ten years—driving and stoping on the reefs and leaders between Nos. 1, 2, and 3 levels in the main shaft, and on the large reef between Nos. 1 and 2 levels in the Mary Ann shaft. The mill consists of twenty-one stamps, 6 cwt. each, and five berdans, and is driven by a 16-horse-power steam-engine. Twenty stamps were run for three hundred days, crushing 1,613 tons of quartz. This is the only mill on the Thames driven by steam-power, all the others using water-power. The gold obtained was 2,057 oz. 5 dwt., value £5,606 0s. 1d., for the company, and 261 tons, for 342 oz. 4 dwt., value £932 9s., for tributers. Twenty-one wages-men and four tributers were employed.

Nonpareil Mine (Area, 21 acres).—This mine includes the ground formerly known as the Little Maggie, and is now held by an Auckland company. A considerable amount of work has been done in cross-cutting and driving on the reef, but no returns of gold have been made since the company acquired the ground. Eight men were employed.

Cambria Mine (Area, 15 acres 2 roods 17 perches).—This mine was worked by the Cambria Gold-mining Company until December last, when it was disposed of to the Anglo-Continental Gold Syndicate, who will add it to the Moanataiari Mine. The following extract from the account of the annual meeting held shows the transactions, and gives an account of the yield of gold for the year up to that date:—

Receipts.	£	s.	d.	*Disbursements.*	£	s.	d.
Calls received	1,711	17	2	Bank overdraft from last year	556	12	5
Gold won from 128 loads quartz, yielding 203 oz. 7 dwt. gold, for	552	12	4	Wages paid at the mine	956	4	0
Public crushing	227	6	0	General charges, including mining requisites	795	14	0
Old copper sold for	12	16	0	Battery charges, including wages ..	264	19	7
Bank overdraft at this date	68	18	6				
	£2,573	10	0		£2,573	10	0

On the 20th November ultimo your directors received from the extraordinary general meeting of shareholders called for the purpose full authority to dispose of the company's property. Thereafter they received an offer from the Anglo-Continental Gold Syndicate (Limited) of 7,450 shares fully paid up to £1 in the Moanataiari Gold-mining Company (Limited) for the company's property. The offer was duly considered in your interest, and was accepted on condition that the shares are placed on the Moanataiari colonial register as soon as the scrip can be received from London. When the directors receive the scrip, which will give one share in the Moanataiari for every six held in the Cambria, the property will be handed over, and the shares will be duly allotted. Your directors consider that they have done as well as could be expected, as the operations at the mine involved making calls to work at a greater depth, which requires capital. For the present year 93 tons 10 cwt. of quartz was crushed, for 154 oz. 5 dwt. gold; value, £408 15s. Eight men were employed.

West Coast Mine.—The mine is worked by the owner, Mr. John Northey. His operations are chiefly confined to working small veins in the upper portion of the ground. 25 tons of quartz was crushed, for a yield of 17 oz. 10 dwt., valued at £46 7s. 6d. Two men were employed.

Fame and Fortune Mine (Area, 71 acres 3 roods 19 perches).—This mine is now the property of the Hauraki Golden Age, an English company. The chief work done during the year has been driving on and opening up the reefs at four different levels. The Golden Age reef, being a large body, is being cut through in different places to ascertain the width of quartz and value preparatory to the erection of a new battery and aërial tramway from the mine to the mill. The new mill is to consist of forty stamps and two stone-breakers, to be driven by both steam- and water-power. The method of treatment of the tailings after passing over amalgamation copper-plates has not yet been decided on. A parcel of 27 tons was crushed, for 6 oz. 3 dwt.; value, £16 5s. 11d. Fifteen men were employed.

Prospecting has also been carried on in the New Caledonia, Cumberland, and Cumberland Extended Claims.

Waiokaraka District.

The Queen of Beauty section of the Thames-Hauraki Goldfields Mine consists of an area of 47 acres. The chief work carried on during the year has been enlarging the shaft to a depth of 425 ft., and in making preparations for the erection of the new machinery and pump. Forty men were employed. The importance of this work towards the development of the reefs at deep levels cannot be overestimated. The plant which is being erected is of a substantial and efficient character, and shows the intention of the owners to provide ample power for drainage of the country to a depth of 2,000 ft. The cost of the undertaking will be great, and the subsidy of £25,000 provided by the Government is being fairly earned, the amount already paid towards the work being £2,593 11s. 1d. The advantages from the drainage of this portion of the field as the sinking progresses will be first realised by the May Queen Company, which, as soon as the shaft is completed to a depth of 650 ft., will be enabled to open a new level and work a large block of ground under the rich quartz taken out at the No. 4 level. The following description of the works and new machinery, furnished by Mr. H. A. Gordon, who is supervising, will be of interest as showing the requirements for the construction of an extensive plant suitable for deep mining and drainage:—

This company has widened the Queen of Beauty shaft to a depth of 426 ft., the dimensions of the shaft being 17 ft. 6 in. long by 8 ft. 6 in. in the clear. It is timbered with frames of 16 in. by 12 in. heart of kauri timber. These frames are placed 4 ft. apart, with upright studdles in the corners of 16 in. square, and lagged behind the frames with 2 in. planking. At 300 ft. the shaft is widened out to 17 ft. 6 in. by 16 ft. 6 in., to provide for space at the change of lifts, which takes place at every 327 ft. At one end of the shaft there is a division of 8 ft. 6 in. by 4 ft. 6 in. to provide for the winding compartments. A new set of poppet-heads is erected, having caps each capable of

bearing a working transverse strain of over 400 tons. The legs are about 2 ft. 6 in. square at the bottom, having a slight taper up to the top. They are about 90 ft. long, well braced and stayed, and capable of resisting the greatest strain that they can ever be subjected to, even if a whole column of pipes were slung from the top. The foundations for the pumping-engines and pump quadrants are all in one solid block, made of concrete, of one part of best Portland cement to five parts of broken metal and sand, enough sand being used to fill up all the interstices. The portion the engines are fitted upon is 61 ft. 6 in. wide by 67 ft. 2 in. long and 20 ft. in depth; and the foundations for the pump quadrants are 12 ft. by 12 ft. and 12 ft. deep on each side of the shaft, with a wall of concrete joining these two blocks 4 ft. thick. The whole of the foundations are built in a homogeneous mass, and form one block, having a weight of about 5,891 tons. Portions of the foundations are on the solid rock, and where this could not be obtained rows of piles were driven into the ground until the rock was reached, and the concrete put on the top of them.

The foundations for the winding-engine and capstan-engine are all in one block, only the winding-engine foundation stands at a level of 4 ft. above the level of the foundation of the capstan-engine. The foundations are 5 ft. long by 26 ft. wide and 12 ft. deep on the place where the winding-engine is fixed, and 8 ft. deep where the capstan-engine is placed. This foundation is made of one block of homogeneous concrete, of the same strength as that already mentioned for the foundations of the pumping-engine, the weight of this block being about 971 tons. A concrete foundation of 16 ft. square and about 4 ft. in thickness was made to commence to build the brickwork. The stack is built in a square shape with bricks, and is 103 ft. 6 in. high, being 7 ft. 3 in. square at the top. A large flue is built of brick to connect the different boiler-flues with the stack. A concrete foundation is made for building in ten boilers 99 ft. 6 in. long by 40 ft. wide. All the flues, wherever subjected to great heat, are built of firebrick, and all the flues from the boilers connect with a main flue, which is constructed at the back end of the boilers, large enough for a man to pass through to clear them out at any time.

The pumping-engine is to consist of one pair of horizontal compound condensing engines, the high-pressure cylinder being 31 in. and the low-pressure 59 in. in diameter, both with 5 ft. stroke. Each cylinder is steam jacketed, and placed side by side with receiver and auxiliary steam-valve on low-pressure cylinder, and working on the cranks at right angles. Steam-chests are fitted at each end of both high- and low-pressure cylinders with variable expansion-valves worked direct from the crank-shaft and variable by hand, the range of cut-off being from nothing to five-eighths stroke. All glands and bushes are lined with gun-metal, and the glands and cylinder covers are polished outside. The piston-rods are carried through each cover. The cylinders and steam-chests are coated with asbestos, slag wool, and timber, and covered with planished steel plate secured by polished brass belts 2 in. wide, fixed with set screws. The cylinders are drained by a cock at each end, and the steam-chests are drained by cocks placed in suitable position. Each end of the cylinders is fitted with 2 in. spring relief-valve; also a side-feed lubricator, with a capacity of one pint (1 lb.), is fitted to each cylinder. The steam-receiver is placed between the cylinders, steam-jacketed and lagged with asbestos, slag wool, and timber, covered with sheet steel. This is drained by a cock connected to the same way-shaft as cylinder cocks. The jacket is also drained by an ejector. The throttle-valve is of double-beat type, with seatings of gun-metal. The governor is of the high-speed Porter type, controlling the supply of steam according to requirement, maintaining regularity of movement, and set so that the speed of the engine will reach thirty-four revolutions per minute. The piston bodies are made of cast iron, 8 in. deep in centre and $7\frac{1}{4}$ in. at the edges. They are attached to the rods by recessed nuts screwed upon the rods, and are fitted with steel coils and cast-iron junk-rings. The piston-rods are of forged steel, and of sufficient length to project through both ends of cylinders, and are secured to front and hind cross-heads by steel cotters, having a solid collar forged on for attachment to piston, to which it is screwed, the diameter of the piston-rod being 5 in. The cross-head and gudgeon are made of hammered steel, bored taper to receive the piston-rod, to which it is cottered. The cross-head has cast-iron slipper-blocks, each 21 in. long by 6 in. wide. The gudgeon is of forged steel, $6\frac{1}{2}$ in. diameter by 8 in. long in the journal, shrunk into cross-head, and fitted with steel key. The cross-head for tail-slide is also of steel, into which the piston-rod is fitted. The cross-head also receives the links actuating the air-pump and circulating pump levers. The connecting-rods are of hammered steel, polished all over; the cross-head end is made adjustable with gibs and cotters, fitted with heavy gun-metal steps; the crank-pin end is worked from the solid, fitted with gun-metal steps, adjusted by means of cotters and set-screws. The length of each connecting-rod is 13 ft. 6 in. centre to centre, being $5\frac{1}{2}$ in. diameter at cross-head end, 6 in. diameter at crank-pin, tapering to $7\frac{1}{4}$ in. diameter in the middle. Large gun-metal lubricators are fitted at each end of the rod. The crank-pin bearing is $7\frac{1}{4}$ in. diameter and 9 in. long. The crank-shaft is made of the best hammered steel, turned and key-grooved if necessary, its bearings being $13\frac{1}{2}$ in. diameter and 20 in. long. The length between centre of engine is 16 ft., and the shaft is swelled in the centre to 16 in. diameter, on which the fly-wheel and spur-pinion for driving pump gearing are placed. The cranks are also made of best hammered steel, machined and polished all over, and are also keyed on at right angles on each end of the shaft. The crank-pins are $7\frac{1}{4}$ in. diameter and 9 in. long; these are forced into the crank by hydraulic pressure, and afterwards riveted over. The eccentrics for working the valve motion are made of cast iron in halves, with adjustable rods of brass, and made with clips to join the eccentric rod with butt ends. All the valve motion rods and spindles are made of the best hammered steel, and all the bearings are of gun-metal made adjustable. The fly-wheel is 15 ft. in diameter, 20 in. wide on the face, and turned on rim and edges. The two halves are bolted together, and further secured by wrought-iron hoops shrunk on the bosses, the weight of the fly-wheel being about 20 tons. This wheel can be used for belt-driving if required. It is also fitted with a spur-ring for barring purposes, and a barring-engine with a pair of cylinders 10 in. diameter is to be fitted on to plates, and bolted to foundations, with all necessary pipes, lubricators, and drain-cocks. A spur-pinion is fitted on the

crank-shaft for driving the spur-wheel on the pump-shaft. This pinion is made in two halves, and turned together, having twenty teeth, 8 in. pitch and 21 in. wide, shrouded up to pitch-line. The engine-bed is made of heavy cast-iron box girder section, having a depth of 18 in. and a width at the narrowest point on the top of 10½ in., and 15 in. over beading at bottom. Each bed is made in two pieces, firmly bolted and joggled together. The beds are planed all over on the bottom, and also faced where the cylinder slide-bars and pedestals rest.

The air-pump is worked from the tail-slide of the high-pressure cylinder by means of steel levers, shafts, and links, the shafts to oscillate in gun-metal bearings, and the ends of the links are fitted with gun-metal bushes. The air-pump body is made of cast iron lined with gun-metal, having the pump-bucket also made of same material. The air-pump rod is made of Muntz metal, having the foot-valves and seatings of brass. The bucket-valve and delivery-valve are made of indiarubber. The hot well at the top of the air-pump is covered over to prevent water flowing into the foundations. The circulating pump is worked from the tail-slide of the low-pressure engine in a similar manner to the air-pump, and is double acting, of sufficient size to maintain a constant supply of water to the condenser. All the valves, seatings, plunger, and liner for pump-barrel are of gun-metal. The condenser is of the surface-condensing type, having a cooling surface of 2,450 square feet, with tubes of 1 in. in diameter outside and 19 w.g. thick, secured at both ends with screwed brass glands and nipples. The tube plates are of brass 1⅛ in. thick, and are stayed together by five gun-metal stays. The condenser body is of steel plates and angles, and the joints lapped and on top. A single-acting feed-pump, with gun-metal seatings and valves, is provided to supply feed-water for seven boilers, and is worked from the same levers as the circulating pumps. There are ten boilers, of the Lancashire double-flued type, each 7 ft. in diameter and 30 ft. long, constructed so as to carry a daily working pressure of 120 lb. to the square inch. The plates for the shell are of Siemens-Martin steel, 5 in. thick; the longitudinal seams are butt-jointed, with inside and outside cover-plates. The circular seams are lap-jointed, and zigzag riveted. All the rivets are $\frac{13}{16}$ in. diameter, $\frac{7}{8}$ in. holes, $1\frac{5}{16}$ in. pitch. The circular seams have a lap of 3¾ in., and the covering-plates for longitudinal seams are 8 in. wide and $\frac{5}{8}$ in. thick. All the holes in the boiler are drilled, and plates bent and ready to put into position on landing in the colony, and also all the plates planed on edges; each belt of plating or ring of the shell is all in one plate. These were sent out to the colony in pieces, and the boilers are now being riveted by Messrs. Price Brothers at the Thames. The flues are 2 ft. 9 in. internal diameter, except the last two rings of plates at the back. The last plate is 2 ft. 3 in. in diameter, and the second to that tapers from 2 ft. 9 in. to 2 ft. 3 in. All flue-plates are of steel, ½ in. thick, welded longitudinally, and flanged outwards at the ends; each length is connected by a solid welded ring, which takes all the rivets out of the action of the fire. The ends of the boilers are also made of Siemens-Martin steel, in one plate, $\frac{11}{16}$ in. thick. The front plate is attached to the shell by an angle-iron ring 4¼ in. by 4¼ in. by $\frac{11}{16}$ in., and the back plate is flanged to meet the boiler. The ends are stayed by means of strong gusset-plates fastened by double angles to shell and end plates. There are five gussets above the flue and two below. These stays are not brought too close to the furnaces, sufficient space being allowed for expansion. The ends are further stayed by two longitudinal stays, 2 in. diameter, extending from end to end of the boiler, and securely fastened by nuts and washers inside and outside of end plates. Each boiler has a dome on its third ring from front 3 ft. in diameter and 3 ft. high, solid welded, and flanged to meet the boiler shell; the top is fitted with an angle-iron ring 3½ in. by 3½ in. by ¾ in. The top plate is 1¼ in. thick, on which the shut-off and dead-weight safety-valves are placed. The hole in the boiler shell to which this dome is riveted is 1 ft. 10 in. diameter, and has a strengthening ring added in the boiler under the dome. A strong steel man-hole is riveted on to the top of the boiler on the second ring from the back, and has a strengthening ring underneath, fitted with covered dogs and bolts. On the top of each dome there is a steam stop-valve, 6 in. diameter, with gun-metal spindle, valve, and seating; also a dead-weight safety-valve, 3 in. diameter, which is used when steam is at 120 lb. pressure. Each boiler is fitted with two check feed-valves, 2½ in. diameter, with iron body and gun-metal working-parts. A horizontal internal pipe projecting for 12 ft. into boiler; also one gun-metal blow-off cock, 2½ in. diameter, with compound glands, and one taper connecting-pipe fitted to cast-steel mountings on underside of boiler shell. Two sets of asbestos packed glass gauge-cocks, with ¾ in. glass; flanges being 4¼ in. diameter, fixed on steel bases. One brass pointer to show working-level of water in boiler. One pressure-gauge, with 9 in. dial, indicating up to 250 lb. per square inch, fitted with syphon and tap, and one fusible plug in each flue. There is also sent along with each boiler one of Howl's patent hot-blast forced-draught furnaces, which is to be fitted to each flue, having a grate 8 ft. long. These, however, are not at present fixed on to the boilers. One of these will be fitted on to see what difference, if any, it will make in regard to its economy in using fuel before fitting them on to each boiler. Three of these boilers are now fitted together, and are in course of being built in, while the whole of the plates for the boilers are landed at the Thames, and are being fitted up at Price Brothers' foundry as quickly as possible. With reference to the whole of the machinery in connection with this pumping plant, only some of it has yet arrived, but the greater portion is now in course of transit from England.

The second motion shaft is to be of the best hammered steel turned all over; the bearings are 20 in. diameter and 30 in. long, three of these being in the shaft. The shaft is swelled in the centre to 22 in. to receive the spur-wheel. The weight of this shaft with solid crank is 18 tons. The spur-wheel, which fits on to the shaft, has seventy-two teeth 8 in. pitch and 21 in. wide shrouded up to pitch-line. There are to be two sets of pumps in the shaft, each plunger or draw-lift being 25 in. in diameter, having a single rising main 20 in. in diameter; these are fitted so that a change of lifts will occur at every 327 ft. of vertical height. All rods and connections are of sufficient strength to admit of sets of pumps being added to lift 2,000 gallons of water from a depth of 2,000 ft. The draw-lift pumps are of the open-bucket type, 25 in. in diameter, and suitable for a stroke of 6 ft. The barrels are made of cast iron, truly bored, and fitted with strong suction-valve boxes of

cast iron, having large man-holes for inspection of suction-valves. The suction-valves are so arranged that they may be fished and withdrawn through the rising main if necessary. At the top of the working barrels are strong iron boxes, or what may be termed door-pieces, having man-holes for convenience in inspecting and removing the pump-buckets. All the flanges are strongly ribbed, and the man-hole mouthpieces have wrought-iron hoops shrunk around the flanges. The suction-valves are made of gun-metal of double-beat type; the seatings are fitted into tapered seats in valve-boxes. The valve-wings are set to give the valves a screw lift. The pump-buckets are made of gun-metal, fitted with delivery-valves of double-beat type, having a screw lift. Each bucket is to be packed with three gun-metal packing-rings, turned larger in diameter than the bore of the pump-barrel, cut on circumference, and sprung into place, stop-pieces being fitted on to each ring. The plunger-pumps are 25 in. in diameter, with a stroke of 6 ft., the pump bodies being of cast-iron, and strongly ribbed at all flanges, with hoops shrunk on all openings, and fitted with strong sludge-doors and -cocks. Strong brackets are cast on pump body for attachment to supporting girders. The plungers are of hard close-grained cast iron, truly turned and solid. Automatic shifting-valves are placed on the top of the plunger-pump barrels. Cast-iron air-vessels are also fitted between the delivery-valve boxes and the rising main, to withstand the same head- and test-pressure as the pumps. The air-vessels have long narrow necks, and are provided with an approved arrangement for replenishing and maintaining the air in the vessels. Each pair of plunger-pumps delivers into one rising main of 20 in. internal diameter, made of cast iron of sufficient strength to withstand the pressure they have to sustain, each pipe being in 12 ft. lengths. They are all coated with Dr. Angus Smith's preparation, and are tested to withstand a hydraulic pressure of 250 lb. per square inch. The branches from the delivery-valve boxes of the plunger-pumps are connected together and to the rising main by strong cast-iron pipes, upon which the air-vessels are seated. These branch pipes are sufficiently strong to withstand the pressure due to a water-head of 327 ft. The spear-rods are on the road out from England, made of iron, 10 in. in diameter; but it is questionable whether these will be used. The company here prefer to use spear-rods made of kauri, having strap-bolts, brackets, and connections, which will be constructed here. The top of each spear-rod will be fitted with gun-metal steps, skeleton straps, gibs, and cotters, with all necessary plates and bolts for connecting the bearings to the top spear-rods. These rods will be made of such a strength to resist a strain sufficient to raise 2,000 gallons of water from a depth of 2,000 ft. Wrought-iron girders are being constructed to support the pumps in shaft. This was not included first in the contract, but the engineer who drew the detailed plan at Home considered that these would be preferable to beams made of timber, and would give more room in the shaft. A hand-power travelling-crane is to be fixed on supporting columns in engine-house for the purpose of erecting and overhauling the different parts of the engine. This crane is sufficiently strong to lift and readily handle a load of 12 tons, and is placed on timber gantries supported on cast-iron columns, being 30 ft. from centre to centre of longitudinal rails, fixed at a height suitable for a lift of 18 ft. clear from the engine-house floor, the gantries running transversely across the engine-house from wall to wall, and the crane is arranged for hoisting and travelling longitudinally and transversly; all motion to be capable of being put into gear independently or at the same time, and actuated from platform on the main crane girder. The pumping-engine is to be utilised to drive a dynamo to supply power to work a forty-stamp battery, having an electric motor in the stamp-mill. The dynamo to be series wound, and to develop 55,000 watts at a speed of 700 revolutions per minute, the electro-motive force of the dynamo being from 300 to 500 volts, according to the distance through which the power has to be transmitted to the milling plant. The magnet limbs of the dynamo are to be either made of soft wrought iron or a special quality of cast steel, as made by Edgar Allen and Co., Sheffield. The armature is built up of soft wrought-iron plates insulated from one another by paper or varnish, and mounted on a strong gun-metal hub, which is securely attached by keys to the shaft, there being no bolts through the armature core-plates, but they are held together by end pressure. The wire has a conductivity of 98 per cent. of pure copper, and insulated with double cotton, well protected from all contact with the body of machine. There are six brushes mounted on a brush-holder capable of rotating round the bearing-end, with suitable means of fixing it in position when the right lead is obtained—*i.e.*, whether the pole-pieces are at each side of the armature or at the top and bottom the brushes will touch the commutator in a horizontal line. The commutator is to be constructed so as to have a high conductivity of solid-drawn copper bars, insulated with mica and fixed in the commutator brush. The spindle is of the best mild Siemens-Martin steel, with provision made for securing the armature hub. All the bearings are of cast iron and bushed with phospor-bronze, with all necessary oil-cups and means of lubrication. The bed-plate is made of strong cast iron, and extended to take a third bearing, with suitable attachments for the belt striking gear, complete with side-rails, tightening-screws, &c. The motor is in all respects similar in design to the dynamo, with the exception that there is no loose pulley and striking-gear, and is capable of giving out 68 brake horse-power at the motor-shaft with 55,000 watts at the terminals at a speed of 650 revolutions per minute. Dynamo and motor are fitted with eye-bolts screwed into magnet yoke for lifting purposes. The switchboard is constructed of ample strength, and contains volt and ammeter, the ammeter being provided with a cut-out plug of negligible resistance. All cables are of sufficient strength for carrying the current at more than 1,000 amperes per square inch density. The countershaft for dynamo is driven from the main pumping-engines when the engines are working below their power, and is arranged so that the dynamo can be stopped for a short period when required, leaving the whole line of shafting and straps running.

An electric-lighting plant is provided, having a separate engine of 10 brake horse-power when working at 100 lb. per square inch. This engine drives a dynamo, compound wound, of sufficient capacity for 2,000 candle-power and 75 16-candle-power, the speed of the dynamo being from 1,250 to 1,350 revolutions per minute. It is provided with one spare armature and six spare brushes.

A separate compound engine is provided for air-compressor and rock-drills, having cylinders of 16 in. and 31 in. respectively, with a 36 in. stroke, the air-compressor being of the coupled compound type, the air-cylinders being also compounded, having 31 in. and 19¼ in. diameter respectively. A water-jacket is fixed around the air-cylinders, the water being admitted by a perforated pipe in the bottom, and overflowing at the top. The compressed air is delivered into an intermediate cooler, made of steel, of sufficient strength to withstand a working-pressure of 60 lb. per square inch, having an air-space of 75 cubic feet, and a cooling surface of about 140 square feet. The small air-cylinder compresses the air from 90 lb. to 100 lb. per square inch. The inlet-valves are connected to the cooler by an ample-sized pipe. Both air-cylinders have large lubricators and all necessary lubricating arrangements for the valves. The air is delivered into a receiver having a capacity of 300 cubic feet; it is constructed of steel, and tested to 170 lb. pressure to the square inch, and fitted with safety-valve, drain, pressure-gauge, manhole-door, and cover, and attachment for air-pipe from air-cylinder. An independent surface condenser is supplied, having a cooling surface of 500 square feet; the tubes are ⅝ in. in diameter, made of brass, and fixed by means of screwed glands and nipples, all parts being sufficiently strong to withstand a pressure of 50 ft. head of water. The plant is capable of working twelve sets of drills, with which it is provided. These drills are also supplied with twelve stretcher-bars; twelve universal clamps; twelve 50 ft. lengths of flexible hose, lapped with tarred marline, and brass fittings; twelve G.M. main cocks, with couplings; and one set of drill-sharpening tools. The whole of the work is progressing as fast as it is possible to get it done. The manager, Mr. T. A. Dunlop, is indefatigable in his exertions to push on the work, and Mr. Hughes, the engineer, who was sent out by the contractors, is always on the ground superintending the operations, and getting out detail designs for the different arrangements of the machinery.

May Queen Mine (Area, 73 acres 1 rood 18 perches).—The mine was early in the year disposed of to the Anglo-Continental Syndicate, who again disposed of it to the May Queen Hauraki, Limited (an English company), under which ownership it is now held and worked. The following extracts from the account of the annual meeting of the May Queen Gold-mining Company (Limited) gives particulars of the transaction, &c. :—

Receipts.	£	s.	d.
Cash balance from last year	3,249	16	7
Gold won from 1,250 loads quartz, 1,186 oz. 7 dwt., sold at	3,312	4	2
Public crushing	11	18	0
Haulage	94	16	6
Winding-rope sold for	40	0	0
Cash received from Anglo-Continental Gold Syndicate (Limited)	764	4	11
	£7,473	0	2

Disbursements.	£	s.	d
Wages paid at the mine	2,080	9	7
General charges, including mining requisites	2,344	18	0
Battery charges, including wages	375	2	10
Cash paid for Hidden Treasure Claim	40	0	0
Cash refund, proceeds of gold paid to Anglo-Continental Gold Syndicate (Limited)	214	11	9
Dividend (1) at 6d. per share paid	1,975	0	0
Dividend (2) at 1d. per share paid	329	3	4
Cash balance in bank	113	14	8
	£7,473	0	2

At the date of the last annual meeting of shareholders negotiations for the sale of the company's property with parties previous to that date were drawing to a close, and afterwards entirely ceased, leaving the directors free to commence afresh. Your directors thereafter, on the 9th April, 1896, received a proposal from Mr. Moss Davis to place the property locally, through the Anglo-Continental Gold Syndicate (Limited). The following offer from the latter was received through Mr. Davis: "Anglo-Continental Gold Syndicate (Limited), Bank of New Zealand Chambers, Auckland, 5th June, 1896.—The Directors, May Queen Gold-mining Company (Limited).—GENTLEMEN,—On behalf of the Anglo-Continental Gold Syndicate (Limited) I agree to purchase your company's property on the following terms: (*a.*) The purchasing company to have a capital of £200,000, in 200,000 shares, of £1 each. (*b.*) Your company to receive 82,000 fully-paid-up shares. (*c.*) A working capital of £30,000 to be provided by the purchasing company, and paid in manner following: (1.) £7,500 cash down, and the balance as required. (2.) The titles to the property to be held in escrow by the Bank of New Zealand, Auckland, until the whole of the working capital be provided by the purchasing company. Your shares as vendors to be pooled *pro ratâ* with the English shares for nine months at a price of not less than £1 per share. I guarantee the due performance of the above conditions, and the completion of the purchase on the above terms.—HENRY A. GORDON, General Manager." Mr. Gordon's offer on behalf of the Anglo-Continental Gold Syndicate (Limited) was accepted, as under: "Office May Queen Gold-mining Company (Limited), Auckland, 5th June, 1896.—DEAR SIR,—I have the honour to acknowledge the receipt of your letter of this day's date, containing an offer for this company's property, and to state that the same was laid before the Board of Directors at a meeting specially convened for its consideration. In reply, I am directed to inform you that the terms set out in your letter have been accepted by the Board."

The work carried on prior to the new company taking over the mine was confined to working on leaders in the Saxon section of the ground, and after the 7th June work was still continued on the reefs in this section. 638 tons of quartz was crushed, for a yield of 578 oz. 12 dwt. of gold; value, £1,533 5s. 6d. The following is a report of the work done since the new company took over the mine:—

This company purchased the whole of the property of the May Queen Company in June, 1896, and since then it has been carrying on prospecting operations on the portion of the old workings above the drainage level. The May Queen Company, prior to the sale of the property, had stoped out all the reefs known to be payable for working down to the level at which drainage is effected—namely, the No. 6 level at the Saxon shaft and No. 4 level in the May Queen shaft, both of these being actually on the same level. The mine cannot be opened out at deeper levels until such time as

the Thames-Hauraki Company's new pumping machinery is erected, and the Queen of Beauty shaft enlarged to a depth of 650 ft. As soon as this is done the mine will be opened up, and from the returns got from the reefs by the old company at the present levels, which proved to be the richest ones got from the mine, there is every reason to believe that rich ore will be got when once the next levels are constructed—at least, the evidence so far is in favour of this—and that it is likely to prove in the future one of the best mines on the Thames Goldfield. In carrying on prospecting operations on the present levels a cross-cut was constructed from the No. 6 level in the Saxon section for a distance of 500 ft., and two new reefs were cut, each varying from 12 in. to 15 in. in thickness. These were cut in the Cardigan ground, near the boundary of the May Queen-Hauraki property on the No. 4 level, in the Saxon section, but the yield at this level in the Cardigan was only about 10 dwt. of gold per ton. The No. 2 reef, in the May Queen ground, which was cut about 300 ft. from the Cardigan boundary, showed fair specimen stone; and, after driving on it to the north-eastwards for about 70 ft., twenty-seven loads of quartz was crushed at the battery, which yielded 46 oz. gold, being equal to an average of 1 oz. 14 dwt. per load. The company are now satisfied with the prospects, and have commenced to construct an uprise to connect with the No. 4 level, which was driven on the boundary of the Cardigan ground in order to obtain ventilation. Stoping cannot be commenced until this is done, as the air is very sluggish at the present time, and has to be forced into the uprise to admit of work being carried on; but when once the connection is made it will give good ventilation in this portion of the mine to enable stoping operations to be continued. The May Queen shaft is being enlarged to 12 ft. by 5 ft. in the clear, to give two winding compartments and ladder-way. This is completed to a depth of 270 ft., leaving about 250 ft. yet to enlarge before it reaches No. 4 level. As soon as the Thames-Hauraki Company commence pumping operations, and lower the level of the water in the ground, this shaft will be sunk to a corresponding depth to the Queen of Beauty shaft as fast as the level of the water admits. Prospecting has steadily been carried on in the St. Hippo and Lone Hand sections of the property, but so far no reefs have been met with containing ore considered payable for working. During the year ending the 7th June last, which is the yearly return for the present company, 346 loads of quartz has been crushed from different leaders and reefs met with in carrying on the development works, which yielded 526 oz. gold, representing a value of £1,411 19s. 4d., while the average number of men employed in carrying on development works for the same period has been thirty-six.

St. Hippo Mine (Area, 75 acres).—This mine has also been purchased by the May Queen-Hauraki (Limited), and important works are about to be commenced in sinking a shaft to prove the ground at Collarbone Creek at a depth hitherto impossible without capital.

Lone Hand (Area, 27 acres 3 roods 35 perches).—This mine, which is situated chiefly in the Karaka Creek, but adjoins the St. Hippo, has been purchased by the May Queen-Hauraki (Limited), and important works will soon be commenced. A small party of tributers working on the surface obtained 2 oz. 15 dwt. of gold from a parcel of 2 tons of quartz, valued at £6 11s. 3d.

Block XXVII. District.

Deep Sinker (section of Thames-Hauraki Mine).—This consists of an area of 93 acres, lying between the Township of Shortland and the Una Hill. The land was formerly prospected by a tunnel driven from Karaka Creek in a southerly direction. It was found that almost the whole of the ground through which the drive had been carried was of a late formation, the solid rock being underneath, as it was occasionally found in the floor of the drive. It was therefore imperative, in order to prospect the ground, to sink a shaft. The company decided to commence operations in the lowest portion of the land, near Rolleston Street. Twelve men were employed. Mr. T. A. Dunlop, the manager, gives the following account of the work already done:—

This ground is virgin, and situated on Block XXVII., part of the Thames Goldfield, and adjoining the Queen of Beauty on its southern boundary, and has hitherto not been prospected, principally on account of its large alluvial-drift formation. The shaft now being sunk has reached a depth of 230 ft., and its dimension 12 ft. by 8 ft., divided into three compartments, two winding and one ladder and pumping. A 10 in. plunger and draw-lift pump has been fixed in position. The first 110 ft. of this shaft was driven through the above-mentioned drift. We are now sinking through a hard diorite formation. It is intended to go to a depth of 300 ft. to 400 ft. before opening out, unless we meet something good before attaining that depth. This property is on the line of several well-known reefs, such as Pride of Karaka, Occidental, Oriental, Silver King, Rose, and Consolidated, all well known to be gold-bearing.

Shortland District.

Deep Level Consolidated (section of the Thames-Hauraki Goldfields property) (Area, 110 acres) is situated to the southward of the Deep Sinker section, and lies chiefly in the Suburb of Parawai. The characteristics of the surface formation are in a great measure similar to those of the Deep Sinker. An adit-level has been driven towards the rising ground from a point not far distant from Hogg's Corner. Six men were employed. Mr. Dunlop gives the following description of the work done:—

This adit tunnel has been driven for the purpose of prospecting. The whole distance has been driven through a volcanic-mud formation, and we have now reached a point in a line with what is known as the Moanataiari Slide or Fault, and is similar in appearance to the Moanataiari. Our intention is to pick up the solid country behind this slide formation on the eastern side, with a view to getting its underlie so as to guide us in locating our principal shaft for pumping and winding. This mine is situated on the goldfield, which has hitherto not been prospected.

Karaka District.

Karaka Mines Mine (Area, 84 acres 3 roods 20 perches).—The land comprises that portion of the field lying between Collarbone Creek and Karaka Creek formerly known as the Prosperity and Little Nell Claims. The claim was protected during the greater portion of the year, but since the beginning of 1897 operations have been commenced by the Austinfriars' Syndicate, of London, and the old low level, near the Karaka Creek, cleared for 460 ft., and a drive on the reef, which is 4 ft. in thickness, put in 50 ft. Five men were employed.

Claremont Mine (Area, 3 roods 13 perches).—This mine is owned and worked by Mr. George Bryant. The workings are on the north side of the Karaka Creek, and on a line of flinties. Several small reefs and veins run across the belt of flinties at right angles, and it is at and near these junctions where the gold is retained. Specimens of rich quartz are found where the flinty is severed by the quartz vein, showing that apparently the flinty vein is of the oldest formation, in that the fissure filled by the quartz must have been formed subsequent to the formation of the flinty vein. A parcel of 521 lb. of quartz was crushed, for 402 oz. 6 dwt.; value, £1,126 8s. 9d. One man was employed.

May Queen Extended Mine (Area, 47 acres).—The work carried on during the year in this mine was mostly of a prospecting nature. The low level worked through the Lone Hand and Adelaide ground has been driven in the May Queen Extended ground about 200 ft., making from the mouth of the tunnel 2,200 ft. A cross-cut in the Onehunga section has been put in about 20 ft., and a drive 120 ft. on a reef averaging 2 ft. wide. From a large 18 ft. reef in the creek 81 tons was crushed, for 13 oz. 17 dwt. gold; value, £37 7s. 11d. A drive is now being put in on a 5 ft. reef in the Hokianga section. The company has purchased Bull's battery of twenty-three stamps and thirteen berdans. The 81 tons from the Big Reef is all that has been crushed for the company, the battery being mostly employed in crushing for other mines. Four wages-men were employed.

The New Hauraki, Only Chance, and other claims have been taken up in this district, and more or less prospecting done.

Adelaide Mine (Area 21 acres 3 roods).—This mine is situated on the western slope of the Una Hill. The shaft has been sunk to a depth of 410 ft., and a level driven on the reef. A winze was sunk from the adit to the low level. Portions of the reef were stoped out, and a cross-reef also worked on. A parcel of 81 tons of quartz was crushed, for a yield of 63 oz. 17 dwt.; value, £187 16s. 6d: and a small party of tributers crushed 25 tons, for 14 oz. 19 dwt.; value, £43 11s. Twelve wages-men and four tributers were employed.

The Thames Claim, of 51 acres, consisting of portion of the Una Hill, has again been taken up, but very little work has yet been done.

Gloucester Mine (Area, 87 acres).—This mine is situated in the Upper Karaka, and includes the ground formerly known as the Lucky Hit. Prospecting has been carried on during the latter three months of the year, and a commencement has now been made to sink a shaft 12 ft. by 5 ft. in the clear, for the purpose of testing at a low level the No. 2 and Good Fortune reefs, from which good returns were formerly obtained in the surface levels. Eight men were employed.

Prospecting work has also been carried on in the European, Duplex, Lincoln, Bell Rock, Manchester, McIsaacs, and Young Australia, all situated in the Upper Karaka.

Little Willie Claim.—A parcel of specimens was crushed, for 20 oz. 13 dwt. of gold; value, £57 16s. 5d. Two men were employed.

Una Hill and Te Papa District.

Occidental Mine (Area, 59 acres).—This mine now includes the old North Star ground. The chief workings were conducted from the adit known as the Una low-level tunnel, and driving was done on the Hague Smith reef, from which small parcels of gold were obtained. The workings in the North Star section are, however, the best for turning out payable quartz. It is the intention to continue a low level from the adit, to prospect the reefs in this district at a greater depth than has yet been attained. A parcel of 119 tons of quartz yielded 239 oz. 2 dwt.; value, £645 11s. 5d. Seven men were employed.

Fortuna Mine (Area, 61 acres).—This mine has not been vigorously worked. A crushing of 28 tons yielded 9 oz. 8 dwt.; value, £25 7s. 8d. Four men were employed.

Homeward Bound Claim.—A crushing of 10 tons 10 cwt. of quartz yielded 6 oz. of gold; value, £16 2s. One man was employed.

Hape Creek.

Anchor Mine.—This claim was granted to Mr. Adolph Kohn in the latter end of 1895, and the ground for a time protected; but latterly a large staff of miners have been employed in prospecting and reopening some of the older workings. The following extract from the *New Zealand Herald* gives a very correct description of the work carried on:—

"This mining property, which is situated on the left-hand spur of the Hape Creek, just above the Old Consols Mine, and comprising an area of 96 acres 2 roods, is being developed most vigorously by an English syndicate known as the Hauraki (Auckland) Goldfields Syndicate (Limited). . . . Operations were commenced at the latter end of October, since which date the syndicate have not only reopened and repaired no less than five different levels for a total length of several thousands of feet, and commenced operations in each of them, but also erected a four-stamp battery, with three berdans, for the purpose of practically testing the various lodes that exist in the property. At present a staff of thirty miners is employed. So far the prospects met with have been of a very encouraging character, quite good enough to warrant the expenditure being incurred. Several reefs that have in past years and at higher levels yielded excellent returns of gold trend through the whole length of the property. The works now in progress will eventually test these same bodies at a greater depth below the surface. One of these

reefs, known as the Jupiter, is a large body quite 40 ft. in thickness where cut through in the Golden Cable low level, the lowest level now in progress. A contract for driving 100 ft. on the hanging-wall side of this large body is now proceeding at the level mentioned, and a contract is also in course of fulfilment for its intersection at another level about 100 ft. higher —the Golden Anchor level. At each of these points a most favourable class of sandstone country is being entered upon. At the Stephenson level two reefs are being operated upon, from one of which, averaging about 15 in. in thickness, a trial crushing is now being made at the syndicate's battery, with every prospect of its proving payable. In fact, both driving and stoping is being carried on upon this reef and colours of gold are seen pretty freely in the quartz coming to hand. A junction of this reef and what is known as Prescott's leader is expected shortly to be met with, and, as both bodies are gold-bearing, it is anticipated good results will follow. The other reef being operated upon at Stephenson's level averages about 2 ft. in thickness, in which colours of gold have also been seen; bnt the ore is scarcely payable as yet. Further development of this body, however, is expected to result remuneratively. At Prescott's level a leader bearing the same name, which averages about 4 in. in thickness, is being opened up. This leader has proved to be a good one in the past, and is now yielding a class of ore worth about 2 oz. per ton. Besides the works already mentioned, two or three other prospecting works are also in progress, in one of which (at the Weymouth level) a nice-looking 4 in. leader has recently been intersected, and strong colours of gold seen in it. The present scheme of development will suffice for amply testing the property."

The battery has been employed in crushing small parcels from the different reefs. About 150 tons have been put through, but the result is not yet given; another parcel of 21 tons yielded 2 oz. of gold. Twenty-four men on the average were employed.

Mascotte Limerick Mine (Area, 200 acres).—The land is situated at Upper Hape Creek, and is on the line of reefs worked lower down the creek. There are two reefs, one 3 ft. and the other 1 ft. 6 in. in width, besides small leaders. The mine is under offer to the Thames Exploration Syndicate, which has recently employed five men, who are engaged in driving and surface prospecting.

Prospecting work was also carried on in the Limerick, Kedge, Shotover, and Masonic Claims.

Otunui District.

Several claims were taken up in this district, but very little work done.

Matatoki District.

Considerable amount of work was done in prospecting Teddy's Golden Chariot Claim.

Kirikiri District.

Fleming's Mine, comprising the Horseshoe, Filly, and Chester Claims, of a total area of 214 acres, was held under option by the New Zealand Exploration and other companies. A considerable amount of prospecting was carried on, but it has not yet transpired whether the purchase will be completed or not. No returns of gold have been received from this mine during the year.

Puriri District.

Hit or Miss Mine (Area, 30 acres.)—This mine is situated some distance up from the main road on the Puriri Creek, and has been worked for several years for small returns of gold. Since the time the present company became the owners a considerable amount has been expended in prospecting, and the old tunnels reopened. No. 1 level is driven 145 ft. on a reef 1 ft. 6 in. in thickness, and No. 2 level 176 ft., on a 2 ft. reef. A low-tunnel cross-cut at a depth of 400 ft. has been driven a distance of 349 ft., but no reef has yet been cut. This property has been worked for some time past by an English syndicate, which holds the option of purchase. Twelve men were employed,

Dover Castle Mine (Area, 100 acres.)—This land has been prospected for the past three months, and a trial crushing of 1 ton taken from a reef in No. 1 drive yielded 1 oz. 17 dwt. of gold; value, £4 16s. 2d. Four men were employed.

Prospecting work has been carried on in the Empress of India, Amazon, Wandoline, Eclipse, and several other claims in this locality.

Puriri Mine (Area, 100 acres).—This land is situated on Puriri Creek. A small reef 3 in. in thickness was driven on 60 ft., and gold occasionally seen in the quartz. A gold-bearing reef 10 in. in thickness was driven on 130 ft. at the top level, and at the new level it was driven on 54 ft., and proved to be gold-bearing throughout. A reef 4 ft. in thickness was discovered on the surface, but gold has not been found in it. The low-level cross-cut was only advanced a few feet, and no quartz has yet been cut. The rock continues to be of a very hard character. Three men were employed.

Fair Alice, Apakura, Lion, Central, Dorrit, and several other claims have been taken up and prospected, but no discoveries or results have been ascertained.

Day Dawn Mine (Area, 23 acres).—This land is situated near the Puriri to Tairua old track. The claim was formerly known as the Brothers, and was worked for several years by Mr. Peter Dorne, and where there is a large quantity of auriferous matter, is being prospected by trenching and driving. The work has lately been carried on by a party who hold an option on behalf of English capitalists. They are prepared to find capital to work the ground and erect a suitable plant on the permanency of the mine being proved. Three men were employed.

Neavesville District.

A number of claims have been taken up in this locality, but mining operations have been delayed for the greater part of the year, consequent on titles not being settled, it being doubtful how far the boundaries of the Kauri Timber Company extended.

Tairua River District.

Broken Hill Mine (Area, 340 acres).—A considerable amount of work has been carried out in this mine for the purpose of developing it in a systematic way for future working. The strike of the gold-bearing lode, which is north and south, has been driven on at the level where the original rich find was made a distance of about 500 ft., and large bodies of payable ore have been seen. The country and the nature of the lode at this level is very broken, and in no case have well-defined walls been found; but this does not in any way interfere with the value of the lode, as quantities of payable ore can be obtained. At a distance of 300 ft. further south from the original rich find, and immediately under the top of the highest hill, very good ore has been met with. Another level, known as the Cutting level, has been started 40 ft. lower down than these workings, and driven a distance of 200 ft. The lode in this level has a very much better appearance, and appears to continue down between well-defined walls, which are expected to continue to the intermediate and low level. The intermediate level driven from the eastern side of the hill is now in 300 ft., and the low level driven from the western side is now in about 400 ft. Those works will prove the character of the reef at this place. The low level is 700 ft. below the top of the hill already mentioned, and will, when in and connected with the other levels, open up the whole of the mine on an extensive scale. A tramway has been erected (self-acting ground) from the upper level to the battery-site, a distance of a quarter of a mile, and excavations have been commenced for the foundations of the battery, which has been ordered from London. The company intends starting with a twenty-head wet-crushing mill, but is carrying on all the work, such as water-races, &c., for a much larger mill. The principal road made by the company is from the mine to the Tairua River landing, and a tramway has been surveyed and levelled, which may eventually be built. All necessary buildings connected with a mine of this kind have been erected, such as assay-room, office, men's quarters, blacksmith's shop, &c. Thirty men were employed.

A considerable amount of prospecting was carried on by Mr. Jonathan Seaver in the Broken Hills Extended and the Tairua Special Claims, with a view of obtaining English capital to work the ground.

Tairua Proprietary (Area, 116 acres 2 roods).—The land is situated in the vicinity of the Broken Hills. A considerable amount of prospecting has been done. Fourteen surface drives were put in, and a low level driven 270 ft., in order to cut the reef, which is 2 ft. in width. Six men were employed.

Albert Mine (Area, 153 acres).—Upwards of 500 ft. of a level was driven and two reefs cut, the quartz being of a promising character. Eight men were employed.

Prospecting has also been carried on in the New Tairua, Tairua Consols, Marguerite, Emerald Mount, Golden Bay, Tairua Big Reef, and other claims.

Ohui District.

Harp of Tara (Area, 30 acres).—A considerable amount of prospecting was done, and four reefs cut, varying from 6 in. to 7 ft. in thickness. A prospect of loose gold can be got in three of the reefs, but not in payable quantities. A tunnel is being put in to cut a large body of quartz which outcrops on top of the hill, and from which prospects of gold have been obtained by washing in the dish. Four men were employed.

Nil Desperandum Mine (Area, 86 acres).—There has not been a great deal of work done during the year, and no quartz was crushed. Three men were employed.

Prospecting has been carried on in the Maori Dream, Golden Hill, Sea View, and other claims.

In the Ohui properties, held by Seaver Brothers, in all some 5,000 ft. of driving has been carried out, and now work has been concentrated upon the properties known as the Maorilander and the Last Chance, as it is thought that these properties will be the means of opening up the field. It is intended to erect a small battery on the Maorilander, and also drive a large low level into the Last Chance, which will thoroughly prospect this property under what is known as the Big Blow.

Whangamata District.

Flemington Mine (Area, 88 acres 1 rood 29 perches).—Two drives were put in, one 60 ft. and the other 100 ft. A large body of quartz 60 ft. in thickness was discovered, and two smaller reefs, but no payable quartz has yet been found. Four men were employed.

In the following mines considerable prospecting was done, and reefs, in some instances containing a little gold, discovered: Iolanthe, Herald, Marco Polo, Electric, Moa, My Sweetheart, Sybil, Iolanthe Extended, Inca No. 1, Golden Castle, and Peruvian.

Ptolemy Mine (Area, 219 acres).—This property is being prospected by Riley and Company, of London, who hold it under option. A large amount of prospecting work has been done—ten drives, varying from 30 ft. to 150 ft.—with a view to cut the Luck at Last reef. Eight men were employed.

Tamihana Mine (Area, 71 acres 2 roods 29 perches).—A considerable amount of surface prospecting has been done, and four reefs discovered, varying from 20 in. to 12 ft. in thickness. A cross-cut drive is to be put in to test their value at greater depth.

King of Whangamata Mine (Area, 66 acres 3 roods).—About 250 ft. of a cross-cut was put in, and a 7 ft. reef cut and driven on 85 ft. Eight men were employed.

Whangamata Proprietary Mine (Area, 294 acres).—This mine comprises the Luck at Last, Luck at Last Extended, and Wharekawa Special Claims, and is now owned by the Whangamata Proprietary, an English company. A large staff of men was employed in carrying on works to develop the reefs. It is the intention of the company to erect a twenty-stamp battery, to be driven by water-power, which is plentiful and adjacent to the ground.

Extensive prospecting works have been carried on in the Phœnix, Golden Mount, Golden Falls, Pukewhau, Three Star, Whangamata, and others.

General Remarks.

In this district there has been a considerable decrease in the yield of gold. The principal gold-producing mines were worked down to the extent of the ground opened up, and in the case of the Moanataiari, Cambria, Hazelbank (now known as the Kuranui-Caledonian), and May Queen the principal work carried on has been in the extension of development works and reconstruction of the crushing plants, and not in the actual work of mining and crushing quartz. However, the advancement of the shaft in the Queen of Beauty will before long enable the May Queen Mine to resume operations on the shoots of gold at deeper levels. The Moanataiari Mine also is being thoroughly opened up, and when the new plant is ready the treatment of ore on a large scale will be commenced. The Kuranui-Caledonian Mine has again been cleared to the No. 4 level, and the workings opened up, so that crushing operations will in the future be continuous instead of intermittent, as has been lately the case. The New Alburnia and Tararu Creek Mines are now in a position to yield good returns; a large amount of development work has yet to be done and machinery erected before an addition to any great extent is made to the annual yield of gold from the newer mines throughout the county.

During the year 15,693 tons 15 cwt. 50 lb. of quartz was crushed, for a yield of 10,799 oz. 3 dwt., while 11,367 tons of tailings was treated, for a return of 2,611 oz. 12 dwt., the whole being valued at £34,253 14s. There were 1,527 men employed.

Ohinemuri District.

This district lies to the southward of and adjoining the Thames County. The land is of a very broken and disturbed character, densely covered with timber, except in the Waihi district, where it is of a more open and less hilly nature. The chief mining districts are Karangahake, Waitekauri, and Waihi, where the mines are turning out to be highly profitable, and where the most extensive and improved machinery is being introduced for ore treatment. The cyanide process is most successfully adopted in the saving of gold, which exists in the quartz in a very finely subdivided state in the various mines throughout Ohinemuri. It is worthy of note that in this district the cyanide process was first introduced. The Cassel Company had an agreement to extract the gold from all ore crushed by the Crown Company at Karangahake, and their manager, Mr. John McConnell, treated a quantity with such marked success that the value of the process soon became established.

It will be seen from the following list of claims that a great extent of country has been taken up for mining purposes:—

Abstract of Licenses for Special Claims and Licensed Holdings issued from the Warden's Office at Ohinemuri, in the Hauraki Mining District, and registered on or before the 31st March, 1897, in the Books of the Mining Registrar at Ohinemuri.

Date of License.	Area.			Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
	A.	R.	P.					
22/4/88	10	0	25	Karangahake	I.	Aroha ..	Abbey	New Zealand Crown Mines.
2/6/96	19	2	12	"	II., VI.	" ..	Acorn	The Oakley Gold-mining Co. (Ltd.).
13/1/97	100	0	0	Komata ..	VII.	Ohinemuri	Admiralty ..	Henry D. Abbott.
30/11/96	99	3	6	Waihi ..	XII.	"	African	John Endean.
23/12/96	99	1	6	" ..	"	"	African No. 2 ..	Charles Ralph Pinder.
24/10/96	30	1	24	Waitekauri ..	X.	"	Ailsa	John R. Clouston.
17/2/96	100	0	0	Waihi ..	XV.	"	Aladdin's Lamp ..	Waihi Reefs Gold-mining Co. (N.L.).
19/2/97	99	0	0	" ..	XV., XVI.	"	Albermarle United	George Crosby.
4/10/95	100	0	0	Komata ..	X.	"	Alfred	Omega Gold-mining Co. (N.L.).
17/2/96	86	2	0	Waitekauri ..	X., XIV.	"	Alfred Extended ..	Exchange Gold-mining Co. (N.L.).
1/2/96	99	2	9	" ..	XIV.	"	Alhambra ..	Belmont Gold-mining Co. (N.L.).
30/11/94	14	3	32	" ..	X.	"	Alpha	Alpha Gold-mining Co. (N.L.).
31/12/95	26	1	32	" ..	"	"	Alpha Extended ..	Waitekauri Consolidated Gold-mining Co. (Ltd.).
14/9/96	100	0	0	Maratoto ..	V., VI.	"	Alpine	John W. Thorp.
31/12/95	50	0	0	Waihi ..	XVI.	"	Amaranth ..	Union Waihi Gold-mining Co. (Ltd.).
27/2/96	100	0	0	Waitekauri ..	X.	"	Anglian ..	Waitekauri Union Claims (Ltd.).
3/9/96	86	2	0	Maratoto ..	VI.	"	Aotea	Herbert Gentles.
19/2/97	100	0	0	Waitekauri ..	XIII., XIV.	"	Arcadia	Gregory B. Ormond.
23/12/96	100	0	0	Karangahake	VI.	Aroha ..	Aroha	Samuel H. Gordon.
23/7/96	76	2	24	Owharoa ..	XIII.	Ohinemuri	Ascot	John Phillip, jun.
24/10/96	86	1	13	Waitekauri ..	X.	"	Asmodeus ..	Pierce Fouhy.
17/2/96	83	3	25	Karangahake	II.	Aroha ..	Asteroid ..	The Asteroid Gold-mining Co. (N.L.).
23/7/96	57	1	16	"	"	" ..	Aster	The N.Z. Crown Mines (Ltd.).
8/8/96	100	0	0	Whangamata	VII.	Ohinemuri	Atlanta	William L. Hunter.
25/4/96	100	0	0	"	"	"	Atlas	Atlas Gold-mining Co. (N.L.).
19/2/97	77	3	0	"	"	"	Auckland Chief ..	Edward Joseph Smith.
19/2/97	99	0	31	"	"	"	Auckland Prince ..	"
19/2/97	100	0	0	"	III., VII.	"	Auckland Princess	"
19/2/97	100	0	0	"	VII.	"	Auckland Queen ..	James D. Foley.
3/9/96	71	0	1	Owharoa ..	XIV.	"	Augusta ..	Thomas Ussher.
30/11/96	54	3	35	Karangahake	III.	Aroha ..	Aurifera Extended	Thomas Corbett.
24/10/96	100	0	0	Owharoa ..	XIII., XIV.	Ohinemuri	Auriflamme ..	John Falvey.
23/12/96	22	0	0	Whangamata	VII.	"	Aurora Australis ..	John Edward Banks.
23/3/96	100	0	0	Waitekauri ..	X.	"	Australia ..	Waitekauri Union Claims (Ltd.).
25/4/96	100	0	0	Waihi ..	XII.	"	Baggott	Waihi Pinnacles Gold-mining Co. (N.L.).
24/3/96	99	2	16	Owharoa ..	XIV.	"	Bain	Ohinemuri Syndicate.
24/3/96	14	0	29	Karangahake	II.	Aroha ..	Ballance ..	G. S. Budge.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Ohinemuri—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
26/8/96	22	0	0	Waihi ..	XVI.	Ohinemuri	Balmoral Castle ..	Joseph Varney.
9/2/97	10	0	0	Whangamata	III.	"	Ballarat ..	John B. Empson.
3/12/95	30	0	0	Owharoa ..	XIV.	"	Band of Hope ..	James Corbett.
23/3/96	100	0	0	Karangahake	II.	Aroha ..	Bank of England	Samuel Lowrie.
3/9/96	99	2	6	Waihi ..	"	Waihi North	Baraieto ..	William Shaw.
1/3/97	100	0	0	Te Puke ..	IX.	Maketu ..	Bay of Plenty ..	James Liddell.
8/8/96	100	0	0	Waihi ..	XVI.	Ohinemuri	Beacon Hill ..	Beacon Hill Gold-mining Co.
3/6/96	100	0	0	" ..	II., III.	Aroha ..	Beatrice ..	Waihi Sphinx Syndicate (Ltd.).
30/11/96	90	0	0	Komata ..	X., XI.	Ohinemuri	Belleville ..	James H. Fleming.
1/2/96	98	0	6	Owharoa ..	XIV.	"	Belmont ..	Belmont Gold-mining Co. (N.L.).
19/2/97	99	0	0	Karangahake	XIII.	"	Benmore ..	Gregory B. Ormond.
2/9/96	100	0	0	"	II.	Aroha ..	Bertha	Alexander Robinson.
29/10/96	30	0	0	Waihi ..	XII.	Ohinemuri	Big Reef ..	The Mataura Gold-mining Co. (N.L.).
25/3/96	100	0	0	Maratoto ..	VI.	"	Black Star ..	William Horne.
23/12/96	47	1	35	Karangahake	"	Aroha ..	Blarney Stone ..	Charles W. Cave.
23/12/96	40	0	27	"	II.	" ..	Boonie Doon ..	Hugh Butler.
2/6/96	18	1	35	Maratoto ..	VI.	Ohinemuri	Boomerang ..	A. P. H. Cashel.
20/8/96	50	3	34	" ..	"	"	Boojum	Maurice Kelly.
2/6/96	14	3	0	Karangahake	II.	Aroha ..	Braemar ..	James William Shaw.
3/9/96	96	3	34	Whangamata	VI., VII.	Ohinemuri	Brigadier ..	James Henry Fleming.
31/12/95	97	2	0	Waihi ..	XV., XVI.	"	Bright Smile ..	Waihi Reefs Gold-mining Co. (N.L.).
30/11/96	100	0	0	" ..	IV.	Aroha ..	Bright Star ..	Don of Waihi Gold-mining Co. (N.L.).
19/6/95	100	0	0	" ..	XVI.	Ohinemuri	Brilliant ..	Waihi Consolidated Gold-mines (Ltd.).
1/3/97	70	3	4	Maratoto ..	V.	"	Bristol	Herbert F. Sergeant.
27/2/96	100	0	0	Waihi ..	XV., XVI.	"	Britannia ..	The Waihi Gold-mining Co. (Ltd.).
17/10/95	80	2	5	Waitekauri ..	X.	"	Burbank ..	Waitekauri Consolidated Gold-mines (Ltd.).
16/1/96	16	2	20	Whangamata	III.	"	Burleigh ..	Robert Kelly.
7/5/95	30	0	0	Komata ..	X.	"	Byron Bay ..	Byron Bay Gold-mining Co. (N.L.).
23/3/96	91	1	9	" ..	"	"	Byron Bay Ext. ..	"
5/5/96	6	3	20	Waitekauri ..	X., XI.	"	California ..	Waitekauri Union Claims (Ltd.).
12/8/96	78	1	15	Maratoto ..	V., VI.	"	Cameron ..	John W. Thorp.
25/4/96	100	0	0	Waitekauri ..	XI.	"	Capstan ..	The Capstan Gold-mining Co. (N.L.).
23/12/96	100	0	0	Waihi ..	XI., XII.	"	Carbine	Henry Culpan.
23/12/96	60	1	16	Waitawheta	VI.	Aroha ..	Castleton ..	William Shaw.
24/3/96	100	0	0	Waitekauri ..	XI.	Ohinemuri	Caversham ..	Charles Burrell Stone.
30/11/96	100	0	0	Waitawheta	VI.	"	Cecil Rhodes ..	James Henry Fleming.
30/5/96	100	0	0	"	"	Aroha ..	Celbridge ..	Joseph William Shaw.
8/10/95	29	3	0	Waitekauri ..	X.	Ohinemuri	Central ..	Waitekauri Union Claims (Ltd.).
14/7/96	4	1	20	" ..	"	"	Central Consols ..	Waitekauri Junction Gold-mining Co. (N.L.).
8/10/95	25	0	16	" ..	"	"	Central Extended	Waitekauri Union Claims (Ltd.).
13/1/97	100	0	0	Waihi ..	XI.	"	Champion ..	Isaac Marchesseau.
23/12/96	94	2	12	Karangahake	I.	Aroha ..	Champ D'Or ..	Jesse King.
17/9/95	14	2	20	Owharoa ..	II. IV.	" Ohinemuri	Charles Victor ..	Owharoa United Gold-mining Co.
6/8/95	14	0	13	Waitekauri ..	X.	"	Chelt	Chelt Gold-mining Co. (N.L.).
2/6/96	30	0	0	" ..	"	"	Chelt Extended ..	"
19/2/97	97	2	0	Waihi ..	III.	Aroha ..	Cheshire ..	Robert S. Ready.
4/10/95	100	0	0	Waitekauri ..	X.	Ohinemuri	Christina ..	Omega Gold-mining Co. (N.L.).
8/8/96	60	0	0	Waihi ..	XV.	"	Christmas Box ..	Waihi South Gold-mining Co. (Ltd.).
17/12/95	30	0	0	" ..	XVI.	"	Churchill ..	William Corbett.
19/2/97	100	0	0	Waitekauri ..	IX., X.	"	Cid	John Schischka.
26/8/96	24	0	0	" ..	XIV.	"	Clansman ..	Charles Collins.
8/8/96	80	0	0	Waihi ..	XV.	"	Clem Cornes, Waihi	Clement A. Cornes.
23/3/96	100	0	0	" ..	II.	Aroha ..	Cleopatra ..	Waihi Sphinx Syndicate (Ltd.).
6/4/96	100	0	0	" ..	"	" ..	Cleopatra's Needle	"
25/4/96	100	0	0	" ..	VII., IX.	Ohinemuri	Colestream ..	George Colebrook.
23/12/96	35	2	31	" ..	VII.	"	Colestream Ext. ..	John Clare Latimer.
21/4/96	30	0	0	Waitekauri ..	XIV.	"	Colewinser ..	George H. Purchas.
24/10/96	100	0	0	Karangahake	I.	Aroha ..	Commercial ..	Robert Walker.
14/9/96	33	2	25	Maratoto ..	VI.	Ohinemuri	Coptic	Wilfred Rathbone.
23/12/96	81	3	12	Waitekauri ..	XIV.	"	Countess ..	John Phillips, jun.
10/12/95	94	2	0	Karangahake	II.	Aroha ..	Crescent ..	Crescent Gold-mining Co. (N.L.).
23/12/96	93	0	0	Te Aroha ..	X.	" ..	Crimson Thread ..	Brian J. Chaytor and Harry Robert Burt.
16/3/96	100	0	0	Waitekauri ..	"	Ohinemuri	Crœsus	The Waitekauri Gold-mining Co.
8/5/96	100	0	0	" ..	"	"	Crosscut ..	"
1/3/97	48	2	0	Komata ..	"	"	Cross of Komata ..	John Thomas Ryan.
16/6/96	30	0	0	Karangahake	I.	Aroha ..	Crown Imperial ..	Crown Imperial Gold-mining Co.
2/6/93	98	0	31	"	I., II.	" ..	Crown Mines ..	The New Zealand Crown Mines Co. (Ltd.).
17/9/95	27	1	0	"	XIII. I.	Ohinemuri Aroha	Crown Nimrod ..	Joseph Barber.
14/9/96	100	0	0	"	II.	" ..	Crown Reefs ..	John M. Haslett.
23/7/96	50	3	0	"	XIII.	Ohinemuri	Crown Woodstock Junction	Archibald McLoghry.
20/8/96	100	0	0	Waihi ..	XV.	"	Daisy	John Phillips, jun.
30/11/96	51	2	17	" ..	III.	Aroha ..	Daisy Extended ..	John Murray.
24/10/96	100	0	0	Maratoto ..	VI.	Ohinemuri	Daniel Boone ..	Robert Kelly.
30/5/96	100	0	0	Waihi ..	XV.	"	Dauntless ..	Edward Mann Corbett.
25/3/96	100	0	0	Owharoa ..	XIV.	"	Dawn of Hope ..	Edward Bain.
8/8/96	89	3	32	" ..	"	"	Dawn of Hope Surplus	James Smyth.
1/2/96	100	0	0	Waihi ..	XIV.	"	Day Dawn ..	Thomas Mace Humphreys.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Ohinemuri—*continued.*

Date of License.	Area. A.	R	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
19/2/97	100	0	0	Maratoto ..	VII.	Ohinemuri	Day Spring ..	John Edward Banks.
23/3/96	100	0	0	Waihi ..	XIV.	"	Deep Lead ..	Deep Lead Gold-mining Co. (N.L.).
22/3/97	84	2	17	" ..	XV.	"	Defiance ..	John Guest Ralph.
28/7/96	3	0	0	Waitekauri ..	XIV.	"	Diamond ..	Peter Prudence.
10/12/95	75	0	8	Waihi ..	I., XIII.	Aroha ..	" ..	W. H. Pearce and W. Hellaby.
17/12/95	30	0	0	Owharoa ..	II.	" ..	Dickson's Lead No. 1	Thomas Morrin.
17/12/95	30	0	0	" ..	"	" ..	Dickson's Lead No. 2	"
17/12/95	30	0	0	" ..	"	" ..	Dickson's Lead No. 3	"
17/12/95	30	0	0	" ..	"	" ..	Dickson's Lead No. 4	George S. Budge.
3/3/96	30	0	0	" ..	"	" ..	Dickson's Lead No. 5	"
23/12/96	97	3	20	Maratoto ..	V.	Ohinemuri	Dick Swiveller ..	Robert McCall.
30/5/96	67	0	0	Waihi ..	VII.	"	Dixon No. 1 ..	Mataura Gold-mining Co. (N.L.).
30/11/96	100	0	0	" ..	III., IV.	Aroha ..	Don	John Henry Porter.
27/10/96	10	1	24	" ..	III.	" ..	Don Extended ..	The Don of Waihi Gold-mining Co. (N.L.).
14/9/96	51	0	15	Maratoto ..	VI.	Ohinemuri	Doric	Wilfred Rathbone.
23/7/96	100	0	0	Waitekauri ..	XV.	"	Dorothy	The Dorothy Gold-mining Co. (N.L.).
23/12/96	47	1	0	Maratoto ..	VI.	"	Dragoon ..	Henry David Abbott.
23/3/96	100	0	0	Waihi ..	XI.	"	Dublin	James Corbett.
30/11/96	100	0	0	" ..	III.	Aroha ..	Duke of Kent ..	Moritz S. Lees.
19/5/96	23	0	0	" ..	XII., XVI.	Ohinemuri	Eagle	Waihi Pinnacles Gold-mining Co. (N.L.).
13/9/95	87	0	11	Karangahake	I., II.	Aroha ..	Earl of Glasgow ..	New Zealand Crown Mines Co. (Ltd.).
8/8/96	89	0	26	Waitekauri ..	X., XIV.	Ohinemuri	Edward Norman ..	Norman Proprietary Gold-mine (Ltd.).
23/4/95	30	0	0	Karangahake	II.	Aroha ..	Eileen	Mariner Gold-mining Co. (N.L.).
7/10/96	100	0	0	Aongatete ..	IV.	Aongatete	Eliza	Henry M. Shepherd.
25/4/96	94	1	12	Owharoa ..	XIV.	Ohinemuri	Elliot	Ohinemuri Syndicate.
19/11/95	30	0	0	Waitekauri ..	X.	"	E.M.C.	The Waitekauri Union Claims (Ltd.).
18/2/96	30	0	0	" ..	"	"	E.M.C. Extended ..	"
23/4/95	9	0	26	Karangahake	I.	Aroha ..	Emerald ..	Woodstock North Gold-mining Co.
19/2/97	100	0	0	Waitekauri ..	III.	Ohinemuri	Emerald Isle ..	Robert C. Speer.
23/12/96	80	0	0	" ..	III., VII.	"	Emerald Isle Ext.	Samuel Draffin.
13/1/97	36	2	25	Maratoto ..	VI.	"	Emperor ..	George Loram.
23/12/96	100	0	0	Waihi ..	XV.	"	Empress of Waihi	Henry Culpan.
17/2/96	100	0	0	" ..	XII.	"	Emu	James G. Wilson and others.
8/8/96	100	0	0	" ..	III.	Aroha ..	Enterprise ..	Alfred Ernest Whittome.
19/2/97	99	3	31	" ..	XI., XIII.	Ohinemuri	Esperanza Ext. ..	William B. A Morrison.
30/11/96	100	0	0	" ..	XV.	"	Esk	William John Downie.
9/3/97	29	1	10	" ..	XV., XVI.	"	Esk Extended ..	William Henry Potter.
23/7/96	51	2	5	" ..	XIII.	"	Eureka	Benjamin M. Myers.
22/3/97	68	2	5	" ..	"	"	Eureka King ..	A. M. Myers.
19/2/97	97	0	0	Maratoto ..	VII.	"	Evangeline ..	John Edward Banks.
1/3/97	98	0	0	" ..	"	"	Evangeline No. 2	"
3/9/96	100	0	0	Waihi ..	XVI. IV.	" Te Aroha	Evening Star ..	Joseph Varney.
7/10/96	35	0	0	" ..	XVI.	Ohinemuri	Evening Star Ext.	"
13/6/96	7	1	8	Waitawheta	VI.	Aroha ..	Ewaru Tau ..	James William Shaw.
30/4/96	100	0	0	Maratoto ..	"	Ohinemuri	Excellent ..	Wilfred Rathbone.
24/3/96	38	0	9	Karangahake	II.	Aroha ..	Excelsior ..	Excelsior Gold-mining Co. (N.L.).
14/9/96	97	2	35	Waitawheta	VI.	Ohinemuri	Express	Guy Fosberry Ronalds.
19/6/95	100	0	0	Waihi ..	XVI.	"	Favona	Waihi Consolidated Gold-mining Co. (Ltd.).
23/7/96	100	0	0	" ..	XII., XIV.	"	Favona Extended	Charles McLean.
28/8/95	100	0	0	Owharoa ..	II.	Aroha ..	Fern Spur ..	Waihi Gold-mining Co. (Ltd.).
23/7/96	100	0	0	Wharekirau-punga	XIV.	Ohinemuri	Fiery Cross ..	Fiery Cross Gold-mining Co. (N.L.).
19/1/97	8	1	0	Komata ..	X.	"	Flabbergast ..	Walter Byers Sealey.
7/10/96	100	0	0	Waihi ..	XVI.	"	Flora	William John Downie.
7/10/96	32	3	25	" ..	"	"	Flora Extended ..	Joseph Varney.
23/7/96	100	0	0	Maratoto ..	..	..	Florence ..	Hikutaia Gold Syndicate (Ltd.).
16/12/96	25	0	0	Katikati ..	IV.	Aongatete	Flossie	Alfred E. Price.
24/3/96	100	0	0	Waihi ..	II.	Waihi North	Flower of Waihi ..	Flower of Waihi Gold-mining Co.
28/7/96	6	1	0	Waitekauri ..	XIV.	Ohinemuri	Fortunatus ..	Waitekauri King Gold-mining Co. (N.L.).
8/8/96	88	0	0	" ..	XI.	"	Free Lance Ext. ..	John Jesse Odlum.
7/10/96	100	0	0	Maratoto ..	VI., VII.	"	Fusilier	James Henry Fleming.
3/11/96	100	0	0	Waihi ..	III.	Aroha ..	Gabriel's Gully ..	John Kennedy.
1/3/97	33	1	9	Maratoto ..	VII.	Ohinemuri	Galatea	John Anderson.
23/12/96	97	0	0	Waitekauri ..	XIV.	"	Gem	Gem Gold-mining Co. (N.L.).
31/12/95	26	1	32	Komata ..	X.	"	Germanic ..	Germanic Gold-mining Co. (Ltd.).
23/7/96	54	2	0	Karangahake	I.	Aroha ..	Germanic Ext. ..	George S. Kissling.
23/12/96	100	0	0	Maratoto ..	VI.	Ohinemuri	Gertie	George William Basley.
19/2/97	100	0	0	Te Puke ..	V.	Maketu ..	Gibraltar ..	John C. Galbraith.
24/3/96	100	0	0	Waihi ..	XV.	Ohinemuri	Gigantic ..	Henry C. Wick.
30/11/96	74	1	6	" ..	II., III.	Aroha ..	Glamorgan ..	Robert Worth.
1/3/97	100	0	0	Waitekauri ..	XIV.	Ohinemuri	Glamoorth ..	Charles H. Knowles.
29/10/96	13	1	12	Karangahake	II.	Aroha ..	Glenn	Alexander Robinson.
7/11/95	20	2	32	Waitekauri ..	VI.	Ohinemuri	Globe	Waitekauri United Gold-mining Co. (Ltd.).
27/2/96	90	0	0	" ..	XIV.	"	Golconda ..	Sovereign Gold-mining Co. (N.L.).
23/12/96	70	0	0	Karangahake	II.	Aroha ..	Golden Age ..	Frederick Richard Quinton.
23/12/96	93	2	30	" ..	II., VI.	" ..	Golden Age Ext. ..	"
23/12/96	100	0	0	Te Aroha ..	V., VI.	" ..	Golden Band ..	Brian T. Chaytor and H. Robert Burt.
23/12/96	54	1	24	Te Puke ..	I.	Maketu ..	Golden Belt ..	Thomas C. Simpson.
23/12/96	84	1	0	" ..	"	" ..	Golden Butterfly ..	Stephen W. Goss.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Ohinemuri—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
24/3/96	27	3	0	Karangahake	I.	Aroha ..	Golden Crown No. 2	Golden Crown No. 2 Gold-mining Co. (N.L.).
16/3/96	100	0	0	Waitekauri ..	X., XI.	Ohinemuri	Golden Cross ..	Waitekauri Gold-mining Co. (Ltd.).
3/9/96	56	2	37	Karangahake	I.	Aroha ..	Golden Fleece ..	Golden Fleece Gold-mining Co. (N.L.).
3/6/96	100	0	0	"	XIII.	Ohinemuri	Golden Giant ..	Golden Giant Gold-mining Co. (N.L.).
10/12/95	100	0	0	Owharoa ..	XIV.	"	Golden Lion ..	Golden Lion Gold-mining Co. (N.L.).
23/3/96	62	2	17	" ..	"	"	Golden Lion Ext..	"
19/2/97	40	2	20	Waihi ..	XV.	"	Golden Lure ..	Norman F. J. Hazard.
23/3/96	96	1	37	Karangahake	I.	Aroha ..	Golden Reefs ..	Robert Stackpole, jun.
3/6/96	67	2	25	"	"	" ..	Golden Reefs Ext.	"
27/2/96	96	0	0	Waihi ..	XV., XVI.	Ohinemuri	Golden Run ..	Waihi Gold-mining Company (Ltd.).
13/11/95	100	0	0	Waitekauri ..	X., XIV.	"	Golden Spur ..	Golden Spur Gold-mining Co. (N.L.).
24/3/96	96	2	24	" ..	XIV.	"	Golden Stream ..	Hugh Butler.
28/8/96	100	0	0	Wharekirau-punga	VII.	"	Goldstream ..	The Goldstream Gold-mining Co.(N.L.).
23/12/96	100	0	0	Ditto ..	"	"	Goldstream Ext. ..	William L. Hunter.
23/12/96	46	0	0	" ..	"	"	Goldwater ..	Hugh Poland.
30/11/96	63	2	3	Karangahake	XIII.	"	Goliath	Trevor Gordon.
31/3/96	6	3	0	Waitekauri ..	X.	"	Gondoliers ..	The Russell Gold-mining Co. (N.L.).
2/6/96	14	3	14	Maratoto ..	VI.	"	Goodbridge ..	William Shaw.
7/10/96	82	1	0	Waihi ..	XII.	"	Good Luck ..	John Murdoch Ross.
16/10/96	29	0	36	" ..	"	"	Good Luck Ext. ..	"
2/9/96	100	0	0	Waitekauri ..	XI.	"	Gothic	Joseph Thorne.
30/11/96	89	3	7	" ..	X.	"	Grace Darling ..	Grace Darling Gold-mining Co.
22/10/95	30	0	0	" ..	"	"	Grafton	Grafton United Gold-mining Co. (N.L.).
17/2/96	100	0	0	" ..	"	"	Grafton No. 2 ..	"
27/2/96	96	0	0	" ..	"	"	Grafton No. 3 ..	"
23/3/96	90	0	0	Waihi ..	XVI.	"	Grand Junction ..	Waihi Grand Junction Gold-mining Co. (Ltd.).
13/1/97	92	1	21	Katikati ..	IV.	Aongatete	Great Bernard ..	Robert Simms.
3/6/96	100	0	0	Waihi ..	VIII.	Ohinemuri	Great Britain ..	Nat Clotworthy.
7/10/96	91	1	0	" ..	XII.	"	Great Central ..	John Murdoch Ross.
12/10/96	90	2	8	Maratoto ..	VI.	"	Great London ..	William Henry Aitken.
12/10/96	87	0	0	" ..	"	"	Great London Ext.	"
30/5/96	100	0	0	Waihi ..	VIII.	"	Great Northern ..	Great Northern Gold-mining Co. (N.L.).
19/2/97	99	2	18	Katikati ..	IV.	Aongatete	Great Pacific ..	William L. Hunter.
19/5/96	27	1	0	Karangahake	I.	Aroha ..	Great Southern ..	Prince Regent Gold-mining Co. (N.L.).
22/7/95	98	2	30	Waihi ..	XV.	Ohinemuri	Haines Morrin ..	Waihi Consols Gold-mining Co.
30/11/96	99	2	0	Te Puke ..	V. VIII.	Maketu Otanewaiu-uku	Hake	James W. Gray.
23/2/97	22	2	0	Komata ..	V., VI., IX., X.	Ohinemuri	Harp of Erin ..	James Crosby.
25/6/96	100	0	0	Karangahake	XIII., XIV.	"	Hercules ..	The Hercules Gold-mining Co. (N.L.).
30/11/96	40	0	0	"	XIV.	"	Hercules Extended	James H. Fleming.
22/10/95	23	0	32	Waitekauri ..	"	"	Heroic	William J. Cornes.
27/10/96	23	0	32	" ..	"	"	"	Lionel McLellan.
25/4/96	49	3	30	Komata ..	X.	"	Hibernica ..	Key of Komata (Ltd.).
14/9/96	81	2	0	Waihi ..	XV.	"	Hinemoa ..	Frederick W. Rickards.
27/10/96	7	0	22	Katikati ..	IV.	Aongatete	H.M.S. ..	Henry Medland Shepherd.
13/1/97	100	0	0	Wharekirau-punga	VII.	Ohinemuri	Horse Guards ..	Henry D. Abbott.
13/11/95	48	3	25	Waitekauri ..	X.	"	Huanui	The Huanui Gold-mining Co. (N.L.).
3/9/96	100	0	0	Owharoa ..	XIV.	"	Huntley	John F. Andrew.
27/2/96	62	0	15	Karangahake	II.,	Te Aroha	Imperial ..	Imperial Gold-mining Co. (N.L.).
3/6/96	100	0	0	Komata ..	X.	Ohinemuri	Ingall	Godefroi Drew Ingall.
2/9/96	42	2	7	" ..	"	"	Ingall No. 2 ..	"
29/10/96	17	0	33	Waitekauri ..	XIV.	"	Ingall Extended ..	Maurice Harris.
3/3/96	7	2	16	" ..	X.	"	Innisfail ..	William Duncan Smeaton.
13/1/97	96	0	0	" ..	XI.	"	Invincible ..	John Menzies.
16/10/96	29	1	10	" ..	X., XIV.	"	Iolanthe	Thomas O'Toole.
26/8/96	17	0	13	Maratoto ..	VI.	"	Ionic	Wilfred Rathbone.
13/11/95	49	0	12	Waitekauri ..	XIV.	"	Iota	Golden Waitekauri Gold-mining Co. (N.L.).
3/6/96	100	0	0	" ..	"	"	Iota Extended ..	Ditto.
2/9/96	87	2	23	Maratoto ..	VI., VII.	"	Ironclad	James Henry Fleming.
8/8/96	100	0	0	" ..	VI.	"	Irving	Irving Gold-mining Co. (N.L.).
25/4/96	72	0	12	Karangahake	XIV. I., II.	" Aroha	Ivanhoe ..	Ivanhoe Gold-mining Co. (N.L.).
8/5/96	95	3	21	Maratoto ..	VI.	Ohinemuri	Jason	Herbert Gentles.
22/3/97	31	0	0	Waihi ..	XI.	"	Jessie	William Forrest.
23/12/96	77	3	28	Katikati ..	IV.	Aongatete	Jesmond ..	William J. Gray.
8/8/96	100	0	0	Waihi ..	XI.	Ohinemuri	Jess	James E. Jones and Walter J. Binstead.
18/12/96	30	0	0	Waitekauri ..	XIV.	"	Jewel	Jewel Gold-mining Co. (Ltd.).
5/5/96	24	3	10	" ..	"	"	Jewel Extended ..	"
19/2/97	100	0	0	Te Puke ..	V.	Maketu ..	Jocelyn	John G. Galbraith.
10/11/87	103	0	15	Waitekauri ..	XIV.	Ohinemuri	Jubilee	The New Zealand Jubilee Gold-minin Co. (Ltd.).
24/3/96	100	0	0	Waihi ..	XV.	"	Julius	Julius Gold-mining Co. (N.L.).
23/12/96	40	0	0	Waitekauri ..	XIV.	"	Julius Cæsar ..	James H. Fleming.
8/8/96	59	0	0	Waihi ..	XVI.	"	Jump Up ..	David Lucas.
25/4/96	78	3	35	Maratoto ..	VI.	"	Kapai Kaiser ..	William Horne.
6/8/95	30	0	0	Karangahake	II.	Aroha ..	Karangahake ..	Karangahake Gold-mining Co. (N.L.).
27/10/96	30	0	0	"	"	" ..	Karangahake Reef	Lawrence McNamara.
27/2/96	59	0	15	"	I., II.	" ..	Karangahake South	Charles Frederick Reid.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Ohinemuri—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
16/12/96	25	2	10	Katikati ..	IV.	Aongatete	Katikati Consolidated	William Robinson.
30/11/96	56	0	0	" ..	"	"	Katikati Prospectors Ext. No. 1	Edward F. Buckworth.
18/2/96	5	1	32	Waitekauri ..	XIV.	Ohinemuri	Keep-it-Dark ..	New Zealand Jubilee Gold-mining Co. (Ltd.).
27/10/96	10	3	19	Owharoa ..	"	"	Kenilworth ..	Ohinemuri Syndicate (Ltd.).
16/3/96	99	2	0	Komata ..	X.	"	Key of Komata ..	Key of Komata (Ltd.).
30/11/96	49	3	8	Waihi ..	III.	Aroha ..	Kilkenny ..	Annie Tanner.
8/8/96	99	2	24	" ..	"	" ..	Killarney ..	"
8/8/96	87	1	0	" ..	"	" ..	Killarney Extended	William Scott Lyell.
23/12/96	94	0	6	Maratoto ..	VI.	Ohinemuri	King	John Morrissy.
5/5/96	17	0	0	Waihi ..	XIII.	"	King Midas ..	Arthur M. Myers.
8/8/96	44	0	0	Komata ..	X.	"	Komata Chief ..	Komata Chief Gold-mining Co. (N.L.).
14/9/95	100	0	0	" ..	"	"	Komata Consolidated	Komata Queen (Ltd.).
21/5/95	29	1	0	" ..	"	"	Komata Extended	"
1/3/97	100	0	0	" ..	IX., X.	"	Komata Gem ..	Alfred William Sergeant.
25/6/96	100	0	0	" ..	X.	"	Komata King ..	Komata King Gold-mining Co. (N.L.).
8/8/96	62	2	0	" ..	"	"	Komata Proper ..	Robert Walker.
31/12/95	100	0	0	" ..	"	"	Komata Proprietary	New Zealand Exploration Co. (Ltd.).
23/7/96	98	1	37	" ..	"	"	Komata Queen ..	Komata Royal Gold-mining Co. (N.L.).
17/8/95	79	1	24	" ..	"	"	Komata Reefs ..	Komata Reefs Gold-mining Co. (Ltd.).
13/11/95	100	0	0	" ..	"	"	Komata Reefs Ext.	John Mason Sharp.
30/11/96	100	0	0	" ..	"	"	Komata Reward ..	James Henry Fleming.
30/11/96	100	0	0	" ..	"	"	Komata Reward Extended	"
23/7/96	100	0	0	" ..	IX., X.	"	Komata View ..	John Edward Banks.
9/12/96	86	0	0	" ..	X.	"	Komata View South	"
3/6/96	100	0	0	" ..	"	"	Komata West ..	George Burgess.
20/8/96	75	1	10	Karangahake	II.	Aroha ..	Leap Year ..	James Barrett, Lawrence McNamara, and Edwin Edwards.
19/2/97	73	3	30	Waitekauri ..	XIV.	Ohinemuri	Liberal	George Charles W. Morris.
23/12/96	100	0	0	Wharekirau-punga	VII.	"	Lily	John Edward Banks.
16/10/96	14	2	10	Karangahake	I.	Aroha ..	Lioness	Thomas Herbert Biggs.
23/7/96	86	2	13	Maratoto ..	VI.	Ohinemuri	Liverpool ..	Newell B. Lusk.
3/9/96	79	0	22	Karangahake	I.	Aroha ..	Locksley ..	John Sherlock White.
25/6/96	86	0	30	Waihi ..	XVI.	Ohinemuri	Lone Star ..	William John Downie.
29/9/96	13	2	27	Komata ..	X.	"	London	Thomas Seaver.
24/10/96	98	1	0	Waitewheta	VI.	Te Aroha ..	London Exchange	Gregory B. Ormond.
7/4/96	64	2	0	Waitekauri ..	XIV.	Ohinemuri	Londonderry ..	Waitekauri No. 2 Gold-mining Co. (N.L.).
25/6/96	100	0	0	Maratoto ..	VI.	"	Long Drive ..	Edward M. Corbett.
23/2/97	10	3	23	Wharekirau-punga	VII.	"	Loyalty	Robert Kelly.
10/11/96	26	2	0	Waihi ..	III.	Aroha ..	Lord Brassey ..	William Henry Potter.
30/11/96	100	0	0	" ..	II.	" ..	Lord Clyde ..	Don of Waihi Gold-mining Co. (N.L.).
27/10/96	27	1	0	" ..	III.	" ..	Lord Clyde Ext. ..	"
30/11/96	45	2	17	Katikati ..	IV.	Aongatete	Lord Nelson ..	James T. Inglis.
29/6/96	100	0	0	Maratoto ..	VI.	Ohinemuri	Lord Roseberry ..	Nathaniel Dunlop.
7/10/96	46	1	5	" ..	"	"	Lord Roseberry Ext.	"
3/6/96	100	0	0	" ..	"	"	Lord Salisbury ..	Henry M. Shepherd.
19/9/96	65	3	37	Karangahake	II.	Aroha ..	Luckpenny ..	Charles S. Farmer.
6/8/95	30	0	0	Maratoto ..	VI., X.	Ohinemuri	Lydia	Hikutaia Gold Syndicate (Ltd.).
19/2/97	50	0	8	" ..	VI.	"	MacGregor ..	Walter Thorp.
5/9/89	14	3	25	Owharoa ..	XIV.	"	Madden's Folly ..	Ohinemuri Syndicate (Ltd.).
23/12/96	46	0	26	Maratoto ..	VI.	"	Madge	Michael Crosby.
8/8/96	61	3	4	" ..	"	"	Magazine ..	Edwin Edwards.
14/9/96	100	0	0	Waihi ..	III.	Aroha ..	Maid of Erin ..	Andrew Cunningham.
10/12/95	100	0	0	" ..	"	" ..	Maid of Honour ..	Queen of Waihi Gold-mining Co. (N.L.).
23/7/96	100	0	0	" ..	XIII.	Ohinemuri	Makarina	Joseph James Craig.
23/7/96	100	0	0	" ..	XIII., XIV.	"	Mammoth	Hercules Gold-mining Co.
28/7/96	25	2	0	" ..	XIII.	"	Mammoth Ext. ..	Hercules Gold-mining Co. (N.L.).
19/2/97	36	1	12	Waitekauri ..	XIV.	"	Mangakara United No. 1.	The Mangakara United Gold-mining Co. (N.L.).
24/10/96	98	1	32	" ..	"	"	Mangakara United No. 2	The Mangakara United Gold-mining Co. (N.L.).
19/12/96	22	2	0	Waitewheta	VI.	Aroha ..	Mangakino Reefs ..	Edwin Edwards.
30/6/96	30	0	0	" ..	"	" ..	Manukawa ..	Robert Walker.
23/3/96	100	0	0	Komata ..	X.	Ohinemuri	Marburg	Waitekauri Union Claims (Ltd.).
25/3/96	100	0	0	Maratoto ..	VI.	"	Marguerite ..	Herbert Gentles.
23/4/95	30	0	0	Karangahake	II.	Aroha ..	Mariner	Mariner Gold-mining Co. (N.L.).
17/2/96	100	0	0	"	"	" ..	Maritana	Maritana Gold-mining Co. (N.L.).
23/12/96	67	3	13	"	"	" ..	Maritana Extended	James M. Lennox.
15/5/96	82	1	20	Maratoto ..	V.	Ohinemuri	Maratoto United ..	Hikutaia Gold Syndicate (Ltd.).
27/2/96	100	0	0	Waihi ..	XV., XVI.	"	Martha	Waihi Gold-mining Co. (Ltd.).
27/2/96	100	0	0	" ..	XI.	"	Martha Extended	Martha Ext. Gold-mining Co. (N.L.).
14/9/96	93	1	0	" ..	XII.	"	Martha No. 2 ..	David Lucas.
20/1/97	30	0	0	Waitekauri ..	XIV.	"	Marquis	John Phillips, jun.
30/11/96	100	0	0	Karangahake	I.	Aroha ..	Mary Queen of Scots	Robert Kelly.
25/4/96	77	0	0	Waihi ..	XII.	Ohinemuri	Mataura	Mataura Gold-mining Co. (N.L.).
23/7/96	38	1	0	" ..	XI.	"	Matawai	Martha Ext. Gold-mining Co. (N.L.).
22/3/97	53	3	10	Komata ..	X.	"	May Day	Seering H. Matthews.
22/3/97	71	3	37	"	"	"	May Day Extended	"
30/11/96	95	0	0	Karangahake	II.	Aroha ..	Maynooth ..	William Shaw.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Ohinemuri—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
14/9/96	100	0	0	Waihi ..	III.	Aroha ..	Mavourneen ..	Moritz Samuel Leers.
18/2/96	29	3	4	Maratoto ..	VI.	Ohinemuri	Melbourne Cup ..	James Nicholls.
5/11/95	30	0	0	Karangahake	I.	Aroha ..	Mere	John Rutherford.
18/2/96	5	1	7	"	"	" ..	Mere Surplus ..	Thomas P. P. Seaver.
8/5/96	100	0	0	Marototo ..	VI.	Ohinemuri	Mexico	Herbert Gentles.
19/5/96	23	2	0	Karangahake	I.	Aroha ..	Micawber ..	Farquhar Stewart.
23/12/96	44	0	0	Wharekirau-punga	VII.	Ohinemuri	Millionaire ..	William L. Hunter.
14/9/96	100	0	0	Komata ..	VI., X.	"	Microphone ..	William Thorne.
8/12/96	29	3	14	Waihi ..	II.	Waihi North	Miners' Friend ..	Algar Bunyard.
17/9/95	12	0	22	Waitekauri..	X.	Ohinemuri	Missing Link ..	Waitekauri Extended Gold-mining Co. (Ltd.).
25/4/96	76	1	10	Karangahake	II.	Aroha ..	Mitre	George Symons Budge.
3/6/96	34	0	6	Waitekauri..	XI.	Ohinemuri	Monarch Extended	Waitekauri Monarch Gold-mining Co. (N.L.).
23/7/96	75	2	30	Owharoa ..	XIV.	"	Morgan	Ohinemuri Syndicate (Ltd.).
1/3/97	99	3	16	Waihi ..	III.	Aroha ..	Morning Light ..	Archibald Clements.
25/4/96	97	3	0	" ..	VI.	Ohinemuri	Morning Star ..	Waihi Reefs Gold-mining Co. (N.L.).
24/3/96	100	0	0	" ..	XV.	"	Mount	Mount Waihi Gold-mining Co. (N.L.).
7/10/96	100	0	0	Waitawheta	VI.	Aroha ..	Mount Cathrine ..	Edwin Charles Martin.
8/8/96	100	0	0	Waihi ..	III.	"	Mount Lyell ..	William Scott Lyell.
24/10/96	100	0	0	Waitawheta	VI.	"	Mount Magnet ..	Edwin Charles Martin.
8/8/96	100	0	0	Waihi ..	III.	"	Mount Morgan ..	Andrew Cunningham.
21/1/96	19	3	17	Karangahake	II.	"	Multum in Parvo	James Barrett.
21/4/96	6	2	38	"	"	"	Muriel	The Maritana Gold-mining Co. (N.L.).
30/11/96	77	0	0	Waitawheta	VI.	Ohinemuri	Musketeer ..	Charles S. Farmer.
28/7/96	14	0	20	Waitekauri ..	X., XI.	"	Musket	Alexander Hanlen.
20/8/96	100	0	0	Wharekirau-punga	VII.	"	Myrtle	John Churton.
30/11/96	46	0	0	Ditto ..	"	"	Myrtle Extended..	Benjamin Adams.
23/12/96	34	1	23	Waitawheta	VI.	Aroha ..	Mount Zion ..	John Kneebone.
3/9/96	100	0	0	Waitekauri ..	XI.	Ohinemuri	Napoleon ..	Edwin Charles Martin.
18/2/96	25	0	0	Komata ..	X.	"	National ..	Edward Quinn.
23/3/96	95	2	32	Waitekauri ..	"	"	Nebraska ..	Waitekauri Union Claims (Ltd.).
10/11/96	20	1	22	Katikati ..	IV.	Aongatete	Nellie	James Henry Fleming.
23/7/96	100	0	0	Waitekauri ..	XIV.	Ohinemuri	Nelson	Mangakara United Gold-mining Co. (N.L.).
23/12/96	99	3	35	Waihi ..	XII.	"	Nero	John M. Ross.
27/2/96	52	2	0	Karangahake	II.	Aroha ..	Nevada	David Snodgrass.
30/11/96	100	0	0	Waihi ..	III., IV.	" ..	New Boy ..	Don of Waihi Gold-mining Co. (N.L.).
25/6/96	49	3	2	Karangahake	II.	" ..	New Caledonian ..	Richard Gooch.
30/11/96	100	0	0	Waihi ..	IV.	" ..	New Chum ..	Don of Waihi Gold-mining Co. (N.L.).
19/2/97	93	3	0	" ..	XV.	Ohinemuri	New Era ..	Frederick P. Jones.
27/2/96	46	0	0	Karangahake	II.	Aroha ..	New Tariff ..	The Owharoa United Gold-mining Co. (N.L.).
18/2/96	25	2	0	Waitekauri ..	XIV.	Ohinemuri	New Waitekauri ..	Star of Waitekauri Gold-mining Co. (N.L.).
8/8/96	66	3	9	Waihi ..	XV.	"	New Year ..	Waihi South Gold-mining Co. (N.L.).
14/9/96	82	1	0	Waitekauri ..	XIV.	"	New-Zealander ..	New Zealand Gold-mining Co. (N.L.).
24/3/96	82	1	4	Waihi ..	XVI.	"	Ngapuhi ..	Waihi Eldorado Gold-mining Co. (N.L.).
24/10/96	96	2	16	" ..	XIII.	"	Nimmo	Henry Fletcher.
25/6/96	100	0	0	Te Puke ..	V.	Maketu ..	None	James Henry Felton.
14/9/96	45	0	0	Waitekauri ..	VI., XX.	Ohinemuri	North Waitekauri	William Horne.
2/9/96	100	0	0	Komata ..	X.	"	Norina	William Elliott.
23/12/96	100	0	0	Waihi ..	III. / XV.	Aroha / Ohinemuri	Nottingham Castle	William Henry Potter.
24/10/96	97	0	0	Wharekirau-punga	VII.	"	Novia Scotia ..	John Murdoch Ross.
23/3/96	100	0	0	Waitawheta	II., VI.	Aroha ..	Oakley	The Oakley Gold-mining Co. (Ltd.).
30/5/96	97	2	21	"	"	" ..	Oakley Extended..	"
19/9/95	100	0	0	Komata ..	X.	Ohinemuri	Oceania	Oceania Gold mining Co. (N.L.).
24/3/96	91	0	0	Waihi ..	XV.	"	Oddfellows ..	Michael Sheehan.
10/12/95	100	0	0	Owharoa ..	XVI.	"	Ohinemuri ..	Ohinemuri Gold-mining Co. (N.L.).
19/5/96	30	0	0	Waitekauri ..	X.	"	Ohinemuri Star ..	John W. Ryan.
23/7/96	100	0	0	Waihi ..	XI., XII.	"	Onuku	Patrick Keegan.
7/10/96	100	0	0	Maratoto ..	VI.	"	Oom Paul ..	James Henry Fleming.
9/7/95	20	0	0	Owharoa ..	XIV.	"	Ophir L.H. ..	Ophir Gold-mining Co. (N.L.).
27/2/96	34	3	0	Waihi ..	XV., XVI.	"	Ophir	Waihi Gold-mining Co. (N.L.).
3/12/95	30	0	0	Karangahake	II.	Aroha ..	Orient	Orient Gold-mining Co. (N.L.).
24/8/95	90	0	0	Owharoa ..	"	" ..	Owharoa ..	The Ohinemuri Syndicate (Ltd.).
13/11/95	100	0	0	Maratoto ..	X.	Ohinemuri	Pakirarahi ..	Hikutaia Gold Syndicate (Ltd.).
23/12/96	100	0	0	" ..	"	"	Pakirarahi ..	Edwin G. Banks.
21/1/96	16	1	0	" ..	"	"	Pakirarahi Ext. ..	Hikutaia Gold Syndicate (Ltd.).
25/6/96	99	3	10	Karangahake	II.	Aroha ..	Pandora ..	Pandora Gold-mining Co. (N.L.).
2/9/96	100	0	0	"	"	" ..	Pandora Extended	"
3/9/96	37	2	28	"	"	" ..	Pandora No. 2 ..	Alexander Robinson.
23/12/96	72	2	15	Wharekirau-punga	VII.	Ohinemuri	Parnassus ..	Auckland Prospecting Association (Ltd.).
1/3/97	100	0	0	Waihi ..	XI.	"	Paul Jones ..	Charles John Francis Ratjen.
6/8/95	30	0	0	Maratoto ..	VI.	"	Pay Rock ..	Hikutaia Gold Syndicate (Ltd.).
7/10/96	79	1	18	Waitekauri ..	X., XIV.	"	Pearl	Edward Kersey Cooper.
19/2/97	97	3	0	Maratoto ..	V.	"	Peel's Creek ..	Thomas James Adams.
30/6/96	4	0	11	Waitekauri ..	XIV.	"	Perseverance ..	The Waitekauri United Gold-mining Co. (Ltd.).

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Ohinemuri—*continued*.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
30/11/96	100	0	0	Wharekirau-punga	VII.	Ohinemuri	Persimmon ..	Henry M. Shepherd.
23/12/96	100	0	0	Katikati ..	IV.	Aongatete..	Persimmon Ext. ..	Dan Campbell.
31/12/95	100	0	0	Waitekauri ..	X.	Ohinemuri	Pilot	Waitekauri Union Claims (Ltd.).
24/10/96	73	1	24	" ..	XV., XVI.	"	Pleiades ..	Edmund Charles Brown.
16/10/96	3	3	0	Komata ..	X.	"	Pointer	James Ansenne.
5/9/93	15	0	0	Waitekauri ..	"	"	Portsea	Portsea Gold-mining Co. (Ltd.).
28/7/96	30	0	0	" ..	XIV.	"	Premier	Charles Collins.
1/3/97	100	0	0	Te Puke ..	XVI.	Otanewaiu-uku	Premier of Te Puke	Robert Hood.
8/8/96	56	1	26	Waihi ..	XII.	Ohinemuri	Pride of the Martha	George Birnie.
22/3/97	61	1	2	" ..	XV.	"	Primrose ..	John Murray.
19/2/97	100	0	0	Komata ..	V., IX.	"	Prince	George Crosby.
16/2/96	52	1	32	Karangahake	I.	Aroha ..	Prince Regent ..	Prince Regent Gold-mining Co. (N.L.).
7/10/96	100	0	0	Waihi ..	XVI.	Ohinemuri	Prince of Waihi ..	Prince of Waihi Gold-mining Co. (N.L.).
9/2/97	17	0	0	" ..	"	"	Prince of Waihi Extended	Arthur Edward Langley.
2/9/96	100	0	0	Wharekirau-punga	VII.	"	Prince of Wales ..	Prince of Wales Gold-mining Co. (N.L.).
30/11/96	86	3	6	Karangahake	I.	Aroha ..	Princess Louise ..	William Whytehead.
3/6/96	100	0	0	"	"	" ..	Princess May ..	Arthur Roland Brett.
7/10/96	98	3	23	Maratoto ..	VI.	Ohinemuri	Privateer ..	James Henry Fleming.
19/2/97	97	2	29	Te Puke ..	V.	Maketu ..	Problem ..	George Crosby.
23/12/96	100	0	0	Maratoto ..	VII.	Ohinemuri	Puzzle	William Elliott.
3/6/96	100	0	0	Waitekauri ..	VI., X.	"	Queen Anne of Waitekauri	The Queen Anne Gold-mining Co. (N.L.).
8/8/96	76	1	8	Komata ..	X.	"	Queen Anne Ext.	Annie Sergeant.
23/12/96	100	0	0	Maratoto ..	VI., X.	"	Queen of Maratoto	William H. Cooper.
4/10/95	67	3	37	Komata ..	X.	"	Rainbow ..	Alfred Kidd.
3/5/95	90	0	0	Karangahake	XIII. / I.	" / Aroha	Ravenswood ..	Woodstock Main Reef (Ltd.).
23/12/96	35	2	10	"	II.	" ..	Reefton	John M. Haslett.
24/3/96	97	2	6	Owharoa ..	XIV.	Ohinemuri	Remuera ..	Ohinemuri Syndicate (Ltd.).
3/5/95	100	0	0	Maratoto ..	VI.	"	Retreat	John Schischka.
19/9/96	100	0	0	Waihi ..	II.	Waihi North	Rhodes	Charles W. Cave.
19/2/97	56	1	0	Katikati ..	IV.	Aongatete	Riotanto No. 1 ..	Alfred Shepherd.
23/12/96	64	2	21	" ..	I.	"	Riotanto No. 2 ..	"
19/2/97	59	3	9	" ..	IV.	"	Riotanto No. 3 ..	"
23/12/96	58	1	21	Waitekauri ..	XIV.	Ohinemuri	Rising Sun ..	Rising Sun Gold-mining Co. (N.L.).
25/4/96	87	0	6	Karangahake	II.	Aroha ..	Rob Roy ..	Arthur Ernest Plummer.
21/1/96	30	0	0	Waihi ..	XVI.	Ohinemuri	Robin Hood ..	Henry Gilfillan, jun.
14/9/96	90	1	20	" ..	XV.	"	Rosamond ..	George Benmore Osmond.
1/3/97	100	0	0	Maratoto ..	VII.	"	Rose	John Edward Banks.
31/12/95	100	0	0	Wahi ..	XVI.	"	Rosemont ..	Union Waihi Gold-mining Co. (Ltd.).
3/6/96	100	0	0	Karangahake	I.	Aroha ..	Rothschild ..	Rothschild Gold-mining Co. (N.L.).
23/12/96	86	3	3	"	"	" ..	Rotokohu ..	Edward Ryan.
30/6/96	3	1	21	..	..	..	Royal	George Crosby.
14/9/96	99	0	0	Waitekauri ..	XIV.	Ohinemuri	Royal Arms ..	The Devon Gold-mining Co. (N.L.).
13/1/97	100	0	0	Komata ..	IX., X.	"	Royal Mail ..	Charles F. Wrigley and D. Allen.
2/9/96	100	0	0	Maratoto ..	VI.	"	Royal Mint ..	George Loram.
2/9/96	100	0	0	" ..	"	"	Royal Mint Ext. ..	Robert Walker.
10/11/96	12	0	0	Wharekerau-punga	VII.	"	Royal Shield ..	The Royal Shield Gold-mining Co. (N.L.).
7/4/96	100	0	0	Ditto ..	"	"	Royal Standard ..	John Guest Ralph.
25/3/96	100	0	0	" ..	"	"	Royal Standard Extended	Thomas D'Arcy O'Toole.
29/6/96	95	0	8	" ..	"	"	Royal Standard No. 1	John R. Robinson.
3/6/96	100	0	0	Karangahake	II.	Aroha ..	Ruapehu ..	William Grey Nicholls.
22/10/95	26	0	0	"	I.	" ..	Ruby	Joseph Barber.
16/6/96	20	0	32	Waitekauri ..	X., XIV.	Ohinemuri	Salem	Robert C. Speer.
19/2/97	89	1	24	Maratoto ..	VI.	Aroha ..	Sancho Panza ..	John Edward Banks.
30/11/96	100	0	0	" ..	"	Ohinemuri	Saturn	Charles Daw.
23/7/96	100	0	0	Wharekirau-punga	VII.	"	Sceptre	Auckland Prospecting Association (Ltd.).
19/2/97	96	3	8	Waitekauri ..	XIV.	"	Scotia	John Henry Porter.
1/2/96	100	0	0	Waihi ..	XII.	"	Sea View ..	Waihi Monument Gold-mining Co. (N.L.).
9/2/97	25	2	0	Owharoa ..	II.	Aroha ..	Seddon	Ralph Montgomery.
24/11/96	30	0	0	Karangahake	"	" ..	Shannon ..	Lawrence McNamara.
8/8/96	89	2	24	Waihi ..	XV.	Ohinemuri	Sheila	W. T. J. Bell.
22/3/97	100	0	0	" ..	XVI.	"	Shining Light ..	John Hastie.
25/4/96	100	0	0	" ..	XII., XV.	"	Silver Moon ..	Waihi Pinnacles Gold-mining Co. (N.L.).
25/3/96	76	2	10	Te Aroha ..	X.	Aroha ..	Silver Star ..	Edwin C. Martin.
23/12/96	100	0	0	" ..	"	" ..	Silver Streak ..	Brian T. Chayter and H. Roberts Burt.
23/3/96	83	0	0	Maratoto ..	VII.	Ohinemuri	Silver Stream ..	Thomas Corbett.
25/6/96	82	2	38	Waihi ..	XVI.	"	Silverton ..	Waihi-Silverton Extended Gold-mining Co. (Ltd.).
23/12/96	91	1	7	" ..	"	"	Silverton No. 2 ..	Ditto.
25/4/96	99	3	36	" ..	III.	Aroha ..	Smithfield ..	John A. Marshall.
3/9/96	64	0	27	" ..	XV.	Ohinemuri	Sink to Rise ..	Edward Mann Corbett.
8/5/96	99	2	6	Waitekauri ..	X.	"	Socket	Waitekauri Gold-mining Co. (Ltd.).
13/9/95	62	2	5	" ..	XIV.	"	Sophia	British Empire Gold-mining Co. (N.L.).
23/7/95	30	0	0	Karangahake	II.	Aroha ..	South British ..	South British Gold-mining Co. (N.L.).
31/3/96	30	0	0	Komata ..	X.	Ohinemuri	Southern Cross ..	Southern Cross Gold-mining Co. (N.L.).

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Ohinemuri—*continued.*

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
30/11/96	100	0	0	Waihi ..	XII.	Ohinemuri	Stackpole's Caledonian	Robert Stackpole, jun.
1/3/97	100	0	0	Te Puke ..	IV.	Maketu ..	Standard ..	John Mason Sharp.
17/2/96	61	2	37	Karangahake	I.	Aroha ..	Stanley ..	Stanley Gold-mining Co. (N.L.).
8/8/96	66	3	8	Maratoto ..	VI.	Ohinemuri	Star Extended ..	Frederick C. McFlinn.
30/11/96	100	0	0	" ..	VII.	"	Star of Fortune ..	Richard Gooch.
23/3/96	66	3	0	Waihi ..	XI.	"	Star of Waihi ..	Patrick Keegan.
23/7/96	91	3	32	Karangahake	II.	Aroha ..	Sterling ..	Sterling Gold-mining Co. (N.L.).
23/3/96	33	0	0	"	I.	" ..	St. Patrick ..	St. Patrick Gold-mining Co. (N.L.).
24/10/96	79	0	0	Waitekauri ..	XIV.	Ohinemuri	Success ..	Waitekauri King Gold-mining Co. (N.L.).
30/11/96	100	0	0	Waihi ..	III.	Aroha ..	Sunbeam ..	William H. Potter.
23/12/96	83	2	25	Waitekauri ..	XIV.	Ohinemuri	Surprise ..	George Loram.
13/1/97	34	1	0	Waihi ..	XV., XVI.	"	Sultan of Waihi ..	Arthur Edward Langley.
19/2/97	100	0	0	Karangahake	II.	Aroha ..	Sylvia	John S. White.
3/6/96	90	1	36	Maratoto ..	VI., VII.	Ohinemuri	Takapuna ..	Robert Wynyard.
3/9/96	60	0	0	Karangahake	I.	Aroha ..	Talisman ..	New Zealand Talisman Gold-mining Co. (Ltd.).
29/6/96	79	2	15	"	"	" ..	Talisman Extended	Talisman Extended Gold-mining Co. (Ltd.).
25/4/96	100	0	0	Waitawheta	VI.	" ..	Taupo	Ernest C. Beale.
8/8/96	74	2	0	Wharekirau-punga	VII.	Ohinemuri	Tavistock ..	John Guest Ralph.
30/11/96	77	2	19	Ditto ..	"	"	Tavistock Central	Henry Hughes.
30/11/96	100	0	0	" ..	"	"	Tavistock No. 2 ..	William Edwin Griffin.
24/10/96	81	3	18	" ..	"	"	Tavistock Reefs ..	George W. C. Morris.
14/11/95	97	3	36	Komata ..	X.	"	Te Ao Marama ..	Waitekauri Gold-mining Co. (Ltd.).
3/9/96	100	0	0	Waitekauri ..	XIV.	"	Te Awamutu ..	Isaac Jones and others.
25/6/96	100	0	0	Te Puke ..	V.	Maketu ..	Te Puke	John Angus Clark.
19/2/97	100	0	0	" ..	"	" ..	Te Puke Central ..	George Carrick.
19/2/97	100	0	0	" ..	"	" ..	Te Puke Prospectors	James William Shaw.
19/2/97	100	0	0	" ..	"	" ..	Te Puke Reefs ..	Edwin Edwards.
18/2/96	30	0	0	Waitekauri ..	X.	Ohinemuri	Thistle	Russell Gold-mining Co. (N.L.).
3/6/96	73	3	4	Owharoa ..	XIV.	"	Thorpe	The Ohinemuri Syndicate (Ltd.).
1/3/97	79	3	0	Maratoto ..	V., IX.	"	Three Castles ..	Harry Moore.
27/10/96	2	3	13	Waitawheta	VI.	Aroha ..	Tit Bit	Edwin Charles Martin.
25/4/96	100	0	0	Maratoto ..	"	Ohinemuri	Tomoana ..	William Horne.
24/10/96	99	0	0	Wharekirau-punga	VII.	"	Tornado	Thomas Henderson.
23/12/96	32	2	28	Waitawheta	VI.	Aroha ..	Transvaal ..	Benjamin Anderson.
24/3/96	30	0	0	Karangahake	II.	Te Aroha ..	Travita	Arthur E. Langley.
17/10/95	100	0	0	Komata ..	X.	Ohinemuri	Triumph ..	Komata Triumph Gold-mining Co. (N.L.).
25/4/96	51	2	8	" ..	"	"	Triumph Extended	Ditto.
13/1/97	99	0	15	Waitekauri ..	XIV.	"	Teutonic Amalgamated	Teutonic Gold-mining Co. (N.L.).
27/9/95	27	1	24	Owharoa ..	"	"	Tunnel	Ohinemuri Syndicate (Ltd.).
21/5/95	14	1	36	Waitekauri ..	VI.	"	Two-and-Two-makes-Four	Waitekauri Central Gold-mining Co. (Ltd.).
23/12/96	76	0	16	Te Puke ..	I.	Maketu ..	Ulster	Stephen Weston Goss.
22/3/97	91	1	13	Katikati ..	IV.	Aongatete	Una	Henry F. Gotz.
31/12/95	100	0	0	Waihi ..	XVI.	Ohinemuri	Union	Union Waihi Gold-mining Co. (Ltd.).
27/2/96	100	0	0	Karangahake	I.	Aroha ..	Union Jack ..	Union Jack Gold-mining Co. (N.L.).
19/2/97	33	2	16	Waitekauri ..	X., XIV.	Ohinemuri	Utunui	James M. Brigham, jun.
2/6/96	14	2	10	Karangahake	I.	Aroha ..	Vandora	Charles P. Brown.
1/3/97	90	0	0	Te Puke ..	IX.	Maketu ..	Venture	Benjamin Anderson.
25/12/96	94	3	0	" ..	I., IV.	" ..	Vermont ..	David F. Lundon.
11/5/96	99	1	10	Karangahake	I.	Aroha ..	Victor Waihou ..	Victor Waihou Gold-mining Co.
30/11/96	91	0	7	Waihi ..	II.	Waihi North	Waihi Big Reefs ..	James J. Ormond.
30/11/96	100	0	0	" ..	III.	Aroha ..	Waihi Broken Hill	Peter McFarlane.
30/11/96	100	0	0	" ..	"	" ..	Waihi Broken Hill Extended	Henry Fletcher.
22/3/97	100	0	0	" ..	II.	Waihi North	Waihi Castle ..	Henry Moore.
24/10/96	100	0	0	" ..	XI., XII.	Ohinemuri	Waihi Central ..	George Loram.
1/2/96	100	0	0	" ..	XVI.	"	Waihi Eldorado ..	The Waihi Eldorado Gold-mining Co. (N.L.).
14/8/95	100	0	0	" ..	"	"	Waihi Extended ..	Waihi Extended Gold-mining Co. (Ltd.).
1/2/96	87	2	0	" ..	XII.	"	Waihi Fluke ..	King of Waihi Gold-mining Co.
1/3/97	66	2	8	" ..	XVI.	"	Waihi Gladstone ..	Waihi Gladstone Gold-mining Co. (Ltd.).
17/2/96	100	0	0	" ..	XIII.	"	Waihi Golden Pinnacle	Waihi Pinnacles Gold-mining Co. (N.L.).
17/2/96	100	0	0	" ..	XII.	"	Waihi Golden Pinnacle Extended	Waihi Pinnacles Gold-mining Co. (N.L.).
30/5/96	100	0	0	" ..	II.	Waihi North	Waihi Grand ..	Edward Vincent Ralph.
30/11/96	100	0	0	" ..	"	"	Waihi Grand Ext.	Robert Pearce Gibbons.
1/3/97	97	3	0	" ..	XII.	Ohinemuri	Waihi Investment	Freeman Johnson.
17/2/96	100	0	0	" ..	"	"	Waihi New Find	Esperanza Gold-mining Co. (N.L.).
10/12/95	91	2	0	" ..	II.	Waihi North	Waihi Monument	Waihi Monument Gold-mining Co. (N.L.).
1/2/96	100	0	0	" ..	VII.	Ohinemuri	Waihi Monument Extended	Ditto.
13/11/95	98	1	0	" ..	XV., XVI.	"	Waihi North ..	Waihi Consols Gold-mining Co.
13/11/95	97	1	35	" ..	XV.	"	Waihi Proprietary	Queen of Waihi Gold-mining Co.
8/10/95	14	0	16	" ..	"	"	Waihi South ..	Star of Waihi Gold-mining Co. (N.L.).
23/3/96	90	0	0	" ..	"	"	Waihi West ..	Waihi Grand Junction Gold-mining Co. (Ltd.).

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Ohinemuri—*continued*.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
23/12/96	97	2	12	Waihi ..	V.	Ohinemuri	Waimarie ..	Wilfred E. Bruce.
23/12/96	100	0	0	Waitekauri ..	XI.	"	Waimea ..	William Elliott.
30/5/96	100	0	0	Waitawheta	II.	Aroha ..	Waitawheta ..	Ernest C. Beale.
30/5/96	100	0	0	"	"	" ..	Waitawheta No. 2	"
20/9/88	9	2	23	Waitekauri ..	XIV.	Ohinemuri	Waitekauri ..	Waitekauri Gold-mining Co. (Ltd.).
3/3/96	28	3	36	" ..	X.	"	Waitekauri Central No. 1	Waitekauri Junction Gold-mining Co. (N.L.).
23/7/96	100	0	0	" ..	VI., VII.	"	Waitekauri Consols	Thomas Henderson.
27/10/96	10	1	0	" ..	XXV.	"	"	Mangakara United Gold-mining Co. (N.L.).
17/8/95	100	0	0	" ..	VI., VII., X., XI.	"	Waitekauri Cross	Waitekauri Cross Gold-mining Co. (Ltd.).
23/3/96	95	2	19	" ..	VI.	"	Waitekauri Ext. ..	Waitekauri Extended Gold-mining Co. (Ltd.).
18/2/96	30	0	0	" ..	XIV.	"	" ..	Waitekauri South Gold-mining Co. (N.L.).
18/2/96	30	0	0	" ..	"	"	Waitekauri Golden Gem	James Henry Porter.
19/6/95	100	0	0	" ..	X., XIV.	"	Waitekauri Jubilee Extended	The New Zealand Jubilee Gold-mines (Ltd.).
5/5/96	30	0	0	" ..	XIV.	"	Waitekauri Junction	John Guest Ralph.
26/8/96	30	0	0	" ..	"	"	Waitekauri Junction Extended	Joseph T. Armitage.
20/8/96	32	0	0	" ..	X.	"	Waitekauri Kathleen	Nathan Alfred Nathan.
17/2/96	40	0	0	" ..	XIV.	"	Waitekauri King ..	Waitekauri King Gold-mining Co. (N.L.).
17/2/96	100	0	0	" ..	XI.	"	Waitekauri Monarch	Waitekauri Monarch Gold-mining Co.
14/9/96	45	1	31	" ..	XIV.	"	Waitekauri No. 2	Waitekauri No. 2 Gold-mining Co. (N.L.).
8/10/95	15	1	31	" ..	"	"	"	Ditto.
23/6/95	29	3	10	" ..	X.	"	Waitekauri No. 4	Waitekauri United Gold-mining Co. (N.L.).
8/10/95	25	0	16	" ..	XIV.	"	Waitekauri No. 5	Ditto.
17/9/95	30	0	0	" ..	"	"	Waitekauri No. 6	"
6/4/96	100	0	0	"	X., XIV. XV.	"	Waitekauri Proprietary	Thomas Henderson.
1/2/96	100	0	0	" ..	X.	"	Waitekauri Prince	Waitekauri Prince Gold-mining Co. (N.L.).
24/3/96	16	3	0	" ..	"	"	"	Ditto.
14/9/96	100	0	0	" ..	"	"	Waitekauri Queen	Waitekauri Queen Gold-mining Co. (N.L.).
28/7/96	23	3	30	" ..	XIV.	"	Waitekauri Reefs	John Guest Ralph.
23/7/96	100	0	0	" ..	XI.	"	"	William Eddowes.
19/2/97	41	1	26	" ..	"	"	Waitekauri Reefs Extended	William McCormick.
25/4/96	88	1	36	" ..	X.	"	Waitekauri Russell	The Russell Gold-mining Co. (N.L.).
20/8/96	100	0	0	" ..	VII.	"	Waitekauri Surprise	Edward McWilliams.
27/2/96	100	0	0	" ..	VI., X.	"	Waitekauri West Cross	William Horne.
19/2/97	100	0	0	Waihi ..	II.	Aroha ..	Wairiporipo ..	Henry Moore.
22/3/97	94	0	0	Katikati ..	IV.	Aongatete	Waitakohe Junction	Edward F. Buckworth.
29/9/96	27	1	14	Waihi ..	XIV.	Ohinemuri	Waitemata ..	George Fraser.
17/2/96	100	0	0	" ..	XVI.	"	Waitete	Henry Gilfillan, jun.
25/6/96	100	0	0	" ..	"	"	Waitete Extended	"
24/10/96	100	0	0	" ..	XI.	"	Waiuku	William Lonergan.
19/6/95	100	0	0	" ..	XVI.	"	Waka	Grand Junction Gold-mining Co. (Ltd.).
19/2/97	97	0	0	Waitekauri ..	XIV.	"	Wakatere ..	Charles D. Wright.
19/9/96	80	2	2	Maratoto ..	VI.	"	Walker's Maratoto	John Watson Walker.
30/5/96	100	0	0	Waitawheta	II., VI.	"	Wanaka ..	Ernest C. Beale.
19/9/96	65	3	37	Karangahake	II.	Aroha ..	Ward Proprietary	Ward Proprietary Gold-mining Co. (N.L.).
30/11/96	100	0	0	Waihi ..	VII., VIII.	Ohinemuri	Warwick ..	James M. Lennox.
30/11/96	46	0	0	" ..	XVI.	"	Watchman ..	William H. Churton.
13/11/95	63	2	35	Karangahake	I.	Aroha ..	Waverley ..	Waverley Gold-mining Co. (N.L.).
3/6/96	85	0	29	"	I., II.	Ohinemuri	Wealth of Nations	Wealth of Nations Gold-mining Co. (N.L.).
3/6/96	89	0	0	Waihi ..	XV.	"	Welcome ..	William Charles Hunter.
27/2/96	100	0	0	Waitekauri ..	VI., X.	"	West Waitekauri	William Horne.
11/12/94	15	0	0	" ..	X.	"	We Three ..	Alpha Gold-mining Co. (N.L.).
11/5/96	100	0	0	Wharekiraupunga	VII.	"	Wharekiraupunga	Royal Shield Gold-mining Co. (N.L.).
23/12/96	50	2	35	Katikati ..	IV.	Aongatete	Wide-awake ..	William Lonergan.
30/11/96	100	0	0	Wharekiraupunga	VII.	Ohinemuri	Windsor Castle ..	James M. Brigham, jun.
3/6/96	100	0	0	Maratoto ..	VI.	"	Winn	Wilfred Rathbone.
13/1/97	88	3	30	Katikati ..	IV.	Aongatete	Woodlands ..	John McDonald.
18/1/94	72	1	18	Karangahake	I.	Aroha ..	Woodstock United	Woodstock Gold-mining Co. (Ltd.).
24/3/96	100	0	0	Owharoa ..	XIV.	Ohinemuri	Wright	Ohinemuri Syndicate.
17/4/94	14	3	12	Waitekauri ..	"	"	Young New Zealand	The New Zealand Gold-mining Co. (N.L.).
13/11/95	72	2	0	" ..	"	"	Zion	Zion Gold-mining Co. (N.L.).

Maratoto District.

Hikutaia Gold Syndicate Mine.—This mine was formerly held by local owners, who, after expending a large amount in prospecting and development work, ascertained that the ore was of low grade, and required to be dealt with on a large scale, for which additional capital was required. Mr. J. E. Banks, general manager, describes the mine and workings as follows:—

The Hikutaia Gold Syndicate (Limited) was incorporated in London on the 15th April, 1896. The group of mining properties owned by the syndicate comprises the Maratoto United Special Claim and several adjacent holdings, containing a total area of about 350 acres. The property is situated at the head of the Pakirarahi Creek, Hikutaia, in the Ohinemuri district of the Thames Goldfield, and occupies the northern slopes of the range forming the watershed between the Waitekauri, Komata, and Maratoto districts. The principal mine-workings are situated on the Maratoto United Special Claim, in which a large lode has been driven upon at six levels a total distance of 2,500 ft. The average width of the lode is 12 ft. A cross-cut tunnel is now being driven, which will intersect the lode 150 ft. below the present workings; the average total backs obtainable from this adit being 275 ft. A considerable amount of prospecting work has also been done on the other sections of the property, sufficient to prove the persistence of the lode through these areas, which, however, will be worked more advantageously through the adit now being driven. The character of the ore is generally low grade, and large reduction works will be necessary to insure success. The company possesses ample water rights.

Walker's Maratoto (Area, 80 acres 2 rood 2 perches).—This mine comprises the original Prospectors' Claim, from which very rich silver-ore was obtained in the early days of Maratoto. There was not much work carried on by the present owner other than opening some of the old workings. In the beginning of 1897 the mine was placed under option to the Mines Corporation Company, and since then work has been vigorously carried on, and in the low levels a continuation of the rich ore worked near the surface was traced. Another reef has also been discovered, the ore being worth about £4 per ton. These results are so far satisfactory that a company with £20,000 available working capital is prepared to take over the mine. It is proposed to undertake extensive works in putting up milling and ore-treating machinery on a scale equivalent to the value of the mine. Arrangements are also made for developing the reefs at a great depth by driving a long low-level tunnel, which will pass through and also develop the adjoining special claim, named the Long Drive. Sixteen men were employed.

Prospecting works have also been carried on in the Waitekauri, Magazine, Express, Irving, Ophir, Lord Salisbury, Retreat, and other claims.

Komata District.

Komata Queen Mine (Area, 120 acres).—Komata Queen (Limited), an English company, is the owner. A large gold-bearing reef was discovered on the surface, and 326 ft. of driving done to prove it. A considerable amount of cross-cutting was done, and over 1,000 ft. of deep trenching. Twenty-five men were employed.

Komata Amalgamated (Area, 344 acres, comprising the following claims: Komata Royal, Komata King, Komata Proprietary, each 100 acres, and Komata Chief, 44 acres).—This property was acquired under option, with the exception of the Komata Proprietary section, which has been purchased by the London and New Zealand Exploration Company (Limited). Thirteen prospecting tunnels were put in, and surface trenching done. No defined reef has yet been cut. Twelve men were employed.

Komata Reefs Mine (Area, 79 acres).—A large amount of work has been carried on by the Komata Reefs Gold-mining Company (Limited), the owners of this mine, during the year. The three reefs known as Argall's lode, Lavington's lode, and the Komata reef have been well opened up, and the mine will shortly be in first-class working-order. Tramways are being constructed to convey the quartz from the mine to the new battery, a distance of about 120 chains. A staff of fifty men was employed during the year. The following description of the mine-workings, tramways, and plant has been furnished by the general manager, Mr. W. H. Argall:—

Argall's Lode: The drive on foot-wall portion of the lode north from the main cross-cut has been extended a distance of 57 ft. A long piece of bottom had to be taken up a length of 218 ft., average depth 3 ft., caused through driving south from No. 2 cross-cut. At a point from main cross-cut 200 ft. north No. 1 rise was started, and rose 52 ft. A further distance northward on this level of 60 ft. No. 2 rise was commenced, and rose 111 ft. Three cross-cut drives, averaging 11 ft., at intervals of 50 ft., were put through to the hanging-wall to show the thickness of the ore-body at this level. Also a drive on the hanging-wall portion, 39 ft. long, to prove its value. I am pleased to say that all work done on this portion of the mine is of a most promising and payable nature, besides which, immediately at the point of No. 2 rise, a branch leader was discovered running into the foot-wall. This leader is now known as Hartridge's leader, and has been driven on 101 ft., and proved highly payable throughout. An intermediate level, commencing from surface, and about 250 ft. north from main cross-cut, has been driven a distance of 50 ft., for the purpose of intersecting No. 2 rise for ventilation. A drive northward from the rise on the foot-wall portion of the lode has been made 32 ft. The ore-body at this point is 12 ft. thick, showing payable ore throughout. Argall's lode south from the main cross-cut has been extended a distance of 120 ft.; total length, 145 ft. The ore-body is very large, averaging fully 12 ft. of clean solid stone. The first 70 ft. from the flat sheet the ore is of a very payable character, but from this point south the ore is low grade, which shows that we must expect parts of this large lode to be not so remunerative; but when further developed on its course there is every reason to expect that we shall discover other rich runs in this direction.

Lavington's Lode: This remarkably large body of stone, fully 30 ft. in thickness, has been driven upon the hanging-wall portion a distance of 80 ft. north. Although the rock is of a splendid

character in appearance, and carries the best of mineral and other indications for gold, the assays made so far prove the ore to be low grade. This is the whole of the work that has been done on the lode, owing to having no place to stack quartz.

The main cross-cut has been extended 47 ft., making a total of 482 ft. For ventilation a 10 ft. water-wheel and fan has been erected, also tail-race completed for same. Pipes from here carry air to all parts of the workings at this level. The low-level cross-cut was started at the beginning of the year, and up to date has been driven a distance of 593 ft. At 578 ft. the Komata reef was cut, being a nice body of stone 5 ft. wide. Assays have been made, showing strong traces of gold. Still, at the point of intersection the ore is low grade. From this point 200 ft. more driving will cut Argall's lode. When this work is completed the company will, without doubt, possess a most important and valuable mine. All these works have been securely timbered where necessary. Ventilation has also been carried into low-level cross-cut by means of a water-blast, which required a small flume and trestling to get the necessary pressure, about 35 ft. This works very satisfactorily. The total amount of feet driven during the year was as follows: Driving and cross-cutting on lodes, 512 ft.; rising, 163 ft.; cross-cutting country, 640 ft. We have also in a very forward state earthwork formation completed for 5 chains of ground-tram, commencing from ore-paddock and leading to a shoot 70 ft. in length, to convey ore to the hopper, which is constructed, and will hold about 50 tons. From this point a short length of tramway is in course of construction to convey ore to No. 1 hopper, at the upper terminal of the aërial tramway. An assay office has been built and fitted with the necessary appliances, an assayer engaged, and practical assaying carried out at the works. All works have been carried out with a view to practical use and strict economy.

The connection between the low level of the mine and the company's battery is being made by, first, a continuously working aërial tramway, a little over half a mile in length, and, second, by a steam tramway three-quarters of a mile in length. The arrangements are made so that the ore will be trucked direct from the low level to the hopper at the upper terminal of the aërial tramway, from which it is to be delivered by a skip to the buckets of the aërial line, which again will deliver it near the lower terminal to a hopper at the head of the steam tramway. From this hopper the trucks are to be loaded, and will be taken by a locomotive direct to the stone-crusher at the top of the battery. In the whole of this work the company are sparing no reasonable expense, so that the ore-delivery from the mine to the mill will be made at the lowest possible cost per ton, and, in pursuance of this policy, the most modern aërial machinery has been obtained, of which practice has actually proved the efficiency for their work. The whole of the tramway-works are being constructed in the most finished and substantial manner. The delivery by the aërial line will be 50 tons in eight hours, but could be very much increased if necessary. The great advantage of this machinery over any so far erected in the district lies not so much in an extraordinary capacity for delivery as in the simplicity and strength of the parts, which make it in a high degree suitable for the work of a permanent mine. The steam tramway is laid at a gradient of 1 in 30, with a gauge of 3 ft. 6 in., and 40 lb. rails. The minimum radius of curve is 223 ft. The tramway is made in earthwork 10 ft. wide for the whole length, excepting the four stream-crossings, two of which are crossed by two bridges, each of 30 ft. span, and two by viaducts, one of 134 ft. in length, in seven spans, and one of 30 ft. in length, in two spans. The whole of the timber being used in connection with the works is first-class heart of kauri, and the structures may therefore be considered of a decidedly permanent character. At the present time the earthworks are practically completed both for the aërial and steam tramway. The bridges and viaducts are all built, and the platelaying of the steam tramway and timber-work of the aërial line are now being energetically proceeded with.

The first work done was the erection of the blacksmith's shop and an office, the latter containing two rooms, one of which is at present used for sleeping-accommodation for the men working at the plant. The next work taken in hand was making a tail-race and wheel-pit, and laying on the water from the water-race to the mill-site, with 20 in. water-main. A circular saw was next erected and driven by the water-power, to cut timber to be used in the erection of the mill. Up to date the following works have been completed: The building is finished, and the wheel to drive the mill is in place. The assay and smelting furnaces are complete, and the concrete sumps are finished. Three of the steel vats are already completed, and the foundations are in for seven out of the eight. The battery foundations and framing are erected, and the stamper-boxes placed in position; also the stampers. The towers are made and put in position. The revolving roaster and Gate's crusher are on the site, and the work of erecting them is being pushed on. All the machinery and other material is on the ground, and at the end of July the completion of the works will be drawing to a close. The bad weather and bad roads have greatly delayed the progress of the works. We have a water-race constructed for a length of between two and three miles, capable of carrying ten Government sluice-heads of water. This is completed, and in good working-order throughout.

The following will be the mode of treating the ore: The ore is tipped from the tramway-trucks into storage hopper at the back of the mill. From there it passes through a No. 2 Gate's ore-crusher, and then through a revolving screen, which sizes the ore down to ½ in. mesh. From there it goes through a revolving automatic roaster, 24 ft. long by 52 in. diameter. The ore is dried in this, and conveyed from it to a large hopper at the back of the stampers. From this hopper it is fed automatically into the self-feeders, there being four of them, of the Challenge type; it then passes into the mortar-boxes, where the stampers, twenty in number, crush it to 50-mesh. It falls from the boxes into a small hopper at the front of the stamps. At the bottom of this hopper there is an elevator attached, which conveys the crushed ore to a large hopper placed in the centre of the six large steel percolating-vats. The crushed material is conveyed automatically from this hopper to any of these vats, and, after being treated by the cyanide process, and the greater

part of the gold extracted, the tailings are washed through launders on to copper tables. Should any of the coarse gold have escaped the cyanide it is caught on these tables, and the balance of the material is allowed to run into a swamp alongside the mill.

The mill consists of the following machinery and appliances: Twenty stampers suited for wet- or dry-crushing, their weight being 850 lb.; a revolving automatic roaster; one Gate's No. 2 ore-crusher, with sizing-screen and elevators; four automatic self-feeders; six 22 ft. steel percolating-vats; two steel dissolving-vats, 21 ft. diameter; three concrete sumps, 12 ft. by 12 ft. by 4 ft.; and two zinc towers. The assay-plant is complete—melting-furnaces, oxidizing-pan. All furnaces are built in brick, with brick chimney 40 ft. high. The whole plant is covered by a building 90 ft. by 150 ft. and 60 ft. at the highest part, the building being covered with corrugated iron. The machinery is driven by two Pelton wheels, with a head of water of 140 ft. pressure. The following form also part of the plant: One centrifugal pump, one vacuum pump, vacuum chamber, one 60-light dynamo for lighting up the hill, copper tables, and one berdan.

Te Ao Marama Mine.—This mine has been worked by the Waitekauri Company, and the works carried on are mentioned in Waitekauri Mine report.

Byron Bay Mine.—This land was prospected, and several gold-bearing reefs opened.

Prospecting work was also carried on in the National, Triumph, Queen's Birthday, Komata, Treasury, Royal Mail, and other claims.

Karangahake District.

Woodstock Mine (Area, 72 acres 1 rood 18 perches).—Work in this mine has been vigorously carried on during the year, and development of the different reefs effected in order that in the future a supply of quartz may be maintained to fully employ the new forty-stamp mill. The position of the new mill on the point between the confluence of the Ohinemuri and Waitawheta Streams entailed great expenditure in conveying materials and machinery to the site. Delay from this and other causes prevented the completion of the plant in August last, and crushing was only commenced on the 26th February, 1897. This delay has been the means of causing no return of gold to be possible, and the anticipation that the mine would yield an addition to the returns from Ohinemuri for 1896–97 has not been fulfilled. (The returns that have been obtained for the first cleaning-up show that for next year this mine promises to be one of the best gold-producers.) The mine is carefully and systematically worked, and the series of levels opened between the tramway-line and the outcrop of the reefs have disclosed such an abundance of quartz that no difficulty will be experienced in producing large quantities from the portion of the mine already developed. It is, however, intended to carry on operations below water-level at no distant date, and from the ascertained value of the reefs at the present lowest level there is very little doubt that when a shaft has been sunk developments in low levels will prove that the reefs continue in richness. The mine is at present one of the best conducted in the laying-off and execution of all underground work and machinery, and reflects credit on the manager, Mr. J. McCombie, who has supplied the following particulars:—

The No. 1 level, Maria lode, has been extended south of the cross-cut about 142 ft. on the line of the lode, which measures 4 ft. in thickness, and carries payable ore throughout for the whole of that distance. Two extensive blocks have been timbered and opened up, with ore-passes and travelling-ways for stoping operations, and a winze sunk to connect with the intermediate level a depth of 130 ft. In the intermediate level, Maria lode, a distance of 137 ft. has been driven along the line of the lode south of the cross-cut. For the first 80 ft. of driving the lode was somewhat disturbed, and the ore low grade in consequence. Thence forward it improved steadily in size and value, and now it is fully 6 ft. wide, carrying payable ore from wall to wall, and signs are not wanting of further improvement going southward. During the year the No. 2 level, Maria lode, has been extended 100 ft., making its total length 688 ft. from the starting-place at the surface cross-cut. At this point 19 fathoms of stoping has been done on the lode, which averages 5 ft. in thickness throughout the whole of these workings, and the ore is all of good quality. The No. 2 level cross-cut has been extended westward a distance of 220 ft., making its total length 700 ft. Several gold-bearing lodes have been intersected, and these will be all exploited as opportunity offers. The No. 2 level cross-cut, Woodstock lode, has been driven upon for a distance of 60 ft. south of the cross-cut and 200 ft. north of the same point. Owing to the disturbed nature of the country, and consequent low-grade character of the ore, work here has been suspended for the present. Since writing last annual report the No. 3 level, Maria lode, has been driven southward a distance of 315 ft., making its total length 855 ft. The lode ranges from 3 ft. to 15 ft. in thickness, and it maintains an average grade of high-class ore so far as explorations have gone upon it, with every indication of improvement going downwards. Stoping over the back of this level is in active operation, and 162 fathoms have been blocked out. A rise has been put up to connect with the No. 2 level a height of 156 ft., and two winzes, 80 ft. and 85 ft. in depth respectively, have been sunk till connection was effected with the No. 4 level workings. Over the back of the No. 3 level, Shepherd's lode, about 72 fathoms of stoping have been done, which varies from 1 ft. to 6 ft. in thickness, and there is a high percentage of the precious metals distributed through the whole body of the ore. Steady progress has been made with developments at the No. 4 level, Maria lode, which has been advanced 537 ft. for the year, making its total length 612 ft. The lode here averages 4 ft. in thickness, and the ore coming to hand therefrom is all of good quality. Above this level about 45 fathoms of stoping have been carried out, and the resulting ore is all high grade. The distance driven in the No. 5 level, Maria lode, has been 360 ft., making the total length of the level 438 ft. About 200 ft. of this distance has been driven upon the lode, which is very irregular in size and value, and I do not expect any improvement till the level reaches under the shoot of rich ore now being worked upon at the upper levels. The cross-cut west, No. 5 level, is being driven for the purpose of developing

the Woodstock lode at the lowest obtainable level. It is now in 257 ft., and the lode in question should be met with in another 163 ft. of driving. In the Ivanhoe section of the mine the kiln tram-line has been carried along through the gorge on the right-hand bank of the Waitawheta River for a distance of 500 ft. This involved 398 ft. of tunnelling and 102 ft. of scarfing. The northern continuation of the Maria and Woodstock lodes has been intersected, and driving northwards upon both ore-bodies is now in progress. The following is the average number of men employed during the year: Mine, fifty-six contractors, fifty-four wages-men; mill, twenty contractors, four wages-men: total, 134 men. Regarding the difficuty of minimising the dust nuisance so prevalent in all dry-crushing plants, we have succeeded in overcoming it, so far as the battery is concerned, by the application of an exhaust fan, which is connected with the mortar-box screens by means of a series of pipes, and we are arranging for the removal of the dust arising from the stone-breakers by adjusting thereto somewhat similar appliances. From the dust-bins to the percolating-vats the reduced ore is being conveyed automatically by a system of revolving conveyors with a spiral screw inside, and the whole concern is working splendidly.

New Zealand Talisman Mine (Area, 60 acres).—This mine is situated at Karangahake, and adjoins the Crown and Woodstock properties. The land is favourable for carrying on mining operations, the present adit-level being 700 ft. above the level of the Waitawheta Stream. The principal workings are at No. 6, or adit-level, and Nos. 5 and 4, the levels being each 100 ft. apart. A considerable amount of work was done in driving at the different levels and stoping portions of the reef. The mill, which comprised ten stamps and a complete cyanide plant, was not used to any great extent, it being found that the number of percolating-vats was insufficient, and that a great deal of time was lost in treating the crushed quartz by the cyanide process. From April to September, 1896, 285 tons of quartz was crushed, 280 tons being treated by cyanide, for a yield of 1,429 oz. 5 dwt., and 5 tons by amalgamation, for 5 oz. 14 dwt. The whole of the tailings from the 280 tons were, after the cyanide treatment, run over amalgamation-tables, and yielded 55 oz. 18 dwt. of gold. The value of bullion recovered by cyanide was 19s. 10d. per oz., and by amalgamation £1 10s. 4¾d. The average value of the ore before treatment was £5 17s. 6d. per ton. Thirty men were employed at the mine and nineteen at the battery and buildings. On the completion of the treatment of the quartz as above the company decided to erect a more extensive and suitable plant. The following account by Mr. W. A. Mercer gives full particulars of the mine and new works carried on during the year:—

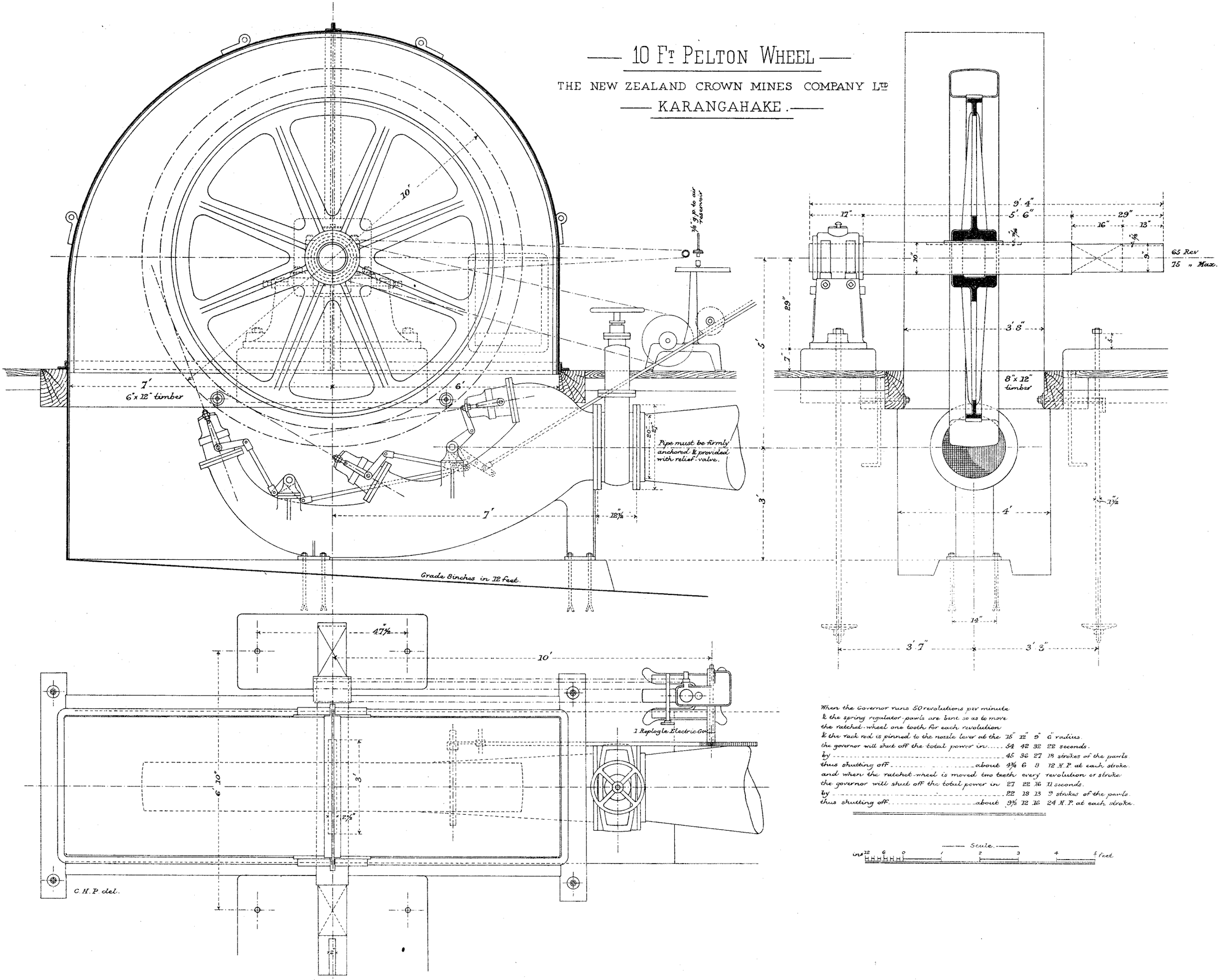
The property of the New Zealand Talisman Gold-mining Company (Limited) is situated at Karangahake, in the Ohinemuri district, and comprises the licensed holdings known as the Talisman and Bonanza respectively, each having an area of 30 acres; also a machine-site, 1 acre in extent, on the right bank of the Waitawheta River, and a special site of the same area at the junction of the Ohinemuri and Waitawheta Rivers. On the taking-over of the property by the English company on the 15th June, 1896, the Talisman and Bonanza Licensed Holdings were converted into a special claim of 60 acres. The capital of the new company is £150,000, in shares of £1 each, the working capital being £25,000. The company constitutes the first subsidiary undertaking of the London and New Zealand Exploration Company (Limited), the general management being in the hands of Messrs. Bewick, Moreing, and Co., mining engineers, of London, represented in the colony by Mr. William A. Mercer, with whom is associated Mr. Alfred H. Curtis, another representative of the firm, these two gentlemen being also the attorneys of the company in New Zealand. Prior to the acquisition of the property by the English company some 280 tons of Talisman ore treated at the Crown Gold-mining Company's battery yielded £2,770; and subsequently 285 tons of ore treated at the company's own ten-stamp mill yielded £5 7s. 6d. per ton. Under the new direction the mine has been systematically and rapidly developed, the principal workings consisting of six adits driven at intervals of about 100 ft. below each other (for the purpose of intersecting the main reef), and of extensive drives along the reef in northerly and southerly directions. The width of the reef has varied in these workings up to as much as 8 ft., the average size being probably from 3½ ft. to 4 ft. The exploratory work has proved the existence of at least two shoots of very rich ore in the main reef, which strikes into the Talisman section of the property from that of the Woodstock Gold-mining Company (Limited). On taking over the property the engineers in New Zealand were confronted with numerous difficulties in the matter of the reconstruction and enlargement of the reduction-works, owing to the want of a battery-site of sufficient area to allow of the whole of the plant being erected under one roof. This difficulty was overcome by the construction of a Howe truss bridge across the Waitawheta River for the purpose of connecting the machine-site proper with the special site. On the former area there is ample accommodation for the erection of crushing appliances, as well as for a small number of cyanide-vats; but the bulk of the cyaniding will be effected on the works at the special site.

The following is an outline of the process adopted for the treatment of the Talisman ore: The ore is conveyed from the mine by aërial tramway, and delivered into the kiln formerly used for drying the ore and now utilised as a storage-hopper. From the kiln the ore passes over a grizzly to a rock-breaker of reciprocatory jaw type, falling thence into a hopper from which it is automatically fed into a revolving ore-drier (a conical cast-iron cylinder 24 ft. in length, 34 in. in diameter at the small end, and 50 in. at the larger, erected with axis horizontal), through which the ore gradually travels towards a storage-hopper lined with sheet iron immediately over the stamper-boxes. The capacity of the drier is from 40 to 50 tons per twenty-four hours, according to the amount of moisture in the ore. The use of this contrivance is a new departure in New Zealand, and is expected to effect a considerable saving in fuel, to obviate loss of cyanide caused by the presence of pieces of charcoal and partially-carbonised wood in ore dried by the kiln process, and to prevent the fusion of fine particles of gold into globules on which cyanide solution cannot effectually act. The pulverising plant consists of ten heads of 850 lb. stamps with single-discharge mortars (these stamps forming part of the mill as originally erected by the old company and ten heads of 1,000 lb. stamps

10 Ft Pelton Wheel

THE NEW ZEALAND CROWN MINES COMPANY Ltd

KARANGAHAKE.



When the Governor runs 50 revolutions per minute
& the spring regulator-pawls are bent so as to move
the ratchet-wheel one tooth for each revolution
& the rack rod is pinned to the nozzle lever at the 16" 12" 9" 6" radius.

the governor will shut off the total power in	54	42	32	22 seconds.
by	45	36	27	18 strokes of the pawls
thus shutting off	about 4¾	6	8	12 H.P. at each stroke.
and when the ratchet-wheel is moved two teeth every revolution or stroke				
the governor will shut off the total power in	27	22	16	11 seconds.
by	22	18	13	9 strokes of the pawls.
thus shutting off	about 9½	12	16	24 H.P. at each stroke.

Scale.

ins 12 6 0 1 2 3 4 5 Feet

with double-discharge mortars). The remainder of the plant on the machine-site consists of two wooden cyanide-vats, each 16 ft. in diameter (part of the old plant), and four new cyanide-vats each 22 ft. in diameter, into the latter of which the ore is fed by means of a revolving ore-conveyor, a horizontally-laid pipe 8 in. in diameter, to the inner surface of which a worm is fitted. Over each of the four new vats there is an adjustable door in the revolving pipe, through which the ore passes when desired into a canvas hose lowered into the vats. The use of this form of conveyor obviates the necessity for the use of trucks in this part of the works, thus greatly reducing the amount of dust in the atmosphere of the building. The tailings, after treatment by the cyanide process, pass over amalgamated copper-plates for the extraction of the coarser gold, and the blanketings are subsequently treated in berdan-pans, of which there are three, 4 ft. in diameter, on the machine-site. Water for the driving of the mill is conducted from the company's dam on the Waitawheta River first through a tunnel 90 ft. in length, then through an open cutting 20 ft. in length, passing finally into a wrought-iron pipe 4 ft. in diameter and 925 ft. in length, delivering the water into a concrete-walled turbine-pit 28 ft. in depth. The motive-power is generated by means of two Victor vertical turbines, 21 in. and 12 in. in diameter respectively, the latter being used for the operation of a dynamo generating electric light for the works and offices, and for the transmission of power to the cyanide works on the special site. The cyaniding plant on the special site (to which ore, after its passage through the mortars, is conveyed by covered tram *viâ* the Howe truss bridge, newly erected over the Waitewheta River) consists of six wooden vats, each 22 ft. in diameter, with the usual accessories, including amalgamated copper-plates and three 4 ft. diameter berdan-pans. The sumps are substantially built of concrete. The centrifugal and vacuum pumps on this site are driven by an electric motor operated by the dynamo on the machine-site. Water for vat-sluicing, &c., is brought to the special site from the Hauraki Creek by means of a pipe 3 in. in diameter. It is expected that the mill will be able to treat a minimum of 25 tons per day, and it is hoped that the stamps will eventually prove equal to as much as 30 tons. A No. 5 Krupp ball mill, recently received from England, will shortly be erected, and may be expected to increase the crushing-capacity of the plant by at least 20 tons per day. In addition to the buildings, machinery and plant, bridge, &c., above referred to, suitable office premises and residences for the mine and battery managers (Messrs. W. Goldsworthy and C. H. Taylor) have been erected since the property was taken over by the new company.

Crown Mine (Area, 135 acres 1 rood 31 perches).—This mine, which now includes the Earl of Glasgow ground, is situated on the north and south sides of the Waitawheta River. The river flows through a very deep gorge, the rock on either side being nearly perpendicular, and its direction generally contrary to the run of the reefs. The gorge is virtually a natural cross-cut made by the river, and shows the reefs and veins of quartz as they lie in the rock on both sides. Extensive operations are being conducted. The mine development is expeditiously carried on. The splendid water-power obtainable from the Waitawheta is being utilised in driving air-compressing machinery, and the power developed will provide a supply of compressed air to work all the machinery required at the mine. The battery now consists of forty stamps, and is being converted to suit wet-crushing and the use of cyanide solution in the stamp-boxes. One hundred and ninety-five men were employed. Mr. Daw, the general manager for the New Zealand Crown Mines Company (Limited), has furnished the following short description of the mine-workings, &c.:—

During the year ended the 31st March last the mine has been worked continuously to provide quartz for the mill, and for the opening-up of reserves. The principal mining operations consist of the pushing-forward on the course of the Welcome reef of Nos. 4 and 6 tunnels, south of the Waitawheta River, and the putting-up of two main rises to connect with Coward's old workings, the latter in order to provide ventilation and to open up the immense blocks of valuable stoping-ground between the river-level and Coward's No. 3 level above. No. 4 level has been extended south on the reef about 340 ft., making its total length 1,670 ft. The reef, it will be remembered, was picked up about 60 ft. west of the point at which it was cut off by the great fault mentioned in last report, and, while its characteristics are similar to those north of the fault, its value has greatly improved. Its average thickness is 4 ft., varying from 2 ft. to 10 ft.

The reef in No. 6 level, which has been extended 370 ft., was intersected by a cross-cut put out west after striking the great fault, and its position was found to agree generally with the reef in No. 4 level above. It continues to maintain its average width, and the quartz from this tunnel and the stopes above and below it continues to be the most valuable received from the mine. Two main rises are being put up from No. 4 level to Coward's No. 3 level above, a total distance of about 480 ft. on the underlie of the reef. No. 1 of north rise has been risen 150 ft., and No. 2 210 ft. These rises, when completed, will be valuable for ventilation and stoping, as well as for passing filling for the workings below river-level. Stoping has been carried on in the backs of Nos. 4 and 6 levels, the quartz mined yielding an average assay-value of about £4 per ton. Little or no stoping has been done north and south of the winze below the river-level, owing to the incapacity of the small Tangye pump to cope with the inflow of water. During the year 11,737 tons of ore has been mined, of which 10,432 tons was milled, and yielded 7,691 oz. of gold and 9,040 oz. of silver, valued at £33,368. Over 1,600 tons of quartz is stocked at the battery, but, owing to the limited paddock-accommodation, it has been found impossible to take advantage of the full output obtainable from the mine in its present state of development. Twenty heads of stamps were in operation up to the 10th August last, and since that date forty heads. At the reduction-works the battery, which is now a dry-crushing plant, is being converted into one of wet-crushing; the experiments in this direction up to the present have given most satisfactory results. In the No. 6 level north of the Waitawheta River a chamber has been stoped out for an air-compressing plant. The compressor to be erected is a Riedler horizontal two-stage tandem type, having cylinders of

17 in. and 26 in. diameter, and 3 ft. 6 in. stroke; working at sixty-five revolutions per minute it will deliver 1,680 cubic feet of free air per minute at 75 lb. pressure per square inch. On the south side of the Waitawheta River chambers have been excavated for pumping- and winding-engines. The cylinders of the winding-engine are 12 in. in diameter and 18 in. stroke. The diameter of the drum is 59 in. and the face 4 ft. The pumping-engine has a 14 in. cylinder by 24 in. stroke, fitted with slide-valve with Meyer's cut-off. The whole of this plant is being supplied by Messrs. Fraser and Chalmers (Limited), of 43, Threadneedle Street, London. A 10 ft. Pelton water-wheel (3 nozzles) will be attached direct to the driving-shaft of the compressor. The water-race to supply power for the air-compressor is a mile and a quarter in length, with a present capacity of sixty sluice-heads, the pressure being 32 lb. per square inch.

A large amount of prospecting work has been done in driving cross-cuts, trenching, &c., in the following mines, but no discovery of any value reported: Hercules, Deep Lead, Excelsior, South British, Karangahake, Mariner, Rothschild, Golden Fleece, Wealth of Nations, Union Jack, Asteroid, St. Patrick, Crown Imperial, Prince Regent.

In the Stanley a considerable amount of prospecting work was done, and gold has been discovered in a reef formerly worked in the original Prospectors' Claim, but no returns are reported.

Sterling Mine.—Work has been steadily carried on and the reefs driven on.

Waverley Mine (Area, 64 acres).—This mine adjoins the Woodstock, and extensive driving works were carried on and reefs cut carrying gold, but no returns have yet been reported. Mr. Tregoweth, manager of the mine, thus describes the result of operations:—

During the past twelve months we struck a large lode, and operations have been confined to its development. We have driven about 400 ft. on it, and the stone proves to be of a sugary friable nature, carrying a little gold, but not sufficient to make it payable. The lode was followed into the Woodstock ground, but as the dip is towards the Waverley ground we will get this lode at the next level. This is an unusual lode for this district, having two clay walls, and the gold in the stone being similar in character to that at the Thames, whilst the formation is a blue sandstone similar to the Thames formation, and is an entirely new development in this locality, nothing being known of it outside the Waverley ground. Work has been stopped on this at present, as it will be necessary to go deeper, and we are now cross-cutting for the old Prospectors' lode, which the manager of the Stanley has picked up in his ground, where it gives good prospects of gold. We are in hopes of getting it in our ground carrying gold, as the country is most favourable for gold where driving is now being carried on.

Imperial Mine (Area, 60 acres).—This mine adjoins the Crown, and, although there are several gold-bearing reefs in the ground, no quartz has been crushed. The work has chiefly been in driving a low level at a depth of 300 ft. below the surface, and in driving and sinking winzes in the levels above. Eight men were employed.

Prospecting operations have also been carried on in the Ravenswood, Golden Giant, Crown Nimrod, New Shotover, Victor-Waihou, Mere, Rotokohu, Leap Year, Dickson's Lead, Waitawheta, Pandora, and Golden Age.

Ohinemuri Syndicate Mine (Area, 700 acres, partly freehold and partly on Crown land).—The property is situated at Owharoa, and includes the claims formerly known as the Smile of Fortune, Radical, Cadman, on the Ohinemuri River, and extending to the Mangakara Creek, taking in Bein's and Eliott's freeholds. A prospecting drive from the Mangakara Creek was continued 1,130 ft., and a shaft sunk 20 ft. for ventilation. It is intended to sink a main shaft near the Owharoa battery to work the Smile of Fortune and Radical reefs below the water-level. Twenty-three wages-men were employed.

Prospecting works have also been carried on in the Rising Sun, Ophir, Maritana, Owharoa, United, Dawn of Hope, Fern Spur, J. G. Ward, Kinsella's Freehold, Teutonic, Tandem, Ruapehu, Crescent, Fabulous, Unexpected, and Golden Stream Claims.

Heitman's Freehold.—The shaft which was sunk to a depth of 255 ft. last year was deepened to 267 ft., and a level driven 266 ft., but as the formation was unfavourable for reefs no discovery was made.

Waihi District.

Waihi Mine (Area, 346 acres).—This mine continues to maintain highly profitable yields. The following particulars will show the character of the work done and the extensive machinery employed, also the results of the year's operations: The No. 1 shaft has not been made deeper, but No. 2 shaft has now reached a depth of 415 ft. The length of the adit driven through the hill is 3,200 ft., and the total drift at adit-level is 6,400 ft. The lowest level worked is 280 ft. below the collar of the shaft. The reefs worked are the Martha reef, north-east and south-west, varying in size from 12 ft. to 52 ft. in width; Welcome reef, parallel towards the east end, and then bending to the south, travelling west, when it again becomes more parallel with the Martha reef—the Welcome reef varies from 1 ft. to 30 ft., the average width being 12 ft.; Surprise reef, between the Martha and Welcome reefs, is from 1 ft. to 2 ft. wide. The No. 2 shaft has been sunk 123 ft. during the year. No. 2 level: Total driving on Martha and Welcome reefs, 1,902 ft.; No. 1 level, 1,697 ft.; adit-level, 2,677 ft.; and in the upper levels, 701 ft.: a total of 6,977 ft. of driving during the year. The tonnage of ore forwarded to the mill from Welcome reef was 21,681 tons, and from Martha 16,704 tons. The machinery used at the mine is as follows: No. 1 shaft—compound pumping-engine, 12 ft. by 20 ft.; winding-engine, 20-horse power, 16 in. by 3 ft. stroke; one Cornish boiler, 25 ft. by 5 ft.; one Cornish boiler, 26 ft. by 5 ft., one 14 in. pump, pump-rods, balance-bobs complete; one 10 in. draw-lift pump; one air-compressor; one Evans pump; one duplex pump (Tangye). No. 2 shaft—one Hathorn Davy 19 in. vertical ram pump, 10 ft. stroke; one Tangye sinking-pump; one steam crab-winch; one Tangye double-cylinder winding-engine; one Tangye 2-ton crab-winch; four multitubular boilers (Anderson and Co.). The mill and machinery consists of ninety stamps (870 lb.), two stone-breakers (one Wheeler, one Gate's crusher), one berdan,

thirteen kilns, from 50 to 150 tons capacity; twenty-four vats, 30 tons capacity; mill driven for the most part by water; auxiliary steam-power; one (Gates and Thom) 350-horse-power engine; one (Golden State) engine, 120-horse power; one Tangye "colonial," 20-horse power; two Babcock and Wilcox's boilers, one multitubular, and one semi-portable (Fowler and Co.) boiler. The mill worked 354 days during the year, the average number of stamps employed daily being eighty-two, and the average quantity of quartz per stamp daily was 1·195 tons. The quantity treated was 34,410 tons; value per ton (actual), £3 16s. 8·6d. Bullion recovered — 29,722·53 oz. gold, 63,885·37 oz. silver. Total product, £132,021 14s. 2d. from mill; £3,069 10s. 10d. from tailings, 2,522 tons treated; £109 11s. 6d. from concentrates sold: total, £135,200 16s. 6d. (silver valued at 2s. 3d. per ounce). The whole of the above bullion was recovered by cyanide process. The average number of men employed at the mine was about 350 (irrespective of new works), of which probably two-thirds were employed on wages and the balance on contract work. The company is erecting a new mill at Waikino, Owharoa, a description of which is given in the following extract from Mr. H. P. Barry's general report:—

Owing to some little trouble in getting the road-bridge across the Ohinemuri River completed, work on the new reduction plant was somewhat retarded; but since the bridge has been finished and open for traffic the various works have been steadily pushed on. This bridge is a strong piece of work, 155 ft. in length, the main truss on trestles built on two concrete piers, the decking of the bridge being 30 ft. above normal level of water, which I think will insure its not being carried away by any flood which we are likely to experience. Wherever it was to the company's advantage, all the new works have been let by contract. In this connection seventy-four contracts have been let, nearly the whole of which have been completed. After getting quotations from several firms in different parts of the world, the contract for the supply of the one hundred head of stamps was let to A. and G. Price, of the Thames, New Zealand, who have already delivered a considerable portion of the machinery. The main shafting for the mill and the pulleys has been delivered, as also the two turbines and the two Gate's stone-crushers. The whole of the heavy timber for the mill is on the ground, including the twenty bed-logs, 4 ft. 8 in. by 2 ft. 6 in. by 18 ft. in length, of good heart of kauri, which were sawn in our own kauri bush. The necessary excavations for these bed-logs, plates, and sills have been completed, and the masons have commenced the erection of the stone wall which is to carry the ore-bins. A considerable amount of work has been done on the tail-race, which has been taken out in a large open cut, but it is proposed to tunnel the rest of the distance. The following buildings were either completed or nearly finished at the close of the year: Store, 60 ft. by 25 ft.; sawmill, 80 ft. by 23 ft.; carpenter's shop, 60 ft. by 23 ft.; blacksmith's shop, 50 ft. by 25 ft.; machine and fitting shop, 60 ft. by 25 ft.; office, 35 ft. by 29 ft.; locomotive-shed; store and dwelling house.

New water-races: The necessary motive-power will be obtained from a high-pressure system of races, having a fall of 198 ft., and a low-pressure system, having a fall of 54 ft. The high-pressure system consists of three races—the Mangakara Race and the Stony Creek Race, both tributaries of and falling to the Waitekauri Race. The Waitekauri Race, 6 ft. by 2 ft. 6 in. deep, and below the junction of its tributaries 7 ft. by 2 ft. 6 in., is upwards of four miles and three-quarters long, and commences at a dam a few hundred yards below the Waitekauri Gold-mining Company's mill. This race passes under the old kauri bush, through a tunnel 1,530 ft. long, a portion of which has been securely cribbed where it passes through slidy ground. The Waitekauri dam is a substantial wooden structure, 16 ft. high, with a spill of 68 ft., the total length being about 170 ft., with the two wings built of heart of kauri throughout. I do not anticipate that we shall have any trouble with this dam for many years to come, as it was subjected to a very severe test soon after completion, when we experienced very severe floods, and it stood the test well. The dam on the Mangakara is a permanent piece of stonework, upwards of 30 ft. in length, and running from 2 ft. to 8 ft. in height. The Mangakara Race, 5 ft. by 18 in., is upwards of 22 chains long, passing through a tunnel 268 ft. in length. The dam on the Stony Creek will be a wooden structure upwards of 45 ft. in length. The Stony Creek Race is nearly half a mile long, 3 ft. wide by 18 in. deep. The pipe-line for conveying the water from these races to the mill is of wrought-iron, 2 ft. 4 in. in diameter, and upwards of 1,200 ft. long. The low-pressure system consists of the Ohinemuri Water-race, four miles and an eighth long, 12 ft. by 4½ ft. deep, running for the most part on the south bank of the river, but will cross at one place to the north bank by a high trestle flume, and recross again to the south bank after a distance of about a quarter of a mile. These crossings, although expensive, were unavoidable, owing to the nature of the ground. With the exception of these flumes just referred to and a wrought-iron syphon-pipe 5 ft. in diameter and about 475 ft. long, the whole of the race has been carried through a ground-channel, so as to obviate the constant repairs that would inevitably be necessary after the elapse of a few years where fluming to any extent on a water-race obtains. The dam on the Ohinemuri, at the intake of this race, will be a strong and solid structure of masonry. It was considered advisable to do this rather than to construct it of wood, so as to prevent any possible danger in the future through the wood rotting and serious damage being done to dams, bridges, flumes, &c., further down the river. The extra cost will not be very great. The water from this race, which has a fall of 1 ft. in 2,000 ft., will be conducted to two 200-horse-power vortex turbines by a pipe-line 4 ft. 6 in. in diameter, branching off into two pipes of 3 ft. 6 in. in diameter, fitted with equilibrium-valves for each turbine.

The length of the tramway from mine to Owharoa Mills is, approximately, five miles and three-quarters. It has been constructed of a gauge of 2 ft. 9 in., the smallest curve having a 6-chain radius. It has been well graded throughout, being, with only one exception (which has an up-grade of 1 ft. in 90 ft.), all down-hill with a load, the steepest grade being 1 ft. in 40 ft. The line crosses from the north to the south bank of the Ohinemuri River, at a distance of two miles and three-quarters from the mine, by means of a strong truss bridge, upwards of 185 ft. in length, and 30 ft. 6 in. high from

water-level to decking, and built of good sound heart of kauri and totara. The whole of the formation of this tramway has been completed, and upwards of three miles laid with heart of kauri sleepers and 40 lb. iron rails. All the culverts have been made with glazed earthenware pipes, which will be more durable than wooden culverts; and all the swamps which the line traverses have been drained by good substantial drains. The locomotive has been put together, and is now busily engaged ballasting the line and hauling building-stone to the mill. Twelve of the iron side-tipping trucks are on the ground, and we have received advice that fifty more, which should be sufficient for our requirements, are now on their way out from England.

Union Mine (Area, 250 acres).—This mine is adjacent to the Waihi Company's ground, and is held by the Union-Waihi Gold-mining Company, an English company. A large amount of development work has been done during the year. No. 1 shaft is now 270 ft. in depth, and the depths of workings below surface are 177 ft. on Amaranth and 120 ft. on the Union reef. The Amaranth reef at No. 1, or adit level is 112 ft. below collar of shaft; and the Union reef at No. 4 level is 120 ft. below the collar of the shaft. The Amaranth reef varies from 14 ft. to 28 ft. in width, running nearly north-east and south-west, and is free milling, with large amount of silica. The Union reef varies from 4 ft. to 9 ft. in width, running north-east and south-west, and is of free-milling ore, rather soft and clayey; and the Winner reef undeveloped in No. 9 drive. Other works are as follow: Cross-cut driven to Amaranth reef, 486 ft.; cross-cut through country, 620 ft.; driving on Amaranth reef (adit-level), 787 ft.; cross-cutting, Amaranth reef, 107 ft.; winzes sunk on Amaranth reef, 420 ft.; other drives, winzes, and cross-cuts, 861 ft.: total, 3,281 ft. The whole of the above is development work, as the company does not at present possess any mill.

The No. 1 shaft has now (15th April) been sunk to a sufficient depth to allow of another level being driven to the Union reef 80 ft. below the lowest workings. A cross-cut will also be driven at this level to the Amaranth reef, which will intersect it at a depth of 160 ft. below the adit-level. The distance to drive will be, approximately, 300 ft. to the Union reef and 450 ft. to the Amaranth reef. Thirty men were employed.

Waihi-Silverton Mine (Area, 174 acres).—This mine has been continuously worked during the year. The shaft has been sunk to a total depth of 180 ft., which will give another 80 ft. of backs where the reef is opened up. The average width of the reef is about 10 ft. The total quantity of quartz crushed amounted to 7,922 tons, which yielded 6,605 oz. of bullion, of the value of £15,289. Sixty-one men were employed. The forty-stamp mill is in fairly good working-order. The mill has been provided with exhaust fans for the removal of the dust caused by the dry-crushing. These fans have the effect of carrying off the dust, and when further improvements are made it will be possible to alleviate the evil.

The *Gladstone Mine*, which is now owned by an English company, had a staff of men employed for several months past in sinking a shaft and clearing out the old levels formerly driven in the mine.

Favona and Brilliant Mine (Area, 200 acres).—The land is situated to the eastward of the Waihi and north of the Silverton. The chief work carried on during the year has been in sinking the main shaft. The size of the shaft is 14 ft. by 6 ft. in the clear, timbered with 9 ft. by 9 ft. framed sets, heart of kauri, and divided into three compartments, two for winding and one for pumps. Thirty men were employed. The management have supplied the following description of the mine and machinery:—

At a depth of 70 ft. from surface a cross-cut was put in for a distance of 100 ft. in a westerly direction. This work intersected a large ore-body, fully 60 ft. through. The course of this reef is north and south, and underlying about 20° west. Various assays were taken from this reef, varying from 4s. to £1 12s. per ton; and the last 120 ft. sunk in the shaft has been in quartz from which assays have been taken with similar results to the reef cut in 70 ft. level, and the general character of this ore-body resembles the Silverton very much. Hitherto the water has been lifted from this shaft by a 7 ft. by 4 ft. Tangye's pump, but as depth was obtained the inflow was so great that it quite overpowered the pump. It was therefore decided to cease operations in the shaft until the plunger and draw-lift could be put in. Previous to work stopping in shaft a chamber 8 ft. wide by 10 ft. high and 15 ft. long was cut out at 200 ft., or 10 ft. from bottom of shaft. It is the company's intention to drive two cross-cuts from this level, one to go east-south-east and the other west-north-west. It is also the directors' intention to put down another shaft about 30 chains north of the present shaft. This work will not be started until the Martha reef can be correctly located in the ground. Some loose quartz which has assayed up to £6 per ton has been got about 60 chains east of the present workings.

The pumping machinery consists of a plunger and bucket-lift, 12 in. diameter, with a differential stroke of 6 ft. and 4 ft. respectively. The motive-power is obtained from a compound condensing horizontal tandem engine with cylinders 16 in. and 26 in. diameter, with a stroke of 36 in. Keyed on the crank-shaft is a spur-pinion 3 in. to 4 in. diameter, geared into a spur-wheel 10 ft. diameter, 5 tons in weight, and prepared to receive a crank-pin for the 6 ft. or 4 ft. stroke, as may be required. The fly-wheel of the engine has a gross weight of 10 tons. The engine is also fitted with a crank-shaft governor connected to an automatic cut-off valve. This cut-off valve has a range of from 0 to three-fourths of the stroke of the engine. The boiler for supplying steam is of the multitubular horizontal type, 16 ft. in length, with a diameter of 6 ft. The tubes are sixty-six in number, running longitudinally, and with an outside diameter of 3½ in. Twelve of these tubes are of greater strength, and are chased, and secured with lock-nuts so as to form stays. Above the tubes there are also six longitudinal bolt stays 2 in. diameter; below the tubes are two gusset stays. The thickness of shell is ¾ in., and the boiler is designed to carry a working-pressure of 150 lb. to the square inch. This mine is now owned by the Waihi Consolidated Gold-mining Company (Limited).

Waihi-Grand Junction Mine (Area, 280 acres).—This mine comprises two blocks of land—the Grand Junction section, of 190 acres, adjoining the Waihi Mine, on the north-east; and the Waihi West section, adjoining the Waihi Mine, to the south-west. In the Grand Junction section a shaft has been sunk to a depth of 507 ft. and a cross-cut driven at that level 167 ft. to the northward and 199 ft. to the southward of the shaft. The shaft was sunk for the first 250 ft. through the rhyolite deposit, and the remaining distance through the andesite or favourable rock, similar to what is found in the Waihi Mine adjacent. The reef, however, has not been cut in this end. In the Waihi West section a shaft was sunk to a depth of 170 ft. and a drive put in to the northward for 601 ft. To the southward a drive was put in, and at a distance of 430 ft. from the shaft a reef was cut, supposed to be the Martha reef, worked in the Waihi Mine. This drive has been further extended a distance of 350 ft., with a view of intersecting the Welcome reef, also in the Waihi Company's mine. The machinery used at the Grand Junction shaft consists of one 40-horse-power multitubular boiler, 16 ft. by 5 ft.; one Tangye 7¼ in. by 12 in. winding-engine, with 4 ft. 6 in. drum; three Tangye vertical special pumps, throwing about 5,000 gallons of water per hour each from a depth of 507 ft.: at the west section, one 30-horse-power multitubular boiler, two Tangye boilers, one Davy pump, two Tangye vertical special pumps, and one hauling-engine with pair of 6 in. cylinders. Mr. J. M. Chambers, the secretary of the Waihi-Grand Junction Gold Company (Limited), of London, informs me that "the company has expended £18,000 in addition to £5,000 by the syndicate before the company was formed. If a good reef is discovered more machinery will be put down to develop the mine and a crushing plant will be erected." Forty-eight men were employed.

Waihi Consols Mine (Area, 2,000 acres).—This mine adjoins the west section of the Grand Junction Mine. A shaft was sunk to a depth of 160 ft., but further development was not undertaken from there. The shaft in the west section of Grand Junction was then used, and the northern drive continued for 200 ft., but no discovery was made. Six men were employed.

Prospecting was done in the Mount Waihi and Sir Julius Claims, of 100 acres each, but, as sinking must be carried on, work has been suspended pending further arrangements being made.

In the Waihi Extended and Star of Waihi very little work has been done, and in the Waihi Reefs a shaft has been sunk to a depth of 170 ft., with a view of striking the Amaranth reef. No further work has been done in the Queen of Waihi.

Martha Extended (Area, 130 acres).—In this mine, which lies about three miles north-west of Waihi, a considerable amount of driving has been done from different drives, one 383 ft. and the others 125 ft., 102 ft., and 112 ft. Several well-defined reefs have been cut, carrying a little gold and silver. Six men were employed.

Waihi Monument (Area, 100 acres).—This mine lies about four miles east of Waihi Township. The shaft was sunk to a depth of 110 ft., and a drive put in from the bottom of the shaft 86 ft. It is intended to sink to a depth of 160 ft. in order to get into more solid country, and then cross-cut for the reef, which on the surface is from 12 ft. to 15 ft. in width. Eight men were employed.

Great Northern Mine (Area, 100 acres).—The land is situated about five miles north of Waihi, and near Wharekiraupunga. Two reefs were cut in surface drives, and a low level advanced 211 ft., in order to cut the reefs 100 ft. deeper. The first reef is 4 ft. in width, and the other, which is of a flinty nature, is 45 ft. wide. It is expected that the reefs will be cut in the low level when the drive is extended to 330 ft. Four men were employed.

King of Waihi (Area, 89 acres).—Three prospecting drives were put in, of a total length of 500 ft.; a large reef of flinty quartz 20 ft. in width was cut, and also a number of quartz veins. Three men were employed.

Mataura Mine (Area, 86 acres).—Driving to the extent of 648 ft. has been carried on to cut a reef 12 ft. in thickness, consisting of hard flinty quartz. Four men were employed.

Waihi South Mine (Area, 128 acres).—This mine is situated to the westward of the Waihi Township and to the south of the Waihi West. A shaft has been sunk to a depth of 150 ft., and a drive put in from the shaft to the southward 50 ft. and northward 150 ft. No quartz has yet been cut. Two Tangye boilers, with pump and steam-winch for winding, is all the machinery used. Thirteen men were employed.

Prospecting works have been carried on in the Waihi Golden Pinnacle, Waitete, Waitete Extended, Waihi Proprietary, Queen of Waihi, Ohinemuri, El Dorado, Waihi Reefs, Waihi Welcome, Waihi Mint, and Flower of Waihi.

Wharekiraupunga District.

A large amount of prospecting has been done in the Royal Standard Mine. The reefs are being opened up and a tramway made to a point on a creek where machinery can be landed. A large battery of forty stamps is to be erected near the mine, and, as there is ample water-power adjacent, this company will be in a position to treat quartz of low grade. The mill is to be fitted with all the latest appliances in gold-saving. Mr. J. G. Ralph, the manager, gives the following account of the mine and works:—

The low-level tunnel has been driven a total distance of 151 ft., at right angles to the general course of the various lodes traversing the property. This is sufficiently large to admit of a horse-tram line being laid. The country-rock is a very hard, splintery, close-grained andesite. The Royal Standard main lode will be intersected at this level, at a total distance of 640 ft., giving 380 ft. of backs, and affording crushing material for years to come before sinking is resorted to. The Le Messurier level is being driven along the foot-wall side of the Le Messurier reef. Bore-holes are drilled at equal distances along the lode, and the borings assayed, which proves the quartz to be highly payable. A cross-cut is to be commenced at a point 200 ft. from the mouth, and driven

through the reef, where a junction of two other smaller reefs with the Le Messurier is expected to be met with. In the Le Messurier cross-cut the total distance driven is 62 ft.; another 220 ft. of driving will intersect the Royal Standard main lode on the south side of the creek. The lode on the spur through which the cross-cut is penetrating is a splendid body of stone. Sulphides of silver, associated with extremely finely divided particles of gold, are freely seen in the large pieces of ore strewn about the surface of this spur. From here we expect a long run on highly payable ore. The Junction cross-cut will intersect the main lode on the northern slope of creek in 30 ft. of driving, and will pass through a further distance of about 60 ft. to reach the western branch of the lode, from which good dish prospects are obtainable on the surface. The want of storage-room for the quartz broken out necessitates the stoppage of development works on the various reefs until the tram-line is connected with the quartz hoppers. The total distance driven in the intermediate level is 95 ft. The rock here being near the surface is an oxidized andesite (propylite), through which progress is more speedy. The main lode will be intersected here at a point some 800 ft. north of the Junction cross-cut. A shoot for the conveyance of the quartz to the tram-line will shortly be in course of construction. The bulk of the crushing-ore will be obtained from the Le Messurier, Junction, and intermediate levels for a considerable time to come.

The tram-line for the transit of quartz to battery is being constructed from the low-level tunnel to the kiln-site, a distance of 20 chains. From the entrance to the Junction cross-cut a bridge is to be constructed across the main creek, at the south end of which a large storage-hopper is in course of erection. The tram-line from this hopper will be cut around the precipitous rock to the mouth of the Le Messurier level. The tram from the Le Messurier to a point opposite the low-level tunnel is being made, and when a quartz hopper is erected a stretch of tram-line from this to the low level will complete the tramway formation. Great difficulties have to be contended with during the formation work, very precipitous rocks, the crust of which is extremely hard, towering up perfectly straight for 200 ft.

The water-race formation, when completed, will have a total length of 40 chains, giving 197 ft. of fall. The excavation for battery is being carried on with expedition. A firm class of sandstone is met with for the foundations of stamps. The site will shortly be in readiness for the cyanide plant. Bricks for the assaying-furnaces can be made close to the battery-site. The greater portion of timber for the battery, water-race, hoppers, &c., is ready at the different pits, and a tram-line is being laid down in readiness for conveyance of timber to the battery-site.

Mr. Charles Judd, of Thames, is the contractor for the manufacture and supply of a forty-head dry-crushing stamper-mill and a cyanide plant of the latest type, the whole plant to be erected without delay. The natural position of the mill-site enables the quartz, when once dumped into the kilns, to pass by gravitation through the whole mill without handling. The main-line formation of the railway from battery to landing is complete a distance of 4 miles 52 chains. This work is at a standstill until the arrival of the rails from England.

The company is experiencing great difficulties in conveying supplies to its property. The Ohinemuri County Council appear to take no interest whatever in opening up this district. The Royal Standard Company have for some considerable time employed upwards of two hundred men, which surely entitles them to something in the matter of roads.

Prospecting works have also been carried on in the Atlas and La Mascotte, where several gold-bearing reefs have been discovered. Work was also carried on in the Devon, Gold Stream, Royal Shield, Tavistock, Prince of Wales, Fiery Cross, Sceptic, Day Spring, and Waitekauri-Tavistock Reefs Junction.

Waitekauri District.

Waitekauri Mine (Area, 507 acres and 25 perches).—This mine comprises the following claims: Golden Cross Special Claim (Golden Cross section), 100 acres; Crœsus Special Claim (Golden Cross section), 100 acres; Socket Special Claim (Golden Cross section), 99 acres 2 roods 6 perches; Te Ao Marama Special Claim (Komata section), 97 acres 3 roods 36 perches; Cross-cut Special Claim (Komata section), 100 acres; Waitekauri Licensed Holding (Waitekauri), 9 acres 2 roods 23 perches: total, 507 acres and 25 perches. The important development works projected last year have to a great extent been carried out. The low-level adit cross-cut has been extended, and No. 1 and No. 2 shafts sunk to a depth of 282 ft. and 86 ft. respectively. The mine is worked from three levels, viz.: Corbett's level, a drive in the side of the hill about 22 ft. below the level of the sill of No. 1 shaft; kiln level in the north, and battery level in the south, at a level of 129 ft. below the level of the sill of the same shaft. The reef consists of a dark-coloured quartz strongly impregnated with manganese and partially-oxidized iron-pyrites. It varies from 12 ft. to 20 ft. wide of payable ore, but at points is of a much greater width than this. Development work carried on at the Golden Cross section during the year is as follows: Sinking the two shafts; the extension of Corbett's, kiln, and battery levels; driving the Corbett's, kiln, and battery cross-cuts to prospect the ground to the west of the reef; and driving the low-level tunnel or adit-level. At Waitekauri Licensed Holding the work consists of a prospecting drive to get under a rich shot of gold worked by the original company. At the Komata section the work has been the opening-up of the magazine level gully drive, the extension of Nos. 1 and 2 levels, and the driving of the adit-level from the eastern side of the hill.

The machinery used in mining operations consists of two air-compressors, one with 12 in. air-cylinders, belt driven by water-power, used for working the rock-drills; the other 12 in. air-cylinder 2 ft. stroke combined with steam-engine with 12 in. cylinder, used for working two Tangye pumps in the shafts. The quartz from Corbett's level is brought to mouth of the drive in tram-wagons, and that from kiln and battery levels by the same means, through kiln and battery cross-cuts respectively. There are also four miles and a quarter of tramway connecting the mine

with the forty-stamp mill. The machinery used for milling comprises one forty-stamp mill of 1,000 lb. weight each stamper and one ten-stamp mill of 600 lb. weight each stamper. There are also two stone-breakers; eight kilns, each of 250 tons capacity; and two, each of 200 tons capacity; nineteen vats, each of 30 tons capacity; and three, each of 23 tons capacity. The power for the above milling plant is water, with an auxiliary steam-power. Water-power: Two 6 ft. 8 in. Pelton wheels to work the forty-stamp mill; head of water, 195 ft.; length of wrought-iron pipe, 2,000 ft.; length of water-race, three miles and a quarter; one 4 ft. Pelton wheel for working vacuum pump; one 6 ft. Pelton wheel, with 162 ft. head of water, for working ten-stamp mill; length of 10 in. main pipe, 835 ft.; length of water-race, 123 chains. Auxiliary steam-power: One compound condensing engine, 150 indicated horse-power, with two Babcock and Wilcox boilers of 190 indicated horse-power for forty-stamp mill; one high-pressure horizontal engine, 24 indicated horse-power, with one multitubular boiler for ten-stamp mill. The average quantity of quartz crushed per stamp-head daily for the forty-stamp mill is 1·5 tons, and for the ten-stamp mill 0·67. The average number stamp-heads employed daily was—forty-stamp mill, 37; ten-stamp mill, 10: total, 47 heads. The number of days worked during the year was—ten-stamp mill, 313; forty-stamp mill, started in August and worked until the 31st March. The total quantity of quartz crushed was 11,410 tons, giving 30,232 oz. bullion; value of £32,645 extracted by the cyanide process. The cost of mining, per ton, was 9s. 11d. The cost of milling and treatment, per ton, was 17s. 3d. The average number of men employed during the year was 352: all wages-men.

New Zealand Jubilee Mine (Area, 292 acres 2 roods 25 perches).—Work has been steadily carried on during the year. The low-level adit has been extended 576 ft., and a considerable amount of work done on Christie's and No. 2 reefs. No returns of quartz crushed have been received. Twenty men were employed. This low-level tunnel is being subsidised by the Government, and £42 12s. has already been paid on account of subsidy.

Young New Zealand Mine (Area, 14 acres 1 rood 12 perches).—This mine, which is owned by the Young New Zealand Gold-mining Company, is situated at Waitekauri, adjoining the Waitekauri United and Sovereign, and in close proximity to the old Waitekauri Licensed Holding. The land includes the old Welcome and Young New Zealand Claims, which were profitably worked in the early days of Waitekauri. The quartz was then treated by the old battery process, which did not save a very large percentage of the gold. Since the present company took over the property some of the old workings have been repaired and timbered, for the purpose of proving by sinking whether the reef maintains its richness at a lower depth. The first winze was sunk 43 ft., and from the bottom 2 tons of quartz were sent to the School of Mines at Thames, the value of which was stated at £6 5s. 9d. per ton. 80 ft. further north another winze was sunk 14 ft., and operations were suspended on account of the influx of water. From this winze 1 ton was sent to Auckland for treatment by the Fraser process, its value being given at £18 12s. The results from these trial parcels are satisfactory, and the low level, which will give 150 ft. of backs, is advanced 450 ft. up to date. About 200 ft. more driving should intersect the reef, which varies in size from 2 ft. to 4 ft. 6 in. The hanging-wall portion is heavily mineralised, and the foot-wall portion full of blue sulphide veins. Assays made from stone that would give a prospect by pounding and washing by the old battery process were very rich. There are a number of other reefs that have proved to be gold-bearing, varying in size from 34 ft. to 4 in.; in fact, there is a network of reefs and small leaders, so that when a battery is erected the mine promises to be a gold-producer. Five men were employed.

Grace Darling Mine (Area, 90 acres).—This mine is situated on one of the branches of the Waitekauri Stream, about two miles up from the Township of Waitekauri. About two years ago a mill was erected and a portion of the reef worked, but the results were disappointing. The mine is now opened up in a more systematic manner, and hopes are entertained that, although of low grade, the quartz may prove payable if large quantities are economically treated. The claim comprises the land formerly known as the Progress, Grace Darling, Portsea, Prioress, Vendor, and Pyramid Licensed Holdings, each of which was held by a separate company, but amalgamation was effected, and the Grace Darling Company is sole owner. The following is a description of the works done in the mine:—

The property comprises an area of 90 acres, originally held in six 15-acre licensed holdings, and known as the Progress, Grace Darling, Portsea, Prioress, Vendor, and Pyramid Licensed Holdings, which are now amalgamated. In the Grace Darling section No. 1 level has been opened up for a length of 150 ft. on the reef, and has an average height of about 60 ft. of backs. The reef, which is of a friable nature, varies in size from 2 ft. to 8 ft. Three rises have been put up to the surface. In No. 2 level a cross-cut was put in, and the lode intersected at a distance of 175 ft. The reef, where cut, is about 5 ft. in thickness. A block about 40 ft. long and 30 ft. high has been stoped out and treated at the mill. The treatment was found to be unsuitable for the class of ore, and, as a consequence, a large percentage of the gold was lost, as no provision had been made for saving the tailings. This level has been opened up for a distance of 500 ft. Three rises have been put up to No. 1 level a height of 82 ft., and passes and chutes constructed at regular intervals. A winze has been sunk about 10 ft., and gold is showing in the bottom of the winze. The average width of the reef is about 6 ft., and in the south face about 8 ft., all of which is gold-bearing. The gold does not seem to be uniformly distributed through the stone, but occurs in narrow runs or shoots. At the No. 3 level a cross-cut 300 ft. in length was required to intersect the reef at a depth of 110 ft. below No. 2 level. The lode, where intersected, is about 11 ft. in thickness, and has been driven on for a distance of 25 ft. along the foot-wall side. No gold has been seen in this level, but portions of the quartz taken from it have given very favourable assays. In the Portsea section No. 1 level has been opened up for a distance of 250 ft., and two rises have been put up to the surface for ventilation. The reef has an average width of 8 ft., carrying gold in

places. No. 2 level has been opened up for a distance of 315 ft. at a depth of 72 ft. below No. 1, and is connected with it by rises and winze. The average width of the reef is about 5 ft. Some dabs of gold have been seen, but the greater part of the ore is of low grade, easily procured, and of a free-milling character. In the Progress, Prioress, Vendor, and Pyramid sections operations have been confined mostly to surface prospecting and trenching. A number of reefs and leaders varying from 6 in. to 3 ft. in thickness have been discovered, but there has not been sufficient work done on them to prove whether they are of a payable nature. Nine men were employed. The mine is well opened up, and the present owners, having exhausted their funds, have placed the property under offer to an English company for the purpose of furnishing sufficient capital for the erection of suitable machinery, as the present ten-stamp mill is inadequate to deal with low-grade ore.

A considerable amount of prospecting has been done in the Waitekauri King, Golden Spur, Omega, Dorothy, Waitekauri No. 2, Waitekauri South, New-Zealander, Exchange, Southern Cross, Belmont, Golden Waitekauri, Jewel, British Empire, Oceania, Huanui, Waitekauri Reefs, and Waitekauri Queen Claims, but no valuable discovery has been reported.

Alpha Mine (Area, 30 acres).—This mine is situated near the old whim on the tramway to Komata. Three levels are opened, and four reefs, varying from 3 ft. to 14 ft. in width, have been worked on, but the quartz is generally of low grade, and until suitable machinery is available no returns of gold can be obtained. Four men were employed.

The Rainbow Claim, of 60 acres, has also been prospected, and several reefs, varying from 2 ft. to 6 ft. in width, have been tested, and found to be of low grade, which to be payable must be dealt with in large quantities. Four men were employed.

Waitekauri United Mine (Area, 109 acres).—This mine is now held by the Waitekauri United Gold-mining Company, Limited (English). A staff of forty-five men has been employed in driving tunnels to cut the reefs which are known to exist in this property. A 14-horse-power steam-engine is used for driving the air-compressor to work the rock-drills. Although several gold-bearing reefs are to hand, the crushing machinery is not to be erected until further development has been done. Mr. F. Stone, mine-manager, gives the following account of the work done:—

During the past ten months this company commenced operations to open up the mine by tunnelling. No. 1 tunnel is now in a distance of 500 ft. into the main range. Several small leaders were cut, assays from which vary in value from 14s. to £6 per ton. We expect to cut the main reef in this tunnel in another 160 ft. of driving. This tunnel is being driven through the main range 2,800 ft. to meet No. 2 tunnel, which is started from the opposite side of the range, and will give from 220 ft. to 345 ft. of backs on the reef. No. 2 tunnel is now in a distance of 440 ft., but nothing of any importance has yet been met with; but it is a well-mineralised country, favourable for gold, and I would not be surprised to strike a good reef at any time. No. 3 tunnel is started at a point near the north-western boundary, and is now driven 293 ft., its course being south-west. We have passed through several small leaders, but not of any great value, although the class of country is favourable. No. 4 tunnel has been driven 40 ft. in a southerly direction from the northern boundary. No. 5 tunnel is now in a distance of 170 ft. from the south-west side of the range, to intersect what is known as the "United Blow," and to prove this part of the mine at a deeper level, as there was a good deal of gold got on the surface in the early days. The upper level, on the point reef, has now been driven a distance of 320 ft. on the line of reef, which varies from 6 ft. to 18 ft. in width, and the assay-value is about £2 per ton. There will be about 150 ft. of backs above this level. We have started a low-level to cut the point reef; it will give about 90 ft. of backs to the level above. This cross-cut or low level is now in a distance of 92 ft., and we expect to strike the reef in another 30 ft. of driving. We have also opened up several drives on the old workings. The Energetic reef has been driven on for a distance of 100 ft.; the size of the reef varies from 2 ft. to 4 ft. in width, and assays about £3 10s. per ton.

Waitekauri Cross Mine (Area, 100 acres).—This is owned by an English company, the Waitekauri Cross Gold-mining Company (Limited). It is situated on the line of reef worked in the Waitekauri Mine, and the following development work has been carried out during the year: An adit is being put in from near the south-western boundary in an easterly direction, with a view to intersecting the well-known Golden Cross reef. This is now in progress, and is already in about 600 ft. During the construction of this adit the Taranaki reef (formerly cut on surface) was intersected, and driven on for 100 ft. in a northerly direction. It proved to be a large lode, varying in width from 18 ft. to 30 ft., with a strong dip to the east. There is little doubt but that this lode is the same as that being worked in the Waitekauri Extended ground. In addition to the above, a cross-cut was put in for 300 ft. from the south-eastern boundary in a north-westerly direction. At the present time a shaft is being sunk near the eastern boundary adjacent to the surveyed line of the Golden Cross lode, from which it is proposed to open out in order to intersect this reef. Twenty-five men were employed.

Waitekauri Extended.—Work was carried on at different parts by tunnelling with small surface tunnels to find out the exact course of the lode; about 1,000 ft. of driving was done. It was then decided to drive a cross-cut tunnel 160 ft. below the surface at the top of the range, and in the centre of the Hippo section, to be known as the "blow tunnel." This was driven a distance of 400 ft., passing through a favourable channel of country, and cutting ten different defined reefs. The last reef, No. 10, which looked the most promising, and gave the best results, was at once opened up and driven on about 250 ft., cross-cutting at every 50 ft. It proved the reef to be 35 ft. wide at this level. A tunnel 55 ft. lower down was also driven into and through the No. 10 reef. At this level the reef was opened and driven on north and south over 400 ft., cross-cutting as above east and west. The reef in this level proved to be about the same thickness, and better in value. The country passed through in all these upper levels is of the favourable rock found in the Waitekauri district, and the lode itself is evidently on the run of and somewhat similar to the Waitekauri reef.

The workings in this mine up to the present, and no doubt in future, will be the means of leading to the developing and opening up a large tract of country known as the Hikutaia Falls and the water-shed of that river. A low level has been driven a distance of 500 ft., and is 200 ft. lower down than the above-mentioned workings. All buildings connected with the working of a large mine are being erected, such as manager's house, men's quarters, blacksmiths' shops, assay-room, &c., and everything will soon be in working-order. The water rights and machine-sites which were obtained for the company consist of five water rights and two machine-sites, and ample water for a large crushing-mill can be obtained. A water-race is being constructed, consisting of a ditch, about 500 ft. of wood fluming, and 950 ft. of iron piping 16 in. in diameter. This water-race is about three miles long, and has about 380 ft. of a fall, and is estimated to give about 460-horse power. A forty-stamp crushing-mill is being erected on the battery-site, and will shortly be completed. The mill was ordered and obtained from the Union Ironworks, San Francisco, and consists of 1,000 lb. stamps, two double-discharge mortars, two large Comet rock-breakers, 6 ft. Pelton wheel, large wooden vats, &c., and we hope to be crushing and in full swing about September next. An aërial tramway of a very large size and a mile and a quarter long has been obtained from Fraser and Chalmers, London, and will, I think, be erected within ten months. In the meantime a temporary tramway, consisting of partly ground and partly wire, is being erected, and will be ready for transmitting the ore from the mine to the battery before the mill is ready to crush. The work has been carried on carefully, and will be one of the best plants in the district. The prospects of the mine are such as to warrant the expenditure which has been incurred. The reefs are large, and on account of the facilities for working and the character of the ore the cost of reduction and treatment will be reduced to a minimum. A considerable sum of money was expended on making roads, to which the Ohinemuri County Council have contributed. This work, of course, had to be performed before the machinery could be got on the ground, and the road will largely assist in the opening-up of this part of the field. About 110 men were employed.

Prospecting work has also been done in the Bombadier, Musketeer, Brigadier, Takapuna, and Consols by surface tunnels, for the purpose of tracing and locating the large lode worked in the Waitekauri Extended. Some 1,000 ft. of driving has been carried on in these properties.

Prospecting operations were also carried on in the Nebraska, Australia, Marburg, Pilot, and Central properties owned by the Waitekauri Union Claims (Limited), an English company.

Prospecting was also carried on in the Zion, Queen Annie, Waitekauri Consolidated, Norena Key of Komata, Wangakara United, Burbank, and Alpha Extended.

The Waitekauri Union Claims comprise in the western section (228 acres 3 roods 20 perches)—the Pilot Special Claim, the Pilot Extended Licensed Holding, the E.M.C. Licensed Holding, the E.M.C. Extended Licensed Holding, the Central Licensed Holding, the Central Extended Licensed Holding, and the Californian Licensed Holding; in the eastern section (406 acres)—the Australia Special Claim, the Nebraska Special Claim, the Anglian Special Claim, and the Marburg Special Claim. These were taken over by the Waitekauri Union Claims (Limited) in August, 1896, and extensive prospecting operations will shortly be commenced.

General Remarks.

In this district success still attends the principal mines. The returns from the Waihi, Silverton, Waitekauri, Crown, Woodstock, and Talisman Mines are most satisfactory, and the mines are so well opened up that ore reserves are in sight sufficient to keep up a continuance of rich returns for several years to come. New mills will shortly be ready at the Waitekauri Extended and Komata Reefs Mines, whilst other mills are in process of erection at the Royal Standard, Cross, and other mines. The yield of gold from the district for next year may be confidently anticipated to exceed that of the present year. The mills are used for dry-crushing and cyanide treatment. In the mill at the Crown Mine, however, the manager is again resorting to wet-crushing, using cyanide solution instead of water in the stamp-boxes.

The quantity of quartz treated last year was 64,463 tons 4 cwt., for a yield of 148,626 oz. 8 dwt. The quantity of tailings treated was 2,522 tons, the whole producing gold and bullion of the value of £218,067 19s. 9d. During the year 1,820 men were employed.

Te Aroha District.

This goldfield is situated to the southward of Ohinemuri, and includes part of Ohinemuri and Piako Counties. The claims taken up are on the northern, southern, and westerly spurs of Te Aroha Mountain. The ore is chiefly of a refractory character, requiring special treatment. The past returns of gold were, however, obtained from the parts of the reefs not highly mineralised. Substantial parcels of ore have been sent to England, with a view of ascertaining a method of profitably dealing with the large quantities of quartz in the various lodes. The following list shows the claims taken up in this district:—

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office at Te Aroha, in the Hauraki Mining District, and registered on or before the 31st March, 1897, in the Books of the Mining Registrar at Te Aroha.

Date of License.	Area. A.	R.	P.	Locality.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
1/6/95	26	2	32	Waiorongomai	X.	Aroha ..	New Find No. 1 ..	Aroha Gold-mines (Ltd.).
1/6/95	10	1	2	"	"	" ..	New Find No. 2 ..	"
13/9/95	60	0	0	"	"	" ..	Sceptre	"
13/9/95	99	0	0	"	XII. II.	" Katikati	Sceptre Extended	"
28/6/95	28	1	25	"	X.	Aroha ..	Loyalty Palace ..	P. Snewin.
26/9/95	30	0	0	"	"	" ..	Hot Springs ..	W. Rycroft.
26/9/95	30	0	0	"	XII.	" ..	Cadman ..	J. Mills.
26/9/95	20	0	0	Te Aroha ..	IX.	" ..	Mount Morgan ..	J. Williams.
25/10/95	10	2	34	Waiorongomai	XII.	" ..	Welcome ..	R. Burke.
13/11/95	100	0	0	"	X. XI.	" Katikati	Empire	Aroha Gold-mines (Ltd.).
13/11/95	99	2	25	Te Aroha ..	X., XI.	Aroha ..	Taranaki ..	G. S. Graham.
19/11/95	48	1	34	Waiorongomai	XII.	" ..	Seddon	J. Mills.
10/1/96	49	1	20	Te Aroha ..	IX.	" ..	Montezuma ..	J. Williams.
1/2/96	71	2	0	Tui ..	X.	" ..	Extended ..	P. Snewin.
1/2/96	43	2	23	" ..	"	" ..	Day Dawn ..	J. A. Pond.
1/2/96	50	0	0	" ..	"	" ..	Grand Junction ..	E. Griffith.
28/11/95	29	3	10	Te Aroha ..	IX.	" ..	Golden Crown ..	J. Williams.
27/1/96	29	0	1	" ..	"	" ..	City of Durham ..	G. Robson.
27/1/96	29	3	11	" ..	X.	" ..	Plutus (L.H.) ..	W. T. J. Bell.
2/3/96	20	1	2	" ..	IX.	" ..	Hot Springs No. 2	W. Rycroft.
30/4/96	99	0	0	Waiorongomai	X.	" ..	Gentle Annie ..	W. Steele.
30/4/96	46	0	0	Te Aroha ..	IX.	" ..	Stony Creek ..	W. Rycroft.
30/4/96	99	0	30	Waiorongomai	X.	" ..	Great Western ..	T. Gavin.
30/4/96	50	0	0	Tui ..	IX.	" ..	Plutus	C. F. Bell.
19/5/96	17	0	0	" ..	X.	" ..	Plutus No. 2 ..	W. T. J. Bell.
19/5/96	23	3	2	Te Aroha ..	IX.	" ..	Wellington ..	W. Dibsell.
29/6/96	94	0	0	Waiorongomai	X.	" ..	New Munster ..	New Munster Gold-mining Co. (Ltd.).
16/7/96	100	0	0	..	XII.	" ..	Trident	Aroha Gold-mining Co. (Ltd.).
16/7/96	50	2	16	Tui ..	X.	" ..	Silver King ..	G. B. Osmond.
16/7/96	50	0	24	" ..	"	" ..	Planet	A. E. Whittome.
29/4/96	94	0	9	" ..	IX.	" ..	Waitara ..	J. Wallace.
9/7/96	30	0	0	..	"	" ..	Waihou ..	G. Robson.
16/10/96	100	0	0	Tui ..	IX., X.	" ..	Merchant of Venice	R. Kelly.
16/10/96	100	0	0	" ..	"	" ..	Gipsy King ..	A. E. Langley.
20/10/96	99	1	21	" ..	IX.	" ..	Te Aroha ..	R. Dovell.
24/10/96	99	0	17	" ..	X.	" ..	Grand Result ..	T. McIndoe.
30/11/96	46	3	32	" ..	V., IX.	" ..	Te Aroha Extended	R. Dovell.
30/11/96	99	0	0	..	X.	" ..	Mount Ryan ..	W. Shaw.
11/12/96	27	2	0	..	"	" ..	Manchester ..	A. A. Lockwood.
13/1/97	100	0	0	Tui ..	"	" ..	Waitara Extended	A. B. Millar.
13/1/97	96	0	4	..	IX., X.	" ..	Ethel Reef ..	Ethel Reefs Gold-mining Co.
13/1/97	93	3	30	..	IX.	" ..	Mayflower ..	E. Cameron.
21/1/97	19	1	0	..	X.	" ..	Ballarat.. ..	C. J. Sanderson.
30/11/96	100	0	0	..	IX.	" ..	Devereux ..	J. W. Walker.
24/2/97	100	0	0	Te Aroha ..	"	" ..	Night and Morning	"
22/3/97	98	0	0	..	X.	" ..	Te Aroha Queen ..	"
22/3/97	94	2	0	..	"	" ..	Premier Extended	"
22/3/97	79	2	0	..	"	" ..	Ajax	R. Lhoest.
22/3/97	99	2	16	..	"	" ..	Ajax Extended ..	"
22/3/97	98	1	6	Tui ..	"	" ..	Tui	Tui Gold-mines (Ltd.).
24/3/97	93	0	0	Waiorongomai	XI.	Katikati ..	Loyalty Extended	W. Newsham.
29/3/97	100	0	0	" ..	XII.	Aroha ..	Waiorongomai ..	E. Edwards.

Waiorongomai District.

Aroha Gold-mines (Limited) Mine (Area, 395 acres).—This company also owns water rights and machine-sites. The property includes the greater number of claims which produced most of the bullion from this part of the goldfield when worked by companies with small capital. The mine-manager reports as follows:—

The works carried on have been prospecting and development. Two winzes have been sunk, the total depth of which is 202 ft. 6 in. A distance of 763 ft. has been driven in cross-cuts, and 883 ft. has been driven on the reefs. The amount of ore treated was 708 tons, of which 308 was crushed wet with amalgamation, while 400 tons was dry crushed, and treated with cyanide. The percentage of bullion extracted by wet-crushing and amalgamation was 42 per cent., against 85 per cent. yielded by dry-crushing and cyanide. The plant consists of a ten-stamp battery, one small stone-breaker, and one kiln, and the power used is water. Each stamp crushed per day 35 cwt. of wet and 1 ton of dry quartz. The battery was working sixty days, and the average number of men employed during the year was fifty (including wages-men and contractors). The company are now driving a main low tunnel to open up their property in a systematic manner. The dimensions of the tunnel are 11 ft. high by 9 ft. wide in the clear. Its length up to the present is 300 ft. Air-compressing machinery is now on the ground, and will be used to work rock-drills in the formation of this tunnel. A water-race is in course of construction, which will give over 600 ft. of fall, and provide power for working the air-compressor. The tunnel is being driven along the main reef, which outcrops the entire length of the property, a distance of two miles and a quarter. The backs will average 1,400 ft., and the greatest depth reached will be 2,200 ft. The tunnel will not only

open up the main reef, but will intersect numerous cross-reefs where they junction, and will be of great service to the adjoining properties, by enabling them to work at a great depth without being troubled with water. This will no doubt become the main outlet for the ore for the whole district. The intention is to erect a large plant to treat the ore, and have a locomotive to convey it from all parts to the mill. The company have already spent about £10,000 in prospecting, development, ore-testing, and machinery, and are doing everything possible to hasten the completion of the main low tunnel, which is estimated to cost over £30,000.

Seddon and Cadman.—A considerable amount of work has been done in prospecting the various reefs formerly opened in this mine. It is understood that an option has been obtained over this property, and sufficient capital will be forthcoming to still further continue development works, and then, if satisfactory, the purchase will be arranged.

Prospecting work has been carried on in the Welcome, Loyalty Palace, New Munster, Great Western, and other mines.

Montezuma Mine (Area, 70 acres).—This mine is situated on the western slope of the main range, and extends from the boundary of the hot-springs reserve to within 8 chains of the Champion Mine. A large number of reefs traverse the ground, varying in thickness from 3 ft. to 6 ft., and generally of a highly-mineralised character. The situation is such that 900 ft. of backs on the reef can be had with a moderate length of cross-cut. Three men were employed. Mr. John Williams, one of the owners, supplied the following particulars:—

"Machinery is about to be erected in the near future, under the supervision of the Rev. Joseph Campbell, who is at present in England procuring a complete plant for treating the quartz by what is known as the "thermo-hyperphoric process" (Messrs. Lockwood and Campbell's patent). A company has been formed and registered in London to work the properties. A second company is being formed for the treatment of ores (refractory and otherwise) on an extensive scale. This process is guaranteed to give a return of from 90 to 95 per cent. of the assay-value of stone treated, at a cost of from 5s. to 7s. 6d per ton."

Prospecting operations have also been carried on in the Taranaki, Hot Springs, Golden Crown, Ethel Reef, Gipsy King, Mount Morgan, and other claims, from which no returns have been received.

Tui District.

Champion Mine (Area, 98 acres).—This mine is now owned by the Tui Gold-mines (Limited), an English company. During the greater portion of the year there was very little work carried on, but on the new owners taking possession a staff of twenty men were employed, and the old levels and workings put in order, and a parcel of 25 tons of stone taken out and sent to London for experimental purposes. It is intended to ascertain the most improved method of dealing with the complex ores found in the mine, after which suitable machinery is to be erected.

Prospecting works have been carried on in the Silver Star, Grand Junction, Day Dawn, Silver King, Golden Band, Waitara, and other claims, but no report of any valuable discoveries has been received.

General Remarks.

Several claims are worked by English owners, and extensive works are carried on, notably by the Aroha Mines Company, at Waiorongomai, which is engaged in driving an adit tunnel from the outcrop near the township. This tunnel is designed to be extended two miles and a quarter, and will have a depth from the surface at the northern end of some 1,800 ft. The yield of gold in this district was from 934 tons of quartz, and amounted to 376 oz., of a value of £986 10s. During the year sixty men were employed.

TAURANGA COUNTY.

Te Puke District.

Clarke's Freehold (Area, 300 acres).—Three drives have been put in: No. 1, near surface, 40 ft., in which a reef about 9 ft. in width has been cut; No. 2 drive, 40 ft., of which 25 ft. appears to be quartz and reef formation; in No. 3 drive 90 ft. has been put in, and the reef is expected to be to hand when 100 ft. has been completed. Two men were employed.

Te Puke Gold Reefs, formerly Fleming's Freehold (Area, 1,087 acres).—A large reef was cut in the north cross-cut, and although 40 ft. was driven through it the wall was not reached. In the south cross-cut the reef was 20 ft. in width, and in the low level, 57 ft. deep, the reef was 24 ft. The quartz is generally of low grade; samples assayed varied from 6s. 8d. to £6 3s. per ton. The mine is well situated for being worked, as the outcrop is 480 ft. above the creek-level, and there is sufficient power obtainable from the creek to work machinery. Six men were employed.

Kaimai Valley and Katikati Districts.

A number of claims have been taken up in the locality and prospecting carried out, but so far no important discoveries have been recorded.

ACCIDENTS IN GOLD-MINES.

There was one fatal accident caused by an explosion, and two accidents of a serious nature from other causes, whilst four slight accidents were also reported as being due to explosives.

James May was injured by falling down a pass in the Waihi Mine on the 1st April, 1896.

A miner named Myers was in the act of pressing half a plug of gelignite into a previously-exploded hole when an explosion took place. This occurred in the Sheridan Mine on the 16th May, 1896. The manager of the mine reports that Myers will lose one of his eyes.

Samuel Baker was injured by an explosion of gelignite in the Waihi Mine. It appears two charges were fired and only one report was heard. Baker went back at once, when the second charge exploded, causing him to be injured.

John Dabb was injured in the Talisman Mine on 1st July, 1896. Dabb was picking the mullock thrown by a shot when a slight explosion occurred, injuring him in the face and eyes.

Joseph Develin was killed in the Waihi-Silverton Mine on the 14th August, 1896, whilst drilling a hole in which there was an unexploded charge of gelignite.

Andrew Douglas was severely cut about on the head in the Crown Mine, Karangahake, on the 18th September, 1896. A charge of gelignite was exploded, but he did not get out of the way in time.

Thomas Mulholland was attending a winch at Preece's Point Mine, Coromandel, when he lost three fingers through his right hand coming in contact with the teeth of the winch.

John Terrill had his leg broken on the 17th March, 1897, through a piece of stone falling on him in the Whangamata Mine.

MACHINERY.

It will be seen from the following enumeration of machinery supplied and erected by one engineering firm alone that great expenditure is necessary in connection with the mines throughout the district:—

Kauri Gold Estates, Whangapoua: Small prospecting plant, for sinking shaft, &c., usually supplied for this purpose; a pair of winding-engines, 5 in. by 10 in., complete, with all pit-head gear; a Tangye vertical sinking-pump, with rubber disc-valves, to throw 3,200 gallons per hour 250 ft. vertical, the same driven by a Tangye colonial pattern tubular boiler of 12-horse power.

Dacre's Freehold (Henry Green), Coromandel: A plant similar to above, but a 12-horse-power boiler.

Hauraki South Gold-mining Company, Coromandel: A plant similar to above, but a 14-horse-power boiler, now being completed.

Zealandia Gold-mining Company, Coromandel: A plant similar to above, but with a 12-horse-power boiler.

Kathleen Gold-mining Company, Coromandel: Prospecting plant, for shaft sinking, with all gear belonging to same, to enable the shaft to be sunk while main plant is being erected, with pumps to deliver 8,000 gallons per hour; permanent plant consisting of two 25-horse-power Tangye Cornish boilers, one pair Tangye's improved forward-geared winding-engines, with two drums, cylinders 10 in. by 22 in.; main pumping-engine, compound coupled non-condensing—low-pressure cylinder 24 in. by 30 in., high-pressure cylinder 16 in. diameter, fly-wheel 13 ft. diameter by 22 in. on face, with Meyer's patent expansion-valve, &c.; Cornish pumps and all pit-work complete; poppet-legs and gear, with buildings.

Hauraki Main Lodes (Limited), Coromandel: A small plant complete for shaft sinking, as previously mentioned. Permanent plant is now in course of erection. This will be a duplicate of the Kathleen Company's. The Tangye pumps now in use will lift 10,000 gallons per hour. The permanent pumps will lift 500,000 gallons per day, which is now being done by the Kathleen, with valve only open $\frac{3}{8}$ in.

The Hauraki Golden Shore have ordered a small pumping and winding plant similar to the Hauraki Main Lodes.

The Britannia Company have replaced their small boiler with a 20-horse-power colonial pattern, built in, and have increased the pumping power.

The Waihi Gold-mining Company have put down a pair of Tangye winding-engines, 10 in. by 22 in., same size and pattern as the Kathleen Company's.

Waihi Union Company: A pair of Tangye winding-engines, same size and pattern as Waihi Company's.

The Waitekauri Company have also put down a pair of winding-engines similar to the above.

The Waihi Extended have ordered a small pumping and winding plant similar to others, but have delayed erection.

Waitekauri United Gold-mining Company: We have supplied this company with air-compressing plant, consisting of an Hirnant air-compressor, 12 in cylinders, three rock-drills, &c., driven by a 25-horse-power Tangye under-fired tubular boiler.

Waihi Gold-mining Company, Waihi: We have supplied this company with a 14 in. Hirnant air-compressor complete, for driving Tangye pumps, &c.

Waihi Union Company, Waihi: We supplied this company with a duplicate to above.

Waitekauri Company, Waitekauri: We have supplied this company with a 10 in. Hirnant air-compressor, with pulleys, &c., for belt-driving (water-power); also a 12 in. compressor for steam, same pattern as above.

Waihi Consolidated Company: This company has put down a Tangye winding-engine, pair of 10 in. by 18 in. cylinders.

Waihi South Gold-mining Company, Waihi: This mine has added to its plant a 12-horse-power colonial-pattern boiler and a Tangye pump to lift 7,200 gallons per hour.

These are the principal items supplied and erected. There has been a great number of pumps and general machinery supplied to companies, with the erecting of which the firm had nothing to do.

The Crown Company, Karangahake, has been fitted up with a complete installation of electric lighting.

Woodstock Gold-mining Company, Karangahake: We have fitted up the battery, &c., with an electric-light installation complete.

Waihi Gold-mining Company: This battery has been also fitted up with an electric-light installation, driven by a Victor turbine. The new battery for the Waihi Company is also being fitted up with a complete electric-light installation.

The following table shows the number of tons of stone and mullock crushed, and the yield of gold from the northern goldfields, since the returns have been supplied to the Mines Department. The Thames returns include the Ohinemuri district up to 1886–87:—

RETURN OF STONE, ETC., CRUSHED—AUCKLAND DISTRICT.

District.	Quartz and Mullock crushed or sold.	Yield of Gold or Bullion.	Average Yield of Gold or Bullion per Ton.		
	Tons.	Oz.	Oz.	dwt.	gr.
Coromandel—					
1st April, 1880, to 31st March, 1881 ...	720	4,960	6	18	0
" 1881, " 1882 ...	3,358	7,352	2	4	0
" 1882, " 1883 ...	2,907	7,577	2	12	0
" 1883, " 1884 ...	1,043	4,018	3	17	0
" 1884, " 1885 ...	456	3,201	7	0	0
" 1885, " 1886 ...	550	3,382	6	3	0
" 1886, " 1887 ...	305	4,170	13	13	0
" 1887, " 1888 ...	1,923	6,774	3	10	5
" 1888, " 1889 ...	2,149	8,090	3	15	7
" 1889, " 1890 ...	1,690	6,708	3	19	9
" 1890, " 1891 ...	5,650	9,838	1	14	19
" 1891, " 1892 ...	13,029	12,191	0	18	17
" 1892, " 1893 ...	15,163	12,954	0	17	2
" 1893, " 1894 ..	12,629	9,969	0	15	18
" 1894, " 1895 ...	15,451	22,632	1	9	18
" 1895, " 1896 ...	27,439	48,378	1	15	6
" 1896, " 1897 ...	18,848	35,886	1	18	2
Totals	123,310	208,080	1	13	18
Thames—					
1st April, 1878, to 31st March, 1879 ...	41,917	57,207	1	7	7
" 1879, " 1880 ...	33,017	59,576	1	16	2
" 1880, " 1881 ...	32,405	53,154	1	12	19
" 1881, " 1882 ...	30,698	45,803	1	9	20
" 1882, " 1883 .	25,867	43,311	1	13	12
" 1883, " 1884 ...	34,228	54,878	1	12	2
" 1884, " 1885 ...	31,496	37,705	1	4	4
" 1885, " 1886 ...	35,998	61,540	1	14	4
" 1886, " 1887 ...	34,827	38,142	1	1	22
" 1887, " 1888 ...	32,819	35,949	1	1	11
" 1888, " 1889 ...	47,363	35,796	0	15	3
" 1889, " 1890 ...	60,753	33,817	0	11	14
" 1890, " 1891 ...	61,756	38,113	0	12	8
" 1891, " 1892 ...	86,150	45,735	0	10	15
" 1892, " 1893 ...	78,547	31,336	0	7	23
" 1893, " 1894 ...	62,444	34,637	0	11	2
" 1894, " 1895 ...	48,464	22,810	0	9	10
" 1895, " 1896 ...	44,342	26,332	0	11	21
" 1896, " 1897 ...	27,061	13,440	0	9	22
Totals	850,152	769,281	0	18	2
Ohinemuri—					
1st April, 1887, to 31st March, 1888 ...	2,388	3,406	1	8	13
" 1888, " 1889 ...	3,795	3,679	0	19	9
" 1889, " 1890 ...	4,773	8,564	1	15	21
" 1890, " 1891 ..	9,902	12,914	1	6	2
" 1891, " 1892 ...	13,865	23,659	1	14	2
" 1892, " 1893 ...	22,771	43,405	1	18	3
" 1893, " 1894 ...	31,281	35,666	1	2	18
" 1894, " 1895 ...	51,058	110,628	2	3	8
" 1895, " 1896 ...	57,008	147,499	2	11	18
" 1896, " 1897 ...	66,985	148,626	2	4	9
Totals	263,826	538,046	2	0	18
Te Aroha—					
1st April, 1883, to 31st March, 1884 ...	4,262	4,629	1	1	17
" 1884, " 1885 ...	11,042	9,506	0	17	5
" 1885, " 1886 ...	6,552	4,489	0	13	17
" 1886, " 1887 ...	4,743	3,658	0	15	10
" 1887, " 1888 ...	7,166	2,918	0	8	3
" 1888, " 1889 ...	1,381	1,113	0	16	3
" 1889, " 1890 ...	4,894	20,416	4	3	10
" 1890, " 1891 ...	280	557	1	19	18
" 1891, " 1892 ...	2,722	979	0	7	5
" 1892, " 1893 ...	3,169	1,178	0	7	2
" 1893, " 1894 ...	2,270	833	0	7	8
" 1894, " 1895 ...	1,121	628	0	11	5
" 1895, " 1896 ...	172	168	0	19	12
" 1896, " 1897 ...	934	376	0	8	1
Totals	50,708	51,448	1	0	7
Great Barrier—					
1st April, 1896, to 31st March, 1897 ...	3	219	73	0	0
Grand totals from North Island ...	1,287,999	1,567,075	1	4	8

STATEMENT SHOWING THE WHOLE OF THE QUARTZ-CRUSHING MACHINES AND APPLIANCES FOR TREATING AURIFEROUS AND ARGENTIFEROUS ORES IN THE HAURAKI MINING DISTRICT FOR THE YEAR 1896–97.

Locality where Machine is situated.	Name of Machine.	Name of Owners.	Number of Rock-breakers.	Number of Stamps.	Number of Ore-crushers and Lamberton Mills.	Number of Berdans.	Number of Pans.	Number of Settlers.	Number of Mortars.	Number of Retorts.	Number of Furnaces for Gold-melting.	Number of Furnaces for Assay Purposes.	Number of Plants for Cyanide Process.	Concentrating Plant.	Driven by Steam-power.	Driven by Water-power or Hand-power.
Coromandel County.																W. H.
Coromandel ..	Kapanga ..	Kapanga Gold-mining Company	..	10	..	2	..	..	1	2	..	..	..	..	1	..
" ..	Telephone ..	Hauraki Gold-mining Company	..	15	..	8	..	..	2	3	..	..	..	..	1	..
" ..	Corby ..	Scotty's Gold-mining Company	..	9	..	8	..	..	1	2	..	..	..	..	..	1 0
" ..	*Hauraki North ..	Hauraki North Gold-mining Company	..	..	1	1	..	..	1	1	..	..	..	..	1	..
" ..	Success ..	Success	..	10	..	4	..	..	1	1	..	..	..	..	1	..
" ..	Tokatea ..	Tokatea Company ..	..	15	..	2	..	..	1	1	..	..	..	..	1	..
" ..	Triumph ..	Triumph Company ..	..	10	..	2	..	..	1	1	..	..	..	..	1	..
Opitonui ..	Lanigan's ..	J. Thompson and party	1	10	..	2	..	..	1	2	..	..	..	..	..	1 0
Owera ..	Owera ..	..	1	10	..	4	..	..	1	2	..	..	..	..	..	1 0
Kuaotunu ..	Try Fluke ..	Try Fluke Gold-mining Company	..	16	..	3	..	..	2	2	1	1	1	..	1	..
" ..	Great Mercury ..	Great Mercury Gold-mining Company	..	10	..	1	4	2	4	1	..	1	1	..	1	..
" ..	Irene ..	Irene Gold-mining Company	..	10	..	2	4	..	2	2	1	1	1	..	1	..
" ..	Kapai-Vermont ..	Kapai-Vermont Gold-mining Company	1	..	1†	1	..	..	2	2	1	1	1	..	1	..
" ..	Matarangi ..	Matarangi Syndicate	..	10	..	2	2	1	2	1	..	..	..	..	1	..
Manaia ..	Golden Hill Extended	Golden Hill Extended Company	..	2	..	1	..	..	1	1	..	..	..	..	1	..
Thames County.																
Tapu	Sheridan ..	Sheridan Gold-mining Company	..	15	..	4	..	..	3	3	..	..	..	..	..	1 0
"	Fluke ..	Tapu Fluke Gold-mining Company	..	6	..	2	..	..	1	1	..	..	..	..	..	1 0
Waiomo	Monowai ..	Monowai Amalgamated Gold-mining Company	1	10	..	1	..	..	1	1	1	1	1	..	..	1 0
Tararu	Scandinavian ..	Scandinavian Gold-mining Company	..	8	..	4	..	..	1	1	..	..	..	..	1	..
"	New Alburnia ..	New Alburnia Gold-mining Company	..	20	..	7	2	..	1	3	1	..	..	..	..	1 0
"	Norfolk ..	Tararu Mines Gold-mining Company	..	30	..	6	..	..	3	2	..	..	1	1	..	1 0
"	Berry's ..	Charles Berry ..	..	1	..	3	..	..	1	2	1		..	..	..	1 0
Karaka	Claremont ..	George Bryant ..	..	1	..	1	..	..	1	3	..	..	..	..	..	1 0
"	Karaka ..	J. C. Smith ..	..	5	..	2	1	..	1	3	..	..	..	..	..	1 0
Hape Creek ..	Anchor ..	Hauraki Anchor Company	..	4	..	1	..	..	1	1	..	..	..	..	..	1 0
Otunui	Eureka ..	J. Renshaw ..	..	12	..	4	..	..	1	1	..	..	..	..	1	..
Puriri	Puriri ..	Puriri Gold-mining Company	..	6	..	2	..	..	1	1	..	..	..	..	..	1 0
"	Gillan's ..	A. Gillan ..	..	16	..	4	..	..	1	1	..	..	..	..	..	1 0
Tairua	Bonnie Scotland ..	McLiver ..	..	20	..	6	..	..	2	1	..	..	..	..	1	..
"	Ajax ..	McLiver ..	..	12	..	4	..	..	1	1	..	..	..	..	1	1 0
"	Cannon's ..	Richard Cannon ..	..	4	..	1	..	..	1	1	..	..	..	..	1	..
Thames Borough ..	Brown's ..	James Brown ..	..	..	..	4	8	4	..	2	..	..	..	..	..	1 0
" ..	Kuranui ..	Kuranui Gold-mining Company	..	20	..	10	..	..	1	1	1	1	..	..	..	1 0
" ..	Moanataiari	Moanataiari Gold-mining Company	..	41	..	21	4	..	2	6	3	1	..	..	..	1 0
" ..	Judd's ..	Charles Judd ..	..	..	..	2	9	..	..	..	1	..	..	..	..	1 0
" ..	Comer's ..	Kuranui - Caledonian Company	..	20	..	5	..	1	2	..	..	..	..	..	..	1 0
" ..	Bowden's ..	..	..	..	..	2	13	..	..	1	1	1	..	..	..	1 0
" ..	May Queen ..	May Queen Gold-mining Company	..	33	..	8	3	..	2	3	2	..	..	..	..	1 0
" ..	Cambria ..	Cambria Gold-mining Company	..	21	..	13	1	..	2	5	1	..	..	..	..	1 0
" ..	Waiotahi ..	Waiotahi Gold-mining Company	..	21	..	5	..	..	2	2	1	..	..	..	..	1 0
" ..	Fame and Fortune	Fame and Fortune Gold-mining Company (Limited)	..	21	..	16	..	..	1	1	..	..	..	..	..	1 0
" ..	School of Mines ..	James Park ..	..	2	..	1	1	1	3	3	1	4	1	..	..	1 0
" ..	Bank of New South Wales, H. P. Stark	H. P. Stark ..	..	..	..	..	..	..	1	..	1	1	..	..	..	0 1
" ..	Bank of New Zealand	A. Smith ..	..	..	..	..	..	..	2	..	1	3	..	..	..	0 1

* Robinson ore-crusher, equal to five stamps. † Otis mill.

STATEMENT SHOWING THE WHOLE OF THE QUARTZ-CRUSHING MACHINES, ETC., IN THE HAURAKI MINING DISTRICT FOR THE YEAR 1896–97—*continued*.

Locality where Machine is situated.	Name of Machine.	Name of Owners.	Number of Rock-breakers.	Number of Stamps.	Number of Ore-crushers and Lamberton Mills.	Number of Berdans.	Number of Pans.	Number of Settlers.	Number of Mortars.	Number of Retorts.	Number of Furnaces for Gold-melting.	Number of Furnaces for Assay Purposes.	Number of Plants for Cyanide Process.	Concentrating Plant.	Driven by Steam-power.	Driven by Water-power or Hand-power.
Thames C.—cntd.																W. H.
Thames Borough ..	May Queen Extended	May Queen Extended Company	..	23	..	14	..	..	2	4	1	..	..	..	..	..
" ..	Fairmile ..	W. Manning ..	..	..	..	1	..	..	1	1	1	..	..	..	..	1 0
Ohinemuri County.																
Paeroa ..	Bank of New Zealand	G. Burgess ..	1	..	..	..	..	..	2	1	1	1	..	..	..	0 1
Karangahake ..	Crown ..	Crown Gold-mining Company	2	40	..	1	..	..	2	2	1	1	1	..	..	1 0
" ..	Woodstock ..	Woodstock Gold-mining Company	2	40	..	1	..	..	2	2	1	1	1	..	..	1 0
" ..	Talisman ..	Talisman Gold-mining Company	1	10	..	2	..	..	2	2	1	1	1	..	..	1 0
Owharoa ..	Smile of Fortune..	Ohinemuri Syndicate	..	15	..	2	..	..	1	2	1	..	..	..	..	1 0
Waitekauri ..	Waitekauri ..	Waitekauri Gold-mining Company	2	40	..	6	3	1	4	2	1	1	1	..	..	1 0
" ..	Jubilee ..	Jubilee Syndicate ..	..	10	..	5	2	1	1	2	1	1	1	..	1	..
" ..	Golden Cross ..	Waitekauri Gold-mining Company	1	10	..	2	..	..	2	2	1	1	1	..	..	..
" ..	Grace Darling ..	Grace Darling Gold-mining Company	..	10	..	3	..	..	1	2	1	1	1	..	..	1 0
" ..	Mangakura ..	Reginald Smith ..	..	9	..	3	..	..	1	2	..	..	..	..	..	1 0
Waihi ..	Waihi ..	Waihi Gold-mining Company	2	90	..	1	..	..	3	6	1	1	2	..	1	1 0
" ..	Silverton ..	Silverton Gold-mining Company	2	40	..	2	..	..	2	2	1	1	1	..	..	1 0
Piako County.																
Waiorongomai ..	Te Aroha ..	New Zealand Exploration Company	1	10	..	2	..	..	..	1	1	1	1	..	..	1 0
City of Auckland ..	Bank of New Zealand	..	1	..	..	..	1	1	2	6	4	2	..	..	..	1 0
" ..	Stanley Street ..	George Fraser ..	..	..	1	1	2	2	2	2	1	1	..	..	1	..

In addition to the batteries mentioned above there are twelve others in course of erection throughout the Hauraki district, viz.: COROMANDEL—Hauraki Associated Reefs, ten stamps; Southern Star, ten stamps: total, 20 stamps. THAMES—Moanataiari, twenty stamps; Hauraki Golden Age, forty stamps; Mahara Royal, ten stamps; Luck at Last, twenty stamps; Broken Hills, twenty stamps: total, 110 stamps. OHINEMURI—Waihi, one hundred stamps; Waitekauri Extended, forty stamps; Komata Reefs, twenty stamps; Talisman, twenty stamps; Royal Standard, forty stamps: total, 220 stamps. Grand total, 350 stamps.

STATEMENT SHOWING QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED FOR THE YEAR ENDED 31ST MARCH, 1897.

Locality and Name of Mine.	Average Number of Men employed — Wages-men or Owners.	For Owners.			Tailings.			Estimated Value of Gold and Bullion.
		Quartz crushed.	Gold obtained.		Quantity treated.	Gold obtained.		
			Amalgamation.	Cyanide.		Amalgamation.	Cyanide.	
				COROMANDEL COUNTY.				
Tokatea—		Tons cwt. lb.	Oz. dwt.	Oz. dwt.	Tons.	Oz. dwt.	Oz. dwt.	£ s. d.
Tokatea	35	16 0 0	43 0	..	..	..	..	120 18 9
Royal Oak	40	31 5 0	308 0	..	..	..	..	762 6 0
Golden Spark ..	4	1 10 0	7 2	..	..	..	..	20 2 5
Stirling Castle ..	1	0 5 0	20 0	..	..	..	..	58 0 0
Napier	6	14 0 0	100 5	..	..	..	..	300 0 0
Pride of Tokatea ..	10	34 0 0	403 10	..	..	..	..	1,129 16 0
Success	43	493 0 0	209 0	..	..	..	..	600 5 10
	139	590 0 0	1,090 17	..	..	..	..	2,991 9 0
Cabbage Bay—								
Criterion	6	14 3 14	113 17	..	..	..	..	315 18 8
Queen Victoria ..	4	2 1 0	3 0	..	..	..	..	8 6 6
Bay View	5	6 10 0	19 8	..	..	..	..	53 7 0
	15	22 14 14	136 5	..	..	..	..	377 12 2

STATEMENT SHOWING QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED FOR THE YEAR ENDED 31ST MARCH, 1897—*continued.*

Locality and Name of Mine.	Average Number of Men employed—Wages-men or Owners.	For Owners.			Tailings.			Estimated Value of Gold and Bullion.
		Quartz crushed.	Gold obtained.		Quantity treated.	Gold obtained.		
			Amalgamation.	Cyanide.		Amalgamation.	Cyanide.	
COROMANDEL COUNTY—*continued.*								
Kapanga—		T. c. lb.	Oz. dwt.	Oz. dwt.	Tons.	Oz. dwt.	Oz. dwt.	£ s. d.
Kapanga	100	843 0 0	531 0	..	..	..	..	1,508 12 5
Scotty's	36	122 0 0	256 17	..	..	..	..	749 17 0
	136	965 0 0	787 17	..	..	..	..	2,258 9 5
Kauri Block—								
Hauraki	180	4,437 0 0	24,656 7	..	..	..	..	75,909 13 6
Welcome Find ..	15	54 2 0	531 10	..	..	..	..	1,501 9 9
Golden Pah	34	2 0 0	3 19	..	..	..	..	12 0 0
Hauraki Main Lodes ..	30	4 0 24	4 9	..	..	..	..	13 7 0
Hauraki North ..	16	120 0 0	291 0	..	..	..	..	873 0 0
	275	4,617 2 24	25,487 5	..	..	..	..	78,309 10 3
Tiki—								
Progress-Castle Rock ..	5	1 5 0	35 0	..	..	..	..	94 11 11
Manaia—								
Golden Hill Extended	4	17 0 0	3 3	..	..	..	..	11 2 7
Pukemaukuku—								
Aitken's Freehold ..	8	50 0 0	33 15	..	..	..	..	94 10 0
Waikoromiko—								
Four in Hand ..	7	0 3 64	321 4	..	..	..	..	900 0 0
Lillis	2	4 11 50	720 0	..	..	..	..	2,180 0 0
Hinemoa	5	3 0 0	3 9	..	..	..	..	9 5 0
Forest Queen ..	5	0 19 0	8 10	..	..	..	..	25 10 0
	19	8 14 2	1,053 3	..	..	..	..	3,114 15 0
Whangapoua—								
Maiden Claim ..	6	53 0 0	16 11	..	..	..	..	46 4 0
Kuaotunu—								
Try Fluke, now Mariposa	52	5,305 0 0	1,050 0	815 6	..	..	..	4,150 0 1
Great Mercury ..	20	3,772 0 0	1,579 7	..	..	..	..	1,328 6 4
Irene	12	45 0 0	42 0	..	100	..	40 0	142 0 0
Kapai-Vermont ..	35	3,179 0 0	..	3,332 5	..	..	..	7,151 18 10
Ainsworth	3	35 0 0	94 4	..	..	..	..	235 10 0
Juno	5	22 10 0	87 0	..	..	..	..	200 5 0
Waitaia	9	0 0 8	6 10	..	..	..	..	20 6 5
A1	4	28 0 0	6 0	..	..	..	..	14 0 0
Invicta	3	37 0 0	190 2	..	..	..	..	370 9 10
	143	12,423 10 8	3,055 3	4,147 11	100	..	40 0	13,612 16 6
Totals	750	18,748 5 48	31,698 19	4,147 11	100	..	40 0	100,911 0 10
GREAT BARRIER.								
Great Barrier	..	3 5 0	219 0	..	..	..	..	36 14 6
THAMES COUNTY.								
Tapu—								
Sheridan	8	199 0 0	197 0	..	..	..	..	591 0 0
Golden Point ..	13	4 0 0	1 4	..	..	..	..	3 12 0
Golden Horn ..	4	14 0 0	2 14	..	..	..	..	8 2 0
Sundries	6	21 0 0	10 14	..	..	..	..	32 2 0
	31	238 0 0	211 12	..	..	..	..	634 16 0
Waiomo—								
Monowai	4	50 0 0	..	29 12	..	..	..	95 14 4
Puru—								
Puru Consolidated ..	7	2 0 0	3 15	..	..	..	..	10 10 0
Rangatira	4	10 0 0	2 19	..	..	..	..	8 17 0
	11	12 0 0	6 14	..	..	..	..	19 7 0
Tararu—								
Scandinavian ..	8	145 0 0	55 1	..	..	..	..	154 2 9
Tararu Creek ..	60	2,521 0 0	795 16	..	1,000	..	1,215 10	3,184 7 2
Kaiser	6	1 14 0	4 15	..	..	..	..	12 2 10
Vulcan Extended ..	6	1 0 0	4 11	..	..	..	..	11 17 0
Sundries	6	1 6 0	8 13	..	1,815	187 11	..	515 0 6
	86	2,670 0 0	868 16	..	2,815	187 11	1,215 10	3,877 10 3

STATEMENT SHOWING QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED FOR THE YEAR ENDED 31ST MARCH, 1897—*continued.*

Locality and Name of Mine.	Average Number of Men employed — or Wages-men Owners.	For Owners. Quartz crushed.	For Owners. Gold obtained. Amalgamation.	For Owners. Gold obtained. Cyanide.	Tailings. Quantity treated.	Tailings. Gold obtained. Amalgamation.	Tailings. Gold obtained. Cyanide.	Estimated Value of Gold and Bullion.
		THAMES COUNTY—*continued.*						
		T. c. lb.	Oz. dwt.	Oz. dwt.	Tons.	Oz. dwt.	Oz. dwt.	£ s. d.
Kuranui—								
Kuranui-Caledonian ..	70	379 0 0	599 19	..	..	..	..	1,629 14 2
Kuranui (Hansen's) ..	4	20 0 0	1 16	..	..	..	..	4 14 5
	74	399 0 0	601 15	..	..	..	..	1,634 8 7
Grahamstown—								
Victoria	42	2,089 0 0	2,174 3	..	..	..	..	6,179 1 0
Victoria tributers* ..	2	20 0 0	3 15	..	..	..	..	
Cardigan	6	16 10 0	3 5	..	..	..	..	8 12 3
Sundries	20	..	..	..	4,864	878 8	..	2,327 15 3
	70	2,125 10 0	2,181 3	..	4,864	878 8	..	8,515 8 6
Moanataiari—								
Moanataiari	85	5,073 0 0	2,029 4	..	..	..	..	5,907 18 0
Moanataiari tributers*	12	375 0 0	219 0	..	..	..	..	
Moanataiari Extended	6	15 0 0	3 2	..	..	..	..	8 3 6
Moanataiari North ..	2	15 0 0	1 5	..	..	..	..	3 5 7
Orlando	6	100 0 0	35 0	..	..	..	..	92 3 6
New Alburnia ..	20	1,404 0 0	559 7	..	..	..	..	1,482 5 6
Darwin	5	30 0 0	56 10	..	..	..	..	158 17 0
Sundries	18	40 0 0	18 11	..	564	149 12	..	441 7 10
	154	7,052 0 0	2,921 19	..	564	149 12	..	8,094 0 11
Waiotahi—								
Waiotahi	21	1,613 0 0	2,057 5	..	..	..	..	6,538 10 0
Waiotahi tributers* ..	4	261 0 0	342 4	..	..	..	..	
Cambria	8	93 10 0	154 5	..	..	..	..	408 15 3
Fame and Fortune ..	15	27 0 0	6 3	..	..	..	..	16 5 11
West Coast	2	25 0 0	17 10	..	..	..	..	46 7 6
Little Maggie, now Nonpareil	7	43 10 0	10 10	..	..	..	..	27 10 0
Sundries	12	39 0 0	23 10	..	3,104	148 11	..	451 12 7
	69	2,102 0 0	2,611 7	..	3,104	148 11	..	7,489 1 3
Waiokaraka—								
May Queen	36	638 0 0	578 12	..	..	..	..	1,533 5 6
Karaka—								
May Queen Extended	4	81 0 0	13 17	..	..	..	..	37 7 11
Adelaide	12	81 0 0	63 17	..	..	..	..	231 7 6
Adelaide tributers* ..	4	25 0 0	14 19	..	..	..	..	
Claremont	1	0 5 0	402 6	..	..	..	..	1,126 8 9
Little Willie	2	0 0 50	20 13	..	..	..	..	57 16 5
Karaka Queen	4	5 0 0	6 10	..	..	..	..	18 4 0
Sundries	6	17 10 0	11 4	..	20	32 0	..	120 19 3
	33	209 15 50	533 6	..	20	32 0	..	1,592 3 10
Una Hill and Te Papa—								
Occidental	7	119 0 0	239 2	..	..	..	..	645 11 5
Fortuna	4	28 0 0	9 8	..	..	..	..	25 7 8
Homeward Bound ..	1	10 10 0	6 0	..	..	..	..	16 2 0
Lone Hand	2	2 0 0	2 15	..	..	..	..	6 11 3
	14	159 10 0	257 5	..	..	..	..	693 12 4
Hape Creek—								
Sundries	6	27 0 0	22 12	..	..	..	..	63 5 7
Puriri—								
Dover Castle	4	1 0 0	1 17	..	..	..	..	4 16 2
Empress of India ..	2	10 0 0	2 5	..	..	..	..	6 3 9
	6	11 0 0	4 2	..	..	..	..	10 19 11
Totals	594	15,693 15 50	10,799 3	29 12	11,367	1,396 2	1,215 10	34,253 14 0

* *Tributers.*

Tributes.	Men.	Quartz crushed.	Gold obtained.	Value.
		Tons.	Oz. dwt.	£ s. d.
Victoria	2	20	3 15	10 4 3
Moanataiari	12	375	219 0	581 5 0
Waiotahi	4	261	342 4	932 9 11
Adelaide	4	25	14 19	43 11 0
Totals	22	681	579 18	1,567 10 2

STATEMENT SHOWING QUANTITY OF QUARTZ CRUSHED AND GOLD OBTAINED FOR THE YEAR ENDED 31ST MARCH, 1897—*continued*.

Locality and Name of Mine.	Average Number of Men employed — Wages-men or Owners.	For Owners. Quartz crushed.	For Owners. Gold obtained. Amalgamation.	For Owners. Gold obtained. Cyanide.	Tailings. Quantity treated.	Tailings. Gold obtained. Amalgamation.	Tailings. Gold obtained. Cyanide.	Estimated Value of Gold and Bullion.
OHINEMURI COUNTY.		T. c. lb.	Oz. dwt.	Oz. dwt.	Tons.	Oz. dwt.	Oz. dwt.	£ s. d.
Waihi	350	34,410 0 0	..	93,607 9	2,522	..	..	135,200 16 6
Waihi-Silverton ..	61	7,922 0 0	..	6,605 0	..	..	..	15,289 0 0
Waitekauri	352	11,410 0 0	..	30,232 0	..	..	..	32,645 0 0
Young New Zealand ..	5	3 0 0	12 0 0	..	..	..	..	31 3 6
New Zealand Crown ..	195	10,432 0 0	..	16,731 0	..	..	..	33,368 0 0
New Zealand Talisman..	49	285 0 0	..	1,360 0	..	..	..	1,510 19 0
Maratoto	6	1 4 0	78 19 19	..	..	..	..	23 0 9
Totals	1,018	64,463 4 0	90 19 19	148,535 9	2,522	..	..	218,067 19 9
PIAKO COUNTY.								
Aroha Gold-mines (Ltd.)	30	929 0 0	..	348 0	..	..	..	913 0 0
Alexander Claim ..	2	5 0 0	28 0 0	..	..	..	..	73 10 0
Totals	32	934 0 0	28 0 0	348 0	..	..	..	986 10 0

COMPARATIVE STATEMENT SHOWING INCREASE OR DECREASE OF RETURNS FOR YEARS 1896–97 AND 1895–96.

Locality.	1896-97. Number of Wages-men and Tributers employed.	1896-97. Quantity of Quartz and Mullock crushed and Tailings treated.	1896-97. Yield of Gold or Bullion.	1896-97. Estimated Value of Gold or Bullion.	1895-96. Number of Wages-men and Tributers employed.	1895-96. Quantity of Quartz and Mullock crushed and Tailings treated.	1895-96. Yield of Gold or Bullion.	1895-96. Estimated Value of Gold or Bullion.	Gold or Bullion—Increase or Decrease.	Estimated Increase or Decrease in Value.
SUB-DISTRICTS OF COROMANDEL COUNTY.		Tons.	Oz. dwt.	£ s. d.		Tons.	Oz. dwt.	£ s. d.	Oz. dwt.	£ s. d.
Tokatea ..	139	590	1,090 17	2,991 9 0	214	39	391 3	1,135 9 4	+699 14	+1,855 19 8
Cabbage Bay ..	15	22	136 5	377 12 2	4	3	30 10	88 9 0	+105 15	+289 3 2
Waikoromiko ..	19	9	1,053 3	3,114 15 0	10	4	98 6	285 1 5	+954 17	+2,829 13 7
Kapanga ..	136	965	787 17	2,258 9 5	230	609	1,533 0	4,445 14 0	−745 3	−2,187 4 7
Pukemaukuku..	8	50	33 15	94 10 0	14	11	19 15	57 5 6	+14 0	+37 4 6
Kauri Block ..	275	4,617	25,487 5	78,309 10 3	274	2,841	31,867 6	97,748 2 5	−6,380 1	−19,438 12 2
Tiki	5	1	35 0	94 11 11	10	..	7 5			
Manaia ..	4	17	3 3	11 2 7	25	11	1 10	239 7 11	−36 12	−87 9 5
Whangapoua ..	6	53	16 11	46 4 0	6	..	82 11			
Kuaotunu ..	143	12,524	7,242 14	13,612 16 6	238	23,056	14,330 8	34,831 0 8	−7,087 14	−21,218 4 2
Mahakirau ..	..	..	..	..	..	..	24 13	66 16 11	−24 13	−66 16 11
Totals ..	750	18,848	35,886 10	100,911 0 10	1,025	26,574	48,386 7	138,897 7 2	−12,499 17	−37,986 6 4
SUB-DISTRICTS OF THAMES COUNTY.										
Mata	..	..	..	..	6	15	..	45 0 0	..	−45 0 0
Tapu	31	238	211 12	634 16 0	28	284	258 14	713 8 6	−47 2	−78 12 6
Waiomo ..	4	50	29 12	95 14 4	12	606	2,449 17	233 13 0	−2,420 5	−137 18 8
Puru	11	12	6 14	19 7 0	12	1	0 5	0 13 9	+6 9	+18 13 3
Tararu ..	86	5,485	2,271 17	3,877 10 3	76	2,957	1,274 7	2,703 6 0	+997 10	+1,174 4 3
Kuranui ..	74	399	601 15	1,634 8 7	38	3,470	1,253 15	3,373 2 6	−652 0	−1,738 13 11
Moanataiari ..	154	7,616	3,071 11	8,094 0 11	168	11,628	4,209 8	11,210 2 4	−1,137 17	−3,116 1 5
Grahamstown ..	70	6,989	3,059 11	8,515 8 6	37	9,273	2,160 10	5,618 1 4	+899 1	+2,897 7 2
Waiotahi ..	69	5,206	2,759 18	7,489 1 3	78	4,932	3,518 7	10,665 5 8	−758 9	−3,176 4 5
Waiokaraka ..	36	638	578 12	1,533 5 6	78	9,777	8,413 1	23,534 12 7	−7,834 9	−22,001 7 1
Karaka ..	33	230	565 6	1,592 3 10	49	555	1,065 0	3,267 19 0	−499 14	−1,675 15 2
Una Hill and Te Papa	14	159	257 5	693 12 4	38	1,345	624 2	1,661 3 3	−366 17	−967 10 11
Hape Creek ..	6	27	22 12	63 5 7	17	162	187 11	538 0 0	−164 19	−474 14 5
Puriri	6	11	4 2	10 19 11	10	4	11 11	30 9 1	−7 9	−19 9 2
Tairua ..	..	..	..	..	6	1	56 19	149 10 0	−56 19	−149 10 0
Ohui	..	..	..	..	20	24	47 4	123 18 3	−47 4	−123 18 3
Kirikiri ..	..	..	..	..	4	1	1 11	4 1 4	−1 11	−4 1 4
Whangamata, The Wires	..	..	..	..	10	1	35 6	40 14 11	−35 6	−40 14 11
Totals ..	594	27,060	13,440 7	34,253 14 0	687	45,036	25,567 8	63,913 1 6	−12,127 1	−29,659 7 6
SUB-DISTRICTS OF OHINEMURI COUNTY.										
Maratoto ..	6	1	79 0	23 0 9	22	37	122 0	62 0 0	−43 1	−38 19 3
Karangahake ..	244	10,717	18,091 0	34,878 19 0	282	8,076	34,778 6	37,602 12 10	−16,687 6	−2,723 13 10
Owharoa ..	..	..	..	..	77	530	55 19	151 13 0	−55 19	−151 13 0
Waitekauri ..	357	11,413	30,244 0	32,676 3 6	428	3,733	11,256 17	10,157 8 9	+18,987 3	+22,518 14 9
Komata ..	..	..	..	..	50	..	22 13	52 6 0	−22 13	−52 6 0
Waihi ..	411	44,854	100,212 0	150,489 16 6	865	44,632	101,263 18	126,329 3 5	−1,051 9	+24,160 13 1
Totals ..	1,018	66,985	148,626 0	218,067 19 9	1,724	57,008	147,499 13	174,355 4 0	+1,126 15	+43,712 15 9

Comparative Statement of Return for Hauraki District for the Years ended 31st March, 1897 and 1896, respectively.

1897.

Name of County.	Average Number of Men employed.		For Owners.				For Tributers.				Tailings.			Estimated Value of Gold and Bullion.
	Wages-men or Owners.	Tributers.	Quartz crushed.	Mullock crushed.	Gold obtained.		Quartz crushed.	Mullock or Gravel.	Gold obtained.		Quantity treated.	Gold obtained.		
					Amalgamation.	Cyanide.			Amalgamation.	Cyanide.		Amalgamation.	Cyanide.	
			Tons cwt. lb.	Tons.	Oz. dwt.	Oz. dwt.	Tons cwt. lb.	Tons.	Oz. dwt.	Oz. dwt.	Tons cwt.	Oz. dwt.	Oz. dwt.	£ s. d
Coromandel	750	..	18,748 5 48	..	31,698 19	4,147 11	..	..	..	..	100 0	..	40 0	100,911 0 10
Thames	572	22	15,012 15 50	..	10,219 5	29 12	681 0 0	..	579 18	..	11,367 0	1,396 2	1,215 10	34,253 14 0
Ohinemuri	1,018	..	64,463 4 0	..	90 19	148,535 9	..	..	..	..	2,522 0	..	..	218,067 19 9
Piako	32	..	934 0 0	..	28 0	348 0	..	..	..	..	..	..	..	986 10 0
Great Barrier	6	..	3 5 0	..	219 0	..	..	..	..	..	..	..	..	36 14 6
Totals	*2,378	22	99,161 9 98	..	42,256 3	153,060 12	681 0 0	..	579 18	..	13,889 0	1,396 2	1,255 10	354,255 19 1

1896.

Name of County.	Average Number of Men employed.		For Owners.				For Tributers.				Tailings.			Estimated Value of Gold and Bullion
	Wages-men or Owners.	Tributers.	Quartz crushed.	Mullock crushed.	Gold obtained.		Quartz crushed.	Mullock or Gravel.	Gold obtained.		Quantity treated.	Gold obtained.		
					Amalgamation.	Cyanide.			Amalgamation.	Cyanide.		Amalgamation.	Cyanide.	
			Tons cwt. lb.	Tons.	Oz. dwt.	Oz. dwt.	Tons.	Tons.	Oz. dwt.	Oz. dwt.	Tons cwt. lb.	Oz. dwt.	Oz. dwt.	£ s. d.
Coromandel	1,037	8	17,942 4 82	..	38,425 2	6,209 0	92	45	218 10	..	8,830 0 0	..	3,533 15	138,897 7 2
Thames	590	87	21,946 7 33	1,497	16,586 6	2,449 17	8,030	..	4,006 15	..	13,549 10 0	2,191 13	..	63,913 2 6
Ohinemuri	1,718	6	45,003 0 0	..	1,852 16	121,283 12	281	..	61 15	..	11,724 5 102	414 13	23,886 17	174,355 4 0
Piako	36	..	120 0 0	..	153 3	..	..	..	..	..	54 0 0	14 18	..	941 1 2
Totals	3,381	101	85,011 12 3	1,497	57,017 7	129,942 9	8,403	45	4,287 0	..	34,157 15 102	2,621 4	27,420 12	378,106 14 10

* Number employed in gold-producing mines. Total number of miners in district, 4,932.

	£ s.	Gold or Bullion. Oz. dwt.
Value for 1897	354,255 19 1	198,548 5
„ 1896	378,106 14 10	221,288 12
Decrease for 1897	£23,850 15 9	22,740 7

	£ s. d.
Decrease, Coromandel	37,986 6 4
„ Thames	29,659 8 6
Increase, Ohinemuri	43,712 15 9
„ Piako	47 10 0
„ Great Barrier	36 14 6

WAIHI GOLD-MINING COMPANY.

The following table shows the returns from this famous mine since 1890:—

	Tons.	£	s.	d.
1890	...	21,112	13	6
1891	...	23,935	5	11
1892	18,236	44,888	2	4
1893	19,805	61,900	10	11
1894	24,864	82,827	2	2
1895	33,670	120,334	2	2
1896	34,400	137,321	8	2
Period ending 6th February, 1897	4,140	14,010	14	1
Four weeks ending 6th March, 1897 ...	3,120	10,585	7	4
Four weeks ending 3rd April, 1897... ...	3,150	10,033	2	0
		£526,948	8	7

It will be seen from the foregoing comparative results that the chief fallings-off in the yield of gold have been in Coromandel County. The Hauraki Mine has not maintained an output of rich specimens; therefore it is apparent that the bulk of rich ore from this run has been worked out.

At Kuaotunu also the Try Fluke (now Mariposa), the Great Mercury, and the Irene Mines have not been continuously worked. The output of quartz has thus been materially lessened, and the yield of gold consequently reduced. These mines must in future be provided with more suitable crushing machinery for economical treatment of large quantities of quartz, and until this policy is adopted an increase in the yields cannot be expected. The yield from the Kapai-Vermont Mine has also greatly fallen off, consequent on the richer runs of gold having been first taken out, and until additional machinery is erected for treatment, and development work done to provide reserves of ore, there is no likelihood of increased returns.

In the Thames district the greatest falling-off has been in the returns from the May Queen Mine, the reason for this being that the lower levels could not be worked pending erection of the Queen of Beauty pumping plant; therefore, until drainage has been effected and fresh blocks opened on the reef, a steady output cannot be maintained. The indications at water-level are so good that when the water is drained off rich yields will assuredly follow. In the Moanataiari Mine development has taken the place of production, and until the new plant is available no further treatment of quartz will be undertaken. The mine is being well opened up, and continuous yields will in the future be maintained. Another cause of decrease in the yield from Thames has been that, in consequence of other sources of steady employment being available, the tribute system has almost been given up by the miners, and returns from that source are very limited.

The improved return in Ohinemuri County has been caused by a slight increase from the Waihi Mine, whilst during the year the Waihi-Silverton Extended has largely added to the increase. The Crown Mine and the Waitekauri Mine, consequent on greater crushing facilities, have also exceeded their past year's production. The Woodstock and Talisman Mines, at Karangahake, the Komata Reefs and Waitekauri Extended, at Waitekauri, with the extensive crushing-power available, will increase next year's yield to such an extent that this district will be far in advance of any other quartz-mining centre in the colony in the value of its gold production.

MIDDLE ISLAND.

Attention has been directed to quartz-mining in the Collingwood and West Coast districts, consequent on the introduction of capital to work the mines. Prospecting operations have been carried on and extensive areas taken up in the Lyell, Victoria Range, and Paparoa Range districts, as well as in the different localities around Reefton. The number of claims shown in the following lists as having been registered in the Wardens' offices gives evidence of the keen interest manifested by those engaged in mining pursuits.

ABSTRACT of LICENSES for SPECIAL CLAIMS, LICENSED HOLDINGS, and GOLD-MINING LEASES issued from the Warden's Office, and registered on or before the 31st March, 1897, in the Books of the Mining Registrar.

Date of License.	Area. A.	R.	P.	Section.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
						Collingwood:		
3/3/87	16	2	0	..	VIII.	Aorere ..	Johnston's	Johnston United Mining Co.
5/7/88	6	3	34	..	"	" ..	"	"
6/10/96	16	0	0	..	II.	Waitapu ..	Jacobsen's	Johan S. M. Jacobsen.
6/10/96	29	3	30	..	"	" ..	"	Joseph Jacobsen.
11/1/97	30	0	0	..	VIII.	Aorere ..	Pilliet's	Charles Pilliet.
28/10/95	28	3	29	..	"	" ..	Tyler's	John Tyler.
						Lyell.		
14/3/92	5	0	0	11	XV.	Lyell ..	Fennell's	John Fennell and Robert Perkins.
17/2/97	10	0	0	10	VI.	Inangahua	Rise and Shine ..	Robert McGregor and William Galvin.
13/11/93	22	1	28	91	XIII.	Lyell ..	Tyrconnel	James Edge and John Kelly.
16/1/96	19	0	0	4	VII.	Matakitaki	Tyron	William White.
22/5/96	8	1	24	23	XIII.	Lyell ..	United Alpine ..	United Alpine Quartz-mining Co. (Ltd.).
17/2/97	12	2	0	100	"	" ..	"	"
13/11/93	28	2	16	96	"	" ..	United Italy ..	United Italy Quartz-mining Co. (Ltd.).

ABSTRACT of LICENSES for SPECIAL CLAIMS, LICENSED HOLDINGS, and GOLD-MINING LEASES issued from the Warden's Office—*continued*.

Date of License.	Area. A.	R.	P.	Section.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
						Reefton.		
15/11/95	100	0	0	139	II.	Waitahu ..	Asquith	Inkerman Combined Gold-mines (Ltd.).
1/5/96	99	3	26	145	"	" ..	African	M. J. Hughes.
2/6/96	99	3	0	183	XIV.	" ..	Alpha	H. G. Hankin.
2/6/96	99	3	11	174	"	Reefton ..	Ajax	John Trennery.
2/6/96	59	3	30	77	VI.	Waitahu ..	Alert	James F. Clark.
21/9/96	58	0	0	80	"	" ..	A1	A1 Gold-mining Co.
21/9/96	100	0	0	76	VII.	Reefton ..	Anthony Gibbs ..	John Williams.
1/11/95	100	0	0	169	XIV.	" ..	Beaconsfield.. ..	Consolidated Goldfields of New Zealand.
1/5/96	99	1	0	142	XI.	" ..	Bendigo	Ferris and McKenzie.
2/6/96	100	0	0	151	II.	Waitahu ..	Ballance	G. H. Boyd.
2/6/96	100	0	0	143	XI.	Reefton ..	Blake	"
2/6/96	100	0	0	184	XIV.	" ..	Beta	Henry G. Hankin.
2/6/96	100	0	0	150	II.	Waitahu ..	Bounty	Fleming and Morrison.
20/7/96	50	0	0	69	VII.	Reefton ..	Broadway	G. J. Willis.
7/9/87	37	3	0	19	X.	Waitahu ..	Big River	Big River Gold-mining Co.
1/11/95	100	0	0	141	II.	" ..	Carbine	Inkerman Combined Gold-mines (Ltd.).
1/11/95	99	0	25	37	X.	" ..	Conquest	Robert Lees.
25/11/95	100	0	0	62	VII.	Reefton ..	Caledonia	Consolidated Goldfields of New Zealand (Ltd.).
25/11/95	100	0	0	139	XI.	" ..	Cadman	Ditto.
19/8/95	30	0	0	32	X.	Waitahu ..	Canterbury	George J. Black.
6/1/96	100	0	0	140	XI.	Reefton ..	Carnot	W. McArthur.
1/5/96	100	0	0	148	II.	Waitahu ..	Carroll	G. H. Boyd.
2/6/96	100	0	0	185	XIV.	Reefton ..	Crushington.. ..	G. B. Shepherd.
2/6/96	99	3	16	150	XI.	" ..	Connaught	Edward Black.
3/8/96	43	3	6	147	"	" ..	Chamberlain ..	William Fisk.
21/9/96	51	0	0	157	II.	Waitahu ..	Clarence	C. Kirkpatrick.
21/9/96	100	0	0	156	"	" ..	Cleveland	P. N. Kingswell.
5/11/96	100	0	0	81	VI.	" ..	Caxton	T. H. Lee.
7/2/96	88	0	0	75	"	" ..	Dickens	James F. Clark.
2/6/96	100	0	0	35	XIII.	" ..	Delta	H. G. Hankin.
20/7/96	100	0	0	190	XIV.	Reefton ..	Dunedin	T. H. Lee.
5/11/96	98	3	6	161	II.	Waitahu ..	Deep	Consolidated Goldfields of New Zealand (Ltd.).
6/3/96	60	3	20	176	XIV.	Reefton ..	Empire	J. Scarlett.
3/8/96	99	2	0	73	VII.	" ..	Esma	Thomas North.
21/9/96	54	0	0	201	XIV.	" ..	Energetic	Consolidated Goldfields of New Zealand (Ltd.).
17/10/83	23	0	36	63	XI.	" ..	Eureka	Welcome Gold-mining Co.
28/9/83	34	2	38	92	"	" ..	Fiery Cross Extended	Consolidated Goldfields of New Zealand (Ltd.).
28/9/83	25	2	21	76	"	" ..	"	Ditto.
28/6/93	73	0	19	71	VI.	Waitahu ..	Golden Lead ..	Golden Lead Mining Co.
1/11/95	100	0	0	168	XIV.	Reefton ..	Gladstone	Consolidated Goldfields of New Zealand (Ltd.).
1/5/96	100	0	0	147	II.	Waitahu ..	Gamma	H. G. Hankin.
2/6/96	100	0	0	76	VI.	" ..	Golden Crest ..	B. P. McMahon.
21/9/96	67	0	0	203	XIV.	Reefton ..	Golden Treasure ..	Golden Treasure Extended Co.
21/9/96	95	0	0	199	"	" ..	Golden Fleece ..	Consolidated Goldfields of New Zealand (Ltd.).
5/12/82	52	2	12	15	II.	Waitahu ..	Globe Company ..	David Ziman.
7/9/96	96	2	7	74	VII.	Reefton ..	Holyhead	B. P. McMahon.
1/5/96	100	0	0	146	II.	Waitahu ..	Jamieson	William Fisk.
2/6/96	49	2	0	181	XIV.	Reefton ..	Juno	George H. Boyd.
3/8/96	49	2	32	194	"	" ..	Junction	David Young.
7/9/96	100	0	0	196	"	" ..	Jupiter	Patrick Butler.
20/7/96	65	0	0	70	VII.	" ..	Kismet	R. S. Hindmarsh.
4/7/84	34	3	38	105	XIV.	" ..	Keep-it-Dark ..	Keep-it-Dark Gold-mining Co.
1/11/95	100	0	0	140	II.	Waitahu ..	Larnach	Consolidated Goldfields of New Zealand (Ltd.).
16/9/95	39	0	24	48	XIV.	" ..	Lankey's Creek ..	James Scarlett.
21/2/96	100	0	0	173	"	Reefton ..	Leinster	Joseph McHugh.
2/6/96	50	0	21	43	X.	Waitahu ..	Leighton	Morris Levy.
2/6/96	100	0	0	149	II.	" ..	Lady Mary	W. Irving.
20/7/96	64	3	0	189	XIV.	Reefton ..	London	T. H. Lee.
3/8/96	98	0	0	68	VII.	" ..	Lord Rosebery ..	James S. Wilson.
20/7/96	100	0	0	71	"	" ..	Lady Rosebery ..	"
10/12/96	49	3	15	159	II.	Waitahu ..	Louisa	Walter Irving.
1/5/96	50	0	0	178	XIV.	Reefton ..	Munster	Joseph McHugh.
6/3/96	97	0	9	25	I.	Waitahu ..	Magnet	T. Hubert Lee.
2/6/96	100	0	0	42	X.	" ..	Matthias	H. F. Doogan.
2/6/96	100	0	0	146	XI.	Reefton ..	Massena	T. Hubert Lee.
16/11/96	100	0	0	82	VI.	Waitahu ..	Mount Aurum ..	A. McCloy.
5/11/96	87	2	37	46	X.	" ..	Mawhera	H. F. Doogan.
26/11/96	100	0	0	2	XIII.	Mangahua..	Magnolia	J. G. Willis.
2/6/96	36	0	10	39	X.	Waitahu ..	Nelson	H. F. Doogan.
5/11/96	34	2	15	197	XIV.	Reefton ..	North Ajax	James Stevenson.
15/10/96	62	3	15	45	X.	Waitahu ..	No. 2 Big River ..	J. S. Wilson.
10/12/96	77	1	25	172	XIV.	Reefton ..	North Star	A. Campbell.
6/6/84	102	2	38	139	"	" ..	New Low-level Tunnel	Consolidated Goldfields of New Zealand (Ltd.).
23/5/95	89	1	16	138	II.	Waitahu ..	Progress	Progress Gold-mining Co.
19/8/95	31	0	23	82	"	" ..	Progressive	Consolidated Goldfields of New Zealand (Ltd.).

ABSTRACT of LICENSES for SPECIAL CLAIMS, LICENSED HOLDINGS, and GOLD-MINING LEASES issued from the Warden's Office—*continued.*

Date of License.	Area. A.	R.	P.	Section.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
						Reefton—continued.		
25/11/95	96	1	10	73	VI.	Waitahu ..	Pactolus	Bernard P. McMahon.
6/1/96	33	2	2	141	XI.	Reefton ..	Pasteur	T. Hubert Lee.
21/9/96	46	1	35	44	X.	Waitahu ..	Prima Donna ..	B. P. McMahon.
1/11/95	57	2	0	143	II.	" ..	Revival	Inkerman Combined Gold-mines (Ltd.).
6/1/96	33	0	0	18	"	" ..	"	"
25/11/95	100	0	0	63	VII.	Reefton ..	Rosebery	Consolidated Goldfields of New Zealand (Ltd.).
2/6/96	100	0	0	152	II.	Waitahu ..	Rose	David Ziman.
2/6/96	100	0	0	153	"	" ..	Radiometer	William McArthur.
21/9/96	85	3	24	37	XIII.	Reefton ..	Revival	Peter McHugh.
21/9/96	99	2	0	200	XIV.	" ..	Royal	Consolidated Goldfields of New Zealand (Ltd.).
26/11/96	100	0	0	7	XIII.	Waitahu ..	Rob Roy	J. Cohen.
6/1/96	100	0	0	138	XI.	Reefton ..	Seddon	Consolidated Goldfields of New Zealand (Ltd.).
2/6/96	100	0	0	171	XIV.	" ..	Salisbury	Ditto.
2/6/96	50	0	0	187	"	" ..	Surprise	Archibald Prentice.
26/11/96	100	0	0	6	XIII.	Waitahu ..	Snowy River ..	J. Scarlett.
6/7/96	100	0	0	155	II.	" ..	Sir F. Drake ..	T. H. Lee.
26/11/96	99	2	0	148	XI.	Reefton ..	Sheba	J. McTaggart.
1/5/96	100	0	0	144	"	" ..	Trial	Alexander McKenzie.
20/3/96	100	0	0	12	X.	" ..	Tasmania	Matthew Wynn.
7/9/96	99	3	0	75	VII.	" ..	Transvaal	T. H. Lee.
21/2/96	100	0	0	13	X.	" ..	Ulster	Alexander McCloy.
7/9/96	50	0	0	28	XV.	" ..	Union Jack	John Knight.
2/6/96	100	0	0	41	X.	Waitahu ..	Wolseley	H. F. Doogan.
2/6/96	100	0	0	79	VI.	" ..	Waterloo	Thomas H. Lee.
10/12/96	99	0	9	164	II.	" ..	Wilson	George G. Dixon.
16/2/83	63	1	13	79	XIV.	Reefton ..	Wealth of Nations ..	David Ziman.
1/5/96	99	3	13	14	X.	" ..	Zealandia	Samuel Wilson.
6/7/86	13	2	30	34	II.	Waitahu ..	Globe Co.	David Ziman.
28/9/86	15	3	33	42	"	" ..	"	"
4/10/86	5	0	0	84	"	" ..	"	"
1/11/86	16	1	37	66	XIV.	Reefton ..	Hercules	Hercules Gold-mining Co.
1/7/83	2	2	20	86	"	" ..	No. 2 South Keep-it-Dark	Keep-it-Dark Gold-mining Co.
1/2/83	16	1	27	68	"	" ..	Ditto	"
2/6/96	30	0	0	40	X.	Waitahu ..	Break-o'-Day ..	Harman J. Reeves.
18/4/88	30	0	0	33	VI.	" ..	Cumberland	W. Irving.
28/10/91	10	0	0	70	"	" ..	"	Cumberland Gold-mining Co.
27/9/93	13	1	1	50	"	" ..	Central	James Thorburn.
4/10/95	28	3	0	52	"	" ..	Cumberland ..	Cumberland Gold-mining Co.
4/10/95	29	3	36	51	"	" ..	"	"
1/11/95	16	0	21	142	II.	" ..	Carbine	Inkerman Combined Mines (Ltd.).
10/4/96	29	1	26	62	VI.	" ..	Central Extended ..	James Thorburn.
29/5/90	30	0	0	7	X.	Reefton ..	Dillon	Dillon Extended Gold-mining Co.
19/8/95	30	0	0	37	VI.	Waitahu ..	Durham II.	Matthew Wynn.
19/2/96	30	0	0	8	X.	Reefton ..	Dillon	Dillon Extended Gold-mining Co.
27/1/96	16	2	4	11	VI.	Waitahu ..	Exchange	Exchange Gold-mining Co.
20/3/96	16	1	0	111	XI.	Reefton ..	Ecclesfield	Thomas North.
26/11/96	9	2	8	66	II.	Waitahu ..	Elliston	Thomas H. Lee.
19/3/97	30	0	0	23	..	Reefton ..	El Dorado	Kenneth B. McIver.
25/11/95	16	2	0	17	VII.	" ..	Golden Arch	Francis Rogers.
25/11/95	16	2	4	18	"	" ..	Golden Crown	John Williams.
17/8/94	16	2	0	15	XIV.	" ..	Hercules	Hercules Gold-mining Co.
20/3/96	28	0	30	127	II.	Waitahu ..	Hopeful	Joseph F. Seawright.
21/9/96	20	0	0	77	VII.	Reefton ..	Home Rule	Coyle and Comerford.
17/8/94	21	1	36	14	XIV.	" ..	Keep-it-Dark	Keep-it-Dark Gold-mining Co.
2/6/96	22	1	7	15	X.	" ..	Killarney	Anton C. Kater.
29/6/95	16	2	6	28	"	Waitahu ..	Lord Edward	Lord Edward Gold-mining Co.
19/3/97	29	3	37	26	..	Reefton ..	Lord Nelson	Frederick A. G. Archer.
19/3/97	28	3	26	9	..	" ..	Lady Agnes	George J. Willis.
19/3/97	30	0	0	22	..	" ..	Lucky	Edward Silcock.
1/11/95	15	3	21	7	VI.	Waitahu ..	Mariners	Walter Irving.
2/6/96	5	3	32	180	XIV.	Reefton ..	Micawber	Joseph Walsh.
20/7/96	30	0	0	192	"	" ..	Mariner	John S. Treloar.
5/11/96	24	1	30	165	II.	Waitahu ..	Maritana	Charles Anderson.
19/3/97	30	0	0	30	..	Reefton ..	Morgan	James Woolhouse.
19/3/97	30	0	0	8	..	" ..	Mutual	Kenneth B. McIver.
1/6/92	28	2	25	166	XIV.	" ..	No. 2 South Keep-it-Dark	Keep-it-Dark Co.
7/2/96	29	3	38	135	XI.	" ..	New Conybeare ..	Patrick Breen.
21/9/96	30	0	0	38	X.	Waitahu ..	New Alexander ..	Thomas J. Malloy.
10/4/96	29	2	25	4	"	Reefton ..	Painkiller	Thomas McGrath.
2/6/96	29	1	11	182	XIV.	" ..	Percival	David Ziman.
18/2/97	29	3	35	8	VI.	" ..	Primrose	James F. Clark.
22/2/88	16	2	4	10	"	Waitahu ..	Success	D. McGee.
17/6/95	30	0	0	22	X.	" ..	St. George	St. George Gold-mining Co.
16/9/95	30	0	0	21	"	" ..	Star	John Trennery.
2/6/96	14	3	29	30	XV.	Reefton ..	Southern Cross ..	John G. Willis.
15/10/96	16	3	0	16	X.	" ..	Triangle	George J. Willis.
2/6/96	30	0	0	179	XIV.	" ..	Victoria Extended ..	William J. Collins.
25/1/93	16	0	26	7	XI.	" ..	Welcome	Welcome Gold-mining Co.
5/10/94	28	2	8	103	"	" ..	"	"

ABSTRACT of LICENSES for SPECIAL CLAIMS, LICENSED HOLDINGS, and GOLD-MINING LEASES issued from the Warden's Office—*continued.*

Date of License.	Area.			Section.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
	A.	R.	P.					
						Reefton—continued.		
17/8/96	16	2	0	15	VII.	Reefton ..	Westralian	Charles W. Martin.
5/11/96	22	3	20	160	II.	Waitahu ..	Wedge	Consolidated Goldfields of New Zealand (Ltd.).
19/3/97	29	3	11	28	..	Reefton ..	Young New Zealand ..	Henry Smith.
10/4/96	16	2	0	16	VII.	" ..	Ziman	Bernard Rogers.
2/6/96	6	3	22	54	II.	Waitahu ..	Zenith	George J. Willis.
						Ahaura.		
25/1/97	100	0	0	30	IX.	Waiwhero ..	Alpha	John T. Tidd.
22/6/96	100	0	0	6	X.	" ..	Ballarat	Thomas Williams.
22/6/96	100	0	0	15	XIV.	" ..	Cœsus	Henry Neilson and others.
26/10/96	100	0	0	18	"	" ..	Corrie's Reward ..	James McMeekin and others.
7/12/96	100	0	0	16	X.	" ..	Comstock	Henry Watterson and another.
7/12/96	100	0	0	33	XIV.	" ..	Caledonia	Duncan McLean.
28/9/96	98	2	32	4	X.	" ..	Golden Crown ..	John Caples.
28/9/96	100	0	0	19	XIV.	" ..	Imperial	Hubert Boustridge.
27/4/96	100	0	0	3	X.	" ..	Moonlight	Richard Devereux and others.
27/7/96	100	0	0	7	"	" ..	"	John Herbertson and others.
22/6/96	95	3	17	13	XIV.	" ..	Minerva	Gerald Perotti.
25/1/97	100	0	0	38	II.	Mawheranui	Mount Sewell ..	F. H. Kells.
26/10/96	97	1	24	20	XIV.	Waiwhero ..	Napoleon	William Fraser.
25/1/97	99	0	0	41	"	" ..	Nil Desperandum ..	John Leitch.
28/9/96	98	2	36	5	X.	" ..	Premier	James Marshall.
7/12/96	97	1	26	27	"	" ..	Paparoa	Joseph Mandl.
19/11/96	100	0	0	17	XIV.	" ..	Sunlight	Henry Deering.
25/1/97	98	1	4	20	X.	" ..	Sunbeam	Donald MacGregor.
25/1/97	99	1	10	40	XIV.	" ..	South Pole	Thomas Jolliffe.
26/10/96	93	2	0	23	"	" ..	Victoria	James Armstrong.
24/8/96	20	0	17	12	"	" ..	Aurora	Gerald Perotti.
28/9/96	29	1	7	2	IV.	" ..	Lady Wylde	John O'Brien and others.
22/6/96	30	0	0	2	XIV.	" ..	Roaring Meg ..	Gerald Perotti and others.
						Greymouth.		
1/3/97	100	0	0	..	V.	Mawheranui	Doogan's	James L. Doogan.
1/3/97	100	0	0	..	II.	" ..	Howell's	H. W. Howell.
1/9/94	32	0	0	..	V.	" ..	Julian	Walter E. Church.
1/3/97	99	0	0	..	"	" ..	Kells's	W. H. Kells.
1/3/97	100	0	0	..	"	" ..	O'Donnell's	Jeremiah O'Donnell.
9/9/96	88	2	27	..	"	" ..	Paparoa	The Paparoa Gold-mining Co. (Ltd.).
21/12/96	99	0	0	..	"	" ..	"	James Creagh.
21/12/96	99	0	0	..	"	" ..	Tymons's	T. W. Tymons.
1/3/97	100	0	0	..	"	" ..	Ward's	John Ward.
9/1/96	16	2	33	..	"	" ..	Bland's	Thomas Bland.
22/11/94	16	2	1	..	"	" ..	Church's	Walter E. Church.
24/1/95	15	0	28	..	"	" ..	Curtis's	Charles Curtis.
24/1/95	16	0	3	..	"	" ..	Dearing's	Henry Dearing.
24/1/95	15	0	28	..	"	" ..	Feary's	Harry Feary.
24/1/95	16	0	1	..	"	" ..	Green's	Richard Green.
24/10/95	8	3	24	..	"	" ..	Jones's	Thomas Jones.
22/11/94	30	0	0	..	"	" ..	McGain's	John McGain and others.
22/10/96	16	0	36	..	"	" ..	"	John McGain.
						Ross.		
25/4/96	100	0	0	..	VII.	Totara ..	Alpha	William Denham Verschoyle.
23/12/96	50	0	0	..	II.	" ..	Captain Russell ..	Antonio Zala.
23/12/96	100	0	0	..	VI.	" ..	Cedar Creek	W. D. Verschoyle and others.
25/4/96	100	0	0	..	VII.	" ..	Helvetia	Antonio Zala.
23/12/96	100	0	0	..	VI.	" ..	Johannesburg ..	Thomas W. Bruce and another.
16/10/96	100	0	0	..	"	" ..	Omega	"
23/12/96	100	0	0	..	"	" ..	Republic	Patrick Healy and another.
21/10/95	40	0	0	..	VII.	" ..	United Helvetia ..	Antonio Zala.
9/1/89	10	0	0	..	II.	" ..	Donnelly's Creek ..	David Yarworth.
26/4/90	14	0	0	..	"	" ..	Gladstone	Charles Porter.

COLLINGWOOD.

Golden Gully Claim (Area, 96 acres).—Prospecting work has been carried on, 270 ft. of a level driven, and two shafts sunk 80 ft. and 60 ft. respectively. Five men were employed.

Taitapu Gold Estates (Limited), West Wanganui.—This company has purchased a very large area of country in the West Wanganui district, and is pushing ahead prospecting and development work vigorously, and giving employment to a large number of men. The following account of the property is furnished by the manager, Mr. James Coutts, since appointed Inspector of Mines for the Auckland District:—

This company's property comprises 88,350 acres of land, a considerable portion of which, facing the coast, is of excellent quality for grazing purposes, but the greater part of it is bush, and is of a broken character. The rivers which traverse the property run in a north-westerly direction towards the west coast. In all these rivers and tributaries gold has been obtained from time to

time. The first rush took place over twenty years ago, and, as a matter of course, the easiest payable alluvial deposits were then worked out. There are still terraces of alluvial drifts containing a fair percentage of gold, which will, in my opinion, be worked at no distant date, but up to the present the great difficulty has been want of sufficient capital to bring in water to work these terraces. This is well worth trying, and should it prove successful it will give a considerable amount of employment to miners. A great deal of gold in the creeks is found adhering to quartz, which leads miners to believe that rich lodes will be found on this company's property. A lode was discovered some sixteen years ago on the eastern side of Slaty Creek, which was worked for a time, giving payable returns; but when the payable portions of the lode became exhausted it was stopped, like many others in New Zealand, for the want of capital to further develop it. About the same time there was also a reef worked, and a five-stamp mill erected, on Friday Creek; but this only worked for a short time, as the quartz crushed from here only yielded at the rate of 4 dwt. to the ton, and the reef, being small, was not of a payable character. This company has pegged off three blocks of 150 acres in different localities, which they have reserved for gold-mining, but at present they are only opening up the Golden Ridge Mine. The work done during the year has been confined to driving two adit-levels from the side of the hill, and the sinking of two winzes on the reef from Nos. 1 to 2 levels. The reef has varied from 8 ft. to 2in. in width, but it was where the reef was thickest that the best tests were obtained. Some of the quartz treated yielded at the rate of 131 oz. of gold to the ton. This, of course, is not what may be considered a fair average, but it was sufficient encouragement for the company to erect a battery, the works in connection with which are in course of construction. The battery is to consist of twenty stamps, 8½ cwt. each, four berdans, and one concentrating-pan. This is to be driven by a Pelton wheel. The tank where the water is to be lifted in pipes will be 450 ft. above the battery, which will give a pressure of 183 lb. to the square inch, so that a small quantity of water will drive the entire plant. The quartz will be conveyed to the battery by an aërial tramway a distance of 60 chains, and this will be connected by a ground tramway from the mine to the upper terminus, the distance being 350 ft. The company is energetically prospecting their property, and making tracks through the country, at considerable expense, and without Government aid, thereby giving a great amount of employment, over sixty men having been employed constantly during the year. In doing this they are worthy of praise, and it is earnestly hoped that the mines will turn out equal to their most sanguine expectations. There are also three other English companies working mines and carrying out prospecting operations on the company's estate, and meeting with a fair amount of success.

The Australasian Gold Trust and Pioneer Company, of London, have also a property of 100 acres at West Wanganui, where prospecting operations are being carried on. An adit has been put in 200 ft., a second 195 ft., and a winze 125 ft. The reef, which runs north and south, is from 1 ft. to 4 ft. in thickness, the foot-wall being slate and the hanging-walls sandstone. Twenty men are employed.

Lyell District.

United Italy (Area, 30 acres).—This mine is the property of the United Italy Gold-mining Company (Limited), and has been worked by a party of six tributers. The quartz is chiefly obtained from leaders; 100 tons yielded 420 oz. of gold.

Lyell Creek Extended Mine (Area, 57 acres 3 roods 32 perches).—This mine is worked from the Lyell Creek low-level tunnel. The reef was struck after 3,000 ft. of driving, and two winzes were sunk, one to a depth of 150 ft., and a level opened at 125 ft. Work was, however, suspended in this part of the mine, and a new shaft commenced between the north and south blocks, which is now sunk to a depth of 50 ft. It is the intention of the company to erect a hauling plant to be driven by compressed air. Six wages-men and four tributers were employed.

United Alpine Mine (Area, 96 acres 2 roods 28 perches).—This mine is worked from a low-level tunnel 3,000 ft. in length, from which an incline shaft was sunk 520 ft., and a low-level, No. 9, and an intermediate, No. 8, opened from the incline-shaft. 2,215 tons of quartz yielded 713 oz. of gold, and for tributers 65 tons yielded 70 oz. Thirty wages-men and six tributers are employed. Mr. Shallcrass, the manager of the company, gives the following account of the work done, &c.:—

"During the year the main incline-shaft has been extended a distance of 200 ft., and the No. 9 level driven. A new air-compressor has been placed in position, and a line of 3 in. wrought-iron pipes, about 6,000 ft., has been laid from the battery to the air-winch at top of incline-shaft. An aërial tramway has been erected from No. 4 to No. 7 level. For haulage, a winch driven by compressed-air, 4-horse power; for pumping, Tangye's pump, capacity 15 gallons per minute, driven by compressed air. The battery consists of twenty heads of stamps and four berdans, the weight of stampers being 800 lb. There are also two air-compressors, 10-horse power each, for hauling and pumping, all of which are driven by water-power."

It would prove of benefit to both the United Alpine and the Lyell Creek Extended Companies if they could arrange to make a connection between their several levels. About 200 ft. of sinking is required from the No. 9 level of the Alpine to the low-level tunnel. Both mines would then be in a better position. The upper mine would be drained, and the lower mine as well as the upper be thoroughly ventilated. All quartz could be sent out by the low tunnel, thus saving hoisting on the part of the Alpine Company.

Tyrconnel Mine.—This mine has again been profitably worked, the quartz being chiefly obtained from leaders. A parcel of 44½ tons yielded 254 oz. of gold.

Golden Crown Claim (Area, 50 acres).—This claim has been prospected by the owner, Mr. J. Grieve, and a gold-bearing reef, 5 ft. to 12 ft., and a leader of 12 in., also gold-bearing, have been discovered.

Maruia.

About twelve months ago gold was found in a quartz reef outcropping on the surface here and there for about a mile in length. It was first discovered in Wheel Creek, about three-quarters of a

mile up from the Maruia River. Some of the outcrops showed a fair quantity of visible gold, and there were all the indications of good reefs being opened up in this locality. The prospectors made arrangements with the Anglo-Continental Gold Syndicate (Limited) to develop the property, but after prospecting it for about nine months by adits, shafts, and winzes it proved that the gold did not go down; the only place where prospects were obtained of the quartz being payable for working was on and near the surface. The syndicate therefore abandoned the option over the property. These reefs are in the same formation as those recently found on the top of the Victoria Range, being a metamorphosed clay slate, having in places a semi-schistose structure. The general impression is that reefs payable for working will be found in this locality yet, but it may take a considerable time to discover them, as the district is very sparsely populated.

The Warwick Gold-mining Company applied for a lease of 100 acres of ground, and have already put in a drive of 100 ft. on the reef, which is from 2 ft. to 4 ft. thick. Six men are employed.

The Grassmere lease, of 100 acres, and Maruia lease, of 16 acres, are also being surface prospected.

The Zealand lease, of 30 acres, is also being prospected, and a winze being sunk on the reef from the top of a hill 700 ft. above the river.

Britannia Mine (Area, 99 acres 3 roods).—This mine is situated at Stony Creek, Republic Range, Waimangaroa. Prospecting has been carried on continuously, with from two to four men, in opening up the outcrop, driving levels, and testing reef. The quartz averages from 2 oz. to 3 oz., and the recent discovery of quartz in a lode about 20 chains west of No. 1 reef has proved to contain rich ore. An English syndicate has had the property under option for the past five months.

Reefton District.

Victoria Range.—A very rich discovery of auriferous quartz was made by Mr. Kerwan on the Victoria Range in December last. The locality is situated about eight miles from Capleston, near the summit of the Victoria Range, at an elevation of about 3,500 ft. above sea-level. There are about 10 acres of ground covered with a loose surface deposit of quartz, which has come from some reef in the immediate vicinity, but so far this has not been found. The ground on which the quartz is lying is a portion of a slip of considerable magnitude. This has been proved by an adit, which was driven into a low spur about 40 ft. below the surface on the summit of the spur. This adit is on loose disturbed ground, the rock being greatly disjointed and tossed about.

The ground where the deposit of quartz is lying now forms a portion of the Lord Brassey Special Claim, comprising an area of 100 acres, which was granted to the prospector. On the northern boundary of this claim there are three other claims—namely, the Lady Brassey, Mark Twain, and Earl Brassey—each comprising an area of 30 acres, and on the eastern boundary there is another claim of 30 acres, known as Kerwan's Reward.

On the Mark Twain, Earl Brassey, and Kerwan's Reward Claims there are large reefs outcropping from 3 ft. to 6 ft. in width, but the quartz is far more crystalline in these reefs than in the surface deposit on the Lord Brassey Claim, and, as far as has been tested by assays, only contains a very small percentage of gold, some samples only giving a trace of gold, while others vary from 2½ dwt. to a few grains to the ton.

The formation where the reefs occur on this range is a metamorphosed clay slate, having in places a schistose structure of Devonian age, and older than the Maitai rocks in the locality of Reefton, which belong to the Carboniferous period. It is a formation where one would expect to find rich auriferous lodes.

The surface deposit of quartz on the Lord Brassey Claim must have come from a large lode, as some of the boulders are 2 tons in weight, but the general character of the loose quartz is in pieces varying from a few pounds to two or three hundredweight, all of which contain gold; indeed, it is a rare instance to break up one of the boulders in which gold is not seen, and, even if it cannot be discerned by the naked eye, by pounding up the stone in a mortar and washing the pulverised material in a dish a very good tail of gold can be got.

From the quantity of timber that is growing on the ground where the deposit of quartz is lying it shows that ages must have passed away since any slip took place in the vicinity, and there is no surface indication to show from what direction the slip came, other than from the wavy surface of the ground. One would suppose it came from the direction of the Lady Brassey and Mark Twain Claims. There is a high sharp ridge running across these claims, having a very steep slope down into a deep ravine facing the Lord Brassey Claim, which bears some indications of a slip having taken place, but whether it is from this direction the slip has come is a question at present unsolved. There is no doubt that the large quantity of quartz that is strewed over the surface has come from some reef in the vicinity, and one at no great distance from where the deposit is lying, as from the physical features of the country, and being on an isolated high range, it could never have been laid down in the position it is lying in from glacier action. It may take a considerable amount of time and money to find the reef where this deposit came from, but when it is discovered it is likely to prove one of the richest reefs ever opened out in the colony.

Progress Mines of New Zealand (Limited).—This group of properties, formerly worked as two separate mines, has since its acquisition from the local owners been in process of development and equipment. The old equipment is entirely inadequate for the requirements in the future, the shafts being small and at too great a distance from the ore-bodies, and the hoisting machinery practically useless for handling the tonnage the mines are now in a position to turn out. The mill was of an ancient type, and is being replaced by one of a more economical pattern and greater capacity. The ore reserve when the mines were purchased amounted to but a few months' run for the mill, owing to the backwardness of development work. The present condition of the property, with its large ore reserve, has been brought about by devoting all attention to opening up fresh ground and

milling only such ore as came from development work. As little or no work has been done outside of known ore-bodies, the amount of dead-work required to develop the present ore reserve is greater in proportion to the tonnage developed than may be reasonably expected in the future. The nature of the ore occurrence will always entail a large amount of development, but with the property properly opened up, as it will be before the new mill is in operation, this need seldom interfere with ore extraction. The new shaft (shaft B) now being sunk has three comparments, two 4½ ft. by 4 ft. for hoisting, the third for ladders and piping. It is timbered in square sets, and will cut the vein on its dip at a depth of about 1,200 ft. Through this shaft it is intended to extract all ore-bodies below 500 ft. in depth, and, as it is already down 625 ft., and progressing at the rate of about 20 ft. to 25 ft. per week, the systematic opening of the mine is assured before the new forty-stamp mill is ready to crush. The following work has been done since February, 1896: Drifting on vein, 1,911 ft.; raised or sunk on vein, 804 ft.; cross-cutting, 1,016 ft.; shaft-sinking (B), 625 ft.; surface tunnel, 200 ft.; reopening old levels and shafts, 1,450 ft.: total, 6,006 ft. Station cut, 26 ft. by 13 ft. by 10 ft. The following surface-work has been done: Road-construction to shaft B, half-mile; water-race construction to new mill, two miles and a half; water-race construction to shaft B, three-quarters of a mile; grading for shaft-house, hoisting engine, &c.; grading for new mill; clearing line of aërial tramway; construction of miners' boarding and living houses; grading for sawmill plant at mine.

Work in the mine has developed a satisfactory showing of ore. The tonnage developed above No. 6 level is 50,000 tons, as against 23,000 tons reported on the 28th September, 1896. The completion of the shaft and opening of the level 100 ft. below No. 6 should add 30,000 tons to this reserve, and will provide over two years' supply at 120 tons per day. All the machinery necessary for the complete equipment of this property has been ordered; some of it has already arrived in New Zealand, and the remainder should reach here shortly. The grading and the foundation walls for the mill are nearly completed. Most of the lumber for the structure is on the ground, and the work of framing and erecting will begin at once. Two miles and a half (including the most difficult section) of the race for the supply of water-power to the mill is practically finished, two miles further has been benched, and there are a hundred and fifty men on the work to push the completion of the total 10½ miles. The heavy grading for the hoisting-works at shaft B is nearly at an end, and the foundations for the new engine and boilers are about to be built in. Nothing but severe weather preventing outdoor work on the water-race should delay starting regular operations beyond the beginning of the coming year.

Wealth of Nations Group.—This group is situated two miles and a half in a southerly direction from the Town of Reefton; it adjoins the Inangahua Tunnel group on the south and the Keep It Dark Mine on the north. The group is composed of the following claims: Southern portions of Gladstone, Beaconsfield, and Undaunted, 130 acres; Energetic, 23 acres 1 rood 38 perches; Wealth of Nations, 63 acres 1 rood 13 perches: total, 216 acres 3 roods 11 perches.

Through the slates which form the country-rock there runs a mineralised belt in which irregularly-shaped bodies of free gold ore occurs. This belt runs about 15° west of north, and has an average dip of 70° to the west. The ore-bodies vary in size up to 180 ft. in length and 20 ft. in width. On the surface there were three parallel ore-bodies in the Wealth of Nations, worked to a depth of 700 ft. through surface tunnels. One of these ore-shoots struck into the Energetic, and formed the ore-body on which that mine worked until 1895, the output being 65,763 tons; value, £131,703. The other ore-bodies were worked to a depth of 450 ft. in the Wealth of Nations, but there appears to be a barren zone about 300 ft. in depth making horizontally along the strike of the ore-belt in which little of value has ever been found. This extended through the Energetic, Wealth of Nations, and in a somewhat lesser degree through the Keep It Dark Mine to the south. Below this zone ore was again encountered on the 200 ft. level, Wealth of Nations, and carried down continuously to the lowest workings. The mine below the battery level has been worked through two underground shafts, ropes being brought 750 ft. through a cross-cut to No. 1 shaft, thence down to the 200 ft. level, and 600 ft. along that level to No. 2 shaft. Power furnished by an over-shot water-wheel. The limited amount of work such a system could perform has directed all efforts towards an installation which would permit the opening-up of the Energetic ground from the lower levels of the Wealth. Connection has been made with the lowest Energetic workings, and an incline-shaft is being sunk to hoist ore and waste to the battery level. Since taken over the following work has been done: Drifting on vein, 1,182 ft.; cross-cutting, 247 ft.; sunk, 499 ft.; old drifts, air-shafts, and winzes reopened and retimbered, 1,840 ft.: total, 3,768 ft. The water-race, furnishing water and power for milling and hoisting, has been enlarged for a distance of four miles. As both the Keep It Dark and Wealth of Nations ore-bodies have been picked up below the barren zone it is reasonable to expect a like result with the Energetic; hence every effort is being made toward pushing development in this direction. All hoisting and milling is done by water-power, and the twenty-stamp mill is in sufficiently good order to treat the ore-bodies now developed. When the Energetic ore-shoot is picked up some remodelling will be necessary.

Inangahua Tunnel Group.—Work has been continued in this group. The tunnel has been advanced at the rate of 146 ft. per month since starting (18th September, 1896), and ore has continued to be developed in the ground towards which the tunnel is being driven. No further attempt has been made to open the old Golden Fleece workings, as it is the intention to exploit this ground from below. The winze being sunk from the lowest workings of the Golden Fleece for the purpose of tracing down the vein to the level of the tunnel 600 ft. below was started on the extreme end of the low-grade body of ore developed in this mine. It is now at a depth of 145 ft., and has carried more continuous ore than could have been expected from its position. It is a promising indication of what should be found below. In the tunnel the last 650 ft. driven has been in likely-looking slate; three stringers of quartz have been cut, two of which are worthy of further investigation. The face of the tunnel is in 3,989 ft., and the point at which the zone carrying the gold-bearing

veins was expected to be encountered was 4,000 ft., so that this belt of country is 650 ft. wider than was anticipated. 650 ft. further should bring us to where the vein being carried down in the winze should be found, when drifting to the north along the strike of the vein will put the tunnel under country carrying known ore-bodies higher up. The following work has been done: Drifting on vein, 591 ft.; cross-cutting, 133 ft.; raised or sunk, 240 ft.; reopened old workings, 180 ft.; Inangahua Tunnel driven, 1,089 ft.; reopened caved portion, 200 ft.: total, 2,433 ft. 800 ft. of road has been constructed to the mouth of the tunnel. Boiler and air-compressor and an air-winch for hauling in empty mine-cars have been installed.

Boatman's Group, consisting of the Welcome United, Fiery Cross, Cadman, Seddon, and Blake, is situated one mile from the Town of Capleston and twelve miles by wagon-road from Reefton ina northerly direction. The ground comprised in this group has been the scene of great activity in the past. £198,600 has been paid in dividends, and the mines were opened to a depth of 1,500 ft. below the surface. The Welcome United has given the largest returns of this group, having paid £110,250 of the amount above mentioned. The average grade of the ore in this mine was 2 oz. 8 dwt. The ore occurs in shoots in a defined channel of slate running nearly north and south, and dipping to the east. The shoots pitch north into the hill in depth, and were followed until either the ore gave out or the continuation of the shoot was lost. From the appearance of the workings it will be seen that development work has been confined to the limits of the different ore-shoots, and there still remains a large extent of virgin ground to the north of the old Welcome and to the south of the Fiery Cross workings. The Eureka incline was sunk in the hanging-wall, with the intention of striking the Welcome ore-shoot as it dipped out of their ground as held at the time. However, the shoot had ceased to be payable 200 ft. above the Eureka level, and in the No. 10 level, 246 ft. below, has not been picked up, though the ground has been pretty thoroughly cross-cut at that depth. Nearly all the workings in the Welcome, except the Eureka incline and level, were caved. Operations in No. 10 level were impracticable, owing to lack of ventilation, and an attempt to reopen from the lower workings upward was also unsuccessful. Attention is now being given to prospecting the untouched ground to the north of the Welcome workings, operating through No. 5 level, and opening the ground between the Welcome and Fiery Cross through a cross-cut from the Eureka level. The latter development has not yet reached the line of reef. The No. 5 level has been reopened, and 18 in. of ore picked up beyond the former workings. There has been no time as yet to ascertain its extent. Work has been entirely confined to the Welcome Company's claims, and is as follows: Drifting on vein, 204 ft.; cross-cutting, 292 ft.; reopened old drifts and winzes, 1,218 ft.: total, 1,714 ft. There is a twenty-five-stamp mill belonging to the Fiery Cross, which could be used on any ores developed for some time to come. The other four claims carry the Welcome line of reef for a distance of a mile and a half, and, should the ground now being opened continue to develop as it has begun, a large extent of country will be available from which the ore may be extracted without being hampered by old workings.

Caledonia and *Rosebery* are situated at Larry's Creek, about seven miles by pack-track from Capleston. They are each special claims of 100 acres. No work has been done on the properties pending the completion of a wagon-road now about to be constructed. When, however, it is possible to haul in machinery with which to prospect this ground there is ample reason for doing so. Access to the lower workings cannot be gained, as the mine is full of water, but they are limited in extent, and have by no means prospected the ground. The property was worked to a depth of 200 ft. at one point, when operations, it is said, were interrupted by the creek breaking through into the stopes. The yield of 6,209 oz. gold for 8,080 tons of ore, and the extensive mineralisation of the belt of country-rock carrying the shoots, are inducements for further investigation as soon as the conditions for working will permit. Ample water rights have been secured, and timber for mining is abundant.

Keep It Dark Mine (Area, 56 acres 1 rood 34 perches).—This mine has been profitably worked during the year. The block of ground opened from the inside shaft continued to yield steady returns. The present workings are 1,240 ft. below the outcrop of the reef, 950 ft. below the Inangahua River, and 300 ft. below sea-level. The reef averages 15 ft. in width, and 2,559 tons of quartz yielded 2,264 oz. of gold. Thirty-eight men were employed. The mine is worked from a shaft which is 503 ft. deep to No. 3 level. An inside shaft was then sunk to a further depth from No. 3 to No. 7 level of 505 ft., making a total depth of 1,008 ft. from the brace. The No. 7 level is at the greatest depth yet attained in this district. The winding machinery is worked by water-power, a large overshot wheel being used. There is, however, a steam-engine of 12-horse power, which can be used for winding if required. The battery consists of twenty stamps with three berdans, and is driven by water-power. There is also an air-compressor driven by water-power. The water-race is 140 chains in length, 6 ft. wide, and 1 ft. 6 in. in depth. The following extracts from the report furnished by the directors at the annual meeting held on the 21st December, 1896, give a full description of the mine and workings:—

"Stoping out stone has been carried on between No. 6 and No. 5 levels, and the top stope is now up to within 23 ft. of No. 5 level. For the last three or four stopes the reef has been gradually making into the hanging-wall. The principal part of the reef is now about 30 ft. into the wall from the perpendicular of No. 5 level, so that there is every likelihood of the reef living up a long way above No. 5. The quality of the stone which was taken from the bottom of No. 6 level is being fully maintained, last month's crushing being the best average yield we have had. A winze has been sunk on the reef from No. 6 level to a depth of 125 ft. The winze for a short distance from the bottom appeared to be on the end of the block, but at the bottom a short drive exposed the stone, carrying payable gold. The inside winding-shaft is now being sunk by contract, and is down 84 ft. from No. 6 chamber. The rock is very hard, consequently the progress of sinking is slow. When it is down the required depth a drive of 180 ft. in length will connect with bottom of winze, and No. 7 level will then be opened up ready for stoping. The work in the mine for the year has

been greatly retarded, and much increased expenditure caused, by the heavy landslip which occurred during the heavy rains in April last. Thousands of tons of *débris* came down close alongside of the main shaft, smashing the poppet-heads, carrying away the blacksmith's shop and a quantity of tools, and completely destroying all the winding gear. The new winding water-wheel (which was just finished) was also totally destroyed, and the mine for some time was in imminent danger of being flooded. The Hercules Company very kindly allowed the directors the use of their winding-wheel, and as soon as a connection was made with wire rope it sufficed to keep the water from rising in the mine until an engine was procured and placed on the ground. New poppet-heads have been erected, and a great amount of extra work had to be done before the mine was got into working-order. The excavation for new water-wheel is completed, and the erection of winding-wheel will be at once proceeded with, as it is much cheaper winding with water- than with steam-power. A new battery paddock will have to be put up, and also some repairs will be required at head of water-race; otherwise everything is in good order. The mine at the present time, for permanency, is looking as well as ever it did, and the battery is proving the stone now being obtained to be superior in quality to what it was on higher levels. The winze which has been sunk from No. 6 level proves payable stone to exist at a depth from the surface of 1,260 ft."

Hercules.—There have been no returns from this mine during the year.

Keep It Dark No. 2 Mine (Area, 50 acres).—Work is not being vigorously carried on. The shaft is 470 ft. in depth, with steam winding machinery. Four men were employed at the time of my visit, but no returns of gold have been received.

Golden Treasure Mine (Area, 69 acres).—There are several reefs and blocks of stone running through the ground from 2 ft. to 20 ft. in thickness. None of them have been worked at a greater depth than 300 ft. from the surface. In the south portion of the mine known as the Band of Hope there is a reef which has been worked down 250 ft. from the surface. 108 ft. has been driven on the stone, which is still showing in the face of the drive. There is a winze sunk on the stone from the level 150 ft. At 70 ft. down a drive was put north on the stone, which averaged 6 ft. to 8 ft. in thickness. If this winze were connected with the main shaft it would give 150 ft. of backs to work up. North of the above there is an antimony block of stone on which 100 ft. has been driven. It averages at least 5 ft. in thickness, and contains from 30 to 50 per cent. of antimony. By crushing this stone and running it over blankets it yielded 5 dwt. of gold per ton, and a sample of 5 tons sent to Freiberg gave a return of £23 per ton. There is a very large quantity of this ore opened up and in sight, with gold showing through it, but on account of the heavy sulphide of antimony the gold cannot be saved by the ordinary battery process adopted on this field. To the north of the antimony reef there is another reef 2 ft. to 3 ft. in thickness, which yielded 2 oz. to 3 oz. of gold to the ton. This stone has been worked some distance from the surface. The level of the bottom of the shaft is 100 ft. deeper, and this stone was never cut in it, and no prospecting done to discover it, through want of funds. The northern workings of the mine known as the Westland carry a reef which averages 4 ft. in thickness. A quantity of this stone was crushed, which yielded a value of £2 per ton. The quantity of stone crushed from the mine was 10,053 tons, which yielded 6,149 oz. gold, valued at £24,400. The stone crushed was mixed with large quantities of antimony-ore and amalgamated by the ordinary battery process, which saved a very small percentage of the gold. A 25-horse-power winding-engine and boiler is employed; and a fifteen-stamp battery and two berdans is driven by a 20-horse-power engine and boiler.

Murray Creek.

Inglewood Extended Mine (Area, 78 acres).—This area includes the mines formerly held by the Inglewood and the Phœnix Companies, with additional ground, joining on to the Golden Fleece and Victoria Mines. In order to bring the mine into profit the lower tunnel already driven 1,500 ft. requires extending 600 ft. to cut other lodes known to exist on the surface and in the upper workings. The proprietor is negotiating for capital to do this work, as well as to sink a shaft below the lowest adit. The Inglewood reef has been worked down from the surface 350 ft., and the Phœnix reef 150 ft from the surface, both reefs producing payable quartz. Another reef in the area, called the North Star reef, was worked down about 70 ft. Very little work has been carried on during the year, two men only being employed.

Painkiller District.

Dillon Extended Mine (Area, 60 acres).—The reefs in this mine vary from 18 in. to 4 ft. in width. 90 tons of quartz yielded 52 oz. of gold. Four men were employed.

Merrijigs District.

The *Sir Francis Drake Mine* has been worked chiefly in the upper or surface blocks. A crushing of 115 tons of quartz yielded 447 oz. of gold, and 60 tons of concentrates were treated for 19 oz. of gold. Seven men were employed.

A1 and *Golden Lead Mines* have both been worked on tribute. A crushing of 482 tons of quartz yielded 295 oz. of gold. Five tributers were employed.

Cumberland Mine (Area, 90 acres).—This mine is worked from a shaft 531 ft. in depth, with steam winding machinery. The reef is from 3 ft. to 18 ft. in width. Six wages-men were employed for nine months, and afterwards for three months, as tributers. A crushing of 125 tons of quartz yielded 128 oz. of gold; value, £527 1s.

Prospecting was carried on in the Exchange and other claims, but no returns of gold have been received.

Inkerman Combined Company's Mine (Area, 206 acres 2 roods 21 perches).—The principal work done in this mine is sinking a main shaft and driving a low level from the Rainy Creek side

of the range. Rock-drills are used, and good progress is made with them. The tunnel is in some 300 ft., and when completed should enable the company to cut the old line of reef, which some years ago yielded 9 dwt. to the ton, and tests subsequently made showed that nearly three times that quantity was lost in the battery. The main shaft has been sunk a further 100 ft., and driving has been commenced therefrom to meet the tunnel coming from the other side. At this level the shoot of stone which was worked out by the late company in the upper levels and left underfoot should be met with. About thirty men are employed.

Big River Mine (Area, 38 acres).—The main shaft was sunk to a depth of 150 ft., and 200 ft. of driving has been done during the year. A reef discovered on the surface has been opened up, and 200 ft. of driving has been done to intersect the same, and a winze has been sunk 70 ft. on the stone. A 16-horse-power Robey boiler and winding-engine is in use, and a water-power winding-wheel is also available. A ten-head stamper battery and six berdans, driven by a Pelton wheel, have been erected. During the year 2,000 tons of quartz were crushed, the yield from which, by amalgamation, was 1,903 oz. Twenty-eight men are employed.

Lord Edward Mine (Area, 16 acres).—The shaft from which the mine is worked is 450 ft. in depth. Three levels are opened up at 200 ft., 420 ft., and 540 ft. At the latter level a tunnel is being driven a distance of 500 ft. Five men are employed.

Grey District.

Blackball Sub-district.

Minerva Mine (Area, 96 acres).—This mine is situated at Blackball, Grey Valley. An incline drive has been put in on the reef, which is about 5 ft. in thickness. The drive is 376 ft. in length, and only a narrow strip of quartz along the drive has been taken out. There is a ten-stamp mill on the claim, driven by water-power. No crushing was done during the year. The quartz is said to be of low grade, and so far has not proved payable. Two men were employed at the time I visited the mine.

Garden Gully Mine (Area, 95 acres).—Mr. G. Perotti, who holds the mine on behalf of the Garden Gully Gold-mining Company, gives the following account of the workings:—

The three auriferous lodes trend north and south, and stand parallel to and within 600 ft. of one another. They have been traced a distance of over 1,000 ft. along the surface. At the surface two of the reefs give prospects that may prove payable, and in one instance very rich stone was obtained. Nothing can be said of their permanency, because very little work has been done yet, owing to the fact that they were discovered only lately. On one lode a tunnel was driven to intersect it at a depth of 100 ft. The formation was cross-cut in the tunnel, but was quite mullocky, consisting of pug, slate, and quartz veins, but not containing payable gold. The claim is situate on a spur of the Paparoa Range, leading to Garden Gully Creek, in Moonlight watershed, and at the head of Black Ball Creek.

The following claims are working on the Paparoa Range, in this locality: Imperial, Sunlight, Golden Crown, Midland, Alpha, and Reward.

In the *Crœsus,* in which five men were working when I was in this district, a winze had been sunk 70 ft. on a gold-bearing reef 2 ft. 6 in. in thickness. A drive was put in 8 ft. to the eastward of the reef, and a leader 6 in. in thickness was cut showing gold freely.

On that portion of the Paparoa Range known as Langdon's a number of special claims have been taken up. The field is not new, large sums of money having been spent in the locality years ago, but nothing payable was then found. Curtis Brothers, the owners of the Victory Mine, have continued stoping in No. 1 level, and have six men employed. They have been sinking a winze in the same level, and have reached a depth of 93 ft. They have also driven a distance of 260 ft. in low level to cut the reef. The number of tons of quartz crushed has been 226, and the yield of gold from the same has been 624 oz.

In the Julian Claim the owners have crushed 12½ tons of stone, yielding 1 oz. 5½ dwt. to the ton.

Ross District.

Prospecting has been carried on in the Captain Russell Claim by Zala and party, and 900 lb. of quartz yielded at the rate of 15 dwt. per ton. The same party also took a parcel of 12 tons of quartz from the United Helvetia, which was treated for 8 oz. of gold. Prospecting was also carried on in the Helvetia by the same party.

Cedar Creek.

Alpha Special Claim (Area, 100 acres).—This claim comprises the old William Tell, Republic, Larnach, and other claims. The present owners, the Alpha Special Claim Syndicate (Limited), found rich stone on the surface, but after driving 223 ft. the stone became poor. It was then cut 28 ft. below the outcrop and a winze sunk 26 ft., carrying stone all the way, until the work was stopped on account of water. One ton of quartz yielded 4 oz. 2 dwt.; value, £16 8s. Nine men were employed. It is proposed to erect a battery of five stamps to thoroughly test the stone before putting up a larger battery.

Battery Returns.

The following statement, compiled from the monthly returns furnished by owners of quartz-crushing machines under section 308 of "The Mining Act, 1891," shows the quantity of stone crushed and the yield of gold from the various mines for year ending the 31st March, 1897:—

Battery.	Tons crushed.	Retorted Gold. Oz.
Big River	2,000	1,983
Golden Treasure	315	146
United Italy	100	420
United Alpine	2,215	713
" (for Tyrconnel)	44½	254
" (for Crœsus)	101	28½
" (for Lyell Creek)	42	6
" (for Alpine tributers)	65	70
Progress and Globe	4,830	2,306
Venus	158	129
Wealth of Nations	1,095	260
Golden Fleece	130	38
Keep It Dark	2,559	2,264
Cumberland	125	128
Dillon Extended	90	52
Inkerman	60	27
Sir F. Drake	1,150	447
" (concentrates)	3⅕	19
" (for A1 tributers)	30	171
Golden Lead	18½	124
Victory	226	624
Zala's	12	8
Totals	15,369⅕	10,217½

The foregoing returns show that there is a decrease of 7,576 oz. compared with last year's yield. This falling-off is in a great measure due to the nature of the work carried on, especially in the mines taken over by the Consolidated Goldfields of New Zealand (Limited). Operations in those mines have been chiefly towards opening up the reefs by sinking shafts and driving long tunnels and levels; consequently, attention could not be directed to mining quartz and keeping the batteries employed. There is every reason to hope that when the new plant for treating quartz is completed no difficulty will arise to prevent this company's battery of forty stamps from being continuously employed, thus improving the future yield from the mines. Any addition to the yield of gold cannot for a considerable period be expected from the newer claims at the Paparoa and Victoria Ranges, as, even after they are proved to contain valuable ores, the introduction and erection of machinery suitable for the treatment of quartz will be costly, and much time must elapse before the recovery of gold will take place. In the other mines the new works to be undertaken consequent on the introduction of fresh capital can scarcely be expected to effect any marked improvement in the yield until after development works are carried out.

The future outlook in quartz-mining throughout the district is of a hopeful nature. The mines are to be opened in a systematic manner, and provision made to provide reserves of quartz, in order that dependence need not be placed on any one particular block, but all parts of the workings be made to produce their quota of ore to keep the mills going with profit.

The peculiar formation of the reefs, in which occur blank portions containing neither quartz nor gold, points to the necessity of a system of mining being adopted to keep prospecting works always in advance of immediate ore reserves.

Otago District.

In this district there is a considerable amount of attention being directed to quartz-mining, and the returns from several of the mines are of a highly profitable nature. It will be noticed from the following lists of special claims and licensed holdings taken up throughout Otago that greater interest is now being evinced, and that more energy is being shown, in this branch of the mining industry than in late years. The introduction of outside capital is leading to more systematic operations being carried on in opening up the mines, and, should development of the reefs show that improved processes for gold-saving are warranted, extensive improvements will be made in the necessary appliances for better extraction.

Abstract of Licenses for Special Claims and Licensed Holdings issued from the Warden's Office, and registered on or before the 31st March, 1897, in the Books of the Mining Registrar.

Date of License.	Area.	Section.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
			Arrowtown.			
	A. R. P.					
10/11/91	80 3 35	51, 55	XII.	Skipper's Cr'k	Farrell's ..	William John Farrell.
10/11/91	75 2 30	56	"	"	" ..	"
12/5/93	52 3 21	11, 12, 23, 29, 49, 52	"	"	Glenrock ..	The Glenrock Consolidated (Ltd.).
13/2/94	22 3 26	57	"	Shotover ..	Tipperary ..	The Tipperary Gold-mine (Ltd.).
		7	XIII.			
10/4/94	74 1 20	50	XII.	Skipper's Cr'k	" ..	"
		6	XIII.	Shotover		
14/5/95	34 3 26	58	XII.	Skipper's Cr'k	" ..	"
		8	XIII.	Shotover		
12/5/93	29 3 12	54	XII.	Skipper's Cr'k	Glenrock ..	The Glenrock Consolidated (Ltd.).
12/5/93	16 0 0	37	"	"	" ..	"
12/5/93	10 0 0	53	"	"	" ..	"

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office—*continued.*

Date of License.	Area.	Section.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
		Queenstown.				
	A. R. P.					
18/6/87	93 3 12	14, 18, 26, 2, 3, 19, 20, 21, 24	II., III.	Skipper's Cr'k	The Phœnix ..	The Achilles Goldfields (Ltd.).
30/8/90	24 0 0	12, 19, 21	II.	"	Achilles ..	"
10/11/91	46 1 4	6, 7, 8	XI.	"	Gallant Tipperary	The Gallant Tipperary Gold-mining Co. (Ltd.).
8/2/96	35 0 26	23	X.	"	Walde's ..	Joseph v. d. Walde.
8/2/96	70 3 38	21 131	" XI.	"	Silk's	Austiss Dottin Silk.
24/9/96	24 1 0	24 132	X. XI.	"	Mackin's ..	R. H. Mackin and party.
24/9/96	25 1 0	133	"	"	Cotter's ..	R. J. Cotter and party.
1/10/96	74 3 11	16A	..	Earnslaw ..	Smith's ..	J. P. Smith and another.
16/2/97	58 3 0	58	..	" ..	Oatway ..	G. H. Oatway.
13/8/88	6 0 0	1	III.	Skipper's Cr'k	Achilles ..	The Achilles Goldfields (Ltd.).
1/1/89	2 0 0	10	"	"	" ..	"
19/6/91	2 1 30	4	"	"	" ..	"
12/11/94	30 0 0	16	VI.	"	Cornubia ..	Frederick Evans.
21/1/96	9 1 27	22	X.	"	Crystal.. ..	The Crystal Mining Co.
31/8/96	20 0 0	25	"	"	" ..	"
2/3/97	20 0 0	17	VI.	"	Dunker ..	Henry Dunker.
2/3/97	20 0 0	17 136	VII. XI.	"	Stenhouse ..	James Stenhouse.
		Cromwell.				
13/1/88	117 2 9	26	III.	Wakefield ..	Cromwell ..	Cromwell Goldfields Co.
25/3/93	71 3 21	25	"	" ..	" ..	"
18/2/97	42 1 32	27	"	" ..	Williams' ..	John Williams.
23/3/97	100 0 0	17	II.	Bannockburn	Talboys' ..	W. T. Talboys.
21/2/90	5 0 30	26	"	"	Lawrence ..	James Lawrence.
12/6/96	3 3 1	28	"	"	" ..	"
		Black's.				
21/1/97	30 0 0	48	XVIII.	Tiger Hill ..	Eureka.. ..	Robert Sheppard.
21/1/97	25 0 0	49	"	" ..	Eureka No. 2 ..	"
19/2/97	50 0 0	50	"	" ..	Enterprise ..	Thomas C. Donnelly.
		Alexandra.				
1/7/92	10 0 0	3	II.	Cairnhill ..	White's Reef ..	Robert Symes.
1/10/93	10 0 0	32	"	"	Belle and Beaux	R. Symes and another.
3/10/93	8 3 24	23, 24	"	"	Exhibition ..	Henry Symes.
17/11/96	30 0 0	29	I.	Fraser ..	Local Enterprise	F W. Gray.
17/11/96	30 0 0	36	II.	Cairnhill ..	Excelsior ..	"
		Lawrence.				
24/3/96	72 3 0	39	XIV.	Waipori ..	New Zealand Minerals Co.	New Zealand Minerals Co. (Ltd.
13/7/96	58 3 0	4, 5	XI.	Tuapeka E.	Lawson's ..	John Lawson.
28/7/96	28 2 0	7	IV.	Waipori ..	Cotton's ..	Robert Cotton.
15/2/97	100 0 0	8	XIV. XV.	Tuapeka E.	Bella	Charles Todd.
15/2/97	100 0 0	24 1	XIV. XV.	"	"	"
15/2/97	85 3 5	25	XIV.	"	"	"
9/12/87	5 2 28	5	IV.	Waipori ..	Cotton's ..	Robert Cotton.
27/10/96	30 0 0	43	V.	Table Hill ..	Canada Reef ..	A. Kerridge and others.
		Dunedin.				
14/8/96	70 0 20	6, 7, 9, 10, 11, 12, 13	IV.	Mount Hyde	Smaill's ..	A. Smaill.
13/1/97	40 0 0	1, 5	XII. VII.	Sutton Lee Stream	Roberts's ..	John W. Roberts.
13/1/97	38 0 0	2 6	XII. VII.	Sutton Lee Stream	Morison's ..	George Morison.
4/10/95	28 3 30	5 8	VI. VII.	Nenthorn ..	..	Barewood Quartz-mining Co. (Ltd.).
11/8/96	30 0 0	6	VI.	" ..	..	E. Turner and G. Meier.
7/8/96	30 0 0	7	"	" ..	..	D. Macdonald.
3/6/92	30 0 0	3 10	VII. XI.	" ..	..	Barewood Quartz-mining Co. (Ltd.).
1/11/95	30 0 0	4	VII.	" ..	..	"
1/11/95	22 0 29	5	"	" ..	..	Robert Lee.
1/9/93	30 0 0	6	"	" ..	..	"
1/5/96	28 3 30	7 4	VII. VI.	" ..	..	Barewood Quartz-mining Co. (Ltd.).
10/1/96	30 0 0	8A	VII.	" ..	..	Robert Lee.

ABSTRACT of LICENSES for SPECIAL CLAIMS and LICENSED HOLDINGS issued from the Warden's Office—*continued*.

Date of License.	Area.	Section.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
			Dunedin—continued.			
	A. R. P.					
8/1/97	30 0 0	6	XI.	Nenthorn ..	..	David C. Simpson.
8/1/97	30 0 0	7	"	" ..	..	"
7/8/96	30 0 0	8	"	" ..	..	D. Reid, jun.
4/10/95	26 0 14	2	VII.	" ..	..	Barewood Quartz-mining Co. (Ltd.).
		9	XI.			
2/10/96	30 0 0	5	XI.	" ..	..	John Lawson.
2/10/96	30 0 0	3	"	" ..	..	"
2/10/96	30 0 0	4	"	" ..	..	J. A. Chapman.
6/3/96	30 0 0	1	XII.	" ..	..	Peter Andrew Lyders.
7/2/96	30 0 0	2	"	" ..	..	"
10/1/96	30 0 0	3	"	" ..	..	Frederick Evans.
10/1/96	30 0 0	4	"	" ..	..	P. A. Lyders and two others.
10/1/96	30 0 0	5	"	" ..	..	"
6/3/96	30 0 0	6	"	" ..	..	Ernest Turner.
6/3/96	30 0 0	7	"	" ..	..	E. R. Smith.
7/8/96	16 2 0	3	V.	Mount Hyde	..	Lyders and Harrison.
3/7/96	16 2 0	4	"	"	..	"
3/7/96	12 3 4	44	IV.	"	..	Richard Sheppard.
2/10/96	9 2 39	2	VI.	"	..	John Macdonald.
6/11/96	26 0 0	46	IV.	"	..	James Macpherson.
8/1/97	13 2 12	Pt. 4	X.	Sutton ..	..	William M. Adam.
8/1/97	20 0 0	47	IV.	Mount Hyde	..	James Garrett.
8/1/97	16 2 0	6	V.	"	..	George Smith.
			Naseby.			
18/9/96	53 3 10	9, 11	V.	Budle ..	Blue Slate Junction	James A. Sligo.
1/10/96	60 0 0	10	"	"	Fowler's ..	Henry Fowler and Brothers.
		6, 7	III.	Hummock		
25/2/96	99 0 0	280	I.	Blackstone	Rough Ridge ..	J. B. Neale.
1/1/88	20 0 0	..	"	Nenthorn ..	Syme's ..	John Symes and others.
1/10/96	60 0 0	7	V.	Budle	Smaill's ..	Alexander Smaill.
		5, 9	III.	Hummock		
23/7/96	30 0 0	8	V.	Budle	Crœsus ..	H. A. Wicks.
		8	III.	Hummock		
22/10/96	30 0 0	1	"	Hummock	Egger's ..	Joshua H. Eggers and another.
		2	V.	Budle		
27/10/96	30 0 0	12	"	Highlay ..	El Dorado ..	John Kinney.
27/10/96	30 0 0	13	"	" ..	" ..	M. Prendergast.
27/10/96	30 0 0	10	VII.	" ..	" ..	W. Guffie.
12/3/95	30 0 0	4, 5	VIII.	Dunback ..	Golden Bar ..	W. H. Feahey.
21/8/95	30 0 0	3	"	" ..	Gray's Extended	J. S. Gray.
23/7/96	27 3 28	4	IX.	Highlay ..	Golden Point ..	W. and G. Donaldson.
23/7/96	30 0 0	13	VII.	" ..	" ..	"
19/11/91	30 0 0	41	V.	Budle ..	Mills's	H. N. Mills and others.
1/9/95	30 0 0	15	"	Highlay ..	Mount Highlay ..	A. Bartleman and another.
29/10/89	30 0 0	5	IV.	Budle	Tipperary Quartz-mine	James Phelan and another.
		5	IX.	Dunback		
8/5/90	30 0 0	8	"	" ..	Tipperary Ext. ..	"

Macetown District.

The *Glenrock Consolidated Mine* (area, 53 acres) comprises the Premier section, which is worked from an incline-adit 2,000 ft. in length with a grade of 1 in 4, from an intermediate level 180 ft. above, and also from another level below the adit. The lode is in mica-schist rock. The gold occurs in shoots of quartz, the rest of the lode fissure being filled with decomposed slate. Mr. Stanford, the general manager, gives the following account of the workings in the mine, the plant, and yield of gold, &c.:—

Only one shoot has been discovered in this mine of any permanence. This underlies with the reef, and has a pitch westwards on the strike of the reef of 1 in 4. It was traced from the outcrop to a depth of about 30 ft. below low-level adit, where it faulted. The year's work up to November, 1896, was devoted to prospecting, and gold was again struck, but it is doubtful if it is the same shoot or a new make. The lode has an underlie of 62½ degrees south-west, and strikes 26 degrees north of west and south of east. The hauling is done by electricity. Power is obtained off the mill shaft and transmitted 830 yards to a motor, which is 530 yards from the mouth of the tunnel; 20-horse power is available, but only 6 to 8 used, hauling 2 ton up 1in 4 at 90 ft. per minute. Thirty stamps, in two separate mills of twenty and ten, are available. The twenty-stamp mill has 600 lb. stamps, the ten-stamp mill 800 lb. There are also two berdans and one Blake Marsden stone-crusher. Power is obtained from a 6 ft. Pelton, working under 560 ft. pressure. The cyanide plant of four vats is capable of treating 5 tons concentrates per day. Twenty stamps worked 3 days 1 hour; fifteen stamps, 48 days 14 hours; ten stamps, 12 days 19 hours. About 1,038 tons was crushed, yielding 398 oz. 2 dwt. 1 gr. gold, value £1,596 17s. 6d.; and 19 tons concentrates treated by cyanide process yielded £69 14s. The cost of mining the quartz is only 17s. 5d., and of milling 4s. 4d. per ton. On the average sixteen men were employed. We

lost the shoot in this mine that had been traced without a break in January, 1896, just after we started sinking below our low-level adit. The shoot faulted on a cross-course, and all endeavours to trace it failed. As the line of reef did not fault, we continued sinking the incline on the reef on an even grade of 1 in 4. In May, 1896, we struck a little gold in driving, but further driving on this gold, and a rise put upon it, failed to disclose anything of value. From the top of the rise 25 ft. above the incline we put in a long cross-cut 70 ft. in length, following a cross-course the whole way, which led to a new line of reef, but no gold was discovered. The rise was abandoned and the incline continued. In October, however, there was a large fall from this abandoned rise, exposing a large body of ore. This was at once attacked and stoped out, and in order to get filling for these stopes the walls of the 70 ft. cross-cut were broken down, when another reef and large body of ore was exposed on the west wall. The May, 1896, prospecting works just missed these bodies by about 2 ft., and pure luck afterwards exposed them. The mine promises very well at present.

The Gallant Tipperary Mine (Area, 47 acres).—This mine has been protected, therefore no work is recorded.

Farrell's Claim is also held under protection for the purpose of flotation.

Sunrise Mine (Area, 56 acres).—This mine, which is situated at Advance Peak, at an altitude of 5,000 ft. above sea-level, is the property of the Glenrock Consolidated Company. The ground has been prospected by driving the low-level tunnel and prospecting near the old workings. The rock consists of broken schist country, and the quartz is found in broken blocks of rusty compact stone, very rich in some places but worthless in others. In extending the low-level tunnel and prospecting in old workings for gold one good block was struck during the year. A sample of 30 lb. yielded by amalgamation at the rate of 11 oz. per ton, but 4 tons crushed only yielded 1 oz. 3 dwt. gold. This mine can only be worked during the summer months—November to May—on account of its great altitude. The peak is covered with deep snow from June to November. Developments promise well, but a new adit is wanted at a much lower level to enable operations to be carried on all the year round. Four men were employed.

Tipperary Mine (Area, 105 acres).—This mine is owned by the Westralia and New Zealand Gold Explorers (Limited), and is situated in the Shotover district. It is opened up by a cross-cut adit 1,930 ft. in length. The reef, after being cut, has been driven on a distance of 490 ft. The reef is in mica-schist rock, and averages 4 ft. in width, with an underlie of 68 degrees, and strike of about 18 degrees north of west and south of east. Low-level adit struck lode on the 11th February, 1896, and since then 270 ft. has been driven west on reef and 220 ft. east; also connected with an unwatered old workings 62 ft. above low-level adit. The gold only occurs in narrow shoots or blocks of quartz. The shoot now being worked is 60 ft. in length and from 1 ft. to 8 ft. in thickness, and has been opened up through the whole of the distance between the two adit-levels. It has no pitch, but runs vertically, with the underlie through the lode. Except for these occasional shoots the rest of the lode is barren. Ten-stamp gravitation mill, 650 lb. stamps, recently replaced by new stems and tappets, American principle, giving 750 lb. stamps; power, Whitelaw turbine, driven by water, about three heads and 70 ft. fall, giving about sixty-eight to seventy blows per minute, and crushing 1·3 tons per stamp per day. When sufficient quartz is available, ten stamps are used. At the 31st March, 1897, 1,234 tons crushed produced 369 oz. 11 dwt.; value, £1,490 13s. 9d. The gold is caught on copper-plates immediately outside the mill, and then on a 24 ft. by 12 ft. blanket-table. The blanketings are passed through a berdan. Fourteen shillings per ton is the cost of mining, and the cost of crushing is 4s. per ton. All wages-men are employed, the number being variable, never less than six nor more than thirty, depending on gold and funds available.

This company has been recently reconstructed in London, and the name changed from the Tipperary Gold-mine (Limited) to the above. The new company is formed with a capital of £52,501 15s., divided into 210,007 shares of 5s. each, each share being credited with 3s. paid up, having a liability of 2s., of which 6d. has been called up to date. The new company was registered in London on the 1st January, 1896. Nothing of value was struck in this mine until October, 1896, when the shoot of stone at present being worked was struck in the No. 7 level, the lowest level of the old 1887 workings, 62 ft. above our new low-level adit. A crushing at the end of October, 1896, of 101 tons yielded 60 oz. 17 dwt. bar bullion, but since then the results have been most disappointing, the yield in bulk being only 5 dwt. to 7 dwt. per ton. There are now, however, signs of an improvement, the quartz coming to hand being worth about 11 dwt. per ton. There is still about 1,000 tons of quartz unstoped above our adit-level. We are shortly preparing to sink with a small pit-engine below the level. During the year two new water-races have been cut in, one 500 yards in length to assist the turbine water, and one 200 yards in length to supply water for the plates and blankets. At the mill the old shanks and discs have been replaced with new and heavier ones, and an amalgamating-barrel and shaking-table have been put in to assist the berdan with the blanketings. A reverberatory roasting-furnace capable of treating 1 ton per day has been erected at a cost of £145, and a small cyanide plant capable of treating 5 tons in six days has been added to the mill plant, to treat the blanketings after having passed them through the berdan or barrel. The pyritical sand is heavily charged with arsenic, and is valued at from £7 to £8 per ton. Treatment was started in April, and at first was not at all successful, the first run of 22 tons only giving 51 per cent. extraction, and the second run of 15½ tons giving a 73-per-cent. extraction. After several modifications in the method of treatment complete success has been obtained, and we are now obtaining 100-per-cent. extractions by a combination of cyanide and amalgamation. After roasting the mercury would not touch the gold, though apparently free, and visible to the naked eye in the pan. Cyanide treatment only gave low extractions, but after cyaniding the residue was passed through the mill and the gold was then found to amalgamate freely. It takes a little over half a cord of wood to roast 1 ton, and costs £1 15s. without labour. Mr. Walter Stanford, the general manager, supplied the above information.

Achilles Mine (Area, 125 acres).—This mine is situated at Bullendale, near the head of Skipper's Creek, on the western slopes of Mount Aurum, from which emerge the richest gold-bearing streams in New Zealand. From the bottom of the shaft, which is 150 ft. deep, starts No. 2 level, with which the lower levels are connected by a perfectly true grade. Up this grade the quartz is hauled in trucks by an engine worked by compressed air, the trucks containing 5 cwt. each, and is sent to the surface, where the quartz is emptied into self-delivering paddocks, whence it goes in trucks holding 25 cwt. to the battery, where all the fine stuff is sifted out on grizzlies, the coarse lumps being reduced by rock-breakers; thence it passes into automatic feeders, which pay the quartz, now reduced to a uniform size, into the mortar-boxes. The automatic feeders have now been in use for twenty-five years, and have given perfect satisfaction. Thus the quartz is conveyed from the face of the mine where it was first broken out to the battery without being handled oftener than at the initial filling into the first trucks. At No. 2 level the lines of lodes have converged so much that they are only 105 ft. apart, so that the work of looking for any missing portion is reduced to one-half of what it was at the low-level adit, 120 ft. above No. 2 level. Now, to carry out the argument: At No. 4 level, 184 ft. below No. 2 level, the distance is only 68 ft. between the converging lodes, and in place of the middle lode, which has so far not been located at this level, there is a body of phyllitic rock that carries payable gold for a distance that has not yet been correctly defined. If the three lines of lodes continue to converge at the same ratio they will unite at a level about 90 ft. below No. 5 level. The present exploitations in the Achilles Mine are chiefly confined to No. 5 level, and are of so encouraging a nature that the chief energies of the management and plant are directed to their development. As stated, this level has reached the depth of 1,200 ft. below the highest outcrop of the lode on the hill sideling above it. It is connected by two winzes 160 ft. apart with No. 2 level, which in its turn is connected with the surface by the present vertical working-shaft 150 ft. deep. A grade already spoken of leads down from No. 2 to No. 5 level, and is fitted with a double line of rails for the ascending and descending trucks. These connections provide the most perfect ventilation that could be desired, as well as all the other necessary conveniences of access, so that it may be pronounced to be in full working-order. The two winzes are in course of being connected. The stone now being attacked had a width of 7 ft. at No. 4 level; but at a depth of 83 ft.—that is, at No. 5 level—it had widened out to 13 ft., the whole of which is sent to the mill. The new shaft, when completed, will be 600 ft. deep from the surface to the bottom of the mine, and will give every convenience in the future working of the mine. It will be 12 ft. by 4 ft., divided into three compartments of 4 ft. by 4 ft. each in the clear. The Achilles stone has been pretty free from pyrites so far, but as greater depths are reached they are increasing in quantity, and may be found to be impregnated with gold when still greater depths are reached. The new race from the left-hand branch of Skipper's Creek will give 400 ft. of pressure, and will be applied directly, instead of employing it for the purpose of generating electric power, as is done at present. The new race is nearing completion, and is expected to be available for motive-power before winter. It will have the effect of very considerably reducing the working-expenses, and will insure a greater degree of efficiency in the work done. The race will be applied to a Pelton wheel, and the present air-compressor at the shaft may be done away with. Hauling and pumping will then be directly done from the mouth of the shaft. The electric power will be held in reserve for the extremes of weather and other emergencies. The Achilles Goldfields Company was registered in 1893, and up to the present date 7,181 oz. of gold have been produced, valued at £27,500. Out of the time of its existence there must be deducted eight months during which repairs were carried on. During the year 5,453 tons of stone was crushed, giving a return by amalgamation of 4,413 oz. Seventy men were employed.

Cornubia Mine, Skipper's Creek (Area, 30 acres).—No work was carried on during the year, owing to liens registered in Court, and the men cannot now be found. Mr. F. Evans, the owner of the mine, says, "This is an instance of the easy manner in which miners can close up a claim. I have dealt with all liens of those men who could be got at, but others cannot be got at, and I cannot see any way that the claim can be relieved."

Leviathan Mine.—This claim is situated near the Shotover River. The outcrop of the quartz is 1,000 ft. above the Shotover. Another reef is located on the opposite side, higher up the gully. An adit has been driven 350 ft. to cut the Crystal reef. No record has been sent in of any crushing from this mine for the year.

The *Sandhills Claim*, of 20 acres, has been lately taken up, and is now under protection.

Lawrence Brothers' Mine, Bannockburn.—Operations are still steadily conducted in this mine; 876 tons of stone was crushed, for a return of 346 oz. of gold, valued at £3 17s. per ounce. Five men were employed.

Cromwell Mine, Bendigo (Area, 137 acres).—Three levels were opened; depths, 115 ft., 420 ft., 520 ft. A leader lode, varying from 1 ft. to 4 ft. wide, composed of clay, slate, and quartz, enclosed within hard walls, was discovered. Driving levels and stoping; nearly the whole work was done for prospecting. The pumping and winding machinery is driven by water-power; 30-horse power in use. The battery of twenty stamps is driven by water; 10-horse power in use. The air-compressor and rock-drills are not in use. The stamps weigh 7 cwt.; and there are four berdans, but only one was used during last year. During the year 650 tons of stone was crushed, yielding 262 oz. of gold. Twenty men were employed.

McCabe and Sons' Mine.—During the last twelve months the owners have been driving a tunnel on a line of reef on the Carrick Range, about four miles from Bannockburn, known as the Young Australian, which yielded good returns about twenty years ago, but was abandoned at that time through meeting with a large quantity of water. The level now being put in is 90 ft. below old workings, and the lode underlies 3 ft. in 1 ft. This will give about 270 ft. of backs. The level is in 300 ft., and it is expected to cut the reef in 300 ft. more. A small mill of two stamps and Pelton wheel is sufficient to deal with 21 tons of quartz per week. The cost of driving the tunnel is about £1 per foot. Two men are employed.

Invincible Mine, Earnslaw (Area, 75 acres).—A considerable amount of work has been done in this mine in development work, and a body of quartz 70 ft. by 13 ft. is exposed. A cyanide plant has been erected, which is kept employed on the tailings accumulated in former years. The mill, which is not at present in use, includes a ten-stamp battery, 800 lb., seven 4 ft. 6 in. berdan pans, one octagonal iron amalgamating-barrel, one shaking-table; cyanide plant consists of one solution-tank, two 25-ton leaching-vats, two extractors, and two sumps. Mill driven by an overshot water-wheel. Six men are employed at the mine and four at the cyanide plant.

White's Reef (Area, 28 acres.)—This mine, which is situated at the Old Man Range, has been steadily worked. The reef varies from 6 in. to 2 ft. The party own a five-stamp battery, driven by water. 236 tons of quartz yielded 270 oz. of gold. Six men were employed.

Excelsior Mine (Area, 100 acres).—This mine is situated on the Old Man Range, near Bald Hill Flat, about 3,000 ft. above sea-level. The shaft has been sunk to a depth of 60 ft., and an adit driven to connect with it 350 ft. in length. The lode is a large body 20 ft. in width, carrying more or less gold throughout, but principally on the two walls. The owner, Mr. F. W. Gray, has a battery of three stamps, driven by water-power. Four men were employed. The property has been placed under option to the New Zealand Minerals Company, who are doing development work, with fair prospects.

Bonanza Quartz-mine, Macrae's Flat (Area, 60 acres).—Three levels have been opened—at 200 ft., 350 ft., and 500 ft. from the surface. The reef varies from 2 ft. to 8 ft. in thickness, the quartz being of a rubbly nature. Two shoots of stone about 400 ft. apart are being worked on. The crushing machinery consists of a Huntington roller-mill, one Dodge rock-breaker, and one Price's pan, all driven by a Pelton wheel. During the year 232 tons of stone was treated, for a return of 219 oz. 12 dwt. Eight men were employed.

Golden Point Mine, Macrae's Flat (Area, 67 acres).—This claim is worked both as an alluvial and quartz claim. The surface consists of peaty soil, with gravel-wash containing boulders, and is ground sluiced by 1½ heads of water under a pressure of 70 ft. A quartz reef varying from 3 ft. to 6 ft. in width is also worked. The battery consists of ten stamps, one 5 ft. roller-mill, one rock-breaker, and two 3 ft. 6 in. grinding-pans driven by a 6 ft. Pelton wheel giving 30-horse power; 300 tons of stone yielded 63 oz. 12 dwt. of gold. Six men were employed.

Barewood District.—The Barewood Quartz-mining Company's properties are now worked by the Anglo-Continental Syndicate, who hold the option of purchase. The reef has been traced two miles and a half, and the company intend to sink two shafts about half a mile apart. It is also intended to drive a long tunnel from the Taieri Valley to drain the country and enable prospecting works to be carried on at a greater depth than has been hitherto practicable on account of the expense of sinking, for which large capital was necessary. During the year 1,192 tons of quartz was treated, for a return of 715 oz. 2 dwt. of gold.

Caledonian Mine (Area, 205 acres; owners, — Orr, H. Piper, Charles Stewart, D. G. Simpson, — Youll, T. C. Simpson).—The land was prospected by trenching and sinking in different places. The reef was discovered on Sections 3, 4, 5, 6, 7, about 3 ft. 6 in. in width, but work has not been commenced. The owners are providing £100 for prospecting purposes in the meantime, and will make further calls of £100 from time to time to continue operations, and if sufficient inducement can then be shown the property will be disposed of in England.

Nenthorn.

Golden Band Mine, Nenthorn (Area, 60 acres).—A shaft has been sunk 60 ft. and an adit put in 200 ft. The reef averages 5 ft. 6 in. between the walls. A battery of five stamps, each of 8 cwt., is driven by water-power. During the year 200 tons of stone was crushed, for a return of £280. Four to six men were employed. The option for flotation of this mine was acquired by a London company twelve months ago. Six months ago it was reported to be sold, but as yet the negotiations have not been completed. This has meantime prevented the working of the mine in a proper manner, as it requires the expenditure of a large sum to open it out at a lower level. It also requires suitable gold-saving plant, as owing to the fineness of the gold and pyritic nature of the stone about 50 per cent. of the gold is lost by the usual method of amalgamation.

Prospecting operations have been carried on in several other claims in this district, but no returns have been recorded.

Preservation Inlet.

The attention of miners is being yearly more directed to the Preservation Inlet district, and there is every indication that in the near future a prosperous mining field will be opened up. As it was impossible for me to visit the district, I am indebted to a gentleman of considerable mining experience who was on the ground during the year for the following particulars. A considerable revival has taken place here owing to the rich quartz found in the Morning Star property, the mine at the present time employing upwards of seventy men. There is now a large settlement, with two stores and a post-office, at what was known as Long Beach, now Te Oneroa.

The Morning Star Gold-mining Company's mine, at Te Oneroa, is still continuing to return satisfactory dividends to the shareholders, the total yield of gold since the commencement of operations being valued at some £20,000. The returns for the year ending the 31st March show that 3,140 tons of stone was crushed, for a yield of 3,420 oz. 14 dwt. of gold, valued at £4 2s. per ounce. The quality of the gold won is of high character, the assay returns from the Melbourne Mint showing a grade of over 23 carats. Ten new berdans have been erected during the year, and the mine machinery generally is in excellent order. The wharf, on which a Government subsidy of £120 has been received, is now completed, giving a depth at low water of 15 ft., thus affording greater facilities for the reception of coal-steamers.

The Alpha Gold-mining Company has been formed to work what has been known as the Longney's Claim. There are several outcrops of quartz on the property, from some of which very fair prospects have been obtained, but for the past year little work has been done.

In the *Golden Site Extended Gold-mining Company's mine*, at Wilson River (area, 144 acres 1 rood 18 perches), cross-cuts have been driven to the eastward 105 ft. and 52 ft., and a tunnel driven on the line of reef. It was decided subsequently to put down a shaft 12 ft. 6 in. by 4 ft., and the required machinery will be erected. A well-defined reef has been traced a considerable distance on the company's property, from a trial crushing a sample of which gave favourable returns.

On the north side the Crown, Lizard, and St. George Claims are under protection.

On the coast-line claims have been taken up on which strong outcrops of quartz have been discovered, but little or no development work has yet been done.

At Isthmus Sound the stone taken from what is known as Bradshaw's reef is highly mineralised, containing copper-pyrites, mispickel, zinc-blende, and galena, with a varying proportion of gold and silver. It is proposed to ship a parcel of ore Home for treatment. Several other claims have been taken up adjoining the Prospectors', but as yet little work has been done on them. It is worthy of note that Bradshaw's reef occurs in gneissic rock, all the other reefs prospected being in similar formation to that of the Morning Star and Golden Site—viz., Silurian slates and sandstones.

Only a few men are employed in alluvial mining, centred chiefly at Coal Island and at Gulche's Head, at the Neck. It is not believed that their earnings exceed a bare living.

Summary of Returns from Quartz-mines from the 1st April, 1896, to the 31st March, 1897.

Owners.	Stone crushed.	Gold obtained.		Remarks.
		Weight.	Value.	
	Tons.	Oz. dwt. gr.	£ s. d.	
Glenrock Consolidated (Limited), Macetown...	1,038	398 2 1	1,600 9 8	Gross.
Westralia and New Zealand Explorers (Limited), Macetown	1,245	379 5 17	1,530 4 5	"
Achilles Goldfields (Limited), Bullendale ...	6,186	4,187 0 0	Not stated.	
K. T. Symes, Bald Hill Flat	200	221 0 0	3 19 0	Per ounce.
Barewood Quartz-mining Company, Dunedin	1,192	715 2 0	Not stated.	
P. A. Lyders, Barewood	146	43 10 0	"	
Phelan Brothers, Macrae's	232	219 12 8	852 13 7	Gross.
W. and G. Donaldson, Macrae's	275	55 12 0	Not stated.	
H. Symes, Alexandra South	Nil.	...	...	
Cromwell Goldfields (Limited), Bendigo ...	650	262 0 0	Not stated.	
Lawrence Brothers, Bannockburn... ...	876	346 0 0	3 17 0	Per ounce.
Morning Star Gold-mining Company, Preservation Inlet	3,410	3,420 14 0	4 2 0	"
	15,450	10,247 18 2	40,000 0 0	

Tailings treated: Glenrock Consolidated Company, Macetown, 19 tons; gold obtained, value £69 14s.

The foregoing summary of returns from the different mines shows that 15,450 tons of quartz was crushed, yielding 10,247 oz. 18 dwt., having a value of about £40,000. The Achilles Company and the Morning Star Company have turned out quartz of a highly profitable character; and the mines at Macetown also give results showing that with increased output of quartz and the application of labour-saving machinery the ore may be also profitably dealt with. The Anglo-Continental Syndicate is devoting attention to the Barewood district, and no doubt have in view properties in other districts that may afford sufficient inducement for the outlay of capital for development purposes. It is also believed that other mining syndicates contemplate commencing operations in the Nenthorn, Preservation Inlet, and other districts. The prospects of quartz-mining throughout Otago are decidedly improving.

ALLUVIAL MINING.

Nelson District.

Collingwood.

The Parapara Hydraulic Sluicing Company hold an area of 415 acres, chiefly freehold, which is worked by hydraulic sluicing. Fifteen heads of water, with a pressure of 125 lb. to the square inch, have been at work on the three faces of 110 ft., 80 ft., and 43 ft. respectively. During the year 200,000 cubic yards of alternate layers of clay and gravel have been treated, but the results have not been made public. Elevators will shortly be erected. Nine men are employed.

The Collingwood Goldfields (Limited), an English company, hold a 200-acre lease at the Quartz Ranges which it is proposed to work by hydraulic sluicing. Mr. C. Y. Fell, the attorney for the company, gives the following report: "This property, and also a lease at Golden Gully, belong to an English company called the Collingwood Goldfields (Limited). As soon as the company was formed I appointed Mr. F. A. Holdsworth, C.E., a man of large experience in America, with a staff

of men under him, to explore and lay off a water-race to supply the nozzle from the Clarke River. This river was wholly unexplored, and the upper part of the race presented almost insurpassable difficulties. Mr. Holdsworth therefore abandoned it, and after great labour reports that he has found a practicable course for a race round Seal Hill to the Boulder Lake, about 3,200 ft. above sea-level. Immediately his plans are ready the construction of the race will be commenced by Mr. F. G. Mace, whom I have appointed manager and engineer for this purpose. So soon as Mr. Holdsworth has finished his work at Boulder Lake he will proceed to Slate River and lay off a race there to bring water to Golden Gully, which will also be taken in hand immediately the survey is finished. There will therefore very shortly be a large number of men employed on both these works."

Takaka.

A fair number of miners have been at work in this district, and have earned good wages. The Upper Waingaro River terraces, Bubu and Anatoki Rivers, have all been worked, but the methods employed are of a somewhat primitive character, and no extensive developments have been made.

Motueka.

Several applications for special claims, licensed holdings, and mineral licenses have come before the Court during the past year, but of these only one—a licensed holding of 30 acres—has been finally dealt with. It is intended to work this claim by hydraulic sluicing, the water being brought from Lake Peel. The special claims applied for embrace an area of 700 acres. The mineral licenses are to work deposits of asbestos; but progress has been delayed on account of the difficulty experienced in getting surveys made. The claims referred to above are all in the neighbourhood of the Mount Arthur table-land. A few miners have been at work on the Leslie River and about the Karamea Bend.

On the Sherry, Baton, and Wangapeka Rivers a number of men are making a living, and it is reported that hydraulic sluicing on a large scale is shortly to be engaged in on Macrae's land at Wangapeka.

MARLBOROUGH.

There is little or nothing of importance to report on in the Marlborough District. A few men are obtaining poor wages. Special claims and licensed holdings are apparently being held for the purpose of sale. The prospects of the district, however, will be greatly improved if capital is introduced for the working of the auriferous deposits, which can only be effected on a large scale, and by considerable expenditure of capital.

WEST COAST.

Westport.

The claims at Addison's and the Northern Terraces, in the vicinity of Westport, are still giving profitable returns to the miners, and apparently will continue to do so for many years to come.

A large number of special claims, licensed holdings, and other mining rights have been taken up at Westport during the past year, but, beyond prospecting, little actual work has been done in connection with most of the rights.

Bradshaw's Terrace.

Lind and party occupy an area of 30 acres. The alluvial deposit consists of black sand and boulders. Ten chains of fluming have been erected, and ground sluicing is being carried on with eight sluice-heads of water with a 30 ft. pressure. Three-quarters of an acre of land has been washed away for a return of gold value £500. The gold is saved on tables 41 ft. in width, on which there are five rows of plush. Three to six men are employed.

Several other parties are at work in this locality.

Addison's Flat.

Maid of Erin Claim (Area, 10 acres).—Employs six men in ground-sluicing, the stones being hauled up the shaft 40 ft. by means of a water-balance of 10-horse power, and fair results have been given during the year.

Golden Sand Company's Claim (Area, 308 acres).—This company expect to be at work in two or three months, and are at present constructing a water-race two miles and a quarter in length and a reservoir capable of storing 3,000,000 cubic feet of water. These works are at present under contract, and the Despatch Foundry, of Greymouth, are making the battery of twenty 500 lb. stampers. The cement which is on or near the surface is from 8 ft. to 9 ft. thick, extending pretty well over the whole of the area held. The cement is easily crushed, but there are stones inseparably connected with it that must be put through the battery also. It is expected that the twenty head of stampers will put through 100 to 120 tons a day. The tables, which will have a spread of 72 ft., will be kept up 8 ft., so as to allow of future concentration and treatment of the tailings, as only about one-third of the gold proved by fire-assay to exist in the ore will probably be saved on the copper-plates and plush. This is owing to most of the gold being coated with a film of oxide of iron.

Gould and party's Claim (Area, 15 acres).—This claim is worked by ground-sluicing, with a water-balance for lifting the stones. The amount of water which is in use in the face for carrying the dirt to the hopper is nine heads. The face of wash-dirt is about 16 ft. deep, chiefly black sand, with a moderate amount of stone in it. The hopper-plates are perforated with ½ in. holes, and all the dirt which runs through these holes, together with the gold, passes down a tunnel 1,000 ft. in length to the tables, which are 50 ft. long—five tables, 2 ft. 6 in. wide, covered with plush; then through a tunnel 7,000 ft. in length. The ground is broken down by means of a nozzle with about

25 ft. of pressure. During the past year the owners have driven 260 ft. of tunnel and erected a new water-balance, which is now in working-order. This work has been done for the purpose of working the stony lead which is on the western side of the claim.

Garryowen Mine (Area, 23 acres).—Messrs. Carmody and party. The face, which is worked by ground-sluicing, with a water-balance and trucks for taking the stones up an incline road, is about 50 ft. in depth, ten of which is black sand. Fourteen heads of water are employed. The black sand and all the finer stuff is carried through a tunnel about 3,000 ft. long. It passes over a hopper, where the stones are separated and taken in trucks of three-quarters of a ton each by a water-balance in an incline road to a height of 60 ft. The sand passes over tables 60 ft. wide by 20 ft. deep, covered with plush to save the gold, the sand passing through the remainder of the tunnel. The plush is washed in tubs, and then put into a churn-barrel with quicksilver and amalgamated. During the year 450 oz. of gold, valued at over £1,700, has been obtained by the eight shareholders at work.

Venture Mine (Area, 60 acres).—The cement is obtained from open workings about 8 ft. in depth. There is an overshot wheel for driving the battery of twelve stamps of 3 cwt. each. During the year 9,231 yards crushed yielded 1 dwt. 1½ gr. per yard by amalgamation. Five men are employed in the battery. The cost of mining and delivery of the cement is 1s. per yard.

Dublin City Mine (Area, 13½ acres; owned by Twohill and party).—The cement, which is 12 ft. thick, is crushed by eight heads of stampers of 3 cwt., driven by a 30 ft. overshot wheel. Some 50 tons are put through daily, at a cost of 2s. 2d. per yard. Five men are employed.

O'Dea and party are also working a claim of ten acres of cement ground with good returns.

The Golden Lead Claim, Halligan and party's claim, and Sullivan and party, as well as several other parties, are engaged sluicing in the district.

At Cascade Creek several parties are engaged in sluicing, and in the Cascade Claim Patz and party are putting in a drainage-race for the purpose of lowering the water in the creek, where they expect to meet with payable wash. They also intend to erect a water-wheel for winding purposes.

General Exploration Company (Limited).—This company has secured a number of mining properties in the Addison's, Charleston, and Mount Rochford districts, and is employing a large number of men. Mr. C. Dencker, the attorney for the company in the colony, reports as follows:—

"We have five properties—three situated at Four-mile, near Charleston, and known as the Empress, Aurora, and Four-mile; one in Addison's Flat, known as the Bendigo; and one at Mount Rochford, about nine miles from here, and known by that name. The first three properties above mentioned I will deal with first. These three properties have an area altogether of 259 acres, and contain large deposits of cement. The gold is very fine, and has a coating of oxide of iron, which makes amalgamation difficult. We have not commenced active operations at these claims yet, but have been, and are still, experimenting to find out the most economical method of working the cement, and we hope shortly to be in a position to place our orders for machinery. The ore is low grade, making economical working essential. The remainder of the ground we propose working by sluicing, the water for such purpose to be brought in from the Argyle Dam. The manager of the above-mentioned properties is Mr. E. G. Braddon.

"The Bendigo and Rochford are both sluicing claims, the former containing 140 acres and the latter 100 acres. We have let a contract at the Bendigo for the construction of a tail-race tunnel, which, when completed, will be about a mile and a half in length. Besides this, another contract will be let shortly for widening about two miles and a quarter of the present race from the old Fair-maid Dam, constructing 26 chains of tunnelling, widening 15 chains of the present race from Reid's Creek and constructing 20 chains; also constructing a race 20 chains in length from Reid's Creek to Island Creek. Besides the above, a race is to be constructed connecting with the Nine-mile Creek, and a race from the Fair-maid Dam, which have not yet been completely surveyed. Up to the present time the Bendigo has not been worked. With reference to the latter property (Rochford), this property has been worked for a number of years by four shareholders on a very primitive scale. A contract has been let by us for raising the present dam (known as Lake Rochford) 12 ft., and constructing a race from Deep Creek to the lake. A by-wash 80 ft. in width and a race from the lake to the claim have yet to be constructed. Further races to be constructed will connect the dam with Wareatea Creek. A contract has also been let for the supply of 1,710 ft. of pipes, which will arrive here in about two months. The property shows many large boulders, which will have to be removed by machinery, and for which purpose we have just acquired a steam-crane. We are actively engaged in developing our claims, and in June or July we hope to start working operations at Rochford, and in August at Bendigo. I may mention that the tables which we are about to erect at Rochford will have a spread of about 200 ft. The manager of the Rochford and Bendigo Claims is Mr. A. G. Hill, late of the Wakamarina."

Charleston.

The Enterprise Claim is worked by a party which employs five men, who are engaged in cement-crushing. They have a battery of four stamps, which puts through 16 tons per day, giving satisfactory results.

Birch and party's claim is worked by four men, who crush 8 tons of cement, with a four-stamp mill.

Lander and Sons' claim, of 4 acres, is situated at Back Lead. This party owns a five-stamp mill, stamps 250 lb. in weight each. During the year 2,340 tons of cement was crushed, for gold of the value of £2,635. Three shareholders are employed.

A considerable number of men are casually engaged in sluicing, and several parties also earn a living by placing tables in the creeks below the other workings, on which it appears sufficient gold is caught to induce them to continue at this kind of work. Several parties also obtain gold by sluicing the black sand on the sea-beach.

At the Barrytown Flat Gold-mining Company's mine extensive development works are being carried out. The manager, Mr. W. White, reports as follows: "This company, which has only recently been formed, has a 192-acre claim on Barrytown Flat. They have a right to thirty heads of water out of Baker's Creek, and a race is to be constructed for a distance of 142 chains to convey the water to the penstock at the head of the pipe-line, which is 600 ft. above the level of the ground we intend to start operations on. The greatest depth that has been reached in the claim is 20 ft., the flat being at too low a level to work deeper by the ground-sluicing system. Messrs. A. and T. Burt, of Dunedin, are supplying the plant, but none of it has arrived yet, and it will be some months before we commence elevating. The main line will be 22 in. and 18 in. pipes, and we will have branch lines of 11 in., 9 in., and 7 in. pipes. Our uptake pipes are to be 15 in., with a 7 in. throat. I do not know what distance we will have to elevate the dirt, as the depth of the ground is not known. If we find it necessary we will sink to a depth of about 60 ft. with our first elevator, and if we do not then reach the main bottom I will, after opening out a large paddock, put in another elevator and sink deeper. The drift is a sea formation. The surface gold is very fine, and there is a great quantity of black sand with it."

On the Barrytown Flat and along the beaches and flats to Razorback in a northerly direction, and to the Ten-mile Creek to the southward, about sixty miners are employed in sluicing, whilst along the terraces in the same district upwards of seventy miners are engaged in sluicing. The returns from those claims cannot be obtained. It is, however, understood that sufficient gold is recovered by the miners to give a fair average rate of wages per man.

Grey Valley.

Roaring Meg Alluvial Mine, Sluicing and Water-race (Area, 30 acres).—This mine is the property of the Roaring Meg Water-race and Gold-mining Company, and Mr. G. Perotti, the manager and one of the owners, supplies the following particulars: "The water-race is about two miles long, 2,000 ft. above the sea-level, supplies thirty heads of water, and has 900 ft. of pressure to the tail-race. The present ditch is only 600 vertical feet above the tail-race, but if required another ditch can be cut 300 ft. higher. It is, perhaps, the largest natural power developed in New Zealand. The alluvial face is 45 ft. high on an average, and yields about 1s. 4½d. per cubic yard. Upon such yield the ground should pay splendidly, but so far the company has been unable to obtain profits. Three years and £6,000 have been spent in bringing the water-race in, making two tail-races (one of which is very long), and preparing the ground for extensive operations. The reason the company is unable to make it pay is because the wash consists almost of seven-eighths of stones ranging in weight from 300 lb. to 40 tons. The water has only been used for one hour out of every eight, the other seven hours are all spent in the terribly laborious work of blasting stones and carrying them away in trucks. The owners are aware that nothing but big mechanical power can turn this into a payable venture. Further capital is required to equip this claim efficiently, and the owners are now trying to arrange for this. It will be necessary to obtain 3,000 ft. of strong piping in order to utilise the pressure; two five-ton cranes to lift the stones and heap them in the back ground, and an electric-light installation in order to enable the water to be utilised for the whole twenty-four hours of every day. It is intended to open a face 200 ft. wide, divided for two hydraulic nozzles, so that the water will have the power of playing alternately on half of the width of the face whilst the cranes do their work with the stones on the other half. When these improvements are effected no doubt the mine with prove remunerative for years to come; but, as in most instances of gold-mining, the fact is again illustrated here that the industry is becoming most difficult and expensive, and that large outlay is required before attaining a payable development."

Moonlight.—The population of this district, which includes Healey's Gully, has also increased. Along the slope of the Paparoa Mountains, from the head of Moonlight to Blackball, a large area of alluvial ground is known to exist, but the difficulty of obtaining a supply of water at a sufficiently high level to command the ground is a great drawback. At Healey's Gully the Republic Company hold a special claim of 35 acres, and has brought in a race capable of carrying forty heads of water. The prospects of this claim appear favourable, but it is not yet sufficiently developed to enable authoritative opinion to be given. About forty men are employed on the field.

Granville, Duffer's, and Noble's Creeks.—There have been no new finds during the past twelve months, and the mining population remains stationary. Judging from appearances the miners seem contented and satisfied with their earnings. Some are engaged tunnelling and others sluicing.

Orwell Creek.—Here also the population remains about the same, most of the miners being engaged tunnelling. The scarcity of water precludes sluicing to any extent, although it is well known that large areas of payable ground exist.

Arahura District.

Work has still been carried on in Boy's Claim, but, on account of having lost the face about ten months ago, very little gravel has been washed, the returns not having paid expenses.

Dwyer and party are engaged in putting in a drainage-tunnel, and are receiving Government subsidy.

The most important mining properties in this district were taken over, and are now worked, by the Consolidated Goldfields of New Zealand.

Humphrey's Hydraulic-sluicing Company (Limited).—As much of the ground held by this company as could be investigated since its acquisition has been carefully sampled, and what water was available has, in the hands of the tributers, been used to check data obtained in other ways. The results so far obtained have shown the gravels found on the two slopes and the various

branches of Humphrey's Gully to be of a payable character. Work is in progress on the gravel deposits to the east, and, should a repetition of the results obtained in Humphrey's Gully be found, there need be no hesitation in starting the new equipment. Surveys are under way with the object of bringing in a race which it is expected will be less expensive in construction than the one already estimated. The tributers' desultory work resulted in obtaining 156 oz. gold, sufficient to pay all labour of prospecting outside of engineer's fee. Surveys and estimates are now being made with the idea of putting the present supply of water on better-grade gravel, so that the time occupied in surveying the large race and prospecting gravel will not be lost.

Kumara.

This is the most important hydraulic-sluicing district in the colony, and for many years past has produced quantities of gold, and has furnished employment to a very large number of miners, not only in the locality adjacent to the ample water-supply provided by the Government in the Waimea-Kumara Water-races, with their recently-established branch races, but also to a very large number of men in the Greenstone and other parts of the district, who, though working on a smaller scale, are yet profitably employed, and will, in all probability, for many years to come be enabled to earn a living, if not a competency. In the vicinity of Kapitea Hill, although the smaller areas of rich ground have been to a certain extent worked out, there still remains a very wide extent of country containing auriferous drifts. The later explorations in the low-level tunnels driven from the Teremakau River terrace show that profitable employment may be given to a number of miners for future years.

Although the yield of gold on the Kumara field has fallen off, there is still a large quantity being obtained, and the field will yield good returns for many years to come. The area of ground on the field that will be sluiced away in the course of years is very extensive, and, although it is comparatively poor, it will, with improved and more economical methods of sluicing, employ a large number of miners. There are three main tail-races (sludge-channels) at present in work. What was originally known as No. 1 main tail-race has been abandoned for the last seven years, as it was found to be too low for the economical discharge of tailings on the tailing-site. No. 2 main tail-race has still four claims making use of it, and there is still an area of known auriferous ground that will take some years to sluice away commanded by the main tail-race. No. 3 main tail-race is used at present by ten claims, and the area of ground untouched commanded by this main tail-race will not all be sluiced away in ten years. Another party has obtained a right to sluice into No. 3, and their branch tail-race will soon be driven from the main tail-race to their claim. No. 4 main tail-race is used by three parties at present, but all of the parties are using large quantities of water—fourteen, fourteen, and twenty-four sluice-heads respectively, and they are in consequence sluicing away about twice the quantity of auriferous wash that the same number of claims washed away six years ago. Another party has driven a branch tail-race connecting No. 4 with their claim, and they will shortly begin sluicing into it. No. 5 main tail-race is not yet completed, as bad and difficult pug ground was met with in No. 1 section of the work, and the loose ground and large inflow of water was met with in No. 2 section. These difficulties have greatly retarded the progress of the work. The total length of No. 5 main tail-race will be 62¾ chains, and of this 40¼ chains has been completed, and 22½ chains has yet to be driven. No. 5 main tail-race will open up a very large area of auriferous ground, and, although the ground is not by any means rich, it will give employment to a number of miners, and enable them to earn wages for the next twenty years.

The number of claims engaged in hydraulic sluicing on the Kumara field are: No. 2 main tail-race, four parties, thirteen men; No. 3 main tail-race, ten parties, thirty-nine men; No. 4 main tail-race, three parties, seventeen men; private tail-races, nine parties, forty men; parties preparing to sluice, three parties, seventeen men. Of the above-mentioned parties, twenty-one are using water from the Government race and five from private races; and of the three parties preparing to work, two will use water from the Government race and one from a private race.

The Kumara Long Tunnel Gold-mining Company have an alluvial claim of 60 acres at Kumara, worked by hydraulic sluicing, the length of the tunnel and tail-race being 2,742 ft. The materials treated consists of an alluvial drift of glacier wash, averaging about 40 ft. in depth. The water used averages twenty Government heads, giving a pressure of 80 ft. The quantity put through during the year was 153,360 yards, yielding 625 oz. 5 dwt. 12 gr.; value, £2,438 11s.—£975 8s. 6d. for owners and £1,436 2s. 6d. for tributers. The quantity washed per hour is 120 yards, averaging 2 gr. of gold per yard.

Waimea.

The Waimea district still continues to give employment to a large number of miners, and there is a fair hope of a considerable revival when the Waimea main tail-race and the Kelly's Terrace drainage-tunnel are completed and working, and the yield of gold will compare favourably with recent years.

The driving of the Waimea main tail-race has been completed throughout its whole length—about 2,100 ft.—and the trustees are about to sink a shaft at the upper end of work to connect it with the surface in the large flat in the middle branch of the Waimea Creek, where highly-payable sluicing-ground is known to exist. When this communication is made the tail-race will be paved with wood blocks, the material for which is now ready. Several parties are ready to drive branch tail-races to connect their claims with the main tail-race, when sluicing operations will be proceeded with. The large area of ground proposed to be sluiced through the main tail-race has nearly all been taken up in claims. The completion of this work and the starting of extensive sluicing operations in connection therewith should give a great impetus to mining in the district, as all the old residents have no doubt as to the payable character of the extensive flat commanded by this main tail-race.

Rimu, Back Creek, and Seddon's Terrace.

The claims continue to yield good returns, and the miners generally appear to be satisfied with their earnings. Craig's claim also is giving satisfactory returns, and the different claims on the University reserve and those extending further south are also doing well. The old beach deposit is also being worked by McBeth and party at the Shanghai lead. Phillips and party are working near Lake Mahinapua, where they purpose commencing dredging operations.

Grimmond and party, who hold an extensive area in this locality, have in view a project of bringing in a large water-race from Lake Kanieri for working their claim and others in the vicinity. A water-supply is being brought in by means of the old Kanieri Water-race, the owners of which are working their own claims and supplying water to other parties at the Kanieri Forks. Should this race be further extended a supply of water will be available for working a large area of ground in the vicinity of the Kanieri Township.

Ross.

Mont d'Or Gold-mining and Water-race Company (Area, 63 acres).—This mine is still steadily and profitably worked, and is one of the most consistent dividend-payers on the Coast. Operations are carried on by ground-sluicing a high terrace, sixteen sluice-heads of water, with a pressure of 240 ft., being used. The company's balance-sheet for the year ending the 30th November, 1896, shows that during that period 1,368 oz. of gold, valued at £5,335 3s. 6d., was obtained, of which amount £3,000 was paid in dividends.

Ross United Gold-mining Company.—The company hold an area of 143 acres, situate at Jones's Flat. The plant and machinery used consist of reversible Peltons for winding purposes, a reaction turbine for elevating, and a 10-horse-power turbine for electric-lighting purposes. The gravel is first elevated and then drawn up an incline to the sluice-box, the water from the workings finding its way through the low-level adit formerly driven to drain the shaft. The claim is worked on the tribute system, twenty-five men being employed. No work has been carried on during the year in the shaft and deep levels.

The Prince of Wales Claim, 60 acres, situate at Donaghue's Creek, is also owned by the Ross United Company. The gravel is here elevated by a dredge to the sluice-boxes, five heads of water, with a pressure of 39 lb. to the inch, being employed to drive a reaction turbine. Sixteen men are employed in this claim, which is also worked on the tribute system.

Several other claims are worked with a fair degree of success by small parties throughout the district.

Parties of men are employed all along the Coast to the southward, and during March a small rush set in between Lake Mapourika and Okarito Forks, where the terrace extends south-east from the Forks to McDonnell's Creek, some four miles distant. Only two claims have as yet proved payable, though a number have been taken up, and some small amount of prospecting done.

On the north bank of the Waiho two special claims have been taken up by the Waiho Hydraulic Sluicing Company. They have secured a right to forty heads of water for working the terraces by hydraulic sluicing.

The Taipo Sluicing Company hold a claim of 80 acres at Seven-mile Creek, Taipo River. Water rights have been secured, and a contract let to construct a race to bring in sixty heads from the Seven-mile Creek to sluice the terraces near the Taipo River.

The Bell Hill Gold-mining and Sluicing Company hold a claim of 50 acres at Bell Hill, and have completed 50 chains of fluming, a dam, and tunnel tail-race. From fifteen to twenty Government heads of water will be worked, with a pressure of 90 ft. Ten men are employed.

West Coast Dredging.

The Matakitaki Gold-dredging Company are at work near Murchison, and report having won 362 oz. of gold, valued at £1,396 11s. 3d. Ten men are employed.

The Cocksparrow Gold-dredging Company have sold their dredge and plant to a party of men who are working with fair success near Three-channel Flat.

The Buller Gold-dredging Company are engaged on their claim of 37½ acres at Fern Flat, Murchison, but the returns of gold are not published. Thirteen men are employed.

Concluding Remarks.

The prospects of alluvial mining throughout the Karamea and Westland Mining Districts are of a hopeful nature, and the continued yields of a substantial character from the various fields are likely to be maintained in the future.

The necessity for increased water-supply in order to profitably work the gravel drifts in which the leads do not contain gold in quantities that would prove payable under present conditions is, however, apparent alike in respect to terrace workings and deep ground. It is to be hoped, therefore, that the encouragement offered by the Mines Department by way of subsidy on water-races will tend to induce private enterprise to undertake the more urgently required works of this description. On the completion of the water-race now in course of construction by the Consolidated Goldfields of New Zealand the vast deposits of Humphrey's Gully will be enabled to be profitably worked; and, should adequate provision be made for utilising the water stored in Kanieri Lake, the drifts at Back Creek, Seddon's Terrace, and the terraces to the southward of the Hokitika River will furnish profitable employment to a much greater number of miners than are at present at work in that locality. The deep levels at Ross Flat before long will doubtless attract sufficient capital to provide machinery for pumping out the water which now precludes the possibility of working the rich leads known to exist below water-level. The new hydraulic-sluicing operations at Black Ball,

Barrytown, Charleston, and other localities will, when the projected water-races have been constructed, also furnish employment to large numbers of men, and consequent increased production of gold. The opening of new ground at Kumara by the construction of No. 5 tail-race, and the additional storage at the Loop-line Dam, will tend to increase the returns by the maintenance of a more regular water-supply, recent prospecting operations having demonstrated the existence of payable deposits at the lower levels in this district.

Otago District.

Maerewhenua.

This field still maintains a limited population. The extent of land worked on the Livingstone portion of the field is about three miles in length by three-quarters of a mile in width. The wash generally consists of 3 ft. of surface sand overlying 6 ft. of blue shell-stone boulders, under which lies 10 ft. to 15 ft. of gray sand, which overlays about 4 ft. of green sand, under which is about 2 ft. of quartz-gravel wash lying on the "Maori bottom." The gold is chiefly found in the quartz wash and green sand, but, as the stripping has to be removed, it will be seen that an ample supply of water is required to sluice the whole face. Several parties also work out the wash lying on the "Maori bottom" by driving, and are dependent on the rainfall in order to wash up. There is one elevating plant on the field, owned by Christian and party, who work to a depth of 30 ft. About twenty-six men are employed in sluicing and eight men in driving out the washdirt in the Livingstone district.

Maerewhenua Range lies on the opposite side of the Maerewhenua River to Livingstone, and the area over which gold is worked about the same. There are two water-races brought in from the left-hand branch of the Maerewhenua, and several other races from small creeks, together with catchwater dams. All the water at present available throughout this district is insufficient to meet the requirements, and, unless a further supply can be obtained, no increase in the number of claims worked is probable. The number of men employed is about thirty-six, and the average earnings do not amount to ordinary wages per man.

The Mountain Hut Water-race is not yet completed. Should it, however, be practicable to bring in the five heads of water to the point to which the survey of the race was made, a considerable area above the level of the other water-races could be worked to advantage.

Naseby.

Mason and Company's claim at Spec Gully is worked by ground-sluicing, with a pressure of 300 ft. supplied by 13 in., 11 in., 9 in., and 7 in. piping, with a Little Giant nozzle. About two sluice-heads and a half of water are available. There is an elevating plant on the claim, but it is not now in use, owing to scarcity of water. There being an ample fall from the terrace workings, a return of 1 gr. to the yard is payable in most of the ground, only one man on shift being necessary to keep the work going. Three men are employed.

A considerable number of men are engaged on the terraces near Spec Gully, and obtain water from the Government race. There are also a number of small parties of men making a living by working the old ground.

In Mulholland's Gully and Robinson's Gully the workings are chiefly carried on by the Chinese.

Several parties are engaged in operations in Wet Gully, with fair success.

In Enterprise Gully Young and party continue to work their claim, the ground being about 40 ft. in depth. They hold a water-race capable of conveying three sluice-heads of water, and are meeting with fair returns. Several other parties of Europeans and a number of Chinese are engaged in sluicing operations in the gully below Young's claim.

Hogburn, or Main Gully: Inder Brothers, John Hore, Baxter and party, and Read and party are working their claims on the elevating system. A number of other claims have also been marked out, the ground being taken up in large areas extending for fully four miles and a half along the gully. It is intended to work these claims by elevating, but it will be necessary for the main water-race to be enlarged in order to secure a sufficient supply of water to do this.

Guffie, McLaren, and Paisley hold a 100-acre claim about a mile and a half below the Township of Naseby, and are elevating with water from the Government water-race with a pressure of 100 ft. for three sluice-heads and a half. The yield per cubic yard is about 7 gr., and the owners are so well satisfied as to the prospects of their claim that they are erecting a second elevating plant; but their operations have been hampered by the lack of a permanent water-supply, the time worked during the year being only equal to four months. They report their return of gold for the year at about 400 oz., valued at £1,560. It is intended to put a dredge on the claim to supplement the two elevators.

Three other elevating claims have been at work during the past year, which worked night and day whenever water was available, all it is understood with good results. On four others in same locality plant is now being got ready to be placed in position before winter sets in.

The total value of water supplied from the Government water-race during the year was £1,580 1s. 10d. The average number of miners supplied with water was 66·5, an increase of 5·25 over that of last year, and the approximate quantity of gold obtained by parties using water from the race was 3,157 oz., valued at £12,154 9s.

During my visit to this district in November last, in addition to the five parties elevating in the Hogburn Gully, ten parties of Europeans and twenty small parties of Chinamen were employed. These were scattered over the gullies from Kyeburn to the Township of Naseby. Altogether about a hundred Europeans and seventy Chinese are working.

Wheeler and party continue to work their claim in the Idaburn, and prospecting has also been carried on in the Wedderburn district, but no valuable discoveries have been reported.

At Blackstone Hill, Rose's claim, which has been successfully worked for many years, still continues to yield profitable returns, and other parties of men are also engaged in this locality, and are fairly successful.

Welshman's Gully.

The Shamrock Elevating Company (Simmonds, Hesson, and Company) occupy 60 acres, on the working of which Mr. Simmonds gives the following account: "Welshman's Gully is situated about five miles from St. Bathan's, on the Blackstone Hill side, commencing about one mile above the footbridge on the Manuherikia River, on the main road to Naseby. The gully appears to have been at one time one of the outlets of the Manuherikia, as the wash is of a similar nature, and the gold is of the same class. The gully runs nearly parallel with the Manuherikia, about two miles in length, varying but little in depth throughout, the mean depth being about 14 ft. The wash is waterworn, and of a coarse nature, with a great number of yellow boulders, varying in size from 9 in. to 18 in. in diameter. The gold appears to be distributed through the wash more or less throughout the gully. The bottom, where we commenced operations, is composed of a hard blue reef, running east and west, which, after exposure, becomes soft and crumbles away. The surrounding deposits are of a granite formation, with the exception of the Manuherikia River and this said gully. We have 30 acres in this place, and we have also 30 acres on the granite formation, in a gully known as Dip or Station Gully. We have done a good deal of prospecting, and in most places obtained a little fine gold from the surface to a depth of 12 ft., the gold running in layers. It is our intention in the near future to place an elevating plant in the gully, but before doing so we have to construct two miles of sludge-channel, and also to erect 14 chains of 15 in. iron fluming across a gully to bring water to the ground. We have a water-race from the Manuherikia River about twelve miles in length, with a carrying-capacity of eighteen heads of water. We have just erected a plant, on the Welshman's Gully Claim, consisting of 3,000 ft. of iron pipes, varying from 9 in. to 15 in. diameter, for the main line leading to the elevator. The branch pipes for breaking-down purposes are 7 in. Our working-pressure does not exceed 250 ft., which will do the work with satisfactory results, as we do not lift over 25 ft. vertical. We have a tail-race running on the main bottom which conveys the drainage, working water, and silt into the Manuherikia, a distance of 700 yards. Half of this tail-race has been cut through solid rock on an average of 9 ft. in depth. The boxes used are our own invention, and have been in use for over five years in the Last Chance Elevating Company's claim, Bald Hill Flat, and we find they are very little the worse for wear. The run is 60 ft. in length, made of 16-gauge sheet steel 6 ft. by 3 ft. turned up 1 ft. on each end to form the sides of the boxes, making a 4 ft. box 3 ft. long. The head-box, or elevator-box, is made in the form of a case with the running end open, 5 ft. high, made in sections. The elevator-pipe passes through the bottom of the head-box about 6 in. from the back end, and projects 4 in. to 6 in. above the ripple-bars on the top, inside the head-box, directly over the elevator-pipe, and allowing for curve of water a striking-plate is placed to break the force of pressure and to prevent wear-and-tear. The dirt and stone strike this, preventing injury to the head-box. We use cross-bar ripples in frames of five bars, each bar being 2½ in. by ½ in., the angle piece underneath being made of 16-gauge steel riveted to the top bars. These ripples are found very effective. We also use a second set of boxes, 24 ft. in length by 2 ft. 6in. wide, made similar to the top boxes. These are placed in an excavation on a level with the inlet to the elevator, with a fall of 10 in. to the 12 ft. In these boxes we can always depend on getting 90 per cent. of the gold. We have 12 ft. of matting at the tail. The lower boxes are very effective, in that they obviate the necessity of the gold passing through the elevator, and can be readily cleaned up. We can put through the elevator on an average in the twenty-four hours about 170 yards. Three shifts are worked when water is available, and, on an average, ten men are employed."

St. Bathan's.

Mr. John Ewing still continues to work his claim at Kildare Hill. During my visit in November last the claim was idle, in consequence of a breakdown in the water-race. The depth from which the elevators raise the drift was said to be 135 ft., and I was informed it was intended to continue to a further depth.

M. and E. Company (Area, 50 acres).—This claim is owned by the United M. and E. Water-race Company (Registered). The work carried on has been stripping off the top drift and removing stones to enable the quartz wash and drift to be worked by elevating. Fifteen heads of water are used for sluicing, the pressure being 300 ft. Upwards of 10,000 yards of material were washed, the yield from the gold-bearing leads averaging 3s. 10d., and in the top drifts from 4d. to 6d. per cubic yard. Nine men are employed by the company, and work was carried on in the claim 290 days during the year.

Eagle and Gray's claim was idle at the time of my visit, owing to want of water.

Several small parties and individual miners earn a livelihood in working the old ground.

Surface Hill.—The Scandinavian Water-race Company (Registered) own a claim of 36 acres. The drifts are worked by elevating, and 28,000 cubic yards were sluiced away during the year, for a yield of 180 oz. of gold. The claim has been worked during eleven weeks of the year, as the company sell all the water they can, the surplus only being used for their own claim. Upwards of £2,000 has been expended on the race to secure a larger supply of water. Fifteen men are employed, mostly on the head-race. The water-race has now a capacity of ten sluice-heads, with a pressure of 300 ft.

The St. Bathan's Water-race Company also own and work a claim of 55 acres at Surface Hill. The method in use is hydraulic sluicing, by which 24,200 cubic yards of drifts and wash were dealt with, for a yield of 3d. per yard. Four shareholders and one wages-man were employed.

A few individual miners are also at work in this district, and earn a somewhat precarious living by sluicing.

Vinegar Hill and Cambrian's.

Never Fail Claim (Area, 10 acres).—The owners of this claim, which has been profitably worked for the past twenty years (Messrs. Hughes, J. and E. Morgan, and Mills), have recently acquired an increased water-supply, a line of 15 in. iron pipes being used for the purpose. The claim was in active operation at the time of my visit, four men being employed. The last washing-up yielded 320 oz. of gold, valued at £1,232, for a period of eleven months.

Ewing's Claim.—At the time of my visit this claim was idle, on account of the scarcity of water.

Excell and Coulson, Fordham and Gay, and Davis and party were all at work when I visited this district, and it is understood that their returns are satisfactory.

The claim situated between Cambrian's Township and Dunstan Creek, owned by Mr. J. Ewing, was also at work, and elevating operations were being carried on, with satisfactory results.

Matakanui.

Undaunted Gold-mining and Water-race Company, Limited (Area, 45 acres).—Operations are carried on in this company's property by hydraulic sluicing. The water is conveyed from the head-races by three different lines of pipes, with pressures of about 350 ft., 270 ft., and 230 ft. respectively. The number of men employed depends on the supply of water, but is generally from five to ten. This season's water has been very short, only about four months' water being available to carry on work to advantage. The Mountain Race Gold-mining Company amalgamated with this company on the 22nd August, 1896, which gives the new company command of abcut 40 acres of known payable ground. The depth of the present face is about 65 ft., the upper part (about 33 ft.) being composed of very compact clay intermixed with layers of gravel. The remaining 32 ft. is very heavy wash, which is elevated with an 11 in. elevator, the nozzle used in the bottom being 2¾ in. in diameter and the throat-piece 5 in.

Sims and Morgan's claim, Ewing and McConochie, the Sugar-pot, Matakanui Water-race Company, and Sheehan and Barron's claims are all worked for profitable returns, the ground in the locality being, on the whole, considered rich. About forty men were employed in these claims. In the Devonshire and Drybread seven claims are at work, employing about twelve men.

Pactolus Claim, Shotover River.—This claim is held under special conditions from the Warden, whereby the owners are entitled to work 70 chains of the river-bed. The wash is raised by a suction elevator. The nozzle from the water-pipes is 1½ in., and, as there is 250 ft. of pressure and a supply of three sluice-heads, there is considerable power available. The pipes are brought along at the level of the beach, and the nozzle injects water into a horizontal pipe at a bend from which the suction-pipe extends downwards to the bottom of the workings. The owners find this a very economical method of working the river-bed, which became too poor to be worked by the ordinary methods. The ground had been abandoned for twenty-four years, and was thrice worked over before that time. A yield of 1½ gr. per cubic yard can be made to pay for working, and the owners, Messrs. Rogers and Tripp, are satisfied with their earnings.

Enterprise Claim, Skipper's Creek (Area, 14 acres).—This claim is held by Alfred Smith and Sons. The wash is raised by a suction elevator, two sluice-heads of water, with a pressure of 400 ft., being used. A paddock 20 ft. square is worked to a depth of about 20 ft. per week, and yields about 4 oz. of gold. Four men are employed.

Alpine Claim (Area, 50 acres).—The owner, Mr. R. Johnson, has given an option of purchase to the New Zealand Minerals Company, and a prospecting drive of 600 ft. has been put in. On account of the dry season, little water has been available for sluicing, and no returns have been forwarded.

Blue Jacket Claim, Maori Point (Area, 8 acres).—This claim is owned by Mr. J. S. Collins. There are altogether in the claim some 500 ft. of piping, 16-gauge steel, commencing with an intake gradually tapering from 18 in. to 9 in., with a Little Giant director. The water for use is stored in two large dams during the night, so as to give sufficient to run fifteen heads for some four hours during the day. The ground is about 140 ft. in depth, and is very stony, there being three layers of wash, of an average depth of 4 ft. each, all carrying fine gold. The wash stones are got rid of by being broken and forced into the tail-race by the jet of water from the nozzle. This tail-race is 16 ft. deep, cut in rock, boarded to a height of 3 ft. and 2 ft. 6 in. in the bottom. For saving the gold light tramway-rails are laid longitudinally for 100 ft. in length, with about 2 in. of scrub between the rails and bottom of the boxes. This forms a catch for the gold as it gets worked down between the rails, which are about 1 in. apart. It is found that the rails make a very even bottom, thereby helping away the stones. The gold in the layers is very fine, but the bottom gold, or that found on the main bottom, is of a much coarser nature than that in the high layers. The top or high layers, together with the gold in the main bottom, would give a return of about 100 oz. with four hours' water per day for twelve months, with two men's labour.

Aspinall's Claim (Area, 5 acres).—This claim was famed for its richness in the early days, gold to the value of over £60,000 having been taken out by different parties. The ground has now been worked by ground-sluicing for nearly twenty years, first by hose, and now by a very complete sluicing plant. There has been a very considerable amount of tail-race cutting in the solid, the ground being very deep at the back. An underground tail-race, 370 ft. long, in the solid rock has just been completed. The water is brought in by a race a mile long to two good dams, and from thence is conducted by 11 in. piping under a head of 250 ft. pressure to the workings below. The ground remaining to be worked is a little less than 3 acres. Work has been rather slack this season, on account of the scarcity of water.

Queenstown and Lake Wakatipu.

Maori Gully Sluicing Claim (Area, 13 acres).—This claim is situated at the Twelve-mile, Lake Wakatipu. The owners, Messrs. Woodhouse and Houston, are ground-sluicing, with fifteen heads of water, for fairly profitable results.

Moonlight Sluicing Company's Claim (Area, 54 acres 2 roods 21 perches).—Three men have been employed in this claim during the year, and 173 oz. 12 dwt. of gold, valued at £668, has been obtained.

The Sugar-loaf Sluicing Claim (Area, 17 acres; Lawrence and Lynch, Owners).—During the year no sluicing operations have been carried on. A race to carry eight sluice-heads of water is being constructed for a distance of four miles and a half, the work being chiefly done by contract.

Alexandra South.

The Golden Beach Hydraulic Company are working a claim of 120 acres. The elevating plant, which is capable of raising the river-wash from a depth of 40 ft., is worked by twelve sluice-heads of water, with a pressure of 110 lb. to the square inch. About a quarter of an acre of gravel has been worked, for a yield of 461 oz. 15 dwt. of gold; value, £1,777 15s. 3d. Seven men were employed.

Bald Hill Flat.

The Bald Hill Flat, commonly called "Spear-grass Flat," is a flat or valley situated at the foot of the slopes of the Old Man Range, directly below the Old Man Rock, it being at one time one of a chain of lakes which I have no doubt existed in Central Otago centuries ago, drained by a number of small gullies and by the cutting-down of the Molyneux or Clutha River. In my opinion this particular flat or basin was drained by two outlets, one at the north end, known as Butcher's Creek, and the other at the south end, known as Coal Creek. This basin consists of about 1,000 acres, and has been prospected throughout. It has been proved that three-fifths of the flat contains gold in payable quantities for the hydraulic-elevating process of mining, and probably for dredging purposes would pay handsomely, as six times the quantity can be put away by the latter process. Very little mining has been done in the locality until within the last six years, when the Last Chance Elevating Company started their elevating plant. Since that time others have followed their example. This basin shows by its alluvial deposits that it must have been fed or the deposit brought down from the slopes of the Old Man Range by the action of water, as the wash is composed principally of broken schist-rock and quartz-drift. At the base of the hill in this basin Maori chisels and wooden bowls and the remains of Maori ovens have been found at a depth of 16 ft., the wooden bowls being very little decomposed. The bottom which the miners are working on is composed of various formations, some parts being of soft sandstone, varying in colour; other parts are of a rubbly clay. No defined reef-bottom has been found as yet. Nothing has been done to test what the deposits may be below this false bottom.

Carroll and Lynch's Claim (Area, 16 acres).—This claim is worked by elevating. Six sluice-heads are used, the pressure of the water being 200 ft. About 140 yards are washed daily, the yield being about 5 gr. per yard. Six men were employed.

Wilkinson's Claim (Area, 6 acres).—A branch tail-race 60 yards in length was cut through a heap of fork stones 25 ft. deep. Four sluice-heads, with a pressure of 100 ft., are used. About 26,400 yards have been sluiced since the tail-race was finished. Four men were employed.

The Last Chance Elevating Company are the owners of a special claim of 64 acres. The claim has been continuously worked. Thirteen wages-men were employed. The following description of the locality, workings, and plant has been furnished by the owners:—

"The Last Chance Hydraulic Elevating Company started operations about six years ago, their right of water being at that time eight heads from the Gorge Creek. Finding this right failed in certain seasons of the year, they purchased the Commissioners' water right of twenty heads from Shingly Creek, for which they cut a race seventeen miles in length, to convey a portion of this water to Bald Hill Flat. Since then they have purchased Quayles Brothers' rights of twelve heads from Shingle and Chasm Creeks. The whole of these rights give a very good supply the most of the year round. The company holds nearly fifty miles of water-race, which costs about £300 per year to maintain. They hold at the present time a special claim of 64 acres. Since they commenced operations they have washed away about 14 acres of ground, at an average depth of 23 ft. This ground averaged about 8 gr. to the cubic yard. The quantity put away per hour would average 7 cubic yards, or 168 yards per day for three shifts, which we mostly work. The plant consists of 4,000 ft. of pipes, varying from 7 in. to 15 in.; two elevating plants, with all the necessary valves, ball-joints, Little Giants, and bends for the working of the two elevators, which we have not worked for the last two seasons, owing to the scarcity of water. Our pressure is 320 ft., and we lift 31 ft. with good results, with 4½ heads of water in the pressure-pipes. The washing appliance for each elevator consists of 60 ft. of iron boxes 4 ft. wide, being bolted together for the convenience of erecting. These boxes are the company's own design, and found to be far superior to wood in every possible way. The ripples used on both lines are cross-bar ripples, made with 2½ in. by ½ in. flat bars for the running part, and 16-gauge steel plate made in the form of angle iron, 2 in. in depth, riveted under bar to form the ripple. The company finds that this ripple cannot be excelled for gold-saving purposes. The company also use 24 ft. of boxes in the paddock, which the whole of the dirt passes through before passing into the elevator. These boxes are also iron, and provided with the same description of ripple as the elevator-boxes. In the lower 24 ft. of boxes the company can always depend on saving nine-tenths of the gold obtained from the paddock."

Roxburgh.

Louden and party, consisting of four men, occupy a claim of 30 acres situated at Roxburgh East. The drift, which is about 60 ft. in depth, is washed away by sluicing, but in order to more effectually deal with the bottom wash a small hydraulic-elevating plant has been erected.

The Roxburgh Amalgamated Mining and Sluicing Company (Limited) still continue to profitably work their claim. The secretary of the company has supplied the following information respecting the claim:—

"This company owns a property of about 100 acres, situated on the banks of the Molyneux, opposite the Township of Roxburgh. The claim is being worked under the management of Mr. William Peters on the hydraulic-elevator system, running four elevators continuously (two being second lifts), using in all forty-five heads of water. During the past dry season work at the claim was stopped for about six weeks, owing to the scarcity of water. The company suffers from the disadvantage of having to submit to prior rights drawing water from the Teviot Creek, notwithstanding the fact that the supply is obtained from the dam at Lake Onslow, built at the expense of the company. The company employ about thirty men, the average wages being about 8s. per day per man, exclusive, of course, of the manager's and assistant manager's salary."

Golden Run Hydraulic Sluicing Company (Area, 100 acres).—This claim is situated at Miller's Flat. The workings are on a large alluvial flat, and the hydraulic elevators are worked with fifteen sluice-heads of water, having a pressure of 300 lb. per square inch. Sixteen men were employed.

Island Block.

Island Block Gold-mining Company.—Operations have been carried on in elevating from the workings on the flat, and also in prospecting on private property on the eastern side of the Molyneux River. No return of gold obtained has been made.

Eadie and Kirkpatrick's claim, of 30 acres, is still being worked by hydraulic sluicing. Ten men are employed. No return of gold recovered is obtainable.

Tuapeka.

Blue Spur and Gabriel's Gully Consolidated Gold-mining Company (Limited).—This company's claim still continues to be most successfully worked by Mr. J. Howard Jackson, to whom I am indebted for the following extract from a report to the directors, dated the 15th March, 1897, as well as the drawings (which are reproduced with this report) illustrating the latest improvements in the hydraulic-sluicing plant:—

"Total net value of gold won during the year 1896–97—*i.e.*, from the 1st March, 1896, to the 28th February, 1897—3,523·69 oz.; value, £13,919 2s. Water used in hours' sluicing-time: No. 1 division of mine, 3,985·5 hours; No. 2 division of mine, 3,931 hours: total, 7,916·5 hours.

"The two main items of expenditure are wages and explosives, and the cost under these heads is as follows:—Wages: No. 1 division of mine, £1,575 4s. 7d.; No. 2, £2,375 19s. 2d.: total, £3,951 3s. 9d. Explosives: No. 1 division of mine, £266 13s. 4d.; No. 2, £406 6s. 4d.: total, £672 19s. 8d. Grand totals: No. 1 division of mine, £1,841 17s. 11d.; No. 2, £2,782 5s. 7d.: £4,624 3s. 6d.

"Roburite was used almost exclusively, and proved satisfactory both in regard to the work done and comparative cost. The largest blast fired contained 1,650 lb. of roburite, which I estimate to be equal in effective force to not less than 3 tons of best blasting powder. Roburite has been used at the mine for some years now, in many instances by men having no special knowledge of the use of explosives, and no accident of any kind has occurred in connection with it.

"Statement of Work, &c., for the Twelve Months ending 28th February.

	Hours Sluicing.	Cement (Cubic Yards).	Gold won.	Value per Yard.	
			Oz.	Gr.	d.
No. 1 division	3,985·5	106,412·8	1,743·59	7·865	15·53
No. 2 division	3,931·0	122,048·0	1,780·10	7·000	13·16
	7,916·5	228,460·8	3,523·69	...	...

"During the latter part of the twelve months a very serious drought prevailed, which greatly interfered with the water-supply. December, January, and February show a falling-off of 124·5 hours' sluicing-time as compared with the corresponding period of the previous year. During February less than $\frac{1}{10}$ in. of rain fell in this neighbourhood.

"The average number of men employed during the year has been forty-one, at wages ranging from 12s. 6d. to 7s. per diem. Of this number, six were constantly employed on the head-races."

The Local Industry Claim and Mill's claim are both being worked in this locality, with satisfactory results.

Weatherstone's.

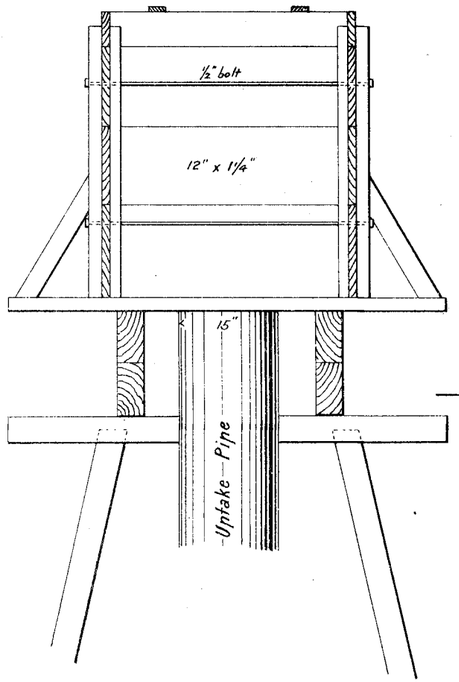
Golden Rise Claim (Area, 33 acres).—Messrs. Smyth, Doulan, and Adams are working the claim, with satisfactory results. The pipes have been extended and altered, at a cost of £300. A hydraulic-elevating plant is used, the height to which the wash is raised being 15 ft. About five sluice-heads of water are used, at a pressure of 190 ft. Five men are employed.

Waipori.

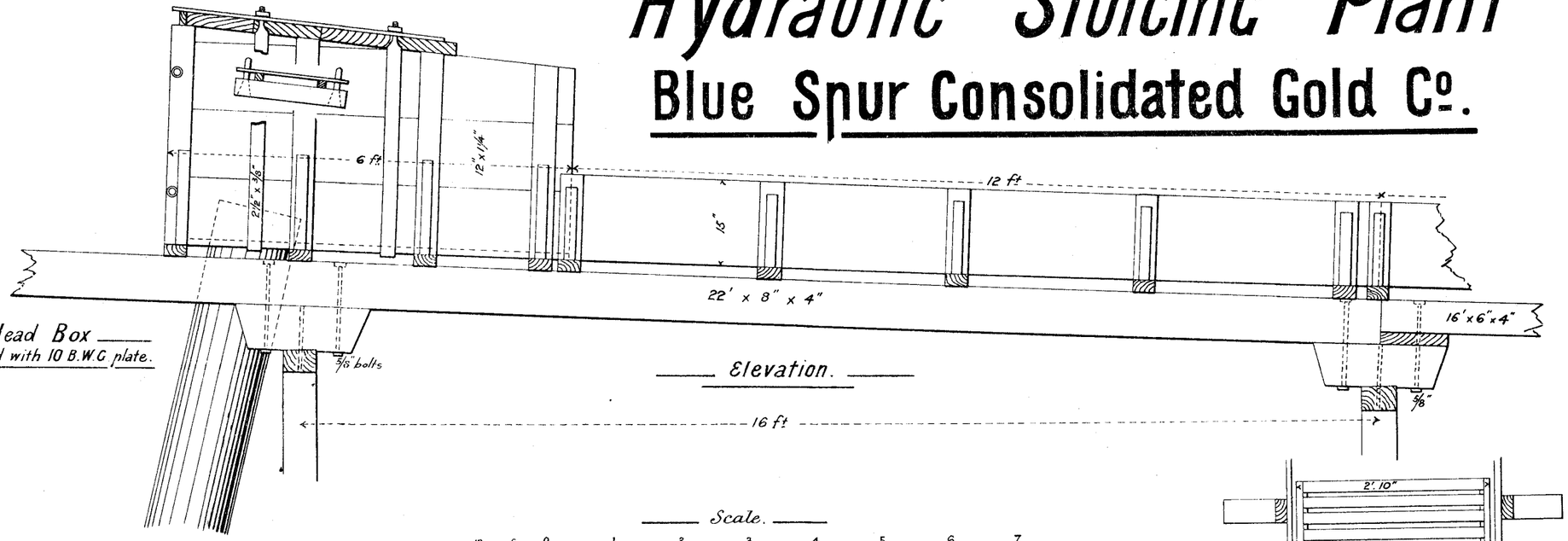
Waipori Deep Lead Claim (Area, 130 acres).—This claim is owned by the Amalgamated Waipori Deep Lead Gold-mining Company (Limited), and is worked by hydraulic elevating. Twelve sluice-heads of water are used, with a pressure of 290 ft. The quantity of drift-wash put

Hydraulic Sluicing Plant

Blue Spur Consolidated Gold Co.



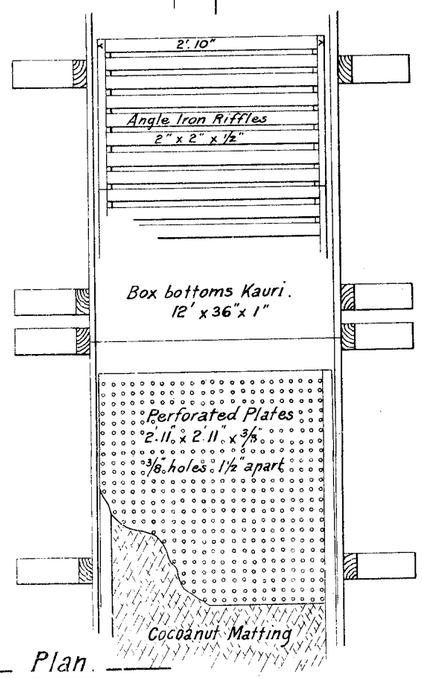
Head Box
lined with 10 B.W.G plate.



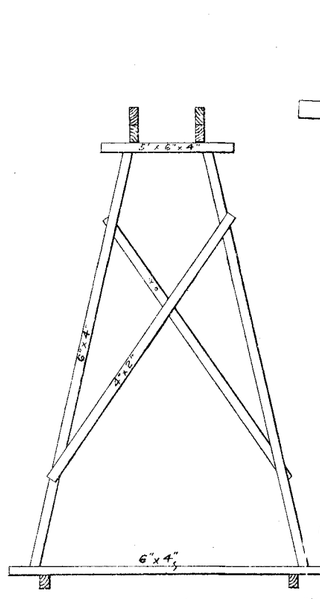
Elevation.

Scale.

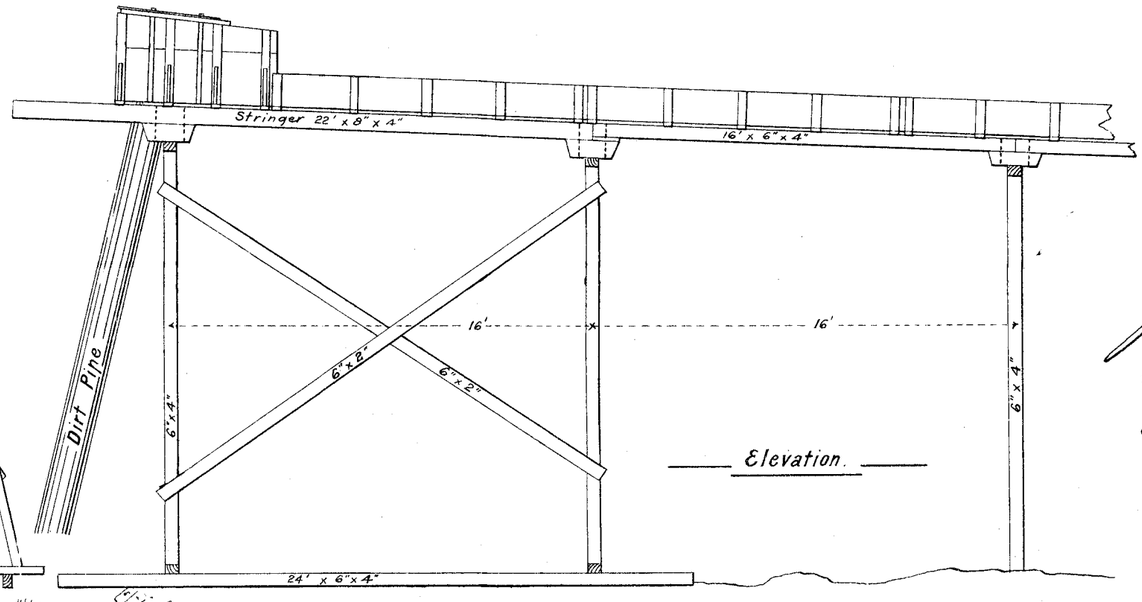
inches 12 6 0 1 2 3 4 5 6 7 feet.



Plan.



Trestle.

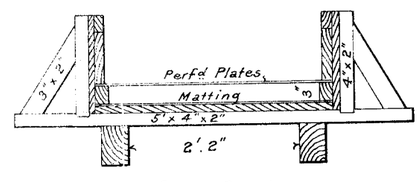


Elevation.

Scale.

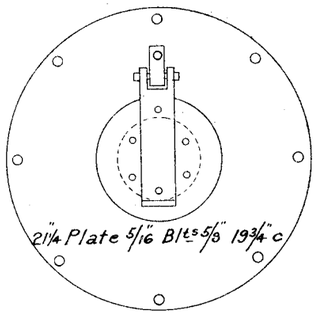
feet 5 4 3 2 1 0 5 10 15 feet.

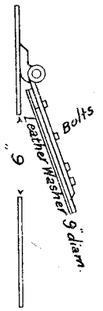
Stuart-Jackson
M.A.I.M.E.
June 1897



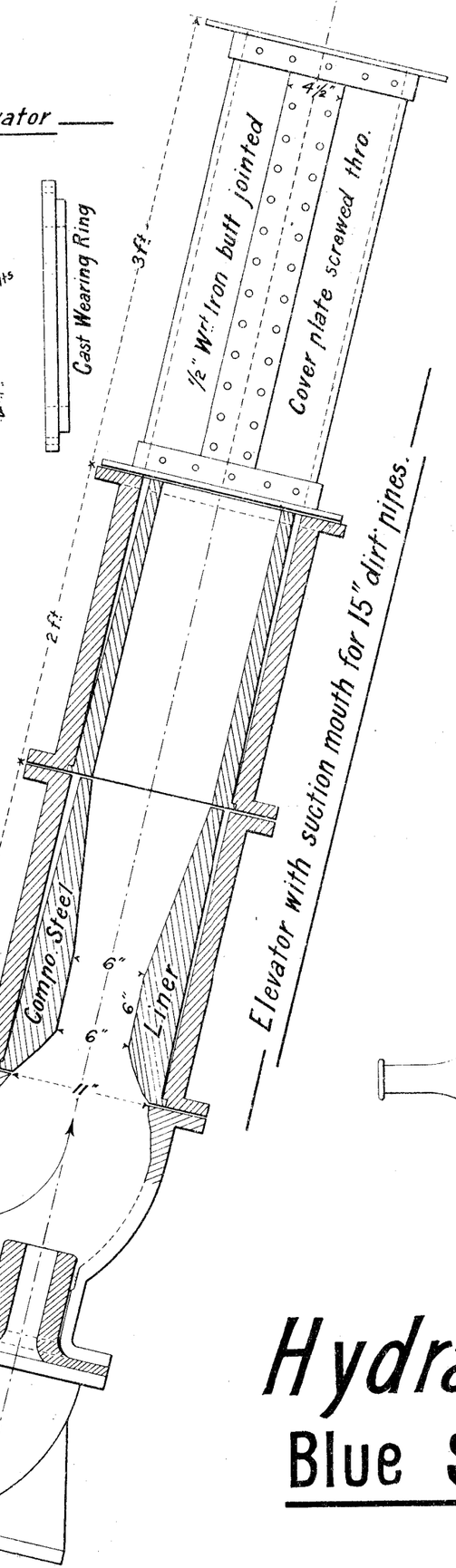
Cross Section.

For mouth of elevator

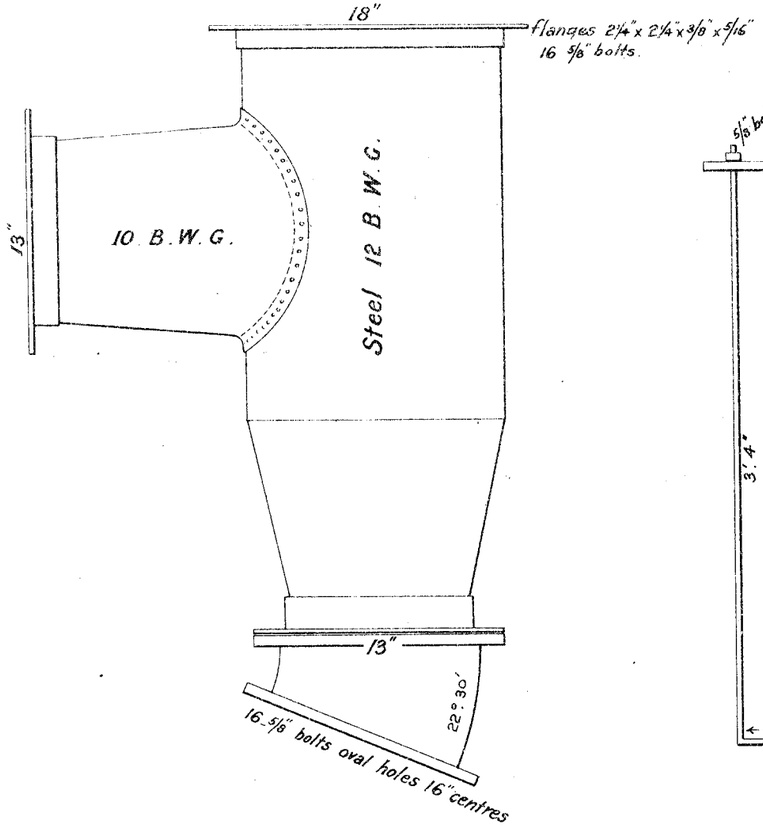


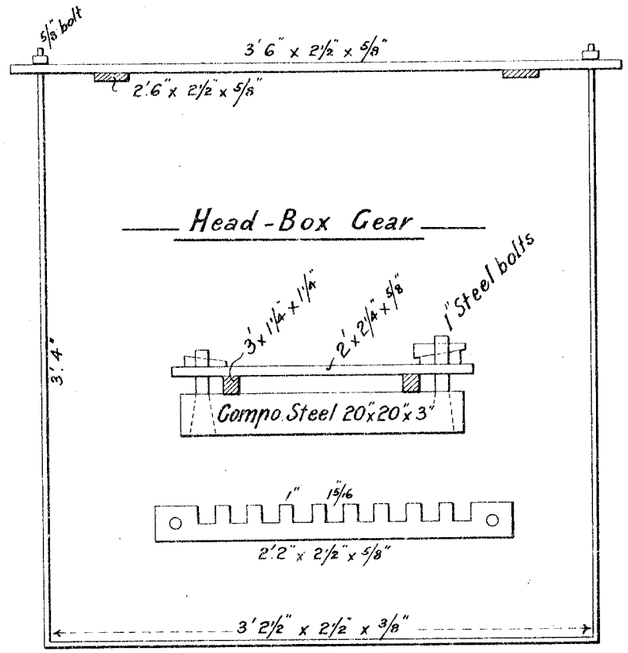


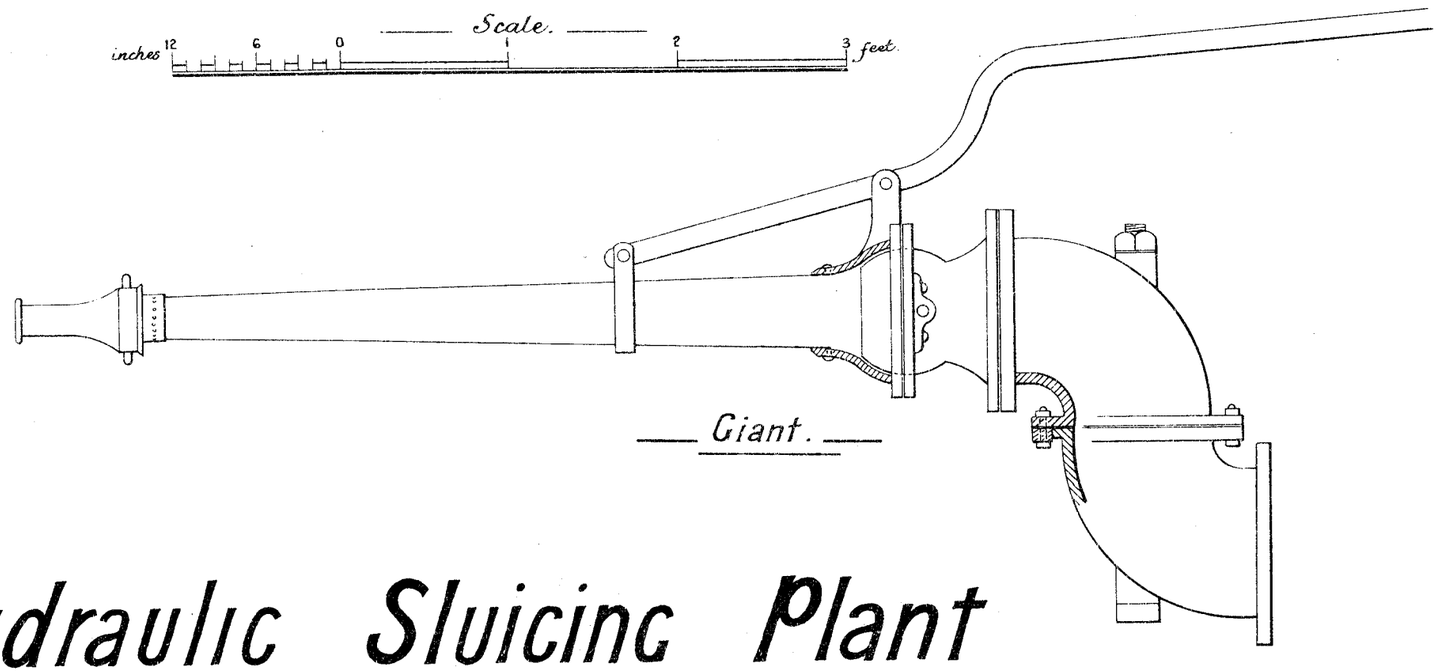
Washdown Valve.



Elevator with suction mouth for 15" dirt pipes.







Giant.

Hydraulic Sluicing Plant

Blue Spur Consolidated Gold Co.

through was 90,000 yards, for a yield of 1·63 gr. per cubic yard. Ten men were employed at the claim and fourteen at race-cutting.

Long Gully Claim (Area, 6 acres).—This claim is worked by the owners, five in number. They use a hydraulic elevator, with four sluice-heads of water, having a pressure of 130 ft. There are 60 ft. of boxes, 3 ft. wide, fitted with Venetian ripples. The wash-dirt is elevated from 15 ft. to 19 ft.

Bakery Flat Claim (Area, 84 acres).—This claim is owned by the Bakery Flat Sluicing Company. The manager, Mr. J. T. Johnson, informs me that the company has only been in existence a few months, and work is not sufficiently developed to warrant a report.

Waikaia.

The Argyle Hydraulic Company, of Waikaia, is in possession of a special claim of 74 acres in Winding Creek Flat, and an extended claim of 6 acres at Frenchman's Hill; also a water-race 11 miles in length, and a right to twenty-four sluice-heads of water, twelve of which are used in carrying on ground-sluicing operations at the extended claim. The pipe line is over 600 ft. in length, giving at the working-face a fall of about 80 ft. The wash is of a very light character, and is treated at the rate of about 60 tons per hour. The other twelve heads of water are used for hydraulic elevating on the special claim, the main pipe line in this case being a mile in length, giving a vertical fall of 315 ft. from the race to the claim. The ground is 40 ft. in depth, consisting of a heavy schist boulder wash lying on a bottom of soft sandstone. The material requires to be elevated to a height of 55 ft. in order to give room for stacking tailings. The power obtained from twelve heads having a fall of 315 ft. is sufficient to elevate the stuff to a height of 60 ft., or 65 ft. if necessary. Though only a prospecting paddock has been opened the ground is proved to be payable, and rich prospects were obtained from the bottom layer of wash. Twelve men were employed.

Kennedy's Claim (Area, 4 acres).—The wash is from 60 ft. to 100 ft. in thickness, but only 6 ft. to 7 ft. of the bottom layer is taken out. This is done by driving, and the wash-dirt taken out and sluiced, the yield being from 2½ dwt. to 3 dwt. per yard. Four men were employed.

The Break-'em-All Claim is again taken up, after the ground had been comparatively idle for fifteen years. An Otago syndicate are about to provide funds for the erection of an elevator and construction of water-races.

The Panama Water-supply and Gold-mining Company (Limited) has taken up a claim on the banks of the Mataura River, and is constructing a race to bring in water from Fiery Creek. It will yet be some time before sluicing operations are commenced.

Nokomai.

The Sew Hoy Nokomai Hydraulic Gold-mining Company's claim, of 128 acres, is owned by Sew Hoy, a Dunedin merchant. Of the water-race, six miles and a quarter was constructed, the total length being now twenty miles, having two siphon crossings of 3,400 ft. and 720 ft. respectively, the pipes being 18½ in. in diameter, made of 8 to 16 gauge of steel. The race is capable of carrying fifteen to twenty sluice-heads of water, with 550 ft. pressure. Two sets of elevators working in connection with 2,050 ft. main line steel pipes and 1,335 ft. service pipes are used for elevating and sluicing the drift, and a 3-horse-power motor for driving the dynamo for the electric light. No account was kept of the quantity treated, nor has any return of gold obtained been furnished. Fifteen men are employed.

Golden Terrace Hydraulic-sluicing Company's Claim (Area, 100 acres; situated about a mile below the junction of the Nokomai and Mataura Rivers).—The Golden Terrace Company, a private company of fifteen shareholders, was formed on the 5th August, 1896, with a capital of £3,000, to take over and develop a claim and water right held by a party of five working miners who did not possess the necessary capital requisite for such development. Immediately on becoming possessed of the property the company set to work in a systematic manner to develop it by constructing a water-race 5 ft. in width and 2 ft. in depth, capable of carrying twenty-five Government heads of water, the total length of which is two miles; also by placing on the ground a thoroughly efficient hydraulic-sluicing plant. The main pipe line is 12 B.W.G. steel, 18 in. diameter, double riveted; and its total length is 1,400 ft., and it gives from the race to the working-face a total fall of 300 ft. vertical, or a water-pressure equal to 128 lb. per square inch. The total depth of the gold-bearing drift is about 280 ft., largely mixed with schist and quartz boulders, some of the latter being very large. Some of the layers of wash through the face carry gold in quantities equal to 2 dwt. of gold per cubic yard. The average quantity of gold per cubic yard from the face, 280 ft. in height, from prospects obtained, appears to be from 4 gr. to 6 gr. The material is treated by ground-sluicing in the ordinary manner, the face being brought down by streams of water from two nozzles, one 3 in. diameter the other 2½ in., and is then run through boxes 3 ft. in width, which are lined in the bottom with angle-iron bottoms, with cocoanut-matting underneath; and thence over a system of concentrating-boxes, they being lined with steel plates ¼ in. in thickness, having perforations of ¼ in. in diameter at 1¼ in. centres, cocoanut-matting also being used underneath these to save the fine gold. The quantity of water used, on an average, will be about twelve heads, or sufficient to treat 40 cubic yards of material per hour for twenty-four hours per day. The amount of capital expended in development has been about £2,900. Eight men are employed. No returns are yet to hand, the plant not having been completed, and sluicing operations only lately commenced.

Southland District.

Round Hill.

The Round Hill Company are still energetically carrying on operations, and have recently completed extensive enlargements in connection with their water-supply. Port's Race has now a capacity of twenty-seven Government heads of water, whilst the continuation of the Cascade Race

will now carry fifteen heads. In all, the company's races have at present a carrying-capacity of thirty-six Government heads of water, and further extensions are contemplated in the near future. The reservoir in the Ourawera Gorge will, when completed, have a storage-capacity of 24,000,000 gallons of water. During the year the company manufactured on the spot some 90 chains of 27 in. pipes and 30 chains of 18 in. pipes, the annealed steel plates being imported from England. The whole plant is of a most complete and modern character, and the company is now enabled to work much more efficiently than in former years. During the year 1,238 oz. of gold, valued at about £5,000, was won. Fifty men were employed.

The Ourawera Company have a claim of 20 acres adjacent to the Round Hill Company, and, the difficulties in respect to water-supply, &c., having been overcome, it is hoped that good returns will be made for the next year's working.

At Wilson's River and Preservation Inlet alluvial mining is practically at a standstill, only a few parties of men being engaged, and these are meeting with but indifferent success.

At Orepuki increased activity has been manifested, and the prospects of the district appear to be on the up grade. A lead parallel to the coast, near the Waiau River, has been all pegged off, the indications being of a hopeful character.

General Remarks.

During the year the exceptionally dry weather in a very great measure lessened the water-supply, and many of the water-races supplying water for hydraulic elevating and sluicing purposes were almost dried up. The yield of gold from alluvial claims was, in consequence, much less than was expected. It is, however, to be anticipated that, with the additional area of land taken up and the number of water-races recently completed, a decided increase on last year's yield of gold will be obtained. The activity displayed throughout the Naseby, St. Bathan's, Shotover, Lake District, Clutha, Tuapeka, Waikaia, and Round Hill districts gives evidence that those fields are not exhausted, but that with improved appliances and a better water-supply the yield of alluvial gold will continue to be of importance for many years to come.

DREDGING.

The success attending on operations in the direction of the recovery of gold from the beds of rivers by means of dredges is every year adding to the demand for suitable dredges and machinery. Improvements in the construction and adaptation of these machines are leading to their application to work wet ground that up to the present could not be dealt with through want of the power required, and in the absence of necessary water-supply. Should the anticipations of success for this method be borne out after trial in the wet ground, where neither sufficient fall nor water-supply for sluicing is available, large areas of auriferous alluvial ground will be made to yield a profit that have up to this time scarcely been touched.

The skill of the different mining engineers is being shown in the improvements made. Each new dredge now being built is furnished with the latest and most suitable machinery both for elevating the gravel, washing out the gold, and conveying the washed gravel, elevating, and stacking it at a distance from the dredges; thus leaving the vessel free to float, and to be moved to the most suitable place for carrying on the work.

The following is a list of the claims taken up for dredging:—

ABSTRACT of LICENSES for DREDGING-CLAIMS issued from the Wardens' Offices in Otago and Southland, and registered on or before the 31st March, 1897.

Date of License.	Area.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
	A. R. P.				
14/8/96	30 3 0	II.	Kawarau ..	..	George Lublin Tacon.
1/12/87	40 3 7	XIX.	Shotover ..	The Sew Hoy Big Beach Gold-mining Co. (Ltd.)	The Sew Hoy Big Beach Gold-mining Co. (Ltd.).
17/1/88	8 0 0	"	" ..	..	The Monte Christo Dredging Gold-mining Co. (Ltd.).
25/4/90	19 2 0	IV., XIX.	" ..	..	The Sew Hoy Big Beach Gold-mining Co. (Ltd.).
12/5/90	7 0 0	XIX.	" ..	..	Ditto.
10/9/94	73 2 0	III., IV.	Skipper's Creek	..	The Sawmills Gold-mining Co. (Ltd.).
12/7/95	100 0 0	IV.	Shotover ..	..	The Sew Hoy Big Beach Gold-mining Co. (Ltd.).
14/8/96	55 0 0	II.	" ..	..	James Gore.
14/8/96	97 0 0	"	" ..	..	Peter Duncan.
14/8/96	79 2 20	"	" ..	..	Thomas Callender.
14/8/96	36 0 0	"	" ..	..	Robert Lee.
17/9/96	15 0 0	I.	Nevis	..	Robert Ritchie.
12/3/97	9 3 10	II.	Cromwell ..	..	Neil McLellan.
6/8/96	43 0 0	II., VII.	Rock and Pillar	Hyde Dredging Co. ..	A. D. Silk.
13/10/96	100 0 0	III.	Maniototo ..	Hogburn Dredging Co...	Robert Paisley.
29/9/96	47 0 0	II., V.	Kyeburn ..	Kyeburn Junction Dredging Claim	Phillip Brown.
29/9/96	75 0 0	II.	" ..	Kyeburn Pioneer ..	George M. Barr.
27/10/96	30 0 0	"	" ..	Mount Ida	Robert Hosie.
27/10/96	25 0 20	" I.	" Swinburn	Naseby Dredging Co. ..	John Thompson Ferguson.
6/5/96	57 0 27	II.	Tiger Hill	Ophir and Ind Gold-dredging Co.	Ophir and Ind Gold-dredging Co.
6/8/96	39 0 24	"	"		
19/2/97	52 1 3	"	" ..	Black's Gold-dredging Co.	John T. Ryan and another.

ABSTRACT of LICENSES for DREDGING-CLAIMS issued from the Wardens' Offices in Otago and Southland—*continued.*

Date of License.	Area. A.	R.	P.	Block.	Survey District.	Name of Claim.	Name of Registered Owner.
19/2/97	62	0	28	IV. XXI.	Lauder Blackstone	White Horse Dredging Co.	William Fisher.
13/9/89	170	2	35	XIV. IV. VII.	Tuapeka East Waipori Town of Waipori	The Upper Waipori Alluvial Gold-dredging Co. (Ltd.)	The Upper Waipori Alluvial Gold-dredging Co. (Ltd.).
8/10/94	185	2	0	XIV.	Tuapeka East ..	The Jutland Flat ..	The Jutland Flat (Waipori) Gold-mining Co. (Ltd.).
24/3/96	53	2	0	VII.	Beaumont ..	Golden Lead	Charles Bennett.
24/3/96	83	0	24	IV., V.	Waipori ..	McNeil and Party ..	James McNeil.
24/3/96	40	3	0	VII. XV.	Beaumont Crookston	..	William McLelland.
25/3/96	49	2	0	X.	Tuapeka East ..	Tuapeka Flat Dredging Co.	John Robinson and five others.
9/12/95	44	0	0	IV.	Beaumont ..	..	Albert Boddington.
25/3/96	61	1	0	I.	Crookston ..	..	Edwin Pyrke.
9/12/95	67	2	0	"	" ..	..	Hugh Crossan.
13/7/96	99	2	0	V.	Waipori ..	..	Richard Pilling.
10/8/96	98	0	18	"	" ..	..	Archibald McKinlay.
10/8/96	30	1	20	III.	Tuapeka East ..	..	John Laffey.
30/11/96	76	3	0	XXI., XVIII.	Crookston ..	..	William C. McGregor.
28/7/96	39	3	0	VI.	Tuapeka West ..	..	Patrick Laffey.
30/11/96	40	2	0	XIV. XV.	Beaumont Crookston	..	John E. McLelland.
15/2/97	14	2	24	I.	Waitahuna West	..	Robert McLeod and two others.
15/2/97	26	1	0	III.	Tuapeka West ..	..	John Laffey.
28/7/96	18	1	2	VII.	Beaumont ..	Golden Lead	James Bennett.
23/12/96	44	1	24	XIV.	Chatton ..	Waikaka Dredging Claim	John R. Perry.
22/11/94	99	0	18	IX.	Leaning Rock ..	Manorburn Gold-dredging Co.	Charles R. Smith.
1/2/95	35	2	20	I.	Fraser ..	Eureka Gold-dredging Co.	Charles G. Leijon and others.
11/10/93	39	2	22	XXI.	Town of Alexandra	Molyneux Hydraulic ..	Molyneux Hydraulic-elevating and Gold-mining Co.
21/12/93	59	0	24	VII.	Leaning Rock ..	Dunstan Dredging Co...	John G. Hyde.
26/1/94	52	0	0	"	" ..	Enterprise Gold-dredging Co.	Enterprise Gold-dredging Co.
30/11/95	33	0	0	X.	" ..	Earnscleugh Dredging Co.	Charles Weaver.
24/4/96	12	1	0	I.	Fraser ..	Pattison and Party ..	J. Pattison and others.
24/4/96	6	0	0	"	" ..	Scott and Party ..	James L. Scott.
16/10/95	27	2	10	"	" ..	Manuherikia Dredging Co.	Oloff Magnus and others.
16/10/95	57	2	0	VI., X.	Leaning Rock ..	Chicago Dredging Co. ..	George Spencer.
16/10/95	38	0	0	X.	" ..	Perseverance Dredging Co.	R. M. Finlay and others.
24/7/96	93	0	0	VII.	" ..	Ditto	"
18/6/96	41	3	16	VI. I.	" Fraser	Hyde and Party ..	J. G. Hyde.
16/9/96	68	0	37	VII.	Leaning Rock ..	Ngapara Dredging Co. ..	R. Ross and others.
16/10/96	92	3	39	X.	" ..	Earnscleugh No. 2 Dredging Co.	C. Weaver and another.
20/11/96	59	2	8	"	" ..	Manuherikia Flat Gold-dredging Co.	L. Ryan, jun.
17/12/96	54	0	0	VI.	Tiger Hill ..	Moutere Gold-mining Co.	C. Colclough.
16/8/92	18	0	8	VII.	Teviot.. ..	Roxburgh Gold Steam-dredging Co.	Roxburgh Gold Steam-dredging Co. (Ltd.).
16/8/92	19	1	32	I.	"	Dunedin Gold-dredging Co.	R. Brownlie.
1/8/92	44	3	10	"	"	"	T. Brown.
16/3/92	50	0	0	VII.	Benger ..	Edina Gold-dredging Co.	J. Ryley.
1/8/92	50	2	0	"	" ..	"	Edina Gold-dredging Co. (Ltd.).
14/8/93	51	3	24	III.	" ..	Golden Run Dredging Co.	Golden Run Dredging Co.
16/3/94	58	3	12	VIII.	" ..	Ettrick Gold-dredging Co.	Ettrick Gold Steam-dredging Co.
25/8/	57	0	0	III., VI.	" ..	Pringle and Party ..	J. Pringle and others.
19/11/95	40	2	24	II., III., VI.	" ..	Golden Run Dredging Co.	Golden Run Dredging Co.
8/5/95	41	0	0	I.	Teviot.. ..	Pitchers and Party ..	R. J. Pitchers and another.
3/12/95	61	3	16	III., VI.	Benger ..	Bennett and Party ..	J. Bennett and others.
19/11/95	66	0	0	III., VI., VIII.	" ..	Golden Treasure Dredging Co.	Golden Treasure Dredging Co.
4/6/96	61	1	16	II. VII.	" Beaumont	Golden Gate Dredging Co.	Golden Gate Dredging Co.
22/8/96	46	3	18	I., VI., XI.	Town of Ettrick	Richardson and Party ..	R. Richardson and others.
22/8/96	64	3	8	VIII.	Benger ..	Nicholson and Party ..	William C. Nicholson.
18/2/97	46	3	8	III.	" ..	Otago Gold-dredging Co.	Otago Gold-dredging Co.

Cardrona River.

The Cardrona Dredging Company hold 300 acres, in three special claims of 100 acres each, on the Cardrona River, and intend working with steam-dredges, fitted with tailings-elevators and all modern appliances.

Upper Shotover.

The New Sandhills Gold-dredging Company have 70 acres on the Upper Shotover, and employ nine men. Power for the dredging plant, pumping, and lighting is supplied by two electric generators, driven by water-power, two motors being placed on the dredge.

Sandhills Dredge.—The following description of the Sandhills Dredging Company's plant and operations is taken from the *Lake Wakatipu Mail* :—

"The Sandhills dredge was built six years ago, the total cost of it being £7,000, of which some £800 was paid for freight and cartage. The dredge was built on the company's first claim, which extended from the Sandhills to Rapid Creek. Although it was well known that a greater portion of the claim had been formerly worked, the company was led to expect substantial returns from the rich patches left untouched. The actual returns, however, proved disappointing, and after five years' work with indifferent results the property changed hands, and the work is now carried on by a small Dunedin company.

"With regard to the electric power by which the dredging is carried on, it will be of interest to give some account. The generator-station is situated about seven miles from Skipper's Point, and three miles from where the dredge is at present working. This part of the plant consists of two Brush Victoria generators driven by an ordinary 4 ft. Pelton wheel. The machines are capable of giving a total output of 52 kilowaths or 70-horse power. The water for driving purposes is brought in by a race from a creek about two miles distant. A pressure-tank is placed 525 ft. (vertical) above the generator-station, from which a line of pipes delivers the water at a pressure of 232 lb. to the square inch.

"The plant is equipped with a very complete set of measuring and controlling apparatus, and the station is connected with the dredge by telephone. A Buss Sombast tachometer—an ingenious piece of mechanism—is mounted on one of the generators and driven direct from the armature shaft. This instrument continuously records the speed of the machines without the usual reference to a timepiece and consequent arithmetical calculation. A Soames Nalder ammeter registers the amount of current, and a Carden volt-meter, designed to read up to 4,000 volts, indicates the electrometer force. Two electro-magnetic cut-outs are included in the main circuit, to prevent damage to generators and motors in the event of a short circuit or total disconnection. In the event of either of these happening the 'cut-outs' automatically switch the power into a set of resistance coils capable of carrying the maximum working current. This arrangement works admirably, and I was told that it had frequently prevented serious damage to the more delicate parts of the machinery.

"A Brush lightning-arrester is connected with each conductor immediately inside the building, which effectually prevents damage from that source. The generator-station and all machinery therein are kept scrupulously clean, and appear to be carefully attended to.

"The conductors which convey the power to the dredge are carried on patent fluid insulators supported (2 ft. apart) on iron rails, the telephone-wire occupying a central position immediately above. I am told that, notwithstanding the heavy current present in the power conductors, no inconvenience is caused by induced currents in the telephone-line. This trouble was anticipated, and the fear of a similar drawback led to much opposition to the proposal to drive the Dunedin city trams by electricity. The telephone instrument in use is of the ordinary kind, and, although working under great disadvantages, the transmission is excellent. To prevent damage to the telephone from accidental contact with the power line an exceedingly fine safety-fuse is included in the telephone circuit.

"Leaving the generator-station, a three miles' walk for the most part on the river-beach takes us to where the dredge is now working, under Muddy Creek Terrace—and, by the way, I may mention that the track is nothing to brag about. This three miles of bad road, or no road at all, is a great drawback to the working of the dredge. From the Skipper's dray-road there is already a trolly track made (but not kept) to the generator-house; from there the heavy machinery for the dredge has to be conveyed the remaining three miles as best one can.

"Midway between the generator-house and the dredge you come to two falls in the river—one 10 ft. and the other 12 ft. About ten months ago it fell to the manager's lot to get his dredge over there, and any one seeing the place can estimate the difficulty. The fact of the dredge getting over, after being lightened of all her gear, without any injury whatever, in spite of the unavoidable rough handling, speaks volumes for the care both of the manager, Mr. White, and Mr. R. Hay, Dunedin, the designer of the dredge.

"Reaching the dredge you get aboard by means of a boat attached to one of the quarter lines. Fortunately, at the time of my visit the river was in excellent condition for dredging, and the dredge was working well in solid ground (*i.e.*, ground never previously worked), and is in every way splendidly adapted for dredging. The power is conveyed from the land-lines by means of flexible cables suspended at a convenient height above water. After passing through guide-blocks they are led to revolving drums (part of the recent alterations, and a great improvement on the old method) by means of a revolving connector attached to each drum. There is no interruption in the connections while paying out or taking in the cable.

"The two motors are duplicates of the generators, the electrical plant having been constructed specially for the work. The several parts of all the machines are interchangeable, and a spare armature and field magnet are provided in case of an accident. A 16 in. centrifugal pump is worked by one motor, and the other drives the buckets, winches, and other gear in connection with dredging. All the necessary switches, shunt coils, &c., for controlling the machinery, &c., are placed in convenient positions on deck. The small space occupied by the whole plant, and the ease with which it is handled, makes electricity a very convenient power for any class of work, and the necessary gear will compare favourably in point of weight, dimensions, and multiplicity of parts with any

ordinary steam plant. The pump, main shaft, and counter-shafts are driven by 5 in. rope bands, and have proved to be durable, efficient, and especially adapted to the work of the dredge.

"The dredge is 90 ft. long and 20 ft. wide, and is constructed entirely of steel; all the buckets, pins, links, and other parts exposed to wear and rough usage are of the same material. The bucket-ladder is designed so as to bottom, if found necessary, 22 ft., and to discharge a ton per minute. It is, however, seldom that the dredge works near the maximum limit of either the depth or discharge. Originally the whole of the upper deck was devoted to gold-saving appliances, consisting of a revolving screen which delivered the rougher material into a chatte laid with longitudinal ripples. The finer material was delivered out of the screen and run over two cocoa-matting tables, one on each side of the screen, the tailings being conveyed aft by means of a side chute.

"By the present arrangement the wash-dirt is discharged from the buckets into a short chute overlaid with heavy steel plates; from thence it drops into the head of the main chute or dummy. The water for washing purposes is pumped into a tank behind the first chute, and carries the material through the chutes. Tailings are discharged 30 ft. astern. The head of the main chute is 16 ft. long by 3 ft. 6 in. wide, the remainder being 40 ft. long and 2 ft. wide. The ripples are quite a novelty in that line, and are made from steel tram-rails; they are of various shapes, and arranged in different positions in the chutes. The portions used in the dummy are bent at angles found most suitable. Owing to the rough nature of the gold the space between each ripple ranges from 1 in. to 2 in. The peculiar manner in which the ripples are arranged causes the wash-dirt to be spread evenly over the whole width of the chute, thus insuring thorough washing before it is discharged. The ripples are laid on strips of wood 1 in. thick, and set in opposite directions to them, and under these is laid cocoanut-matting. The set and section of the bars make the ripples an excellent catch for coarse or fine gold. An important feature in the working of the ripples is they do not fill and become hard. The ripples are easily made, handled, laid, and lifted, there being no bars or bolts connected with them. A section is kept in its place by means of angle irons laid along the sides of the chutes. The ripples should stand an enormous amount of wear, and can be laid in various ways to suit different conditions of work. Mr. White has had some months' experience in the working of the new gold-saving gear, and he claims for it many advantages over the old style. He informs me that all the evidence of its working goes to prove that practically all the gold is saved. The whole of the gold is got from the dummy, which is washed once a week; the remainder of the chute is washed down once a month, and the result barely pays for the time it costs. In the old style of gold-saving the tables had to be washed every shift, which meant a stoppage of nearly an hour, and an extra hand required two days a week to stream down the accumulated washings of the tables. This meant at least fourteen hours a week stoppage. Under the new arrangement all the stoppage required for washing up is three hours per week.

"The screen and parts were exposed to much wear-and-tear, and took a considerable amount of power to drive them. Since the alterations have been carried out Mr. White informs me that he has reduced the necessary power by 9-horse power. This alone—during the past year at least—is an immense gain, as, owing to the extremely dry season, the dredge would not have been able to work under the old conditions during the last month for want of water.

"The dredge is lighted by two Brush arc lamps of 2,500-candle power each. The lamps obtain the necessary current from the power circuit, and the splendid light given is a great convenience to the work at night. The lamps have been in use over five years, and have given every satisfaction."

Shotover River, Queenstown.

The Sew Hoy Big Beach Gold-mining Company (Limited) hold 167 acres 3 roods 7 perches on the Shotover River, near Queenstown, and work with two dredges portions of the year, twenty-nine wages-men being employed. The gold won for the past year was 2,040 oz. 8 dwt. 22 gr.; value, £7,904 8s. 2d. The company own three dredges, 32-horse power each.

Victoria Bridge, Kawarau River.

The Golden Beach Dredging Company have a lease of 31 acres at the Victoria Bridge, on the Kawarau River, and a company which has been formed in London intend placing a first-class steam dredge upon it, as it is considered that the gold obtained in the "sixties" on the beaches of the river and the terraces abutting, as well as the success which has attended the dredge at present working, proves the Kawarau to be richly laden with the precious metal; but, unfortunately, it is for the most part confined to rocky gorges, and is generally on that account too rough for working with present appliances. The river at the Victoria Bridge is, however, comparatively smooth and free from rocks, so that there are fairly good prospects of working it to advantage.

Kawarau–Cromwell.

The Electric Gold-dredging Company hold three claims, comprising about 150 acres, at the Kawarau River, near Cromwell, and have two dredges at work—one capable of dredging to a depth of 40 ft., and lifting 70 cubic yards per hour; and the other dredging 53 ft. deep, and putting through 90 cubic yards per hour. The cost of running the dredges is £100 per week, and the amount spent in building them was £9,000. There are thirteen men employed on the dredges; the engines are 12-horse power and the boilers 14-horse power nominal. During the past two years the Electric Gold-dredging Company have opened up the Kawarau, which is one of the most difficult rivers in Otago to work. Their operations have so far proved successful, and as they are continually improving their plant, so as to overcome difficulties, they hope to be more successful in future. The whole of the gold in their claims is contained in 6 in. of the bottom, and to get at that 40 ft. of tailings, which will not run 3 oz. per week, have to be lifted. During the season, when the river is in flood, operations are suspended altogether, as the dredges are unable to cope with the drift.

Clyde.

The Clyde Dredging Company has a very complete plant, the dredge being 93 ft. long by 27 ft. wide over all, and bucket-ladder 60 ft. long. The tail elevating-buckets are of an improved shape, and are intended to carry away all sand and gravel washed. A second small set of elevators will lift the grit and fine sand passing over the tables, and empty it into the main elevators at the level of the deck, to be discharged with the coarser gravel some distance away from the tail end of the dredge. The object of the tail elevator is to give the dredge plenty of room in the deep ground, or where a large quantity of loose gravel has been deposited in the river by terrace sluicers. In order to strengthen and prevent the dredge hugging, she is fitted with two sets of hog-posts, 28 ft. high, four in each set, diagonally braced, and having long iron tie-rods at top from the ladder hoisting-frame at the bow to the outer end of the tailing elevator. This deck erection to such a height is considered quite a new feature in dredge construction, and it is thought it will be more generally adopted where deep ground has to be worked.

Alexandra.

The Chicago Dredging Company hold 57 acres 2 roods on the Clutha River, near Alexandra, and employ seven men, the dredge being worked by steam-power.

The Eureka dredge, 80 ft. long, with pontoons 9 ft. wide and 5 ft. deep, ladder 53½ ft. long, and ladder-way 4½ ft. wide, works the river-bed half a mile above the Alexandra Bridge. The plant is capable of dredging 36 ft. deep from the water-surface, the capacity of the buckets being 3 cubic feet. The tailings-elevator, 36 ft. long, is capable of stacking the tailings 20 ft. above the water-level.

The Ngapara Gold-dredging Company, at Alexandra South, put through during the year 225,600 yards, for a yield of 940 oz.; value, £3,619. The dredge is worked by a 12-horse-power steam-engine. Seven men were employed.

The Enterprise Gold-dredging Company (No Liability) hold a claim of 55 acres along the river at Alexandra South, and employ seven men on their dredge.

The Manuherikia Gold-dredging Company (Messrs. Steel, McGeorge, and party) hold 28 acres at Alexandra South, and employ four men on their current-wheel dredge. The gold won for the year was 289 oz., valued at £3 17s. per ounce.

The Manorburn dredge, at Alexandra, has a 12-horse-power nominal engine, pontoons 75 ft. long and 11 ft. wide, ladder (4 tons) 53 ft. long, and ladder-way 4½ ft. wide. There are thirty-two buckets, each weighing 3 cwt. 20 lb., and capable of lifting 3 cubic feet each. The capacity of the dredge is estimated at 90 tons per hour. The washing cylinder is 16 ft. long, the perforations being ⅜ in. in diameter, and the material treated is distributed over 220 square feet of gold-saving tables, from which the sand is discharged directly into the tailings-bucket, which casts the tailings some distance behind the dredge, where, if necessary, they can be stacked to a height of 24 ft. above the water-level. The fall in the gold-saving tables, which are all fitted with cocoanut-matting, is 1 in 10.

Ophir.

The Ophir and Ind Gold-dredging Company (Limited) hold a claim of 99 acres at Ophir, and employ six men. They have a steam-engine, with a nominal 10-horse power.

Roxburgh, Clutha.

The Ettrick Gold Steam-dredging Company (Limited) hold 50 acres about nine miles below Roxburgh. A 12-horse-power compound horizontal surface-condensing engine drives all the appliances connected with the dredge.

The Roxburgh Gold Steam-dredging Company's claim of 50 acres is situated one mile below the Town of Roxburgh. The beaches formed in the Clutha River are worked by steam-dredging, the dredge, band of buckets which lifts the wash-dirt, and the centrifugal pump which supplies the water for sluicing being driven by a 20-horse-power compound horizontal surface-condensing engine. Six wages-men are employed.

The Golden Treasure Dredging Company's claim consists of 50 acres, about twelve miles below Roxburgh, a 30-horse-power compound horizontal surface-condensing engine driving the dredge, buckets, and centrifugal pump which supplies the water for sluicing the wash-dirt.

Miller's Flat, Clutha.

The Otago Gold-dredging Company (Limited) hold 52 acres at Miller's Flat, and employ seven men. Two steam-engines of 10- and 14-horse power supply the motive-power for dredge, ladder, and elevator. During the year the dredge worked 197 days, and obtained 660 oz. 18 dwt. 17 gr. of gold; value, £2,544 3s.

The Golden Run Dredging Company hold a claim of 50 acres at Miller's Flat, and employ six wages-men. A 12-horse-power compound horizontal surface-condensing engine drives all the appliances.

Messrs. J. Pringle, R. Patrick, J. McIntyre, J. C. Arbuckle, and J. Pringle, who own the Pride of the Clutha dredge at Miller's Flat, have an area of 57 acres, part river (34 acres) and part land (23 acres). The dredging machinery consists of a 60 ft. ladder, forty buckets, six hand-winches, and one steam-winch. Six men from shareholders and two wages-men are employed.

Island Block, Clutha River, Tuapeka County.

The Golden Gate Dredging Company (Limited) have a claim of 50 acres on the Island Block, Tuapeka County, and employ seven wages-men. Dredging operations were started a few chains below the Island Block line of pipes, where some good ground was met with, but it did not prove as extensive as anticipated. Some prospecting has been done lower down the river, and there is

a probability of finding payable ground on the east side of where the prospecting is going on. The dredge, which is in good order, and capable of doing a large amount of work, is driven by a 30-horse-power compound horizontal surface-condensing engine.

Lowburn, Clutha River.

The Wanaka dredge, at Lowburn, is owned by Messrs. N. P. Kloogh, W. Talboys, and H. Bruce, who hold a claim one mile in length along the Clutha River. Dredging is done by means of a current-wheel, worked by the force of the stream, calculated at about 8-horse power, and lifting 25 tons per hour.

Bowman's Flat, Clutha River.

The Bowman's Flat Company hold a prospecting area of one mile near Bowman's Flat, on the Clutha River, and have spent £3,900 on a dredge, which, with the pontoons, 82 ft. long, have been all made in Dunedin.

Earnscleugh Flat.

The Earnscleugh Flat Dredging Company (Messrs. C. Weaver, P. Weaver, J. Kelman, A. Black, and J. McPherson) have an area of 33 acres at Earnscleugh Flat, on which six men are employed. Rough gravel is worked in the face with a bucket-dredge, driven by a 12-horse-power steam-engine, and lifting about 8,000 yards per week, giving an average of 2 gr., of the value of 2½d.

Waipori.

Messrs. McNeil and party, who own the Perseverance dredge, at Waipori, which is worked by a 10-horse-power steam-engine, have a claim of 84 acres, and employ six men.

The Jutland Flat Gold-mining Company (Limited) hold 187 acres at Jutland Flat, Waipori. The ground is worked by regular faces and paddocks, and enclosed within dams to maintain the requisite level for floating purposes. Cement occurs in irregular patches, bands, and beds, and at different levels, and varies in its different positions as ferruginous and argillaceous, occasionally passing into soft arenaceous conglomerates, the latter being chiefly found near the main bottom at the side of the valley. The drift consists of quartz-gravel, more or less rounded, vari-coloured sands and clays overlying schist and lacustrine deposits of pebble-beds, soft sandstones, quartz-grits, clays, and slates, with bands of partly-carbonised driftwood, &c. The estimated yield is 1·49 gr. of gold per cubic yard, value 3d., and the cost of dredging 1·38d. per cubic yard. There is a modern and improved plant, driven by 18-horse-power compound vertical surface-condensing engine.

In addition to the districts mentioned, dredging operations are being instituted in the Nevis, Waikaia, Waikaka, Gore, Naseby, Waitahuna, Wetherstone's, Glenore, and other districts.

The work of building dredges has given an impetus to the engineering trade in Dunedin, and the various foundries are kept employed in furnishing the extensive machinery required for their equipment. The cost of one of these dredges varies from £4,000 to £6,000, and the weekly cost of working is estimated at £30. Six men are found sufficient to man a dredge in ordinary work, but under certain circumstances one or two additional hands have to be employed. The future yield of gold from the Otago District will be largely augmented by the yield from dredging operations, and, although the whole of the land taken up may not be payable, a number of the claims will prove sufficiently rich to afford a handsome profit for working.

This method of working river-beds is being adopted in other countries. The success attendant on this branch of the industry is causing inquiries to be made as to the latest improvements adopted on the New Zealand dredges.

STATEMENT of AFFAIRS of MINING COMPANIES, as published in accordance with the Mining Companies Acts, 1891 and 1894.

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 up per Share.	Arrears of Calls.	Number of Shares forfeited.	Number of Shareholders at present.	Number of Men employed.	Quantity and Value of Gold or Silver produced since Registration.		Total Expenditure since Registration.	Total Amount of Dividends paid.
											Quantity.	Value.		
AUCKLAND DISTRICT.														
		£	£	£		£ s. d.	£ s. d.				Oz.	£	£	£
Coromandel Queen	4 Sept., 1896	6,200	..	..	62,000	..	..	..	54	5	..	..	387	..
Boss	24 July, 1896	10,000	723	..	100,000	..	..	..	77	4	..	..	438	..
Inca	17 Oct., 1896	4,000	..	..	80,000	..	..	..	30	4	..	..	179	..
Ladas..	18 Aug., 1896	3,500	..	..	70,000	..	..	..	78	5	..	..	258	..
Comstock (Limited)	30 Jan., 1895	15,000	1,061	..	100,000	0 0 3	..	..	220	3	..	..	1,741	..
Lone Hand (Limited)	22 Mar., 1889	15,850	1,578	..	31,700	0 1 1	..	..	60	1	2,267	6,227	8,238	..
Cardigan (Limited)	12 Oct., 1895	15,000	..	..	100,000	..	..	..	240	3	9	23	2,119	..
May Queen (Limited)	4 Mar., 1889	39,500	8,558	..	79,000	0 1 8	..	..	220	46	13,037	39,308	56,509	1,975
Cambria (Limited)	4 Jan., 1884	44,700	4,284	11,175	44,700	0 1 11	..	238	220	..	57,250	158,962	97,661	80,475
Talisman Extended (Limited) ..	29 July, 1895	17,700	..	..	129,888	0 0 2	..	..	300	5	..	..	1,659	..
Vanderbilt (Limited)	13 Aug., 1896	..	..	..	56,500	..	..	..	40	5	..	..	366	..
Broken Hill (Limited)	..	13,500	1,179	..	90,000	0 0 3½	..	..	206	7	..	..	1,307	..
New Munster	5 Nov., 1896	2,500	335	..	100,000	..	..	..	57	2	..	..	86	..
Lorna Doone	23 Sept., 1896	4,500	..	..	90,000	..	..	..	126	5	..	..	628	..
Queen Victoria of Hauraki ..	2 Sept., 1896	8,500	..	..	85,000	..	..	..	92	4	..	8	551	..
Golden Spark	16 Dec., 1895	7,400	..	..	74,000	..	..	..	72	..	7	20	651	..
Katie (Limited)	21 Oct., 1895	5,000	774	2,500	100,000	1d. to 10d.	96 13 4	..	170	7	..	..	1,016	..
Waihi El Dorado	8 June, 1896	7,000	..	..	70,000	..	..	..	76	4	..	..	481	..
Albert	9 July, 1896	12,000	1,225	..	80,000	..	..	..	186	6	..	..	682	..
Adelaide	1 Nov., 1895	15,000	3,227	..	60,000	0 0 10	156 1 10	8,000	149	10	39	119	3,308	..
British Empire	12 Oct., 1895	9,000	1,480	..	60,000	0 0 2	220 4 2	..	106	6	..	..	1,572	..
Crescent	9 Jan., 1896	21,000	1,057	..	140,000	0 0 0½	134 16 3	..	218	6	..	..	1,331	..
Coromandel Freehold Proprietary	11 Nov., 1895	18,750	10,000	..	150,000	..	..	..	268	8	..	..	10,523	..
Imperial	22 Feb., 1895	10,000	2,167	208	100,000	0 0 5	..	..	268	5	2	2	2,456	..
Waipuru	21 Aug., 1896	3,750	270	..	50,000	..	..	..	49	4	..	..	262	..
Waihi Pinnacles	6 Aug., 1896	11,000	1,200	5,000	220,000	..	..	..	91	10	..	..	1,194	..
Royal (Limited)	21 Mar., 1895	12,500	312	..	50,000	..	..	..	89	8	..	53	418	..
Sunlight	9 Dec., 1896	15,000	..	..	75,000	..	..	..	77	4	..	..	83	..
Big Reef	2 Sept., 1896	6,000	..	..	120,000	..	..	..	53	4	..	..	251	..
Esperanza	4 June, 1896	9,000	..	..	60,000	..	..	..	54	4	..	..	677	..
Waitekauri No. 2	11 Sept., 1895	16,905	470	..	112,700	..	..	1,750	381	5	..	..	1,233	..
Tairua Proprietary	23 July, 1896	22,800	..	..	91,200	..	..	..	122	6	..	..	423	..
City of Auckland	7 Aug., 1896	18,750	..	..	75,000	..	..	..	101	7	..	..	775	..
Kinsella's Owharoa Freehold ..	3 Mar., 1896	23,750	1,462	8,037	95,000	0 2 0	..	..	109	7	..	..	1,139	..
King Solomon	2 July, 1896	5,000	95	..	50,000	0 0 0½	11 2 11	5,300	43	..	..	..	284	..
Belmont	7 Aug., 1895	12,750	..	..	102,000	..	..	..	101	10	..	..	802	..
Eureka	7 Nov., 1895	7,500	51	..	50,000	0 0 0½	52 16 3	..	57	3	..	..	657	..
Union Jack	7 Oct., 1896	7,396	..	..	73,960	..	..	..	67	4	..	..	326	..
Boat Harbour	5 Oct., 1896	7,000	..	..	70,000	..	..	..	49	3	..	..	236	..
Mount Catherine (Limited) ..	10 Sept., 1896	4,000	331	2,000	80,000	0 1 0	..	..	73	2	..	..	351	..
Sterling	1 Oct., 1895	8,500	1,080	..	85,000	0 0 3	..	..	195	7	..	..	1,609	..
Conquering Hero	7 Nov., 1895	5,700	450	..	80,000	..	24 15 10	5,950	149	4	..	..	631	..
Hauraki No. 2	10 July, 1895	12,000	2,813	..	80,000	0 0 6	186 15 0	..	207	13	..	..	2,628	..
Clunes	29 Nov., 1895	7,500	923	..	50,000	0 0 2½	97 14 2	..	76	5	..	..	1,095	..
City of Gisborne	11 Sept., 1896	6,000	1,134	..	80,000	..	..	..	147	6	..	..	841	..
Alburnia East	17 Sept., 1895	8,250	1,452	..	55,000	0 0 5	193 13 8	666	134	7	12	2	1,459	..
Alpha	30 Mar., 1895	5,250	837	..	35,000	0 0 3	..	..	113	4	19	10	1,392	..
Ivanhoe	30 Mar., 1895	12,000	1,897	292	120,000	0 0 4	..	286	327	8	2	2	2,000	..

Jupiter	12 Oct.,	1895	10,000	600	..	40,000	..	..	..	97	6	..	..	949	..
Renown	18 Nov.,	1896	12,000	900	..	60,000	..	..	..	56	4	..	..	324	..
Balfour	11 Dec.,	1895	10,500	1,400	..	70,000	..	..	..	137	3	..	..	986	..
Golden Lion	11 Dec.,	1895	8,250	1,048	..	55,000	0 0 3	222 18 4	5,325	101	5	..	..	1,021	..
Tamihana	22 Oct.,	1896	10,000	800	..	50,000	..	..	..	54	..	..	..	208	..
Wealth of Nations	13 Mar.,	1895	12,000	1,625	..	60,000	0 0 3	..	667	169	5	3	3	1,498	..
Waitete	29 Oct.,	1896	4,500	762	..	90,000	..	..	..	20	..	..	..	643	..
Rainbow	3 Sept.,	1896	2,000	98	..	20,000	..	..	..	35	5	..	..	282	..
Welcome Find (Limited)	18 April,	1895	17,500	5,123	1,000	70,000	0 1 9	1 17 6	..	299	14	304	859	5,957	..
New Whau	30 Mar.,	1895	15,000	2,167	417	100,000	0 0 6	..	150	223	10	41	109	2,729	..
Waihi Consols	18 Oct.,	1895	15,000	4,500	..	150,000	..	..	..	410	7	..	..	4,300	..
Exchange	23 July,	1896	2,500	486	..	50,000	0 0 2	64 10 1	..	20	5	..	..	433	..
Omega	29 Oct.,	1896	5,000	602	..	100,000	0 0 0½	65 19 6	..	17	5	..	..	551	..
Queen of Beauty	24 Oct.,	1896	10,000	960	..	100,000	..	..	..	20	..	..	..	545	..
Express	5 Nov.,	1896	16,000	1,200	..	80,000	..	..	..	56	4	..	..	446	..
Mariner	2 Aug.,	1895	9,000	1,031	..	60,000	0 0 2	68 13 8	..	165	5	..	..	978	..
Nonpareil	27 Aug.,	1896	6,000	765	..	60,000	0 0 1	234 11 8	..	140	8	9	24	781	..
Darwin	28 Aug.,		5,500	750	1,500	55,000	0 0 6	..	..	85	7	..	102	528	..
York	7 Nov.,	1896	4,500	..	..	90,000	..	..	..	71	5	..	..	443	..
Zone	7 Nov.,	1896	4,500	..	..	90,000	..	..	..	68	7	..	..	505	..
Progress Castle Rock	19 Sept.,	1895	9,750	716	..	65,000	..	96 6 5	..	160	5	..	18	1,334	..
Golden Fleece	11 Sept.,	1895	12,750	708	..	85,000	..	..	6,065	210	7	..	..	1,189	..
Charleston	9 Dec.,	1896	2,750	..	..	55,000	..	..	..	46	..	..	..	66	..
Mount Waihi	26 Sept.,	1895	12,000	..	..	60,000	..	..	..	106	1	..	..	487	..
Teutonic	26 Sept.,	1895	10,200	386	..	68,000	..	180 4 2	..	82	4	..	..	1,135	..
Karangahake	24 Oct.,	1895	12,000	..	..	60,000	..	..	..	173	5	..	..	1,532	..
New Zealander	19 Sept.,	1895	9,750	428	..	65,000	..	113 17 1	225	139	5	..	..	1,293	..
Sir Julius	21 Nov.,	1895	12,000	..	..	60,000	..	..	..	55	1	..	..	491	..
South British	31 July,	1895	13,000	405	..	65,000	..	136 11 3	100	198	5	..	..	1,275	..
A1	11 Oct.,	1895	8,100	112	..	54,000	..	..	2,550	93	..	..	14	708	..
Waitekauri South	4 Sept.,	1895	11,000	687	..	55,000	..	..	500	125	6	..	..	1,513	..
Kuranui (Limited)	12 Sept.,	1895	15,000	1,250	..	60,000	..	..	..	43	4	..	5	1,270	..
Rothschild	27 June,	1896	7,500	450	450	60,000	..	..	..	101	6	..	..	460	..
Dawn of Hope	2 Oct.,	1896	6,000	705	900	60,000	..	..	..	38	4	..	..	165	..
Waihi Reefs	7 May,	1896	9,000	450	900	45,000	..	93 12 9	..	74	9	..	..	868	..
Owharoa (Limited)	20 Nov.,	1894	37,500	1,778	938	75,000	..	83 11 6	..	58	..	11	23	3,294	..
Owharoa United	22 Aug.,	1896	9,000	735	900	60,000	..	..	..	64	4	..	..	704	..
Carnage	13 Sept.,	1895	9,000	900	900	60,000	..	54 3 4	..	103	5	..	..	1,062	..
Criterion	31 July,	1896	10,100	550	9,000	101,000	..	..	..	106	6	9	27	476	..
Golden Point	4 Sept.,	1895	100,000	5,000	95,000	100,000	0 1 0	..	..	216	9	8	23	5,033	..
De Hirsch	12 Dec.,	1896	1,075	87	..	24,000	..	..	..	11	..	..	..	24	..
Waimarie	29 Oct.,	1896	3,125	525	525	62,500	..	..	..	70	4	..	..	275	..
Flemington (Limited)	1 Oct.,	1896	5,000	207	..	50,000	..	3 7 9	..	23	4	..	..	199	..
Kennedy's Bay Township (Limited)	11 Aug.,	1896	2,000	367	250	200	2 15 0	120 0 0	..	9	..	..	..	630	..
Temple Bar	2 Oct.,	1896	3,035	404	750	60,700	0 0 3	33 6 8	..	86	4	..	..	403	..
Iolanthe	28 Aug.,	1896	3,250	446	750	65,000	0 0 3	54 3 4	..	51	4	..	..	439	..
Dorothy	28 Aug.,	1896	3,462	599	1,050	69,250	..	..	..	62	3	..	..	439	..
Alpine Fluke	25 June,	1896	1,050	..	..	70,000	..	..	..	108	4	..	..	749	..
Vulcan	31 Oct.,	1896	3,225	369	750	64,500	0 0 3	..	..	41	3	..	..	145	..
Specimen Hill	14 Aug.,	1896	4,450	510	1,375	89,000	0 0 3	61 9 2	..	66	4	..	..	509	..
Gloucester (Limited)	1 July,	1896	14,019	10,351	78,500	740,150	0 2 6	3,668 2 6	..	156	8	..	..	4,899	..
Komata (Limited)	23 April,	1892	20,060	..	15,056	..	..	..	..	13	..	19,293	27,544	33,540	1,506
Moanataiari (Limited)	29 July,	1896	..	13,500	50,000	..	..	..	..	228	80	2,185	5,855	18,448	..
Kuranui-Caledonian (Limited)	13 Aug.,	1896	..	2,000	63,000	..	..	..	..	170	28	565	1,535	2,997	..
Waiotahi (Limited)	1 Aug.,	1871	18,000	15,000	..	6,000	2 10 0	..	..	48	28	56,816	159,616	129,381	33,750
Hazelbank (Limited)	1 Oct.,	1890	10,500	5,250	2,100	42,000	0 3 6	..	..	168	27	8,147	22,113	24,587	3,150
Grace Darling (Limited)	30 Jan.,	1894	30,000	4,853	..	60,000	0 6 6	..	..	223	9	71	74	6,940	..

STATEMENT of AFFAIRS of MINING COMPANIES, as published in accordance with the Mining Companies Acts, 1891 and 1894—*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 up per Share.	Arrears of Calls.	Number of Shares forfeited.	Number of Shareholders at present.	Number of Men employed.	Quantity and Value of Gold or Silver produced since Registration.		Total Expenditure since Registration.	Total Amount of Dividends paid.
											Quantity.	Value.		
AUCKLAND DISTRICT—*continued.*														
		£	£	£		£ s. d.	£ s. d.				Oz.	£	£	£
Coromandel Hint (? Mint) ..	19 Oct., 1896	1,456	151	937	58,250	0 0 1	10 8 4	5,250	43	3	..	..	145	..
La Mascotte	28 July, 1896	6,500	420	875	65,000	0 0 3	80 0 0	..	70	4	..	..	409	..
Golden King	28 Aug., 1896	3,250	375	875	65,000	0 0 3	..	..	69	4	..	..	394	..
Waikanae (Limited)	25 June, 1896	6,500	324	..	65,000	0 0 4	44 5 5	1,500	51	3	..	..	316	..
European (Limited)	26 Feb., 1896	7,000	284	..	70,000	0 0 6	8 6 8	7,575	47	3	..	..	274	..
Waitekauri King	26 Feb., 1896	11,545	1,249	..	112,450	0 0 1	..	..	162	6	..	..	1,193	..
Wonona	2 Oct., 1896	6,200	..	..	62,000	..	..	..	63	4	..	..	452	..
Puriri	27 June, 1895	5,000	..	..	50,000	..	..	1,858	143	2	..	7	1,307	..
Moanataiari North	3 Oct., 1895	7,425	778	900	49,500	0 1 6	3 9 2	1,315	109	4	..	5	1,385	..
Golden Planet	18 Sept., 1896	5,070	..	..	67,600	..	..	..	53	3	..	..	296	..
Maioro	2 Oct., 1896	6,150	..	..	61,500	..	..	..	68	4	..	..	332	..
Gladys	24 Oct., 1895	10,500	139	..	70,000	..	6 11 3	1,175	108	2	..	..	880	..
Superb	3 Dec., 1896	2,700	..	..	54,000	..	..	..	31	2	..	..	51	..
Mataura	14 Feb., 1896	17,250	..	..	115,000	..	..	..	87	4	..	..	804	..
Komata Triumph	17 June, 1896	13,500	..	..	90,000	..	..	..	188	10	..	..	637	..
Premier	18 Mar., 1896	12,000	79	..	80,000	..	87 4 11	..	108	4	..	..	661	..
Golden Opportunity	11 May, 1896	6,000	250	..	60,000	..	..	200	106	..	..	1	443	..
Conquest	19 Aug., 1896	6,125	..	..	61,250	..	..	..	53	3	..	..	453	..
Waitaia (Limited)	6 June, 1890	15,000	1,325	34	58,737	..	44 12 6	..	135	6	689	2,010	4,095	1,392
Tapu Fluke	4 Aug., 1894	3,725	1,689	2,000	37,250	0 2 0	11 2 6	..	78	..	..	164	1,816	..
Beaconhill	2 July, 1896	2,000	39	..	40,000	..	44 6 10	..	26	..	..	..	133	..
Alexandra	11 Nov., 1896	1,125	12	..	45,000	..	82 0 8	..	13	3	..	..	71	..
Golden Giant	15 May, 1896	6,300	349	..	63,000	..	44 7 6	..	76	4	..	..	800	..
Rialto	12 June, 1896	4,000	463	..	80,000	0 0 1½	30 17 0	1,000	71	6	..	..	656	..
Nellie	22 Oct., 1896	6,000	..	2,000	80,000	0 0 6	..	..	22	3	..	..	342	..
Mata Reefs	29 Aug., 1896	6,250	..	..	125,000	..	..	..	180	3	..	..	567	..
Don of Waihi	12 Nov., 1896	5,500	64	2,750	220,000	0 0 3¼	161 15 10	..	41	..	..	..	335	..
Hauraki (New Zealand) Associated Gold Reefs (Limited)	25 Mar., 1896	85,000	10,000	75,000	425,000	0 4 0	..	..	198	36	..	473	2,544	..
Gem	2 July, 1896	4,000	109	..	80,000	0 0 0½	..	34,580	51	4	..	..	506	..
Moanataiari Extended ..	28 Sept., 1895	7,500	1,281	825	60,000	1/6 & -/9	..	550	124	4	..	13	1,246	..
Golden Link	28 Oct., 1895	7,500	848	750	60,000	7·7d.	27 15 2	..	164	5	..	56	882	..
Waitekauri Monarch	26 Feb., 1896	6,500	810	1,050	65,000	0 0 6	..	..	129	4	..	..	696	..
Flower of Waihi	28 Oct., 1895	12,375	1,000	1,200	82,500	0 0 6	..	..	110	..	..	..	538	..
Crown Imperial	2 Sept., 1896	6,000	600	600	60,000	0 0 6	..	..	86	4	..	..	284	..
Kaiser	28 Sept., 1895	15,000	1,750	3,000	100,000	1/6 & -/7	..	1,750	106	5	..	..	1,590	..
St. Patrick	28 Sept., 1895	8,000	1,333	1,000	80,000	0 0 6	..	700	211	3	..	..	1,009	..
Bell Rock	14 Dec., 1895	15,000	1,500	1,500	60,000	0 1 0	..	..	119	6	..	..	1,078	..
Occidental	3 April, 1895	7,402	1,530	937	98,700	0 0 6	..	3,900	124	7	..	606	2,322	..
Mangakara United	2 April, 1896	15,000	1,352	1,637	100,000	0 0 8	344 4 5	..	187	6	..	..	1,323	..
Golden Butterfly	26 Nov., 1896	4,767	..	..	47,675	..	..	..	35	..	..	..	116	..
Puru Junction	6 Oct., 1896	10,000	750	4,250	100,000	0 1 0	..	..	57	5	..	..	255	..
British Gold and Silver ..	17 Jan., 1896	9,750	4,051	3,500	65,000	0 2 5	303 2 6	..	57	10	..	..	4,052	..

Puru Consolidated	12 Nov.,	1895	18,600	1,558	4,900	62,006	0 2 1	..	..	144	18	..	..	2,895	..
Waitekauri Prince	29 May,	1896	12,000	990	1,200	80,000	7·2d.	210 0 0	..	141	4	..	..	924	..
Rising Sun	16 Oct.,	1895	18,000	1,000	1,900	120,000	5·8d.	..	..	156	4	..	..	977	..
Ward Proprietary	1 Oct.,	1895	8,000	1,000	1,000	80,000	0 0 6	..	..	93	..	..	..	994	..
Lady Glasgow	26 Feb.,	1896	10,500	892	1,575	70,000	8·65d.	35 4 0	..	59	..	..	..	866	..
Waitekauri Magazine	6 Aug.,	1896	3,000	187	187	60,000	0 0 1½	..	..	63	1	..	..	151	..
Oriental	9 Sept.,	1896	6,200	32	..	62,000	..	97 3 9	..	53	6	..	..	563	..
Ohinemuri	6 Aug.,	1896	8,000	1,200	1,200	80,000	7·2d.	..	..	81	..	..	..	708	..
Matarangi	6 Aug.,	1896	6,000	2,498	2,000	60,000	1s. 4·2d.	201 17 6	..	75	6	..	..	2,684	..
Great Barrier Gold and Silver ..	3 Oct.,	1896	3,000	435	..	60,000	0 0 1	..	..	85	5	160	26	238	..
Leading Wind	9 Sept.,	1896	8,660	1,098	..	86,600	0 0 7	309 15 10	..	182	6	..	3	875	..
Cadman	10 Dec.,	1896	4,500	282	..	90,000	0 0 1	17 6 8	..	45	5	..	..	243	..
Anglo-Saxon	2 Sept.,	1896	5,700	650	..	57,000	0 0 6	..	..	59	3	..	..	415	..
Electric	27 Aug.,	1896	5,100	550	..	51,000	0 0 6	..	..	56	3	..	..	291	..
Queen Annie	1 Sept.,	1896	7,475	1,042	..	74,750	0 0 7	..	..	71	4	..	..	734	..
Orion	2 Dec.,	1896	8,612	622	..	86,125	4·8d.	..	..	50	3	..	..	328	..
Gold Stream	3 Oct.,	1896	8,000	1,200	..	80,000	0 0 7	..	..	57	3	..	..	431	..
Morning Star	17 June,	1896	5,500	658	..	110,000	0 0 1⅝	..	..	297	4	..	..	463	..
Pride of Hauraki	17 June,	1896	4,625	724	..	46,250	0 0 7	..	..	56	4	..	..	633	..
Great Northern	23 July,	1896	3,500	499	..	70,000	0 0 6½	139 11 8	..	92	3	..	..	543	..
Mountain Flower	17 Jan.,	1896	8,000	1,200	..	80,000	0 0 7½	..	..	154	4	..	..	1,003	..
Iona Gold and Silver	17 Oct.,	1896	3,000	258	..	60,000	0 0 1	164 16 11	..	32	5	..	..	163	..
Barrier Gold and Silver Estates ..	17 Oct.,	1896	3,000	265	..	60,000	0 0 1	..	..	40	..	..	..	257	..
Herald	28 July,	1896	6,000	750	..	60,000	0 0 6	..	..	82	6	..	..	459	..
Zion	10 Dec.,	1895	9,750	1,500	..	65,000	0 1 0	..	..	116	5	..	..	1,350	..
Tandem	13 April,	1896	8,250	900	..	55,000	0 0 7	..	..	123	5	..	..	744	..
City of London	13 April,	1896	7,781	1,805	..	62,250	0 0 7	5 12 6	..	126	3	..	2	1,986	..
Tairua Amalgamated Prospecting	8 Dec.,	1896	6,000	..	..	120,000	..	..	..	48	4	..	..	247	..
Wentworth	23 Nov.,	1896	3,500	..	..	70,000	..	..	..	45	5	..	..	149	..
Madge	21 May,	1896	3,000	250	..	60,000	0 0 1	0 4 2	100	133	..	..	..	276	..
Native Chief	26 Feb.,	1896	8,300	..	..	83,000	..	..	..	107	..	..	..	577	..
Doctor Jim Gold and Silver ..	28 Aug.,	1896	5,500	450	..	55,000	..	..	..	61	4	..	..	335	..
Akarana	5 Nov.,	1896	2,187	..	..	43,750	..	..	..	46	3	..	..	203	..
Kuaotunu	— June,	1895	6,000	..	..	60,000	..	..	..	125	4	..	..	1,389	..
Royal Sovereign (Limited) ..	10 July,	1896	3,250	343	..	65,000	3d. & 1s.	32 1 8	..	99	4	..	..	344	..
Argosy	25 Mar.,	1896	8,750	292	..	70,000	..	..	450	94	6	..	..	951	..
Golden Band	6 Nov.,	1896	5,250	469	1,000	70,000	0 0 6	..	..	52	4	..	..	198	..
Seven Reefs	3 Sept.,	1896	2,750	1,000	1,750	55,000	0 1 0	159 0 7	..	42	6	..	..	549	..
Hauraki South (Limited) ..	11 June,	1896	75,000	10,000	..	75,000	1 0 0	..	..	..	8	..	..	599	..
Elvira	17 Oct.,	1896	8,000	570	..	80,000	0 0 7	..	..	68	4	..	..	263	..
King of Whangamata	9 Sept.,	1896	8,000	1,200	..	80,000	0 0 7	..	..	87	5	..	..	545	..
Pigmy	21 Nov.,	1895	10,500	1,350	..	72,200	0 0 8	0 8 4	..	149	3	..	..	1,211	..
Bendigo	21 Aug.,	1896	8,000	1,200	..	80,000	0 0 7	..	..	70	7	..	..	646	..
Monarch of All	17 Jan.,	1896	8,562	1,096	..	68,500	0 0 8	28 19 6	..	140	..	..	..	1,120	..
Atlas	23 July,	1896	9,000	1,575	..	90,000	0 1 0	..	..	96	7	..	..	856	..
Scandinavian	21 Nov.,	1895	11,250	2,746	..	75,000	0 0 8	..	..	168	3	53	129	2,777	..
Rangatira	5 Nov.,	1895	13,575	709	..	90,500	0 0 2½	15 19 11	17,198	146	7	..	10	1,107	..
Gem of Hauraki	23 Sept.,	1896	3,950	..	..	79,000	..	..	..	85	3	..	..	315	..
Merchant of Venice	7 Dec.,	1896	3,625	..	..	47,500	..	..	..	29	3	..	..	117	..
Jubilee (Limited)	16 Sept.,	1896	1,000	167	..	40,000	0 0 1	..	..	21	..	..	..	21	..
Moriori-Puru	20 Oct.,	1896	12,562	..	..	86,000	..	..	2,250	64	4	..	..	1,234	..
Brilliant	22 July,	1896	5,175	56	..	34,500	5/12d.	88 1 0	1,000	64	4	..	..	663	..
Byron Bay	21 Oct.,	1895	25,500	..	..	102,000	..	..	..	268	8	..	..	1,959	..
Empire	18 Jan.,	1896	5,600	392	..	56,000	0 0 1⅜	36 19 4	13,372	77	4	..	..	802	..

STATEMENT of AFFAIRS of MINING COMPANIES, as published in accordance with the Mining Companies Acts, 1891 and 1894—*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 up per Share.	Arrears of Calls.	Number of Shares forfeited.	Number of Shareholders at present.	Number of Men employed.	Quantity and Value of Gold or Silver produced since Registration.		Total Expenditure since Registration.	Total Amount of Dividends paid.
											Quantity.	Value.		
AUCKLAND DISTRICT—*continued*.														
		£	£	£		£ s. d.	£ s. d.				Oz.	£	£	£
Union-Waihi (Limited)	18 Sept., 1895	141,250	26,302	100,000	140,000	£1 & 10/	..	..	..	40	..	..	8,605	..
Ohinemuri Syndicate (Limited) ..	24 Dec., 1895	42,000	6,000	..	42,000	1 0 0	..	..	..	20	..	..	4,347	..
Waihi (Limited)	7 Dec., 1887	160,000	106,667	53,333	160,000	1 0 0	..	..	..	350	..	491,461	442,500	180,500
Waitekauri (Limited)	6 May, 1895	143,000	100,000	36,000	143,000	1 0 0	..	..	..	400	..	33,261	82,481	7,150
Wynyardton	14 Nov., 1895	10,500	1,879	2,100	70,000	0 0 6	55 6 4	13,276	118	5	..	..	1,859	..
Invicta North	4 Sept., 1895	6,500	750	..	65,000	2·7d.	..	..	152	..	..	..	610	..
Star of Waihi	16 Oct., 1896	6,000	900	..	80,000	2·7d.	..	..	120	4	..	..	615	..
Harp of Tara	6 Aug., 1896	6,262	569	..	83,500	1·6d.	..	..	193	..	..	..	108	..
Harbour View	27 June, 1895	8,000	1,292	..	80,000	3·87d.	14 9 2	..	267	..	1½	4	1,055	..
Hit or Miss (Limited)	13 June, 1895	10,000	167	..	40,000	0 0 1	..	..	48	..	..	..	370	..
Martha Extended	26 Feb., 1896	9,000	1,683	..	90,000	0 0 4	..	..	82	7	..	..	1,089	..
Britannia	4 Sept., 1895	8,000	1,854	..	80,000	0 0 5	0 4 2	..	119	..	..	..	2,298	..
Prince Regent	8 Sept., 1896	6,800	665	..	68,000	2·3d.	..	..	69	4	..	..	405	..
My Sweetheart	16 July, 1896	12,500	1,000	..	100,000	2·4d.	..	..	85	5	..	..	475	..
North	4 Sept., 1895	7,000	1,009	..	70,000	3·4d.	32 10 0	7,800	100	..	..	..	797	..
Southern Cross	18 Sept., 1896	8,000	1,050	..	80,000	3·1d.	..	..	62	7	..	..	392	..
Napier	7 Nov., 1895	12,000	..	..	80,000	..	..	..	61	7	..	..	318	..
Caspian	21 Oct., 1896	8,000	520	..	80,000	1·5d.	..	..	52	4	..	..	180	..
Prospect	15 Dec., 1896	18,000	1,319	..	120,000	2·6d.	93 10 10	22,450	128	3	..	..	1,133	..
Rangipuhi	18 Sept., 1896	3,000	240	..	60,000	0·96d.	..	..	29	3	..	..	159	..
A. J. C.	17 Oct., 1896	6,000	390	..	80,000	1·17d.	..	..	35	5	..	..	187	..
Goodenough	8 Oct., 1896	5,500	360	..	74,000	1·16d.	..	..	58	2	..	..	61	..
Buffalo	2 Aug., 1895	10,000	1,490	..	80,000	4·4d.	43 2 7	..	174	5	..	..	1,361	..
Matawai	12 Sept., 1895	6,000	871	..	60,000	3·4d.	117 10 0	28,200	84	3	..	..	811	..
Look-out	22 Aug., 1896	3,000	220	..	60,000	0·88d.	..	..	36	3	..	..	172	..
Nil Desperandum	20 Sept., 1895	16,000	2,270	..	160,000	3·4d.	91 9 10	21,958	296	..	5	12	1,238	..
Sybil	16 July, 1896	8,000	550	..	80,000	1·6d.	..	..	161	5	..	..	435	..
Pukewhau	20 Sept., 1895	6,000	1,494	..	60,000	5·9d.	..	500	219	6	61	19	1,138	..
Golden Anchor	14 Aug., 1895	13,000	1,134	..	130,000	0 0 2	532 17 1	..	396	7	..	..	1,907	..
Moa	2 Sept., 1896	8,000	500	..	80,000	0 0 1½	..	..	126	4	..	..	257	..
Evening Star	6 Aug., 1896	8,000	850	..	80,000	0 0 2½	..	..	50	6	..	..	354	..
Bay View	7 May, 1896	3,000	200	..	60,000	0·8d.	..	..	180	..	19	50	354	..
Great United	10 Oct., 1895	6,500	1,181	..	65,000	4·3d.	39 11 8	9,500	110	3	..	..	1,032	..
Cuvier Light	14 Aug., 1896	7,000	700	..	70,000	2·1d.	..	..	52	5	..	..	218	..
Jersey	9 Sept., 1896	4,000	290	..	80,000	0·87d.	..	..	46	3	..	..	153	..
Norena	17 Jan., 1896	7,300	750	..	73,000	2·4d.	..	..	95	3	..	..	566	..
West Derby	21 Oct., 1896	7,000	612	..	70,000	2·1d.	..	..	80	6	..	..	190	..
Fortuna No. 2	16 July, 1896	7,500	750	..	75,000	2·4d.	..	..	124	6	..	..	438	..
Asteroid	26 Sept., 1895	8,000	1,062	..	80,000	3·2d.	94 16 7	..	122	5	..	..	1,039	..
Invicta	11 July, 1895	7,500	2,257	..	75,000	7·2d.	118 4 9	..	287	3	190	370	2,473	..
Royal Shield	2 Oct., 1896	..	..	..	76,000	..	..	..	103	8	..	..	624	..
Waitekauri Queen	27 Sept., 1895	7,500	..	..	50,000	..	..	..	81	4	..	..	456	..
Ulysses	2 Oct., 1896	10,000	..	..	80,000	..	..	..	79	7	..	..	577	..
Diadem	17 May, 1896	..	..	..	75,000	..	..	..	101	4	..	..	780	..

Freedom	26 Oct.,	1895	12,000	192	..	80,000	0 0 1	141 0 0	400	93	4	15	42	1,556	..
Huanui	21 Aug.,	1895	7,500	606	..	50,000	0 0 3	18 11 8	..	177	4	..	..	1,200	..
Young New Zealand	31 Oct.,	1895	9,750	264	..	65,000	0 0 1	7 1 8	..	145	4	..	..	2,347	..
Great Kapanga	26 Oct.,	1895	9,600	525	..	64,000	0 0 2	8 10 10	..	153	4	..	..	1,510	..
Maori Dream	21 Aug.,	1895	9,000	250	..	60,000	0 0 1	..	..	152	8	..	..	1,532	..
Oceania	3 Oct.,	1895	7,500	219	..	60,000	0 0 1	31 9 9	..	169	4	..	..	1,504	..
Princess May	21 Dec.,	1895	13,500	331	..	90,000	0 0 1	44 2 9	..	122	6	..	..	1,373	..
Conservative	23 June,	1896	8,250	229	..	55,000	0 0 1	..	..	82	5	..	..	939	..
Chelt	17 Sept.,	1895	6,250	412	..	50,000	0 0 2	4 3 4	..	99	3	..	..	1,100	..
Day Dawn	24 Sept.,	1895	12,000	..	..	60,000	..	..	..	126	2	..	..	852	..
Nuhaka of Tararu	24 Sept.,	1896	3,500	..	1,750	70,000	..	..	..	37	..	..	..	140	..
Prince of Waihi	9 July,	1896	8,000	475	..	80,000	0 0 0¼	..	..	40	1	..	..	364	..
Golden Hill Extended	11 July,	1895	8,850	2,064	..	88,500	6·6d.	57 5 10	13,200	272	3	4	11	1,988	..
Mount Aurum	31 Jan.,	1896	8,000	700	..	70,000	2·1d.	..	..	107	3	..	..	604	..
Empress	30 Oct.,	1895	4,126	427	..	82,511	1·2d.	..	..	242	7	..	..	655	..
Aorere	22 Aug.,	1895	6,000	900	..	60,000	3·6d.	..	..	200	4	..	..	801	..
Club	17 Oct.,	1896	7,000	400	800	70,000	0 0 4⅘	..	..	49	4	..	..	156	..
Russell	31 July,	1896	9,000	..	..	90,000	..	..	..	100	3	..	..	240	..
Wairoa	29 Aug.,	1896	10,500	..	..	105,000	..	..	..	64	5	..	..	325	..
Arawata	29 Sept.,	1896	8,000	..	..	80,000	..	..	..	64	4	..	..	247	..
Waitekauri Junction	2 Oct.,	1896	8,000	..	..	80,000	..	..	..	87	..	..	..	85	..
Grafton United (Limited)	10 Dec.,	1896	65,000	..	58,500	65,000	..	..	..	26	..	..	..	38	..
Whakamarama Gold-mining Syndicate (Limited)	28 Oct.,	1896	1,000	..	..	1,000	0 10 0	75 0 0	..	15	..	..	..	188	..
Prince of Wales	20 Aug.,	1896	..	..	..	75,000	..	..	..	82	..	..	..	385	..
Waihi Welcome	14 Aug.,	1896	..	..	..	95,599	..	..	..	126	..	..	..	119	..
Fiery Cross	20 Aug.,	1896	..	..	..	70,000	..	..	..	154	7	..	..	553	..
Trilby	29 Aug.,	1896	..	..	..	75,000	..	..	..	72	4	..	..	331	..
Tararu Extended	14 Aug.,	1896	..	..	..	58,000	..	..	..	54	..	..	..	183	..
Star of Waitekauri	15 April,	1896	..	..	..	86,500	..	..	..	75	7	..	..	1,597	..
New Golconda	22 Aug.,	1895	7,500	3,233	..	75,000	0 0 8	200 15 4	..	208	17	..	..	2,921	..
Nestor	28 May,	1896	4,106	587	..	54,750	0 0 1	165 16 8	..	106	2	..	..	405	..
Mount Argentum Gold and Silver	23 Nov.,	1896	4,000	200	..	80,000	0 0 0⅜	..	..	90	..	..	..	49	..
Golden Caledonia	11 Sept.,	1896	6,000	425	..	60,000	..	..	..	65	3	..	..	279	..
Golden Waitekauri	18 Sept.,	1896	10,000	745	..	100,000	..	..	..	82	5	..	..	426	..
Fabulous	16 July,	1896	6,000	500	..	60,000	..	..	..	88	3	..	..	337	..
Wheal Bassett	10 July,	1896	6,500	1,050	..	65,000	..	..	..	62	6	..	..	865	..
Four in Hand	4 Sept.,	1895	6,000	1,005	..	60,000	0 0 2	..	..	167	4	..	..	1,153	..
Deep Lead	24 Aug.,	1896	5,250	688	..	70,000	0 0 1	291 13 4	..	12	4	..	..	443	..
Excelsior	29 Aug.,	1896	7,369	1,092	..	49,125	0 0 2	97 14 2	..	82	5	..	..	915	..
Waihi Monument	10 Oct.,	1895	25,000	2,200	..	100,000	..	..	..	152	4	..	..	1,370	..
Midas	4 Sept.,	1895	9,000	1,600	..	60,000	0 0 2	244 3 4	..	151	6	..	..	1,371	..
Magazine	16 Oct.,	1895	5,750	1,283	..	57,550	0 0 3	148 10 1	500	91	5	..	..	1,095	..
Kaitoke Gold and Silver	23 Nov.,	1896	4,000	200	..	80,000	6·1d.	..	..	60	3	..	..	97	..
King of Waihi	14 Nov.,	1895	10,000	1,200	..	80,000	..	..	..	150	..	..	..	731	..
Juno	3 Mar.,	1896	7,120	1,371	..	7,119	0 0 2	160 11 0	250	103	4	..	..	1,167	..
Jocelyn	16 July	1896	6,400	515	..	64,000	..	..	..	58	4	..	..	479	..
Golden Hill	18 May,	1895	7,500	1,875	..	50,000	0 0 9	65 11 8	150	137	7	..	..	1,724	..
Golden Horn	25 June,	1896	6,000	426	..	60,000	..	..	..	152	5	..	8	412	..
Marco Polo	17 Oct.,	1896	3,350	350	..	67,000	..	..	..	68	3	..	..	276	..
Jay Gould	7 Dec.,	1896	7,500	400	..	100,000	..	..	..	69	4	..	..	125	..
Hinton	11 Sept.,	1896	6,500	592	..	65,000	..	..	..	64	6	..	..	339	..
Heitman Freehold	7 Nov.,	1895	10,000	2,321	..	80,000	0 0 1	..	27,074	111	..	..	..	2,180	..
Pandora	29 July,	1896	8,000	1,200	..	80,000	..	..	..	138	6	..	..	766	..

STATEMENT of AFFAIRS of MINING COMPANIES, as published in accordance with the Mining Companies Acts, 1891 and 1894—*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 up per Share.	Arrears of Calls.	Number of Shares forfeited.	Number of Shareholders at present.	Number of Men employed	Quantity and Value of Gold or Silver produced since Registration.		Total Expenditure since Registration.	Total Amount of Dividends paid.
											Quantity.	Value.		
AUCKLAND DISTRICT—*continued*														
		£	£	£		£ s. d.	£ s. d.				Oz.	£	£	
Plunger	23 July, 1896	6,800	562	..	68,000	..	..	..	73	5	..	..	406	..
Portsea (Limited)	14 Mar., 1894	11,250	776	4,500	45,000	0 0 3½	6 1 8	..	117	..	..	..	770	..
Sovereign	11 Mar., 1896	15,000	1,500	..	100,000	..	..	..	220	2	..	..	933	..
Stanley	12 July, 1895	8,328	1,763	..	83,285	0 0 4	96 13 1	..	218	5	..	..	1,556	..
Queen of Waihi	3 Sept., 1895	25,000	2,000	..	100,000	0 0 1	..	..	260	..	..	..	1,640	..
Germanic	16 July, 1896	6,000	900	..	60,000	..	..	..	126	7	..	..	471	..
Golden Lead	12 July, 1895	16,800	1,450	..	168,000	0 0 1	246 5 11	..	184	2	..	..	1,188	..
Golden Spur	16 Oct., 1895	9,750	1,500	..	65,000	..	..	..	121	3	..	..	1,417	..
Cuirassier	18 June, 1896	6,000	500	..	60,000	..	..	..	111	5	..	..	434	..
Aotea Gold and Silver	28 Nov., 1896	4,000	200	..	80,000	6·10d.	..	..	60	4	..	..	73	..
Ajax	24 Oct., 1895	13,500	1,275	..	90,000	..	..	..	151	5	..	..	697	..
Hercules	3 Oct., 1895	8,400	1,350	..	84,000	0 0 1	..	..	178	8	..	..	1,272	..
Original Great Barrier Gold and Silver	23 Nov., 1896	6,000	523	..	80,000	..	..	..	40	..	..	..	266	..
Orlando (Limited)	2 April, 1890	10,000	5,920	..	40,000	0 2 9	0 4 2	..	85	5	822	2,071	7,971	..
Kauri Freehold Gold Estates (Limited)	1 June, 1896	250,000	60,000	190,000	250,000	1 0 0	..	..	425	115	..	..	6,198	..
Waitekauri Reefs	12 Nov., 1896	..	..	..	78,000	..	..	..	68	6	..	..	471	..
Devon	19 Oct., 1896	..	..	..	72,500	..	..	..	67	4	..	..	240	..
Alert	12 Dec., 1895	6,325	783	1,000	63,250	0 0 8	..	32,200	144	2	..	..	661	..
Bunker's Hill (Limited) ..	21 June, 1896	15,000	4,500	6,000	60,000	0 3 6	62 7 0	..	354	22	83	247	6,253	..
Crown Royal	17 July, 1896	2,750	250	300	55,000	0 0 2⅖	..	..	54	2	..	..	200	..
Gem of the Tiki	7 Aug., 1896	2,250	285	600	45,000	0 0 4⅘	..	..	46	3	..	..	205	..
New Mint	3 Sept., 1896	6,000	656	900	60,000	0 0 7⅕	..	..	66	3	..	..	169	..
Ake Ake	6 Oct., 1896	7,500	775	..	75,000	..	..	..	63	4	..	..	216	..
Ptolemy	2 Sept., 1896	8,000	798	..	80,000	..	..	..	69	4	..	..	532	..
Waihi Extended (Limited) ..	12 Aug., 1895	149,967	1,994	..	149,402	0 1 0	..	..	385	..	..	..	2,305	..
Phœnix	18 Sept., 1895	10,200	1,089	..	68,000	0 0 8	178 12 3	3,228	164	5	..	..	1,048	..
Queen of Puru	14 Aug., 1896	4,000	200	..	72,000	0 1 0	..	..	40	2	..	..	230	..
Victoria	2 Sept., 1890	23,437	..	..	117,183	0 2 5	..	..	319	48	..	8,554	17,698	..
Waitekauri United (Limited) ..	22 April, 1896	25,000	12,500	..	125,000	1 0 0	..	..	178	25	..	..	4,606	..
Grace Darling (Limited) ..	30 Jan., 1894	30,000	4,853	..	60,000	0 6 6	..	..	223	9	71	74	6,940	..
Woodstock (Limited)	30 July, 1895	150,000	37,500	112,500	150,000	1 0 0	..	..	467	110	13,012	5,958	37,938	..
Waihi-Silverton Extended (Ltd.)	— Feb., 1895	..	..	..	60,000	1 0 0	..	..	119	75	..	10,110	31,459	..
Waihi South (Limited)	18 June, 1896	18,000	2,867	..	120,000	0 1 4½	246 0 1	50	185	14	..	..	2,800	..
Sheridan	19 Mar., 1895	7,500	1,042	..	50,000	0 0 5	..	..	147	19	492	1,491	3,804	..
Maritana	29 Oct., 1895	8,000	1,283	..	64,000	0 0 2	..	..	97	5	..	..	1,229	..
Hauraki North (Limited) ..	31 July, 1895	119,150	3,742	59,657	119,150	1 0 0	..	..	269	19	..	399	4,274	..
Waverley	13 Dec., 1894	6,000	2,150	..	60,000	0 0 7	..	..	137	5	..	..	2,041	..
Zealandia	12 July, 1895	15,383	2,032	..	153,827	0 0 2	104 17 2	85	371	17	..	..	2,358	..
Kapai-Vermont	9 Oct., 1893	21,667	3,767	17,900	100,000	0 4 4	..	8,457	330	34	9,755	24,986	22,043	3,350
Ohui	11 April, 1896	12,000	625	..	80,000	0 0 6	..	..	128	..	..	..	624	..
May Queen Extended	12 Nov., 1896	15,000	1,417	..	100,000	0 0 5⅘	..	..	68	6	..	34	1,499	..

Aurora Gold-mining	10 Sept.,	1895	6,000	451	..	60,000	0 0 2	49 8 5	11,861	172	4	..	19	970	..
Komata Gold-mining	31 July,	1896	9,500	..	..	95,000	..	..	..	95	5	..	..	652	..
Tairua Gold-mining	12 Nov.,	1896	5,050	..	..	50,500	..	..	..	62	4	..	..	282	..
Golden Tokatea	25 Oct.,	1895	10,000	..	..	100,000	..	..	..	120	4	..	..	894	..
Karaka Queen..	27 July,	1896	3,175	..	..	63,500	..	..	..	95	5	..	18	376	..
Duke of Argyle	..		5,850	..	..	58,500	..	..	..	131	..	..	..	279	..
Grand Triple	21 Oct.,	1896	3,200	..	..	64,000	..	..	..	60	5	..	..	311	..
McIsaacs	17 Sept.,	1896	7,975	..	..	79,000	..	..	..	80	7	..	..	551	..
Golden Crown	19 Nov.,	1895	..	..	..	60,000	..	..	..	117	4	..	..	539	..
New Puhipuhi	17 Dec.,	1896	5,000	..	..	100,000	..	..	..	33	..	..	..	250	..
Port Charles	17 Dec.,	1896	4,000	..	..	80,000	..	..	..	24	2	..	..	200	..
Southern Star Gold-mines (Ltd.)	23 Oct.,	1895	..	..	..	..	..	..	..	..	34	..	..	..	..
Tararu Creek Gold-mining (Ltd.)	7 Aug.,	1895	..	..	..	..	..	..	..	..	68	2,095	3,931	..	..
Tokatea Consols Gold-mines (Ltd.)	21 May,	1896	..	..	..	..	..	..	..	..	13	..	..	..	..
Kapanga Gold-mining (Limited)..	3 Oct.,	1893	..	..	..	..	..	..	..	..	103	..	..	..	..
Komata Queen (Limited) ..	21 April,	1896	..	..	..	..	..	..	..	..	9	..	..	..	..
Komata Reefs Gold-mining (Ltd.)	13 Mar.,	1895	..	..	..	..	..	..	..	..	39	..	..	..	..
Kathleen Crown (Limited) ..	27 Feb.,	1896	..	..	..	..	..	..	..	..	52	..	..	..	..
Blagrove's Freehold Gold-mining (Limited)	4 May,	1895	..	..	..	..	..	..	..	..	41	..	..	..	..
Maoriland Gold-mines (Limited)..	5 June,	1896	..	..	..	..	..	..	..	..	9	..	..	349	..
Irene (Hauraki) Gold-mines (Ltd.)	5 June,	1896	..	..	..	..	..	..	..	..	12	..	..	941	..
New Alburnia Gold-mining (Ltd.)	..		..	..	62,851	62,851	1 0 0	..	..	164	25	..	411	2,836	..
Hauraki Golden Bay Mines (Ltd.)	30 July,	1896	..	..	..	..	..	..	..	..	3	..	..	465	..
Try Fluke Gold-mining (Limited)	3 Dec.,	1889	15,250	2,775	275	61,000	0 1 0	..	..	120	37	23,122	57,087	50,897	55,470
Central Gold-mining	11 Dec.,	1895	14,000	1,050	..	70,000	..	..	..	199	8	..	..	1,585	2,908
Victor..	9 Feb.,	1895	8,000	1,083	..	80,000	0 0 2⅛	..	..	139	..	..	..	1,255	..
Irving..	17 Dec.,	1896	9,950	1,185	..	99,500	2·8d.	..	..	101	4	..	..	371	..
Thames-Hauraki Goldfields (Ltd.)	..		275,000	..	..	275,000	..	..	..	..	51	..	..	7,246	..
Preece's Point Proprietary (Ltd.)	21 Aug.,	1895	..	..	..	..	..	..	..	..	51	..	..	..	..
Inglewood Gold-mining	26 Oct.,	1895	13,000	1,050	..	65,000	..	..	..	69	6	..	..	1,050	..
Monument Extended Gold-mining (Limited)	23 June,	1896	10,000	417	..	100,000	0 0 1	216 8 11	..	58	2	..	..	363	..
Oakley Gold-mining (Limited) ..	5 Sept.,	1896	14,700	..	..	98,000	..	..	..	61	3	..	..	103	..
Tokatea of Hauraki (Limited) ..	8 May,	1895	..	..	..	..	..	..	..	..	35	77	223	9,847	..
Kathleen (Limited)	26 Sept.,	1895	..	..	..	..	..	..	..	..	42	..	..	9,125	..
Hauraki (Limited)	5 Dec.,	1894	..	..	..	..	0 2 6	..	..	..	180	62,858	193,078	42,714	..
Royal Oak of Hauraki (Limited)..	28 Mar.,	1895	..	..	..	..	..	..	..	..	40	349	885	8,221	..
Success Gold-mines (Limited) ..	9 Oct.,	1895	..	..	..	..	..	..	..	..	43	127	369	10,810	..
New Hauraki Gold Properties (Limited)	26 July,	1895	..	..	..	..	..	..	..	..	32	..	..	7,728	..
Scotty's Hauraki Gold-mining (Ltd)	29 Jan.,	1895	..	..	..	..	..	..	..	..	36	67	198	12,506	..
Golden Pah, Hauraki (Limited) ..	7 Aug.,	1896	..	..	..	..	..	..	..	..	37	..	..	1,088	..
Rosebery	31 Jan.,	1896	8,000	1,200	..	80,000	3·6d.	..	..	116	..	..	..	1,200	..
Star of Wynyardton	7 May,	1896	9,600	760	3,150	64,000	4·4d.	..	..	102	..	..	..	760	..
New Tokatea	26 Aug.,	1895	8,000	1,083	..	80,000	0 0 3¼	..	..	235	..	19	52	1,178	..
New Zealand Exploration (Ltd.)	10 Jan.,	1896	125,200	..	..	75,200	..	..	..	..	40	..	..	5,400	..
New Zealand Crown Mines (Ltd.)	27 June,	1896	200,000	..	100,000	200,000	1 0 0	..	..	..	162	9,752	19,715	18,964	..
Aroha Gold-mines (Limited) ..	19 May,	1896	100,000	40,000	60,000	100,000	1 0 0	..	..	..	65	98	282	10,082	..
Whangamata	3 Dec.,	1896	625	..	..	75,000	..	73 0 0	..	65	..	..	9	28	..
May Queen Hauraki Gold-mining (Limited)	2 July,	1896	..	3,088	82,000	..	..	..	..	..	47	318	847	3,088	..
Talisman (Limited)	5 Nov.,	1894	20,000	3,104	4,063	80,000	0 1 9½	0 4 2	..	201	23	..	2,391	6,851	..
Lincoln	29 Oct.,	1896	6,350	400	..	63,500	..	..	..	55	4	..	..	273	..

STATEMENT of AFFAIRS of MINING COMPANIES, as published in accordance with the Mining Companies Acts, 1891 and 1894—*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 up per Share.	Arrears of Calls.	Number of Shares forfeited.	Number of Shareholders at present.	Number of Men employed.	Quantity and Value of Gold or Silver produced since Registration.		Total Expenditure since Registration.	Total Amount of Dividends paid.
											Quantity.	Value.		
AUCKLAND DISTRICT—*continued.*														
		£	£	£		£ s. d.	£ s. d.				Oz.	£	£	£
Waitekauri Cross (Limited) ..	6 Aug., 1896	75,000	25,000	..	75,000	..	..	..	..	30	..	..	1,298	..
Norman Proprietary (Limited) ..	2 July, 1896	..	..	..	..	..	..	..	..	12	..	..	478	..
Waitekauri Union Claims (Ltd.) ..	6 Aug., 1896	23,414	8,780	230,000	253,414	0 7 6	125 0 0	..	34	15	..	..	1,633	..
New Zealand Consolidated (Ltd.)	29 May, 1896	50,000	50,000	..	50,000	1 0 0	..	..	186	5	..	..	3,198	..
Inkermann Combined Gold-mines (Limited)	29 June, 1896	25,000	25,000	141,500	166,500	1 0 0	660 0 0	..	26	38	..	..	2,851	..
Totals	..	5,377,225	866,336	1,807,234	29,554,501	..	14,470 11 4	334,634	41,511	4,360	284,420½	1,284,862	1,584,713	371,626
NELSON DISTRICT (INCLUDING WEST COAST).														
Keep it Dark Quartz (Limited) ..	2 Mar., 1874	20,000	6,208	10,000	20,000	0 16 2½	..	..	62	30	64,655	251,435*	278,408	111,417
No. 2 South Keep it Dark (Ltd.)	13 June, 1887	12,000	10,900	..	24,000	0 9 1	56 17 6	..	58	4	5,998	23,839	35,131	8,600
Humphreys Hydraulic Sluicing (Limited)	1 June, 1896	145,000	50,000	95,000	145,000	1 0 0	..	..	108	13	103	402	97,088	..
Julian (Limited)	17 June, 1893	..	..	..	24,000	..	39 10 2	..	..	..	..	..	..	..
Exchange Quartz (Limited) ..	23 May, 1890	..	3,597	..	24,000	0 3 1	..	125	51	2	0⅘	3	3,656	..
Welcome (Limited)	24 July, 1896	100,000	15,000	85,000	100,000	1 0 0	..	..	142	13	..	..	2,447	..
Lord Edward (Limited) ..	13 Nov., 1883	12,000	3,348	12,000	24,000	0 13 0½	200 0 0	..	49	6	33	134	3,468	..
Big River (Limited)	11 April, 1891	12,000	600	..	24,000	0 0 6	..	..	65	28	19,317	77,761	40,185	40,500
Golden Treasure Extended (Ltd.)	4 Dec., 1888	12,000	5,234	..	24,000	0 6 0	..	4,284	24	6	1,078	4,217	8,901	900
Mont D'Or Gold-mining and Water-race (Limited)	25 July, 1882	12,000	10,800	..	12,000	0 18 0	..	..	23	22	19,196	74,068	61,265	24,600
United Alpine Quartz-mining (Ltd.)	7 Aug., 1883	32,000	28,853	16,000	32,000	0 18 1	79 17 6	..	117	41	379	1,458†	6,381†	74,267
Cock Sparrow Gold-dredging (Ltd.)	28 April, 1894	1,575	1,050	8,925	21,000	0 1 0	8 5 0	300	35	9	1,981	7,474	8,294	525
Lyell Creek Extended Quartz (Ltd.)	2 Aug., 1881	24,000	15,171	12,000	48,000	0 6 4	29 3 8	..	108	6	48	186	15,681	..
Addisons Gold-sluicing (Limited)	11 Sept., 1894	3,300	1,211	1,100	3,300	Various	382 15 0	..	26	4	..	..	1,432	..
Venture (Limited)	30 April, 1895	3,750	..	..	..	..	..	..	20	10	966	..	2,851	969
Parapara Hydraulic Sluicing and Mining (Limited)	18 June, 1892	49,400	22,910	19,200	298	Various	150 0 0	..	44	9	525	2,061	28,737	..
Johnstone's United (Limited) ..	27 June, 1881	18,585	12,409	1,668	20,000	0 15 11½	..	8,209	..	..	..	..	..	1,916
Nelson Creek (Limited)	7 July, 1892	26,050	4,890	21,000	26,050	1 0 0	..	185	104	1	274	1,068	5,958	..
Minerva (Limited)	24 Feb., 1890	12,000	5,543	400	24,000	0 5 1	197 6 1	280	16	..	..	..	..	..
Matakitaki Gold-dredging (Ltd.) ..	7 July, 1892	2,000	1,848	..	2,000	0 19 0	24 10 0	44	42	10	2,084	8,068	9,500	..
Buller Gold-dredging (Limited) ..	14 Nov., 1894	1,500	600	..	12,000	0 1 0	..	27	12	..	2,226	8,645	6,138	1,800
Golden Lead (Limited)	30 Oct., 1890	12,000	8,599	..	24,000	0 7 3	100 18 6	..	38	4	2,170	8,727	16,195	..
Hercules Quartz (Limited) ..	22 Nov., 1889	24,000	7,197	..	24,000	0 6 0	2 18 4	..	80	19	3,411	13,629	21,430	3,600
Consolidated Goldfields of New Zealand (Limited)	22 Feb., 1896	185,000	185,000	..	185,000	1 0 0	..	..	..	151	2,082	8,487	113,166	..
Southern Cross Gold-mining (Ltd.)	22 Mar., 1889	14,000	1,984	1,400	14,000	0 2 0	..	8,916	26	..	..	..	1,950	..
Swanston Gold-mining (Limited)	28 July, 1894	1,000	1,000	100	22	50 0 0	..	..	16	4	..	100	1,900	..
Wakamarina Golden Bar (Limited)	Sept., 1894	24,000	727	1,000	24,000	0 1 5½	223 13 7	2,388	51	4	..	..	782	..
Cumberland Gold-mining (Ltd.) ..	10 July, 1890	24,000	6,298	..	24,000	0 5 6	302 7 6	..	102	6	11,261	45,758	38,955	13,800
Dillon Extended Gold-mining (Limited)	14 May, 1896	20,000	1,963	..	40,000	0 1 0	37 2 6	..	63	4	51	202	2,128	..
Kumara Long Tunnel (Limited) ..	16 May, 1882	8,000	7,433	..	16,000	0 9 3½	..	3,440	14	..	..	..	..	5,019
Shamrock Lead (Limited) ..	29 Sept., 1892	11,800	5,423	5,350	11,800	19/ & 16/	411 12 0	120	168	15	1,931	7,626	15,367	..
Totals	..	822,960	425,796	290,143	972,470	..	2,247 17 4	28,318	1,664	421	139,769⅘	545,348	827,394	287,913

* Amount received for crushing, sales, &c., £10,974. † Preceding year.

OTAGO DISTRICT.

Parrawa Water-supply and Gold-mining (Limited)	1 July,	1896	1,500	824	..	1,500	*	50 0 0	..	..	..	..	..	515	..
Enterprise Gold-dredging ..	24 Aug.,	1891	2,000	2,000	..	2,000	1 0 0	..	..	16	7	1,996	7,683	8,644	900
Jutland Flat (Waipori) (Limited)	2 July,	1890	15,000	4,000	3,750	15,000	8/ & 15/	..	..	37	10	4,896	19,122	13,492	4,125
Upper Waipori Alluvial Gold-dredging (Limited)	3 Sept.,	1889	12,000	5,950	5,000	24,000	0 8 6	..	..	83	18	6,995	26,830	24,149	3,600
Roxburgh Amalgamated Mining and Sluicing (Limited)	2 Mar.,	1889	29,152	12,737	15,000	29,152	18/ & £1	..	825	141	30	11,119	42,947	42,826	13,471
Manorburn Gold-dredging (Ltd.)..	28 Jan.,	1896	3,000	3,000	..	3,000	1 0 0	..	..	7	7	174	669	4,413	..
Roxburgh Gold Steam-dredging (Limited)	20 Aug.,	1891	2,500	2,000	2,500	5,000	0 16 0	..	..	55	6	2,807	10,795	9,612	..
Ettrick Gold Steam-dredg. (Ltd.)	29 Aug.,	1890	2,500	1,937	2,000	4,500	0 15 6	..	..	47	6	2,982	11,478	11,511	1,462
Golden Gate Dredging (Limited)	13 Mar.,	1895	2,500	2,500	..	2,500	1 0 0	..	..	29	7	1,145	4,419	5,638	1,000
Golden Treasure Dredging (Ltd.)	19 July,	1893	1,500	1,384	1,500	3,000	1 0 0	..	124	19	7	2,934	11,526	8,749	2,660
Golden Run (Limited)	29 June,	1891	4,000	4,795	2,000	6,000	1 0 0	2 10 0	1,085	66	25	4,083	15,720	15,960	..
Morning Star	26 Jan.,	1895	24,000	2,575	12,000	24,000	Various	32 3 5	487	91	52	3,567	14,475	13,218	3,212
Golden Site (Limited)	21 Nov.,	1893	30,000	6,615	16,900	30,000	0 15 11	2 1 8	12,404	90	6	1,149	4,436	10,744	750
Phœnix Water-race (Registered)..	12 Oct.,	1867	1,500	1,500	1,500	1,000	1 10 0	..	..	22	..	..	..	†	5,850
Blue Spur and Gabriel's Gully Consolidated (Limited)	1 Feb.,	1888	89,066	30,000	60,000	91,266	1 0 0	..	..	..	45	22,393	87,127	114,414	11,659
Clyde Dredging (Limited) ..	17 May,	1895	3,850	3,840	150	80	50 0 0	10 0 0	..	43	7	306	1,176	5,286	..
Sailor's Gully (Waitahuna) (Ltd.)	3 June,	1896	1,807	3	1,800	1,807	0 10 0	..	..	8	4	41	158	643	..
Ourawera (Limited)	23 May,	1895	1,600	1,600	..	1,600	1 0 0	..	..	14	11	512	2,022	4,069	..
Bakery Flat Sluicing (Limited) ..	10 Sept.,	1896	2,000	650	500	2,500	0 6 6	..	..	25	8	..	..	695	..
Westralia and New Zealand Gold Explorers (Limited)	1 Jan.,	1896	52,502	2,625	31,501	210,007	0 3 3	..	..	..	25	200	784	3,689	..
Glenrock Consolidated (Limited)	1 July,	1895	45,000	22,500	..	450,007	0 9 0	..	..	2,000	25	1,195	4,744	9,363	..
Sew Hoy Big Beach (Limited) ..	9 Dec.,	1889	87,750	87,750	72,500	54,000	1 10 0	..	225	177	24	20,822	80,377	63,608	16,138
Amalgamated Waipori Deep Lead (Limited)	20 Dec.,	1889	12,050	5,616	6,150	12,050	1 0 0	..	713	102	12	2,599	10,002	10,236	..
Dunedin Gold-dredging (Limited)	1 Sept.,	1881	8,700	7,540	..	8,700	0 17 4	..	..	70	9	14,807	57,001	42,617	14,835
Edina Gold-dredging (Limited)	10 July,	1893	2,500	1,900	600	5,000	0 10 0	..	..	9	9	1,196	4,574	5,366	..
Teviot Gold-mining and Sluicing (Limited)	4 Feb.,	1895	875	875	..	1,750	0 10 0	..	..	12	..	..	..	1,468	..
Barewood Quartz-mining (Limited)	18 Sept.,	1895	420	420	2,400	84	5 0 0	..	..	25	18	900	3,219	3,478	..
United Hercules Hydraulic-sluicing (Limited)	13 Aug.,	1888	12,000	5,252	6,500	12,000	1 0 0	143 1 0	500	116	13	7,225	28,332	25,199	8,400
Island Block (Limited)	28 Nov.,	1888	56,187	21,917	..	56,187	1 0 0	..	..	..	..	..	5,013‡	32,000	..
Crystal Gold-mining (No Liability)	Dec.,	1895	4,800	638	..	4,800	0 2 9	22 10 0	..	11	2	..	181	819	..
Nevis Gold-dredging (Limited) ..	10 Nov.,	1896	2,000	780	300	2,000	0 11 0	155 0 0	..	20	8	..	..	1,035	..
Moonlight Sluicing (Limited) ..	14 May,	1894	2,000	1,352	450	2,000	0 17 6	3 15 0	..	24	3	269	1,035	2,426	100
Achilles Goldfields (Limited) ..	15 Mar.,	1893	10,721	10,721	80,000	725,771	0 2 6	..	..	..	90	7,182	27,588	..	..
Otago Gold-dredging (Limited) ..	20 May,	1895	4,500	2,000	2,000	4,000	1 0 0	..	..	39	8	808	3,126	3,065	600
Gallant Tipperary Quartz-mining Company (Limited)	— April,	1883	12,000	6,100	..	24,000	0 5 1	1,128 2 6	750	43	2	4,393	17,848	22,242	1,500
New Eldorado Sluicing Co. (Ltd.)	17 April,	1893	2,902	1,198	1,570	2,902	1 0 0	0 17 5	..	57	11	..	..	985	..
Totals	..		546,382	267,094	328,571	1,823,163	..	1,550 1 0	17,113	3,498	515	128,695	504,407	522,174	90,262

* Amount paid up per share: 12s. 6d. on 1,097, 7s. 6d. on 200, and 6s. 3d. on 203.
‡ During the year.
† The company not being directly engaged in gold-mining, is unable to give any reply to this question other than that the whole of the company's capital was expended in the purchase of the company's property.

In addition to the companies named in the foregoing table, the following were registered up to the 31st March, 1897:—

Company.	Capital.
Auckland—	£
Auckland Exploration Company	5,000
Anglo-New Zealand Mines Investment	100,000
Alpine	3,600
Capstan	4,000
Dover Castle	4,000
Doris	6,000
Eaglehawk	8,000
Grosvenor United (Limited)	2,945
Great Maratoto	2,000
Golden Centre	5,000
Hinemca Hauraki	7,500
Kennedy	6,000
Komata Crown	4,000
King of Omahu	4,000
Lioness	1,000
Mangakino	4,000
Monte Carlo	5,000
Mount Taylor (Limited)	15,000
Mount Lyell	5,700
National	3,000
New Year	5,000
Opal	3,500
Peninsula Freehold	25,000
Rachel	3,000
Silas	4,500
Sceptre	5,000
Salisbury	5,000
Thames Exploration Syndicate of London and New Zealand	25,200
Auckland—*continued.*	
Trojan	7,500
Wealthy Mint	4,500
Wellington—	
Franco-New Zealand Gold-mining Syndicate (Limited)	10,000
Marlborough—	
Wakamarina Gorge and Deep Creek Gold-mining Company (Limited)	24,000
Canterbury—	
Alpha S.C. Syndicate (Limited)	5,000
Barrytown Flat Gold-mining Company	20,000
Otago—	
Beaumont Local Co-operative Gold-mining Company (Limited)	3,000
Deep Stream Amalgo-hydraulic Sluicing Company (Limited)	10,000
Golden Crown Dredging (Limited)	3,500
Golden Lead Gold-dredging	3,500
Lion Rock Gold-dredging Company (Limited)	4,000
Matatapu Hydraulic Elevating and Sluicing Company (Limited)	805
Ophir and Ind Gold-dredging Company (Limited)	3,000
Rock and Pillar Gold-dredging	3,000
Taieri Gold-sluicing (Limited)	10,000
Southland—	
Mataura River Steam Gold-dredging Company	5,000

WATER-CONSERVATION.

During my visits to the Otago and West Coast districts the subject of water-conservation was brought forcibly under my notice, and the importance of the question can hardly be over-estimated. An abundant supply of water is essentially the life of the mining industry in these districts, and, as will be seen by reference to detailed reports elsewhere, the lack of a permanent water-supply has been the cause of the yields of many of the mines not coming up to that high standard which would otherwise have been the case. The supply, more especially in Otago, has during the past summer been very limited, and, this being the case, the fact of the Government having taken the necessary steps for an exhaustive examination into the matter, with a view of ascertaining the best method of storage and delivery of the water-supply of the colony, will be very favourably received by those interested in mining. The report of the officer appointed for this purpose will be anxiously awaited by the miners interested. Having in view the fact that the water of the colony is one of its richest natural assets, and with a view of precluding the possibility of such a valuable asset being acquired by monopolists whose aim will necessarily be to derive individual profit from what should be for the common benefit, a series of suggested conditions, to be inserted in licenses issued in respect to reservoirs in which the storage of any considerable quantity of water is proposed and water-races for the distribution of large quantities of water, was issued for the consideration of Wardens. The suggested conditions are as follows:—

Special conditions to be inserted in licenses for dams of large areas, granted subject to the following reservations in favour of Her Majesty the Queen, her successors, licensees, and assigns, and the conditions following, that is to say:—

Reservations.

Reserving—

(*a.*) The full and free right for all and sundry, Her Majesty's liege subjects, who may now or at any time or times hereafter do so, lawfully to fish and to boat over the site of the dam within described.

(*b.*) All fish now or hereafter being or placed in, upon, or about the site of the said dam.

(*c.*) The full and free right for all and sundry, Her Majesty's liege subjects, to use the site of the said dam, and any Crown lands immediately adjoining thereto, as a place of public recreation and resort.

(*d.*) The full and free right to all the water of the watershed of the site of the said dam.

(*e.*) The full and free right of Her Majesty the Queen, her successors, licensees, and assigns, and to all present or future holders of miner's rights issued pursuant to the gold-fields laws of the colony for the time being in force, to discharge water-tailings and mining *débris* into, along, and upon the watershed of the site of the said dam, and through such watershed on to the said site itself, without being liable to any actions, suit, or other proceeding, or to any claim for an injunction made at the instance of the grantee, his executors, administrators, and assigns.

(*f.*) The right to grant to any person or persons, or body or bodies politic or corporate, being the holders of such miner's rights as aforesaid, who shall be prepared to increase the storage-capacity of the said dam, the right to do all things that may be necessary to increase such storage, as well as to divert such a quantity of water as

may be warranted by such increased storage-capacity, but subject to such terms and conditions as the Warden may see fit to impose, but so that one of such terms and conditions shall be the liability either to pay to the grantee, his executors, administrators, and assigns, a proportionate part of the construction of such dam or such annual sum as shall amount to a fair and reasonable interest on the cost of such construction. Such interest not to exceed £5 per centum per annum by the year.

CONDITIONS.

1. That Her Majesty the Queen, her successors and assigns, may at any time resume the ownership of the said dam upon payment merely of the actual cost of any works of artificial construction actually performed by the grantee, his executors, administrators, and assigns, either on or in connection with the said dam, and without any further payment of any kind whatever. Such actual cost to be fixed in case of dispute by arbitration pursuant to the provisions of "The Public Works Act, 1894," or any statute amending or repealing such Act for the time being in force.

2. In the event of any such resumption, the grantee, his executors, administrators, and assigns shall be entitled to no compensation whatever in respect of any purely natural advantages of which he or they may get the benefit by reason of the within grant.

3. That if the grantee, his executors, administrators, and assigns shall at any time or times hereafter sell, let, or lease, or otherwise dispose of, all or any of the water stored in the site of the said dam to any other person or persons, or body or bodies politic or corporate, for use by such person or persons, or body or bodies politic or corporate, for all or any of the purposes mentioned in section 104 of "The Mining Act, 1891," the price per Government head per week at which such water shall be sold or otherwise disposed of, and the rental per annum at and the terms on which such dam and water, and any races to be hereafter constructed to carry such water, shall be let or leased, shall be fixed by the Warden or Wardens for the time being exercising jurisdiction in the mining district in which such dam and water-races may be situate; and such Warden or Wardens shall have further power from time to time to review, alter, and vary the said price and rental, as well as the said terms and conditions, either by highering or lowering such price or rental, or by varying such terms and conditions, or by making any order of review, alteration, or variation, either of general or particular application, and this notwithstanding anything contained or implied in any lease, agreement of letting or selling, or any other contract relating to the said dams, water, and water-races which may at any time or times be entered into between the grantee, his executors, administrators, and assigns and any other person or persons whomsoever, or body or bodies politic or corporate whatsoever, but so, nevertheless, that such Warden shall not exercise the power of reviewing, altering, or varying in this paragraph contained and reserved, either generally or in reference to any particular price or rental, oftener than once in every three years.

4. In fixing any price or rental or any terms or conditions either originally or by way of review, alteration, or variance the Warden shall be guided by what would be a fair value per week or per annum based on a comparison between the capital invested by the licensee on or in connection with the said water-race and the dams used in connection therewith, and the value of the return or the probable value of any returns from any ground proposed to be worked, having regard also to the hazardous and uncertain nature of the return from capital invested in mining operations.

5. That the grantee, his executors, administrators, and assigns do, within a period of twelve months from the date of the grant of the dam, or such extended period as the Warden aforesaid may from time to time grant, erect on the said dam a well- and efficiently-constructed dam-bank of ft. in length to the satisfaction of any engineer to be appointed by the Warden for the time being as aforesaid, so as to make such dam capable of storing million gallons of water at the least.

6. The grantee, his executors, administrators, and assigns shall pay all reasonable fees incurred by the Warden as aforesaid in appointing any such engineer to inspect the site of the said dam.

7. The grantee, his executors, administrators, and assigns shall, within a period of twelve months, calculated from the date of the grant of the dam referred to in the within grant, or within such extended period as the Warden aforesaid may from time to time grant, well and effectually connect such dam, by a siphon consisting of iron pipes, with the dam described in the certificate of registration therefor No. , and dated .

8. None of the water stored or capable of being stored in the said dam shall be allowed to run to waste, and if such water is allowed to run to waste it may be the subject-matter of a grant by such Warden as aforesaid to any person of persons, or body or bodies politic or corporate, being the holders of such miner's rights as aforesaid.

It is hereby declared that the foregoing reservations and conditions have been made in the public interest, and are both necessary and desirable for the public good within the meaning of section 129 of "The Mining Act, 1891."

Special conditions to be inserted in licenses for water-races of large dimensions, granted subject to the following reservations in favour of Her Majesty the Queen, her successors and assigns, and to the conditions following, that is to say:—

RESERVATIONS.

Reserving—

(*a.*) The full and free right for all and sundry, Her Majesty's liege subjects, who may now or at any time or times hereafter do so, lawfully to fish over and along the line of

the water-race described in the within license and the waters at any time or times running therein and over any Crown lands immediately adjoining thereto.

(*b.*) All fish for the time being in, upon, or about the line of the said water-race, or the waters at any time or times running therein.

CONDITIONS.

1. That Her Majesty the Queen, her successors and assigns, may at any time resume the ownership of the aforesaid water-race, as well as the waters authorised to be diverted thereby, upon payment merely of the actual cost of any works of artificial construction to be performed by the grantee, his executors, administrators, or assigns on or in connection with the said water-race, and without any further payment of any kind whatsoever. Such actual cost to be fixed in case of dispute by arbitration pursuant to the provisions of "The Public Works Act, 1894," or any statute amending or repealing such Act for the time being in force.

2. In the event of any such resumption, the licensee, his executors, administrators, and assigns shall be entitled to no compensation whatever in respect of any purely natural advantages of which he or they may get the benefit by reason of the within license.

3. That if the licensee, his executors, administrators, and assigns shall at any time or times hereafter sell, let, or otherwise dispose of all or any of the waters diverted by means of the water-race described in the said license to any person or persons, or body or bodies politic or corporate, other than the licensee, his executors, administrators, and assigns for use by such person or persons, or body or bodies politic or corporate, for all or any of the puposes mentioned in section 104 of "The Mining Act, 1891," the price per Government head per week at which such water shall be sold or otherwise disposed of, and the rental per annum at, and the terms and conditions subject to, which such water and any races to be hereafter constructed by the licensee, his executors, administrators, or assigns to carry the same shall be let or leased, shall be fixed by the Warden or Wardens for the time being exercising jurisdiction in the mining district in which such water-race may be situate; and such Warden or Wardens shall have, further, the power from time to time to review, alter, or vary the said price and rental and the aforesaid terms and conditions either by highering or lowering such price or rental, by varying such terms and conditions, or by making any order of review, alteration, or variance either of general or particular application, and this notwithstanding anything contained or implied in any lease, agreement of letting or selling, or any other contract relating to the said water or water-race which may at any time or times be entered into between the licensee, his executors, administrators, and assigns and any other person or persons whomsoever, or body or bodies politic or corporate whatsoever, and so, nevertheless, that such Warden or Wardens shall not exercise the power of reviewing, altering, and varying in this paragraph contained and reserved, either generally or in reference to any particular price or rental, terms or conditions oftener than once in every three years.

4. In fixing any price or rental or any terms or conditions either originally or by way of review, alteration, or variance the Warden shall be guided by what would be a fair value per week or per annum based on a comparison between the capital invested by the licensee on or in connection with the said water-race and the dams used in connection therewith, and the value of the return or the probable value of any returns from any ground proposed to be worked, having regard also to the hazardous and uncertain nature of the return from capital invested in mining operations.

5. The licensee, his executors, administrators, or assigns will, within twelve months from the date of the within license, or such extended period as the Warden aforesaid may from time to time grant, well and effectually construct the water-race mentioned and described in the within license, so that the same shall be able efficiently and with reasonable safety to divert and carry a hundred Government heads of water.

It is hereby declared that the foregoing reservations and conditions have been made in the public interest, and are necessary and desirable for the public good within the meaning of section 129 of "The Mining Act, 1891."

PRECIOUS STONES.

NORTH ISLAND.

Opals have been obtained in the Tairua district. Mr. McKay, the Government Geologist, who has seen the stones and examined the formation, informs me that the opals are of a valuable kind, but that the method of obtaining them by blasting the rock tends to their destruction by shattering the stones. Mr. McKay also says that opals are present in the rhyolite formation in various places near the Ohinemuri River, and along the east coast, in a northerly direction, towards Tairua.

MIDDLE ISLAND.

In January last a license to prospect for opals was granted over the Mount Peel and Ackland districts, and subsequently the prospectors, being of opinion that their discovery warranted further development, formed the Record Reign Opal-mining Company, but operations have been retarded by the severity of the winter in the locality of the company's mineral lease, and no returns have as yet been published.

A number of other prospecting licenses have also been granted over the same districts.

MANGANESE- AND SULPHUR-MINING.

The manganese-mines in the Whangarei district and at Waiheke Island have not been worked during the year.

Messrs. John Chambers and Son, of Auckland, who are largely interested in the export of minerals, have supplied the following:—

"*Re* manganese-mining: There has been no mining in this district during the last year, the activity in the gold-mining having taken off all the men from the manganese-mining, the wages being better and probably work easier. The European markets have been low all the year, the prices ranging from 10½d. to 1s. 0½d. per metallic unit delivered at Middlesboro or Lancashire, and, as the best only goes 54 units, there is not enough in it to encourage shipping. There has been a demand lately for it from Australia for chlorination and similar purposes, but we have not been able to get any to supply. We have shipped 340 tons of sulphur to Queensland lately, and there is a demand for more from New South Wales. The sulphur was obtained from deposits at Tikitere, Rotorua district. A contract has been entered into to ship 2,000 tons to Sydney at a very low price, about £3 per ton delivered. Our shipment and this one is coming from Rotorua. The Natives would much prefer the whole deposit to be taken over by the Government and worked for them, a royalty being charged. If we could have got any secure tenure for the sulphur deposits we could have arranged for the sulphur to be refined on the ground by a company, and the trade made into an important one, but as it stands now no one can put any money into anything of the sort."

PETROLEUM.

Over thirty years ago the first bores were sunk at Moturoa, near New Plymouth, for petroleum, and since that time efforts have been made at intervals to secure payable supplies of the valuable mineral oil, of which ample indications abound. Some three years ago a strong syndicate undertook fresh operations, and to date some 5,600 ft. have been bored in five bores, but it is considered that the bore, now 1,000 ft. in depth, at which operations are being carried on will have to be deepened at least another 1,000 ft. before strata of sufficient firmness is reached to enable the oil to be payably worked. Many difficulties have been experienced, the water and mud in the bores being great drawbacks. On one occasion the derrick and boring gear was destroyed by a fire resultant on the gas igniting at a lighted lamp some distance from the bore. The manager states that some seventy barrels of crude oil of good quality have been raised by the syndicate, and found a ready market.

COAL-MINING.

North Island.

The output from the mines in the Kawakawa, Hikurangi, and Ngunguru districts is maintained, the coal being used by ocean-going and coastal steamers in Auckland, and by owners of steam-engines on the goldfields and other places along the east coast of the Island.

Kawakawa Mine.—This mine is not likely to maintain an important output for more than another year unless fresh seams are opened.

Hikurangi Mines.—The Hikurangi Coal Company have a large area of coal in their land, and a seam of considerable thickness is now being worked from the incline near the railway. The West Bryan's and Phœnix Mines both have connections with the railway, and the mine-trucks can be emptied into the railway-wagons. Rolleston's Mine is also being worked, and can be connected with the railway at a moderate cost. These mines, if necessity should arise, will be in a position to double or treble their output.

Waikato Mines.—The Waikato Mine has still continued to maintain a profitable yield. The Taupiri Reserve and Taupiri Extended Mines are both working on large seams, and could considerably increase their output, but any great additional demand is not to be expected until direct railway communication is effected with the Thames and Waihi, when the coal, as well as the slack, will be in request for steam and other purposes on the Hauraki Goldfields.

Mokau Mine.—Increased attention is being directed towards opening up this mine. The bar at the mouth of the Mokau River will, however, be always an obstacle to the success of this mine, as only very small steamers can cross the bar and be taken up the river to the mine. It is therefore apparent that until railway communication with the Mokau district is effected the coal deposits cannot be worked to any great extent.

Middle Island, Nelson District.

Collingwood.

Prospecting has been carried on in a new lease taken up by Messrs. Taylor and Walker, at Puponga, in the vicinity of Cape Farewell, and about sixteen miles from Collingwood. The Pakawau Mine still continues to be worked, but operations have been completely suspended in the Wallsend Mine.

Nelson.

The Enner Glyn Mine is being further opened up by a shaft sunk 160 ft. in the rock. A stone drive will be put in from this depth to cut the seam and connect with the workings from the other shaft.

Westport District.

Mokihinui Mine.—The workings were carried on in the area opened by the new incline. The seam is, however, much disturbed in this section, and operations have been stopped. The Hut seam has latterly been worked. The coal in this is better, as it is not intersected with stone veins to such an extent as in the old workings on the big seam. Forty-four men were employed.

Cardiff Mine.—This colliery has been conducted with profitable results; the coal is of a superior quality, and commands a ready market. The output for the year was 40,431 tons, and seventy-eight men were employed.

Granity Creek Colliery.—Since the preliminary work and erection of tramway was completed in the early part of the year a steady output has been maintained. Ninety-two men were employed. The mine is well equipped. All shots are fired by men specially appointed for the purpose. Two coal-cutting machines, driven by compressed air, are now at work; one is a Stanley heading-machine, which cuts two annular grooves in the coal each 5 ft. 6 in. in diameter; the other cutter is of the percussion type, and is used for holing. It appears to work satisfactorily, and relieves the miner of the most dangerous part of his work. The manager, Mr. Brown, states that these machines will not displace any labour, but that a somewhat greater output may be expected from the same number of men, with less liability to accidents from falls of coal when holing. The output since work on the coal commenced was 20,543 tons.

Coalbrookdale Colliery.—This mine, as well as the Granity Creek, is owned by the Westport Coal Company. The Iron Bridge Mine is also worked and owned by this company. The tramways and methods of conveying the coal to the railway are the most extensive in New Zealand, and the company are now in a position to supply all demands for their coal. The output for last year was 190,975 tons of coal from Coalbrookdale, and from Granity Creek 20,453, making a total output of 211,328 tons. Of this, 10,000 tons of Coalbrookdale coal was exported to San Francisco, Valparaiso, and other ports, chiefly by sailing-vessels. Coal-cutting machines are also to be adopted in this mine. A very extensive output can be maintained. During the year 315 men were employed at this mine, and now that direct foreign export is established there is evidence that the trade will largely be increased.

The other mines, in Longford, Boatman's, and Reefton districts, maintain a sufficient production to meet local demands.

Grey River and Grey Valley District.

Blackball Colliery.—The coal from this mine still meets with a fair demand, the output for the year being 45,722 tons, an increase of 2,667 tons compared with that of last year. Ninety men were employed in connection with this mine.

Brunner Mine.—The mine has produced a return which is only 7,491 tons less than the output of last year. The coal was chiefly derived from pillar workings. The disastrous accident which occurred in March, 1896, whereby sixty-five men lost their lives by an explosion in the mine, naturally led to time being taken up in the recovery of the bodies and the necessary repairs to the workings. The decrease may be thus accounted for. In the Brunner Rise Mine, which is owned by the same company, the workings were more in the solid, but latterly, as the coal was thinning out, pillar-work was also resorted to. The company have also been constructing a railway to the coal lease owned by them in the direction of the Seven-mile Creek. This line cannot be completed until the erection of the bridge over the Grey River is finished. The output for the year for the Greymouth-Point Elizabeth Company was 92,118 tons, and the number of men employed 213. The facts connected with the explosion that had such serious and disastrous effects have already been so fully elucidated at the inquiry held by the Commission that it is not my intention to further report on the matter. Efficient precautions are now taken at the mine. The blasting is done by roburite fired by electricity, the persons appointed as shot-firers always examining the places before any charges are exploded. The use of safety-lamps is also enforced on all those working underground.

Canterbury and Otago Districts.

In consequence of my recent appointment, and pressure of other official duties, it has been impossible for me to visit either the Canterbury or Otago coal-mines, but from the returns furnished by the mine-owners it will be seen that the output continues to improve in many of the mines, more particularly in Otago, where the local demands for use in the boilers of the dredges and other mining machinery are increasing rapidly.

In the Malvern district the Home Bush, 3,164 tons, Springfield, 2,680 tons, Mount Somers, 2,018 tons, and Whitecliffs, 1,701 tons, were the chief producers. In North Otago the Shag Point, 21,097 tons, and Allandale Mines, 11,455 tons, stood highest on the list. In South Otago the Kaitangata Mine had an output of 72,536 tons, being an increase of 8,679 tons on the return of the previous year. The Castle Hill Mine's output was 12,825 tons; the Walton Park showed a slight increase, the return being 16,612 tons.

In Southland the Nightcaps Mine yielded 16,905 tons.

In the above districts a large number of small mines and pits yield an ample supply to meet local requirements.

The Phenomena of Colliery Explosions, by Donald M. D. Stuart.*

The subject of colliery explosions has engaged the attention of mining engineers for nearly a century, and experience and science have devised many precautions, with the result that the

* Paper read at the seventh annual general meeting of the Federated Institution of Mining Engineers at Cardiff, 15th to 17th September, 1896.—"Industries and Iron," September 18th and 25th, 1897.

number of disasters have been greatly reduced during each succeeding decade. Explosions, however, still occur in the best-arranged collieries, showing that there are some phenomena not yet fully recognised and understood; and, with this fact as a justification, the author ventures to offer this paper to the members.

The author had the advantage of investigating the first and second recorded explosions in mines that yield no fire-damp—viz., the disasters at the Camerton and Timsbury collieries, Somersetshire, in November, 1893, and February, 1895, respectively. These disasters provided opportunities for observing the phenomena of two explosions not complicated by the presence of fire-damp. They exhibited the effects produced by an explosive agent, and therefore pronounced its identity, as every agent is identified by the phenomena it produces. The records have this value: They demonstrate that explosions are produced in mines by gases derived from coal-dust, and that the processes are originated under ordinary working conditions and operations; they also disclose the phenomena which identify explosions from this agent.

The effects of the disaster at the Camerton collieries were visible from the point of origin for 828 ft. towards the coal-faces, and for 3,714 ft. in the opposite direction, towards the downcast shaft. The phenomena were equally clear at the Timsbury collieries from the seat of origin to the upcast shaft, a distance of 2,900 ft., and into the several districts that branched off at intermediate points.

In the paths of the explosions there were occasional exhibitions of destruction, where men had been exposed to violent forces—trams of coal hurled off the rails, crumpled up, and their contents scattered abroad; empty trams broken, the roof ripped down in large falls, timber structures reduced to matchwood, and wrought- and cast-iron fittings and pipes torn or broken to pieces. These scenes of destruction were separated by intervals varying from 114 ft. to 1,030 ft. in length; and in the intervening spaces the men have suffered no violence, trams of coal were standing undisturbed, the empty trams were uninjured, the timber and fixtures were in their normal positions, and the iron fittings and pipes were not damaged or displaced. The phenomena of explosive violence at distinct points along the paths of the explosion, and the positive absence of such phenomena in the intervening spaces, demand for their explanation distinct modes of energy.

An examination of the local disturbances in parallel passages showed that the materials were displaced in opposite directions; and, where the destruction occurred at junctions, the wreckage was distributed in the entrance of each road. The positions occupied by the displaced materials indicated the exertion of explosive forces from a common centre, and exhibited the phenomena that must arise in a gaseous explosion, in which disruptive forces are necessarily exerted in radial lines, hurling movable objects in all directions around the gaseous body within a local area. The evidence in the disturbances and in the spaces between them left no room to question the occurrence of distinct local disruptions along the paths of the coal-dust.

Between the points of origin and the first disturbances there were considerable lengths of road in which the men were found who fired the originating shots, also their cotton food-bags, loaded and empty trams, and timbering. The men had suffered no violence, not a bone was broken, nor their clothing disturbed, the food-bags were still hanging from the roof by cotton tapes, the loaded and empty trams were alike undisturbed, and the timber standing in its ordinary position. Consequently, there could not have been either explosive violence or a rapid gaseous movement between the shots and the first disturbances; the distances were 408 ft., 420 ft., and 573 ft. respectively; and this undisturbed condition of road was repeated between every propagated explosion.

The author numbered the local explosions for facility of reference, and, referring to the disaster at the Camerton collieries, he observed six loaded trams of coal in the road between No. 5 and No. 6 explosions, which threw some light upon the gaseous movement in the interval of 492 ft. that separated these propagated explosions. The trams have an open end, in which lumps of coal are built up, and this wall of coal in the last tram faced the emergent gases of No. 5 explosion. About 60 lb. of this exposed coal, in lumps of $\frac{1}{4}$ lb. to 4 lb. or 5 lb. each, had disappeared. If the coal had been removed by mechanical force the lumps, or their fragments, must have been present somewhere in the road, but the author could not discover any trace of them. He, however, observed heavy deposits of coked coal along the opposing faces of two rods or collars (6 ft. long each) fixed next to the roof, almost immediately over the tram referred to. This coke and some fine carbon were the only visible remains of the missing coal, which had evidently been reduced to globules of coke by gases at an exalted temperature. Had there been a great velocity in the horizontal movement of the gaseous body that attacked the coal the particles of coke must have been swept along as they were produced, but they ascended almost vertically to the faces of the overhanging timber, and were deposited there, indicating a comparatively slow onward movement of the gaseous body, and showing that the disruptive forces of No. 5 explosion were expended in the immediate vicinity of their production—about 120 ft. from the tram of coal.

In a stall at the Timsbury collieries, about 210 ft. from No. 6 explosion, a tram of coal was found undisturbed upon the rails, the blocks of coal standing from 15 in. to 18 in. above the woodwork, the top surface reaching a height of 4 ft. above the floor. The hard faces of these blocks of coal all round the tram had been made to burst out into globules of bituminous matter, which underwent further destructive distillation, leaving residues of comminuted coke. Some globules remained attached to the faces of coal in different stages of production, and every ledge of coal, the edges of the woodwork of the tram, and the buffers were loaded with accumulated particles of coke resembling small shot or coarse sand. These particles of coke did not ascend to the roof, but gravitated down to the resting-places where they were found, showing an inadequate horizontal movement in the gaseous body that attacked the coal to carry the particles forward; and that the disruptive forces in No. 6 explosion, which were necessarily of an enormous velocity, were also expended in the immediate vicinity of their production.

Another observation upon the air-current at the Camerton collieries adds to this part of the subject. Between the point of origin of the disaster and the downcast shaft there were seven violent disturbances, in several of which the falls were each estimated to measure from 600 to 800 tons of rock and shale. These falls were in the main-intake airway, the last one being 2,838 ft. from the downcast shaft, and the road for this distance approximated to a straight line. During the occurrence of the explosion the onsetter was standing at the bottom of the downcast shaft, and neither felt nor heard anything unusual. He observed that the flame of his open light was momentarily reversed towards the shaft, but insufficiently to arouse a suspicion that anything was wrong. Another man was standing in the intake at an intermediate point 1,848 ft. from No. 10 explosion, and he did not feel or hear anything of the explosions beyond a puff of wind that put out his candle; he attached no importance to this, as it often occurred, the air-current travelling at a high velocity.

The absence of appreciable mechanical force in the movement of the atmosphere between the shot and the first disturbances in the spaces between the successive disruptions and at the end of the propagations, with the phenomena of intermittent exhibitions of explosive violence, amount to demonstration that a series of local explosions occurred at the *loci* of the disturbances, in which disruptive forces were exerted in all directions and expended in their immediate vicinity.

The foregoing phenomena in the atmospherical movement admit the element of time antecedent to each disruption for the destructive distillation of the coal and the production of the explosive gaseous mixtures, to the ignition of which the local explosives were due. The author has therefore described the lengths of undisturbed road that are observed antecedent to each explosion as gas-generating spaces.

Observations made at the *loci* of the disruptions disclosed the fact that they occurred at the junctions and sidings, where large cavities existed in the roof, at sharp angles in the road when the path of the explosion was against the air-current, and where a door formed a cul-de-sac. One condition common to these *loci* was a larger provision of atmospheric oxygen than could be obtained in the antecedent spaces.

Another branch of evidence was the deposition of coked coal upon the timber, trams, and floor of the workings, which appeared to be deposited in these places under special conditions, and not in the general progress of distillation. In the immediate vicinity of the shot at Camerton collieries the floor was covered with a crust of coke, and the faces of the timber fronting the shot were thickly coated with coke to a height of 12 in. above the floor; above that point there was very little deposit.

At Timsbury collieries a tram was standing between No. 4 and No. 5 explosions, from which the author took the following observations: Tram loaded with shale, standing upon the rails, had not been disturbed. Coked coal-dust upon the end facing the course of the explosions. The buffer-ends, measuring 12 in. above the floor, covered with coked coal-dust $\frac{3}{8}$ in. thick. Many patches of coked coal upon the wooden end of the tram, thinning off to nothing at 21 in. above the floor, the upper 9 in. of the wood being clean. No trace of coke upon the angle-irons, draw-bar, link, wheel, or axles, nor upon any other part of the tram.

An obstruction in the path of the explosions will therefore retain a deposit of coke if it present a surface at the necessary height to which intumescent coal-dust can adhere. The evidence at this tram, which is confirmed by many other observations, shows that the coal-dust upon the floor is subjected to distillation, the particles rising to a height in this case of 21 in. The coal-dust on the sides and the upper parts of the timber is, no doubt, attacked by the hot educts; but in the intervals between the explosions the author observed coked coal near the roof in one place only, and that was at a sheltered flank which had flakes of coked coal lying upon it. In the vicinity of explosions coked coal was observed upon the opposing faces of timber on opposite sides of the disruptions, and it is not difficult to conceive how the hot, pasty coal-dust would be projected against these opposing surfaces by the forces of the explosions, which moved in radial lines.

Where propagations were arrested, with small coal left in suspension in a semi-distilled condition, it is also conceivable that with the atmosphere in front at normal or greater tension, and the atmosphere behind in an attenuated condition, due to the chemical changes that had taken place, the suspended pasty coal would retreat, and be deposited on the faces of timber, contrary to the course of the explosions; and this deposition was observed at Timsbury collieries.

The deposits of coked coal on the timber lying next to the roof over the tram between No. 5 and No. 6 explosions at Camerton collieries will present no difficulty when it is known that the distillation was going on in the face of the incoming air-current, and consequently the chemical action was energetic, and the globules of coke were carried upward with the educts. The comminuted coke at the tram beyond No. 6 explosion at Timsbury collieries was in a receding air-current with the supply cut off; hence only a small quantity of coal was distilled, and the action was not sufficiently vigorous to carry the globules of coke in resistance to gravitation. The positions in which the deposits of coked coal were found are explained by the hypothesis of local explosions with antecedent gas-generating spaces, and the condition of the air-currents.

Observations were made upon the nature of the atmosphere that filled the workings after the disasters. The roads had collapsed locally at many of the disruptions, and the circulation of air was suspended. The products of the gaseous explosions with the residual gases filled the roads in the fields of disaster, and were imprisoned between the falls, forming a series of still atmospheres that could only be displaced by diffusion until the final obstruction was reached and removed and the circulation of the air restored.

The exploring parties frequently advanced into the stagnant atmosphere more rapidly than diffusion was effected to make apertures through the falls, and had favourable opportunities of observing the effects of this atmosphere. Their open lights burned brightly, and disclosed the absence of the small percentages of carbon-dioxide and of the inflammable gases that are appreciable

by the ordinary tests; but they suffered physiological sensations that ended in unconsciousness. They observed the atmosphere laden with particles of soot, and compared it to the condition produced by "turning a bed-tick inside out and shaking it in the air." The author observed that this suspended matter had been universally deposited upon the walls and timber of the roads throughout the fields of disaster, and, upon examination, found it to be amorphous carbon, such as may be obtained by burning hydrocarbons in limited quantities of air. The carbon obtained by holding a glass rod in an illuminating gas-flame, and the compact form of the deposit, are well known; the carbon at the Camerton and Timsbury collieries proved, upon investigation, to be the same in substance, but differed in the form of deposition. In numerous places in the mines the carbon upon the timber and strata was in gossamer-like form, and gave the surfaces a veined appearance. The author collected these striated filaments upon paper; but, however carefully preserved, they broke down into powder under the slightest pressure. The general deposit was a loosely-built-up and dilated stratum, which, when touched with a flat surface, shrank to a fraction of its original thickness. It was obviously the accumulation of successive settlements of particles originally in atmospheric suspension, and that condition of the atmosphere in the mines immediately after the disasters is a fact of observation. These depositions of carbon were therefore distinct in structure from the deposition that arises from the impingement of a hydrocarbon flame upon a cold surface. The origin of this carbon is not far to seek: the residues of coked coal already referred to are the evidence of distillation, showing that hydrogen and gaseous hydrocarbons flowed into the atmosphere of the workings; and these hydrocarbons provided the amorphous carbon, of which it formed the solid constituent.

The separation of this carbon of the educts involves questions in thermo-chemistry which cannot be dealt with in this paper beyond saying that the processes that caused its separation were the sources of heat upon which the explosive phenomena depended.

The author suggests the following theory to explain the phenomena now recorded: The products of the mining powder with their unexpended heat were projected through the planes of ruptured strata in fan-like sheets, striking the coal-dust on the floor, and setting up destructive distillation. The educts flowed into the atmosphere of the mine, but could not undergo explosive combustion, although an ignition temperature was at command, because the atmospheric oxygen was inadequate, or not within reach to make an explosive mixture. In the loose dust and *débris* and in interstitial spaces there was necessarily some oxygen, which would be seized by the free hydrogen, and by the hydrogen constituent of gaseous hydrocarbons in the educts, its oxidation liberating the carbon of the latter in solid form to float in the atmosphere. The temperature reached by the oxidation of hydrogen being about 2,000° Cent., and there being a large quantity of heat generated in that process, the remaining hydrocarbons that had not previously undergone change would at that temperature, and in the absence of atmospheric oxygen, undergo dissociation, placing free hydrogen at disposal for disruptive action where oxygen could be obtained, and leaving more of the fine carbon in atmospheric suspension.

A series of chemical actions of constant sequence was therefore established in the immediate vicinity of the shot, in which there was the partial oxidation of hydrogen referred to generating heat, which instituted a series of chemical changes identical with those which the heat supplied by the products of the mining powder had originated, and these regenerative activities were of constant and similar reproduction along the path of the coal-dust, free oxygen undergoing constant accumulation, until a place was reached in the workings where the available quantity of air was greatly increased, and, the partial combustion taking place, the accumulated hydrogen was oxidized with explosive violence, causing the disruptive effects observed at the *loci* of the initial local explosions.

The quantities of heat generated in the initial local explosions greatly exceeded the total quantity of heat in the products of the mining powder, and it will be readily understood that an advancing series of similar changes to those described was again established in the coal-dust beyond, producing secondary explosions at points farther away, where the conditions for the oxidation of the accumulated hydrogen were fulfilled; consequently, the explosions would be propagated along every path of the coal-dust, so long as atmospheric oxygen was available, and there were no wet spaces to bring down the temperature.

This theory satisfies the demand for chemical changes, causing a constant regeneration of heat, and places an explosive gas at disposal for disruptive action without the production of carbon-monoxide or carbon-dioxide, and which did not yield these gases as products. It accounts for the practical absence of carbon-monoxide and carbon-dioxide from the atmosphere in the fields of disaster with the fact that the carbon constituent of the hydrocarbons was not oxidized, but disseminated in the atmosphere, where it was found in copious suspension by the exploring parties, and from which it had been deposited upon the vertical faces of the enclosing walls in dilated layers and in striæ, giving the faces of stone and timber the veined appearance already referred to.

It is not difficult to understand why there was an absence of mechanical effect upon the ventilating-power at the Camerton collieries when it is remembered that the gaseous hydrocarbons that were being constantly added to the atmosphere of the mine were almost immediately eliminated by the oxidation of the hydrogen constituent, and that the volume of the incoming air was being constantly diminished by the removal of its oxygen, forming one-fifth of that volume for oxidation of the hydrogen in the explosions and antecedent actions in successive productions of steam, undergoing eventual liquefaction by surrender of heat, and that by means of this exhaustion the mechanical equilibrium of the air-current was maintained.

The terminations of the explosive phenomena admit of explanation. Propagation of the explosions was observed to have been abruptly arrested in roads where dry coal-dust abounded, and at these places observations disclosed the presence either of coked coal-dust or amorphous carbon, indicating chemical activity that supplied heat and ignition temperature. The absent factor in the

explosive cycle was therefore atmospheric oxygen, and the condition of the air-currents confirmed the conclusion. Propagation failed because the chemical actions languished to extinction, due to an inadequate supply of atmospheric oxygen for the oxidations which yielded heat to carry on the distillation and other chemical changes. The fundamental difference between the path of propagation and the path in which propagation failed was in the condition of the air-currents. In one very small "split" and in return air impoverished of its oxygen the chemical processes were observed to be arrested.

Propagation was also arrested in wet places, and is explained by the fact that the product of the oxidation of hydrogen would by its contact with wet surfaces undergo a change corresponding to what takes place in the condenser of a steam-engine. The external stratum of the product coming in contact with the cold wet surfaces would be instantly condensed, leaving a vacuous space into which another stratum would fall and be condensed, and the process would be repeated so rapidly during the slow gaseous movement as to make condensation practically instantaneous. The product being liquified by surrender of heat, the temperature would fall below the distilling point, and the chemical actions come to an end.

The disaster at the Timsbury collieries originated in the main intake air-way; and, while the disastrous effects that are identified with a colliery explosion were produced from the shot to the upcast shaft on one side, there were no such effects from the shot in the opposite direction towards the downcast shaft. Observations, therefore, show that had the condition of the air-way from the shot towards the downcast also prevailed from the shot towards the upcast shaft the disaster would not have happened. The difference between the two portions of the air-way was as follows: On the upcast side it contained the full circulating current of air, which at the time of the disaster was about 13,000 cubic feet per minute, and the coal-dust was dry; on the downcast side it contained the same circulating current for a distance of 150 ft.; at that point the ventilation entered the intake from a side road, but 525 ft. beyond a door was fixed, and the air between the side road and the door was a still atmosphere. The coal-dust was more or less damp or wet at the side road, and wet up to the door. The still atmosphere was laden with water-vapour to saturation.

At the Camerton collieries the coal-dust was equally dry on both sides of the shot, and disastrous effects were produced in both directions. The propagation against the intake air-current, after being active for 3,714 ft., causing great destruction, was abruptly arrested at 2,838 ft. from the downcast shaft. The atmosphere at this point was the main intake air-current in which the 3,714 ft. of propagation had occurred, and the author made the following observations of the condition of the road where the propagation was arrested, commencing in the vicinity of the last, or No. 10, explosion:—

	Ft.	Ft.
Archway and fall, floor and sides dry and dusty		90
Water and mud on floor, no dust	66	
Floor damp between the rails, damp dust outside of rails	24	
Last fall, floor and sides damp, no dust	21	
Water and mud on floor, sides wet, no dust	48	
	—	159
Floor damp between rails, intermittent wet spots, dust outside of rails damp to dry	234	
Floor and sides damp and muddy	24	
Floor and sides dry and dusty to horse-guy	261	
	—	519

The effectiveness of wet lengths of road in stopping the propagation of an explosion is a fact of observation, and air saturated with water-vapour must, in the nature of the case, be a valuable contributory precaution.

The arrest of propagation is consequently brought about by atmospheric conditions in which heat cannot be generated for the reproduction of the distillatory and other chemical actions, because the supplies of atmospheric oxygen are inadequate; also by wet surfaces, which demand the surrender of the heat for the evaporation of their moisture.

Most of the principal phenomena of the disasters at the Camerton and Timsbury collieries have now been referred to, and the theory which the author has advanced upon his records and investigations may be shortly stated as follows: A colliery explosion in which coal-dust is the principal agent comprises numerous local explosions separate in time and in space, at irregular intervals, where the available supplies of atmospheric oxygen are greatly increased and caused by the explosive combustion of hydrogen derived from the coal-dust in the antecedent spaces by a series of chemical actions of constant sequence, which produce heat for regeneration without auxiliary intervention, and are constantly reproduced along the path of the coal-dust under the conditions named. This theory accounts for the coked residues of coal and the positions in which they were found; explains the presence of amorphous carbon in atmospheric suspension, and its characteristic deposition upon the enclosing walls throughout the fields of disaster; accounts for the practical absence of carbon-monoxide and carbon-dioxide in the gaseous products; supplies the heat for the distillatory action, for dissociation, for raising the air of the gaseous mixture to ignition temperature, and for supplementing the losses due to the contact of the products of combustion with cold surfaces; allows time for the distillation of coal, and the chemical changes in the series of actions; provides the explosive gas for producing the disruptions; explains the occurrence of the disruptions at intervals; the absence of mechanical effects in the intervening spaces, the conditions under which propagation proceeds or is arrested, the maintenance of the mechanical equilibrium of the air-current at Camerton collieries, and excludes no coal, except that which yields no combustible gases when subjected to the temperature of destructive distillation.

TIMBERING IN COAL-MINES.

The following is taken from a report of a lecture delivered by Mr. H. W. Halbaum on the above subject before the Midland Branch of the National Association of Colliery Managers, at Derby, on the 28th November:—

The lecturer said the importance of the subject was very often overlooked. They were apt to consider that fire-damp and coal-dust were the great enemies of the miner, but that was not so. If they looked through the Inspector's reports for the last ten years they would find in that district twelve miners had lost their lives through explosions, but through falls of roofs and sides no less than 329 lives had been lost. Last year in the United Kingdom fifty-five persons lost their lives by explosions, and 426 lost their lives through falls of roof and sides. In the Midland district five persons were injured by explosions, but 570 were injured through falls of roofs and sides. In the United Kingdom 215 received serious injury through explosions, but 2,023 persons received serious injuries through falls of roofs and sides. He wanted to impress upon them that that subject was not only a very important one from the point of view of safety, but also from an economical point of view, and anything which tended towards an economical working of coal-mines—the staple industry of this country—ought to have their best consideration. The item of timbering was one of great expense in all coal-mines. It was one of the chief items of expense, and it was a fortunate colliery where timber only cost 2d. per ton of coal raised. He had heard of collieries where the cost had amounted to 1s. 6d. per ton of the coal raised. The proper and improper use of timber very often meant either paying a dividend or a serious loss. They had always to be liberal with timber, but there was no reason why liberality should degenerate into waste. He had found that economy went always hand-in-hand with safety, and waste of timber only meant increased danger to the miner. That day he only intended to deal with the subject of timbering so far as it affected the pit-prop. The first thing they had to do was to choose the timber, and the question was a very important one, because bad timber involved danger of life and limb to hundreds of their fellow-workers. They knew when they had a long wall-face, roof, and floor coming together, and what the pressure was that caused this movement. In a mine 500 ft. deep the pressure was somewhere about 1,600 lb. to the square inch, and whatever kind of timber they used could not resist that pressure. The maximum pressure and the strength of the whole body of strata were coming down; but the object ought to be not to resist the maximum pressure, but to sustain the loosened fragments which so frequently dropped out. Nothing could resist the maximum pressure. What was wanted was timber props possessing the greatest elasticity, which would bend to the maximum pressure, yet sustain the loosened fragments. Rigid creosoted props were very dangerous. Steel was the typical material for props, because it had great strength with great elasticity, because it would bend to the maximum pressure and sustain at the same time the loosened fragments. It was not unlikely that the use of steel would become common. Science had triumphed over so many obstacles that the difficulties in the way of using steel did not appear insurmountable. The main difficulty was the expense and the recovery.

Mr. Halbaum went on to deal with the various modes of propping in seams of different height, but said the system which answered at one colliery would not answer at another. Larch, fir, and the different orders of pine he recommended as the best kinds of timber, as they possessed the most elasticity. With regard to the props to be used in seams of different heights, in tall seams the maximum pressure was greater in proportion, and its effect was irresistible. In a seam 6 ft. high the roof would descend 2 in., where in a seam 3 ft. high it would only descend 1 in., and the size of the prop should be increased in proportion to the height of the seam. The strength of a prop increased with the square of its diameter, though if a 3 ft. prop, 3 in. in diameter, had to be put in a 3 ft. seam a 6 ft. prop in diameter was more than sufficient for a 6 ft. seam. If they increased their props more than was necessary they wasted timber and infringed upon safety. That part of his subject was one which he should like to see thoroughly investigated by their mining institutions. The strength of timber in ratio to its length and diameter was a very important subject; and then there was the question of knots and other details. The next question was the nature of the roof. The stronger the roof the stronger ought the timber to be. Most of the accidents which happened at the face happened under strong roofs, because they were apt to take liberties with them, and the miner trusted the roof too far. Strong roofs broke into larger fragments, and that was another reason why they required strong props. Again, strong roofs transmitted the maximum pressure more heavily to the timber. The worst roof they could have was a hard pannelled one, a strata of sandstone with a layer of soft shoal above it, which could only be supported by chocks of steel and big timber. The next point was the care of the timber, and that was also one of the highest importance. The prop was simply a collection of fibres which they could tear in pieces. The lecturer went on to explain the nature of the prop, and said their duty was to take care of every one of the fibres to preserve their strength and elasticity. They ought to be kept at the surface under cover, properly stacked and ventilated, and preserved from all vermin. The timber required protection from atmospheric forces; the floor on which it was stacked ought to be raised from the ground, and under no circumstances ought to be left lying about the yard. He was strongly against the use of creosoted or salted timber, because it was too brittle, and snapped like cast iron. Mr. Halbaum went on to explain the different modes of timbering, by means of diagrams. He said that nine-tenths of the accidents happened because they had had good roofs behind them, and they always expected good roofs in front. The majority of accidents could be prevented by putting timber in in time, and with a proper knowledge of how to put it in. The props ought always to be put in squarely and firmly in the line of pressure. That was one of the fundamental principles of timbering. If they put timber in in the direct line of pressure they put in what was known as the resultant force. They should set their timber in the same straight line as the line of gravity.

The line of gravity was not always the line of pressure. In a steep seam all the timber should be set at right angles to the plane of stratification. The props should always be set so that the pressure upon them should be distributed evenly over the surface, that every fibre should receive its fair share of the load. Mr. Halbaum also briefly touched upon the advisability of having lids on the props, but spoke against nails being hammered into them. In conclusion, he again referred to the great importance of the subject, which he hoped would in the future receive more consideration from their mining institutions. They had recently in one course had three papers only on timbering and fifteen on fire-damp and coal-dust, but he hoped that before long the subject of timbering would receive the attention that it deserved.

The above report is taken from the *Mining Journal*.

HYDRAULICS.

The following instructive papers on hydraulics, written by Mr. Alexander Aitken, manager of the Government water-races at Kumara, who has carried out experiments for the purpose of verifying the calculations therein set forth, will be found of considerable service to those interested in hydraulic sluicing and elevating:—

Power of Water.

The following short method of calculating the practical horse-power of water that can be realised by various water-motors is based on the fact that one sluice-head of water falling 8·8 ft. is equal to 1 theoretical horse-power. A sluice-head of water is 1 cubic foot of water per second, or 60 cubic feet per minute. A cubic foot of water weighs 62½ lb., therefore a sluice-head of water delivers 3,750 lb. of water per minute. This multiplied by 8·8 ft. gives 33,000 foot-pounds, or 1 theoretical horse-power:—

$$60 \times 62{\cdot}5 \times 8{\cdot}8 = 33{,}000 \text{ foot-pounds} = 1 \text{ horse-power.}$$

Table No. 1 shows the approximate percentage of the theoretical horse-power of water actually realised by various water-motors. Table No. 2 gives the hydraulic head necessary to obtain 1 effective horse-power from one sluice-head of water with motors that can practically realise from 30 to 100 per cent. of the theoretical power of the water, but no motor has yet been constructed that will realise much more than 90 per cent. of the theoretical power of water.

The hydraulic (or hydro-dynamic) head of water is the total vertical height of the supply above the point of discharge, after due allowance has been deducted for friction and other retarding forces in the pipes (or other conduit) delivering the water to the motor. Total head, *minus* allowance for friction, &c., equals hydraulic head.

If pipes are large enough to convey the required quantity of water to the motor at a velocity not greater than 1 ft. per second, and the length of the pipe-line is not great, allowance for friction, &c., is not necessary, and the total head may be taken as the hydraulic head. If, however, the pipes are small for carrying the required quantity of water, and the velocity of the water is from 3 ft. to 20 ft. per second, the allowance for friction, &c., cannot be disregarded, as it may in some instances where the pipe-line is long absorb the whole of the total head, and only deliver the water without being capable of developing any power.

Pipes conveying water for power cannot be too large, the only limit being the practicability and the cost. For determining loss of head by friction, &c., consult instructions and table prepared for that purpose.

Table No. 1.—Percentage of Theoretical Horse-power realised by Various Water-motors.

	Per cent.
Undershot wheels	30 to 35
Low-breast wheels	50 „ 55
High-breast wheels	55 „ 60
Overshot wheels	60 „ 65
Turbine wheels	60 „ 70
Pelton wheels	80 „ 90
Water-pressure engines	70 „ 80

In the above table the percentage of theoretical horse-power developed by the various water-motors has been ascertained from actual experiments, and it varies within the limits given, according to the manner in which the construction and fixing is carried out.

To obtain the highest efficiency the motors must be suited to the quantity of water used and properly constructed. The manner in which the water is supplied and the regulation to the proper speed are matters of the utmost importance in obtaining good results. The correct speed for the periphery of a Pelton wheel is one-half the speed of the water issuing from the nozzle. The high efficiency of the Pelton wheel is due to the very perfect manner in which it reverses the direction of a jet of water, discharging the water almost without motion.

Table No. 2.—Divisions of Hydraulic Head for ascertaining Effective Horse-power per Sluice-head of Water.

(Calculated from $\frac{8{\cdot}8}{\text{percentage}}$ = head required per horse-power.)

Efficiency of Motor.	Division.	Efficiency of Motor.	Division.	Efficiency of Motor.	Division.
100 per cent.	8·800	76 per cent.	11·578	52 per cent.	16·923
99 "	8·888	75 "	11·733	51 "	17·254
98 "	8·979	74 "	11·891	50 "	17·600
97 "	8·072	73 "	12·054	49 "	17·959
96 "	9·166	72 "	12·222	48 "	18·333
95 "	9·263	71 "	12·394	47 "	18·723
94 "	9·361	70 "	12·571	46 "	19·130
93 "	9·462	69 "	12·753	45 "	19·555
92 "	9·565	68 "	12·941	44 "	20·000
91 "	9·670	67 "	13·134	43 "	20·465
90 "	9·777	66 "	13·333	42 "	20·952
89 "	9·887	65 "	13·538	41 "	21·463
88 "	10·000	64 "	13·750	40 "	22·000
87 "	10·115	63 "	13·968	39 "	22·564
86 "	10·232	62 "	14·193	38 "	23·157
85 "	10·352	61 "	14·426	37 "	23·783
84 "	10·476	60 "	14·666	36 "	24·444
83 "	10·602	59 "	15·915	35 "	25·142
82 "	10·731	58 "	15·172	34 "	25·882
81 "	10·864	57 "	15·438	33 "	26·666
80 "	11·000	56 "	15·714	32 "	27·500
79 "	11·139	55 "	16·000	31 "	28·387
78 "	11·282	54 "	16·296	30 "	29·333
77 "	11·482	53 "	16·603		

Examples.

1. What actual horse-power will be realised by a Pelton wheel having an efficiency of 90 per cent., with one sluice-head of water and 400 ft. total head, less 20 ft. loss of head from friction, &c., in pipes conveying the water to wheel?

$$400 - 20 = 380 \text{ ft. hydraulic head,}$$

and this, divided by the number opposite 90 per cent. in Table 2 (9·777) equals the horse-power—

$$\frac{380}{9{\cdot}777} = 38{\cdot}86\text{-horse power.}$$

2. What actual horse-power will be realised by an undershot wheel having an efficiency of 35 per cent. in the forty sluice-heads of water and 3 ft. hydraulic head?

$$\frac{40 \times 3}{25{\cdot}142} = 4{\cdot}77\text{-horse power.}$$

3. What actual horse-power will be realised by a low-breast wheel having an efficiency of 55 per cent., with 33⅓ sluice-heads of water and 10 ft. hydraulic head?

$$\frac{33\frac{1}{3} \times 10}{16} = 20{\cdot}8\text{-horse power.}$$

4. What actual horse-power will be realised by a high-breast wheel having an efficiency of 60 per cent., with 33⅓ sluice-heads of water and 15 ft. hydraulic head?

$$\frac{33\frac{1}{3} \times 15}{14{\cdot}666} = 34{\cdot}09\text{-horse power.}$$

5. What actual horse-power will be realised by an overshot wheel having an efficiency of 65 per cent., with 33⅓ sluice-heads of water and 20 ft. hydraulic head?

$$\frac{33\frac{1}{3} \times 20}{13{\cdot}538} = 49{\cdot}24\text{-horse power.}$$

6. What actual horse-power will be realised by a turbine wheel having an efficiency of 70 per cent., with one sluice-head of water and 300 ft. total head, when the loss by friction, &c., in the pipes conveying the water to the wheel is 15 ft. of head?

$$300 - 15 = 285 \text{ ft. hydraulic head.}$$

$$\frac{285}{12{\cdot}571} = 22{\cdot}67\text{-horse power.}$$

7. What actual horse-power will be realised by a Pelton wheel having an efficiency of 85 per cent., with one sluice-head of water and 400 ft. total head, the loss by friction, &c., being 20 ft. of head?

$$400 - 20 = 380 \text{ ft. hydraulic head.}$$

$$\frac{380}{10{\cdot}352} = 36{\cdot}7\text{-horse power.}$$

8. What actual horse-power will be realised by a water-pressure engine having an efficiency of 78 per cent., with two sluice-heads of water and 380 ft. hydraulic head?

$$\frac{2 \times 380}{11{\cdot}282} = 67{\cdot}36\text{-horse power.}$$

The more complicated rules given in Gordon's "Miners' Guide," "Molesworth," and other works on hydraulics produce the same results as in the above examples.

CALCULATION OF THE CARRYING-CAPACITY OF OPEN CHANNELS, TUNNELS, AND FLUMES BY EYTELWEIN'S GENERAL FORMULA.

"The mean velocity of water in feet per second equals the square root of twice the fall in feet per mile multiplied by the hydraulic mean depth in feet."

And velocity multiplied by area equals quantity.

The hydraulic mean depth is the sectional area of flowing water divided by the wetted border.

The area is the mean width of the flowing water multiplied by its depth.

The wetted border is readily found for plumb or sloping sides by the following rules:—

Plumb sides	Depth × 2	+ width of bottom.
¼ to 1 sides	Depth × 2·0615 +	"
½ to 1 sides	Depth × 2·236 +	"
1 to 1 sides	Depth × 2·828 +	"

Example 1.

What quantity of water will a channel with ¼ to 1 sides carry, 4 ft. wide at bottom, 2 ft. 6 in. depth of water, and having a gradient of 12 ft. per mile?

$(2{\cdot}5 \times 2{\cdot}0615) = (5{\cdot}15375) + 4 = 9{\cdot}15375$ = wetted border.

$\frac{5{\cdot}25+4}{2} = 4{\cdot}625$ = mean width.

$4{\cdot}625 \times 2{\cdot}5 = 11{\cdot}5625$ = area.

$\frac{11{\cdot}5625}{9{\cdot}15375} = 1{\cdot}2631$ = hydraulic mean depth.

$\sqrt{24 \times 1{\cdot}2631} = 5{\cdot}5058$ = velocity in feet per second.

$5{\cdot}5058 \times 11{\cdot}5625 = 63{\cdot}66$ = quantity in cubic feet per second.

The number of cubic feet per second (or sluice-heads) of water which such a channel will carry, if long, straight, and smooth, is 63·66, but for other kinds of channels the result must be multiplied by coefficients suitable to the character of the channels, as a crooked and rough ditch or tunnel through boulders and stones, or with sets of timber every 3 ft. or 4 ft., will only carry about 40 per cent. of that quantity.

The following table of coefficients for flumes, tunnels, and channels is deduced from a large number of experiments extending over a period of twenty-five years:—

1. Iron fluming straight and smooth	1·0
2. Iron fluming moderately straight and smooth	0·9
3. Flumes and tunnels straight, and lined with dressed boards	0·8
4. Flumes and tunnels straight, and lined with sawn boards	0·7
5. Clay smooth and moderately straight	0·6
6. Gravel moderately rough, with easy curves	0·5
7. Boulders, or with sets of timber and bad curves	0·4

So that a channel of the dimensions and gradient given in the above example will carry the following quantities of water, according to the character of the material of which its wetted border or frictional surface in contact with the flowing water is composed:—

No. 1 character	63·66	sluice-heads.
No. 2 "	63·66 × 0·9 = 57·29	"
No. 3 "	63·66 × 0·8 = 50·92	"
No. 4 "	63·66 × 0·7 = 44·56	"
No. 5 "	63·66 × 0·6 = 38·19	"
No. 6 "	63·66 × 0·5 = 31·83	"
No. 7 "	63·66 × 0·4 = 25·46	"

This is for long lengths, or lengths sufficient to allow the flowing water to acquire its proper train. Short lengths of fluming between tunnels or ditching should in all cases have the same sectional area and as near as possible the same form of flowing water as the tunnels or ditching, and the same gradient. All changes in the form of the sectional area of flowing water should be made gradually.

Example 2.

What quantity of water will a channel carry with side slopes ¼ to 1, 6 ft. width of bottom, 3 ft. depth of water, and a gradient of 4 ft. per mile?

$(3 \times 2{\cdot}0615) = (6{\cdot}1845) + 6 = 12{\cdot}1845$ = wetted border.

$\frac{6+7{\cdot}5}{2} = 6{\cdot}75$ = mean width.

$6{\cdot}75 \times 3 = 20{\cdot}25$ = area.

$\frac{20{\cdot}25}{12{\cdot}1845} = 1{\cdot}6619$ = hydraulic mean depth.

$\sqrt{8 \times 1{\cdot}6619} = 3{\cdot}646$ = velocity in feet per second.

$3{\cdot}646 \times 20{\cdot}25 = 73{\cdot}83$ = cubic feet per second (or sluice-heads)—if in long, straight, and smooth iron fluming. If in gravel moderately rough with easy

curves, 73·83 × 0·5 = 36·91 sluice-heads. If in boulders, or with unlined sets of timber and bad curves, 73·83 × 0·4 = 29·53 sluice-heads.

Example 3.

What quantity of water will a channel carry with plumb sides, 4 ft. width of bottom, 2½ ft. depth of water, and a gradient of 48 ft. per mile?

$(2{\cdot}5 \times 2) = (5) + 4 = 9$ = wetted border.
$4 \times 2{\cdot}5 = 10$ = area.
$\frac{10}{9} = 1{\cdot}1111$ = hydraulic mean depth.
$96 \times 1{\cdot}1111 = 10{\cdot}327$ = velocity in feet per second.
$\sqrt{10{\cdot}327 \times 10} = 103{\cdot}27$ = sluice-heads—if in long, straight, and smooth iron fluming. If in fluming lined with undressed sawn timber, 103·27 × 0·7 = 72·289 sluice-heads.

Example 4.

What quantity of water will a flume carry with plumb sides, 4 ft. wide, 2 ft. depth of water, and gradient 24 ft. per mile.

$(2 \times 2) = (4) + 4 = 8$ = wetted border.
$4 \times 2 = 8$ = area.
$\frac{8}{8} = 1$ = hydraulic mean depth.
$\sqrt{48 \times 1} = 6{\cdot}9282$ = velocity in feet per second.
$6{\cdot}9282 \times 8 = 55{\cdot}425$ = cubic feet per second (or sluice-heads)—in long, straight, and smooth iron fluming. If in fluming lined with dressed boards, 55·425 × 0·8 = 44·34 sluice-heads. If in fluming lined with undressed sawn boards, 55·425 × 0·7 = 38·797 sluice-heads.

In flumes, tunnels, and channels of similar character four times the gradient doubles the velocity or quantity, and four times the hydraulic mean depth also doubles the velocity or quantity.

Velocity is proportional to square root of gradient.
" " H.M.D.
" " gradient × H.M.D.

Friction of Water in Pipes and Channels.

Experiments show that the forces that retard the flow of water in pipes and channels, all of which are generally included in the term "friction," are in pipes and channels of the same character and of equal hydraulic mean depth proportional to the square of the velocity of the water, but where the H.M.D. is greater the loss of head by friction is less for any specified velocity. A velocity of, say, 10 ft. per second in a small pipe produces more loss of head than the same velocity in a larger pipe, because the fictional surface in proportion to the area is greater in the one case than in the other.

In the conveyance of water through pipes or in channels a portion of the head lost is absorbed in producing the velocity of the water; another portion is absorbed by friction proper; and another portion (in many instances very large) is absorbed by eddies and counter-currents, caused by obstructions, inequalities, and roughness in the pipe or channel conveying the water. The last-named loss of head may be easily seen by observing the flow of water in an unlined tunnel or open ditch, with sets of timber every 3 ft. or 4 ft. Eddies and counter-currents caused by the sets of timber disturb and retard the whole sectional area of the flowing water. Experiment has demonstrated that such a tunnel or channel may be made to carry more than double the quantity of water if smoothly and uniformly lined. As in channels, so in pipes and other conduits for the conveyance of water—perfect smoothness and uniformity are of the utmost importance. A change of form in the sectional area of flowing water produces retardation.

There are several methods of ascertaining the loss of head by friction (which term is taken to include all the retarding forces) in pipes of various diameters, carrying water at various velocities. A pressure-gauge may be used at any point in a line of pipes, and the difference between the readings when the water is at rest and when the water is in motion delivering a certain quantity of water (the pipes being full in both instances) is the exact measure of the loss of head that takes place between the source and the point at which the gauge is used when the pipes are carrying that particular quantity of water. Another method quite as reliable is the calculation of the loss of head from the carrying-capacity of pipes of various diameters under various hydraulic gradients. If a pipe of any specified diameter (or H.M.D.) carries a certain quantity of water on a certain hydraulic gradient, then that gradient is the correct measure of the loss of head in that particular pipe when carrying that particular quantity of water. If a pipe 12 in. in diameter carries four sluice-heads of water on a hydraulic gradient of 1 in 100, then the loss of head in that pipe, carrying that quantity of water, will be 1 ft. of head for every 100 ft. in length of the pipe. Such being the case, any correct formula for ascertaining the carrying-capacity of pipes of various diameters under various hydraulic gradients can, by transposition, be made to give the correct loss of head from friction.

The attached tabulated statement gives the results of experiments made for the purpose of ascertaining which formula in general use gives the most correct results. It will be seen that Eytelwein's general formula is not only the most correct, but by far the most simple, and it is applicable not only to pipes, but to channels also, and is in strict accordance with all the known laws of hydraulics. The formula is, "The mean velocity of water in feet per second is equal to the square root of" (twice the fall in feet per mile multiplied by the hydraulic mean depth). This formula may be stated as $\sqrt{RS\ 10560}$ = velocity, R being the hydraulic mean depth and S the sine of the inclination, S 10560 being equal to twice the fall in feet per mile. It must, however, be understood that the formula is correct only for long, straight, and smooth pipes or channels, but it gives the correct proportions for pipes or channels of any kind, whether crooked or straight, rough or smooth, and the results multiplied by coefficients suitable to the character of the pipe or

channel intended to be used give ultimate results quite as correct as the best and more complex methods given in works on this special subject.

The attached table is founded on Eytelwein's formula; it gives the length of pipe in which 1 ft. of head is absorbed by friction in clean pipes from 6 in. to 36 in. in diameter when carrying from one to fifteen sluice-heads of water.

Examples.

What is the loss of head in 2,000 ft. of clean 15 in. pipes when carrying eight sluice-heads of water?

The length of pipe given in the table in which 1 ft. of head is absorbed in 15 in. pipes carrying eight sluice-heads of water being 77 ft.—

$$\frac{2000}{77} = 25{\cdot}97 \text{ ft. loss of head.}$$

If the pipes are slightly rough add 30 per cent.—

$$\begin{array}{rr} & 25{\cdot}97 \\ + 25{\cdot}97 \times 0{\cdot}3 = & 7{\cdot}79 \\ \hline & 33{\cdot}76 \text{ ft. loss of head.} \end{array}$$

If pipes are very rough, and badly laid, add 60 per cent.—

$$\begin{array}{rr} & 25{\cdot}97 \\ + 25{\cdot}97 \times 0{\cdot}6 = & 15{\cdot}58 \\ \hline & 41{\cdot}55 \text{ ft. loss of head.} \end{array}$$

What is the loss of head in 1,740 ft. of clean 15 in. pipes when carrying nine sluice-heads of water?

$$\frac{1740}{61} = 28{\cdot}52 \text{ ft. loss of head.}$$

What is the loss of head in 1,580 ft. of rough and badly-laid 11 in. pipes when carrying nine sluice-heads of water?

$$\frac{1580}{13} = 121{\cdot}53 + (121{\cdot}53 \times {\cdot}6) = 194{\cdot}44 \text{ ft. loss of head.}$$

If the quantity of water intended to be used is more than fifteen sluice-heads, take from the table the number corresponding to one-half, one-third, or one-fourth the intended quantity, and divide by 4, 9, or 16 respectively.

The loss of head in a 20 in. pipe, carrying ten sluice-heads of water, is 1 ft. of head in every 209 ft. length of pipe (as per table).

The loss of head in a 20 in. pipe, carrying twenty sluice-heads of water, is 1 ft. of head in every $\frac{209}{4} = 52{\cdot}25$ ft. length of pipe.

The loss of head in a 20 in. pipe, carrying fifteen sluice-heads of water, is 1 ft. of head in every 93 ft. length of pipe (as per table).

The loss of head in a 20 in. pipe, carrying forty-five sluice-heads of water, is 1 ft. of head in every $\frac{93}{9} = 10{\cdot}33$ ft. length of pipe.

The loss of head in a 20 in. pipe, carrying sixty sluice-heads of water, is 1 ft. of head in every $\frac{93}{16} = 5{\cdot}81$ ft. length of pipe.

Length of Pipe (in Feet) in which 1 ft. of Head is absorbed by Friction in Pipes from 6 in. to 36 in. in Diameter when Carrying from One to Fifteen Sluice-heads of Water.

(Calculated from $\frac{R\ 10560}{V^2}$ = length for 1 ft. of head.)

Diameter in Inches.	One Head.	Two Heads.	Three Heads.	Four Heads.	Five Heads.	Six Heads.	Seven Heads.	Eight Heads.	Nine Heads.	Ten Heads.	Eleven Heads.	Twelve Heads.	Thirteen Heads.	Fourteen Heads.	Fifteen Heads.
6	51	12·7	5·6	3·1	2	..	..	..	..	..	..	..	..	..	..
7	110	27·5	12·2	6·9	4·4	3	2·2	..	..	..	..	..	..	..	..
8	214	53·5	23·7	13·4	8·5	5·9	4·3	3·3	2·6	2·1	..	..	..	..	..
9	386	96·5	42·9	24·1	15·4	10·7	7·8	6	4·7	3·8	3·2	2·6	2·2	..	..
10	654	163	72	40·7	26	18	13	10·1	8	6·5	5·4	4·5	3·8	3·3	2·9
11	1,054	263	117	65	42	29	21	16	13	10·5	8·7	7·3	6·2	5·3	4·6
12	1,628	407	180	101	65	45	33	25	20	16	13	11	9·6	8·3	7·2
13	2,430	607	270	151	97	67	49	37	30	24	20	16	14	12	10.8
14	3,519	879	391	219	140	97	71	54	43	35	29	24	20	17	15
15	4,969	1,242	552	310	198	138	101	77	61	49	41	34	29	25	22
16	6,862	1,715	762	428	274	190	140	107	84	68	56	47	40	35	30
17	9,292	2,323	1,032	580	371	258	189	145	114	92	76	64	55	47	41
18	12,366	3,091	1,374	773	495	344	252	193	152	123	102	86	73	63	55
20	20,943	5,235	2,327	1,308	837	581	427	327	258	209	173	145	124	106	93
22	33,729	8,432	3,747	2,108	1,349	936	688	527	416	337	279	234	199	172	149
24	52,112	13,028	5,790	3,257	2,084	1,447	1,063	814	643	521	430	361	308	265	231
26	77,760	19,440	8,640	4,860	3,110	2,160	1,587	1,215	960	777	642	540	460	396	345
28	112,630	28,157	12,514	7,039	4,505	3,128	2,298	1,759	1,390	1,126	930	782	666	574	500
30	159,040	39,760	17,671	9,940	6,362	4,418	3,246	2,485	1,963	1,590	1,314	1,104	941	811	707
32	219,620	54,905	24,402	13,726	8,785	6,100	4,482	3,431	2,711	2,196	1,815	1,525	1,299	1,120	976
34	297,370	74,342	33,041	18,585	11,895	8,260	6,068	4,646	3,671	2,973	2,457	2,065	1,759	1,517	1,321
36	395,730	98,932	43,970	24,733	15,829	10,992	8,076	6,183	4,886	3,957	3,270	2,748	2,341	2,019	1,758

*Tabulated Statement of Experiments on the Carrying-capacity of Clean Pipes of Various Diameters under Different Heads carried out on the Waimea-Kumara Water-races.**

Diameter of Pipe.	Kind of Pipe.	Total Length.	Total Head.	Hydraulic Gradient.	Actual Quantity of Water discharged.	Calculated from Neville's Formula. $V = 140\sqrt{RS} - 11\sqrt[3]{RS}$.	Calculated from Eytelwein's Formula. $V = \sqrt{RS\ 10560}$.
		Ft.	Ft.		Cubic Feet per Second.	Cubic Feet per Second.	Cubic Feet per Second.
30 in.	Wrought-iron riveted	1,188	4·46	1 in 266	24	25·9187	24·269
21 "	Ditto ...	16,335	28·92	1 " 57	22	24·4003	21·767
18 "	" ...	2,514	32·73	1 " 77	12·5	13·9885	12·689
30 "	" ...	943·8	1·18	1 " 800	14	14·2349	14·099
30 "	" ...	943·8	1·65	1 " 572	16·75	17·1546	16·673
30 "	" ...	943·8	1·51	1 " 625	16	16·3325	15·953
36 "	Cast-iron ...	11,136	4	1 " 2,784	12	11·2204	11·922
36 "	" ...	11,621	24	1 " 484	28·75	29·9566	28·593
36 "	" ...	11,213	11	1 " 1,019	19·75	19·8111	19·703
36 "	" †...	11,975	36	1 " 333	...	36·832	34·520
4·44 "	Galvanised-iron	1,254	12	1 " 105	0·329	...	0·321

* The attached sheet shows the manner in which the calculations are made. † Proposed pipe to carry 35 cubic feet per second.

No. 2 Hole.

Total length of pipes ... 12,500 feet. Total head ... ... 81 feet.
Less ... ... 525 " Less ... ... 45 "
Proposed length ... ... 11,975 " Proposed head ... ... 36 "

$V = 140\sqrt{RS} - 11\sqrt[3]{RS}$. V = cubic feet per second. A = 7·0685

Pipe, 36 in. in diameter					
Radius, ·750	log.	$\bar{1}$·8750613			
Sine, ·003012	log.	$\bar{3}$·4788550			
		2)$\bar{3}$·3539163			3)$\bar{3}$·3539163
		$\bar{2}$·6769581			$\bar{1}$·1179721
140		2·1461280	11 in.		1·0412927
A 7·0685		·8493273	A 7·0685		·8493273
47·034	log.	1·6724134	10·202	log.	1·0086921
10·202					
36·832 cubic feet per second.					

$V = \sqrt{RS\ 10560}$. V = cubic feet per second. A = ·7854

A ·750	log.	$\bar{1}$·8750613	
S ·10560 = 31·80	log.	1·5024271	
		2)1·3774884	
		·6887442	
A 7·0685	log.	·8493273	
		1·5380715	= 34·52 cubic feet per second.

$V = 50\sqrt{\frac{\text{dia.} \times \text{total head}}{\text{total length}}}$. V = cubic feet per second. A = 7·0685

Diameter, 3 ft.	log.	·4771213	
Total head, 36 ft.	log.	1·5563025	
		2·0334238	
Total length, 11975		4·0782755	
		2)$\bar{3}$·9551483	
		$\bar{2}$·9775741	
50		1·6989700	
A 7·0685		·8493273	
		1·5258714	= 33·564 cubic feet per second.

Hydraulic Sluicing.

Capacity of Sluices.

In sluices of similar character, as well as in other channels for the conveyance of water, the velocity of water is proportional to the square root of the hydraulic mean depth multiplied by the gradient.

In hydraulic sluicing as carried out at Kumara (the largest hydraulic-sluicing goldfield in New Zealand) the widths of the sluice-boxes are so regulated in claims that are properly worked that there is but little variation in the hydraulic mean depth of the sluices in use on the field. Such being the case, in the calculation of the velocity of the water in sluices at Kumara, or other places having alluvial wash of a similar character, the hydraulic mean depth need not be taken into consideration, and the velocity of water may simply be stated as proportional to the square root of the gradient. And as the power (or force) of water is proportional to the quantity (or weight) of the water, multiplied by the square of the velocity, and as the velocity is proportional to the square root of the gradient, then it follows that the power of water is directly proportional to the quantity of water multiplied by the gradient. This is only a modification of the well-known laws of water—the velocity of water is proportional to the square root of the hydraulic head, and the power of water is directly proportional to the quantity of water multiplied by the hydraulic head.

Experiment has shown that these laws are not only applicable to hydraulic heads, but also to gradients of sluices and other open channels; and, as the velocity of water from nozzles is proportional to the square root of the hydraulic heads, so velocity of water in sluices having uniform hydraulic mean depth is proportional to the square root of the gradients.

The following rule is in accordance with the laws of hydraulics, and its correctness has been checked by experiments and measurements made at Kumara, and by the experience of most of the hydraulic miners working on that field, extending over a period of several years. The rule gives the quantity (in cubic yards) of ordinary (Kumara) alluvial wash sluiced away per hour, in ordinary sluice-boxes, paved with wood (on end) blocks, with various quantities of water, on various gradients. The rule is: The quantity of water in sluice-heads multiplied by the fall in inches per box of 12 ft. gives the number of cubic yards sluiced away per hour:—

Examples.

Number of Sluice-heads.		Fall per Box of 12 ft.		Quantity sluiced away per Hour.
10 heads	×	6 inches	=	60 cubic yards.
8 "	×	8 "	=	64 "
12 "	×	7 "	=	84 "
14 "	×	8 "	=	112 "
10 "	×	12 "	=	120 "
12 "	×	14 "	=	168 "

The number of cubic yards per hour required to be sluiced away, divided by the fall per box, gives the quantity of water required for that purpose.

The number of cubic yards per hour required to be sluiced away, divided by the number of sluice-heads of water available, gives the required fall per box.

The rule will give a close approximation of the quantity of ordinary alluvial wash that will be sluiced away in sluice-boxes paved with wood blocks, provided a proper use is made of the water, and the width of the box is in proper proportion to the fall, and quantity of water.

The nature of the material to be sluiced away must always be taken into consideration, as with material of high specific gravity and large quantities of spawled stone the quantity put through will be less, and with material of low specific gravity and well-rounded stones the quantity will be more. Wash is more easily sluiced when it contains a fair proportion of well-rounded stones, from 4 in. to 18 in. in diameter; and fine heavy wash is the most difficult: the stones keep the finer and heavier material from settling firmly on the bottom of the sluice.

All the blockages that occur at Kumara in the sluices there are composed of fine, heavy sand, and are seldom or never due to stones. It is necessary that the whole of the material in sluices should be constantly on the move, as otherwise blockages will occur, less material will be sluiced away, and gold will be lost.

As the parties running water and tailings into the main tail-races or channels have to pay a fixed price per shift of three hours for maintenance and repairs, it became necessary to devise some means of regulating the quantity of tailings sluiced by each party into the main tail-race. As the price per shift for each party was equal, it was arranged that each party should sluice an equal number of cubic yards of tailings into the main tail-race; and the trustees of No. 3 channel embodied in their regulations the following table for that purpose. The table was calculated so that each claim would sluice into the channel 64 cubic yards of tailings per hour, thus equalising the wear-and-tear, and giving each party equal advantage of the flush-water supplied free from the Kumara Race.

Water.—Relative Quantities of Water for Hydraulic Sluicing for Various Falls per Box.

Fall per Box of 12 ft.		Number of Sluice-heads.
1 in 48·00,	3 in. per box	21·33 sluice-heads.
1 in 36·00,	4 in. "	16·00 "
1 in 28·80,	5 in. "	12·80 "
1 in 24·00,	6 in. "	10·66 "
1 in 20·57,	7 in. "	9·14 "
1 in 18·00,	8 in. "	8·00 "
1 in 16·00,	9 in. "	7·11 "
1 in 14·40,	10 in. "	6·40 "
1 in 13·09,	11 in. "	5·81 "
1 in 12·00,	12 in. "	5·33 "

Fall to be reckoned from the total difference of level in 60 lineal feet of tail-race running free.

The regulation has now been in force for some years, and has given satisfaction to all the parties interested. It will be seen that the table is calculated from the rule, "The number of cubic yards per hour required to be sluiced away, divided by the fall per box (in inches), gives the quantity of water required for that purpose." Other main tail-races have adopted the same rule.

The table in the regulations for No. 4 channel is based on each party sluicing into the main tail-race 112 cubic yards of tailings per hour.

Fall per Box of 12 ft.	No. of Sluice-heads.
1 in 21·33, 6¾ in. per box	16·59 sluice-heads.
1 in 20·57, 7 in. "	16·00 "
1 in 18·00, 8 in. "	14·00 "

The rule given is in accordance with American authorities on the subject, and produces practically the same results as the rule given in Gordon's "Miner's Guide," but it is more simple, and will be more readily understood and applied by ordinary miners and others.

List of Claims at present sluicing on the Kumara Goldfield, showing Width of Boxes, Fall per Box, Quantities of Water used, and Remarks on Working.

Number of Claims.	Width of Boxes.	Fall per Box.	Quantity of Water.	Remarks.
	In.	In.		
1	32	4	20 sluice-heads ...	Works well.
1	30	4½	20 " ...	Not straight; bad.
1	26	5	12 " ...	Fair.
1	22	5	12 " ...	"
2	26	6	10 " ...	"
2	22	6	10 " ...	"
1	22	6½	10 " ...	"
1	26	6¾	24 " ...	Too narrow.
1	24	7	14 " ...	"
1	22	7	8 " ...	Good.
2	24	8	14 " ...	Too narrow.
3	24	8	10 " ...	Very good.
2	22	8	8 " ...	Fair.
1	22	8	10 " ...	Good.
1	20	8	10 " ...	"
1	20	8	8 " ...	Fair.
1	26	9	12 " ...	Good.
1	24	10	10 " ...	"
1	30	12	10 " ...	"

The total length of private tail-races in use at Kumara is more than seven miles, and quite double that length are now abandoned, as the ground commanded by them has been worked out. The main tail-races in use have an aggregate length of about three miles.

Wear of Wood (on end) Blocks.

Red-pine (rimu), being the most plentiful timber in the neighbourhood of Kumara, is the timber generally used as paving-blocks for sluices. Other timber is, however, often used, and white-pine will stand longer in sluices than red-pine, as it does not wear away so rapidly.

The following rule will give the life of wood-paving blocks in sluices nearly correct, as it has been deduced from carefully-compiled information obtained from all the sluicing claims on the Kumara Goldfield. The width of the sluice (in inches) multiplied by the thickness of the blocks (in inches) multiplied by 320 gives the number of cubic yards of wash that will pass through the sluice before a set of blocks are worn out:—

Examples.

Width of Sluice.		Thickness of Blocks.		Constant.	Quantity.
32	inches ×	6	inches ×	320 =	61,440 cubic yards.
30	" ×	8	" ×	320 =	76,800 "
26	" ×	8	" ×	320 =	66,560 "
24	" ×	7	" ×	320 =	53,760 "
22	" ×	6	" ×	320 =	42,240 "
20	" ×	8	" ×	320 =	51,200 "

Almost any kind of timber would be suitable for paving sluices. Other material has been tried for paving sluices, but in Kumara timber is almost universally used.

A Sluice-head of Water. (Under "The Mines Act, 1891.")

A large number of people not connected with mining, and even a great many miners, have a very hazy idea of what a sluice-head of water really is. If you ask some miners they will say "A sluice-head of water is 40 inches." This is correct under certain circumstances, for a sluice-head of

water is a constant stream having a sectional area of 40 square inches, and having a mean velocity of 3·6 ft. per second, which will deliver 1,728 cubic inches, or one cubic foot, of water per second. The regulations under "The Mines Act, 1891," have a table showing how to construct gauge-boxes for the measurement of any number of sluice-heads of water from one to a hundred, which table is practically correct. The experiments for the calculation of the table for all gauge-boxes over two sluice-heads were made at Kumara from actual measurements of the quantities discharged through large and small openings, under various pressures. A gauge-box for delivering one sluice-head of water has an opening of 20 in. in width by 2 in. in depth (40 square inches), with a pressure-board 5 in. in depth; and, as the total pressure is reckoned from the surface of the water to the centre of the opening, there is an actual head of water of 6 in. In such a box, constructed as described in the regulations, having an opening of 40 square inches, and a pressure of water of 6 in., the mean velocity of the water where the opening is full will be 3·6 ft. per second, and the quantity discharged will be 1 cubic foot per second, or one sluice-head. With the same opening, and a pressure of water of 24 in., the velocity would be 7·2 ft. per second, and the quantity discharged would be 2 cubic feet per second, or two sluice-heads. It takes four times the head of water to double the velocity. A sluice-head of water is a uniform and constant stream delivering 1 cubic foot of water per second. One cubic foot of water contains 6¼ gallons, and weighs 62½ lb. A sluice-head will therefore discharge—

1	cubic foot	6¼ gallons, or	62½ lb.	of water	per second.
60	"	375 "	3,750 lb.	"	per minute.
3,600	"	22,500 "	225,000 lb.	"	per hour.
86,400	"	540,000 "	5,400,000 lb.	"	per day (24 hours).

With figures such as the above before him, any person may have some idea of the effect of ten or twenty heads of water thrown against a face of alluvial wash with a velocity of from 60 ft. to 100 ft. per second, knowing at the same time that the force of the impact is proportional to the square of the velocity. 88 ft. per second equals 60 miles per hour.

NOTES ON BLASTING WITH NO. 1 DYNAMITE, BLASTING-GELATINE, AND AMMONITE, IN CHOTA NAGPUR, BENGAL, INDIA.*

[Communicated by A. Mervyn Smith.]

The following notes are summarised from a carefully-kept daily register, for a period extending over two years, and give the results of actual practice with the above-mentioned high-class explosives:—

The size of the shaft was 12½ ft. by 6 ft.; drives, 7 ft. by 5 ft.; cross-cuts, 7 ft. by 4 ft. Country-rock medium hard blue slate (hydromica schist), easy drilled, but tough, and splitting readily along bedding-planes. Underlie 70° with the horizon. Occasional stringers of hard quartz, from 2 in. to 6 in. wide, and parallel to the bedding-planes, were met with in sinking. The reef was from 7 ft. to 10 ft. wide, consisting of a hard crystalline quartz, showing a banded structure with alternate ribbons of blue, grey, and white quartz. Highly pyritous, the iron-sulphides making up nearly 10 per cent. of the weight of ore extracted.

The drilling was done by hand, the best 7 in. steel being used. It was found in practice that 2 ft. to 3 ft. holes did the most work in sinking and driving. Deeper holes did little or no work. In stoping, deeper holes were more advantageous. The drills were of four sizes—9 in., 1½ ft., 2½ ft., and 3½ ft., the smallest size being 1½ in. wide, tapering down to 1 in. in the 3½ ft. drills. Water tamping was used throughout, the works being wet, the water making at the rate of 5,000 gallons per shift of eight hours. Chisel-face drills, medium-blue temper, answered well for drilling in slate. Cock's-comb or crescent-face drills of the hardest temper had to be used for the quartz. 7 lb. hammers were used, and two men (natives), one striking and the other holding the bit, would drill 6 ft. in slate, or 2 ft. in quartz, in a shift of eight hours. The explosives used were No. 1 dynamite, blasting-gelatine, both supplied by Nobel's Explosive Company; and ammonite, from the Miners' Safety Explosive Company.

The cost of explosives delivered at the mine, 265 miles by rail from Calcutta, was—

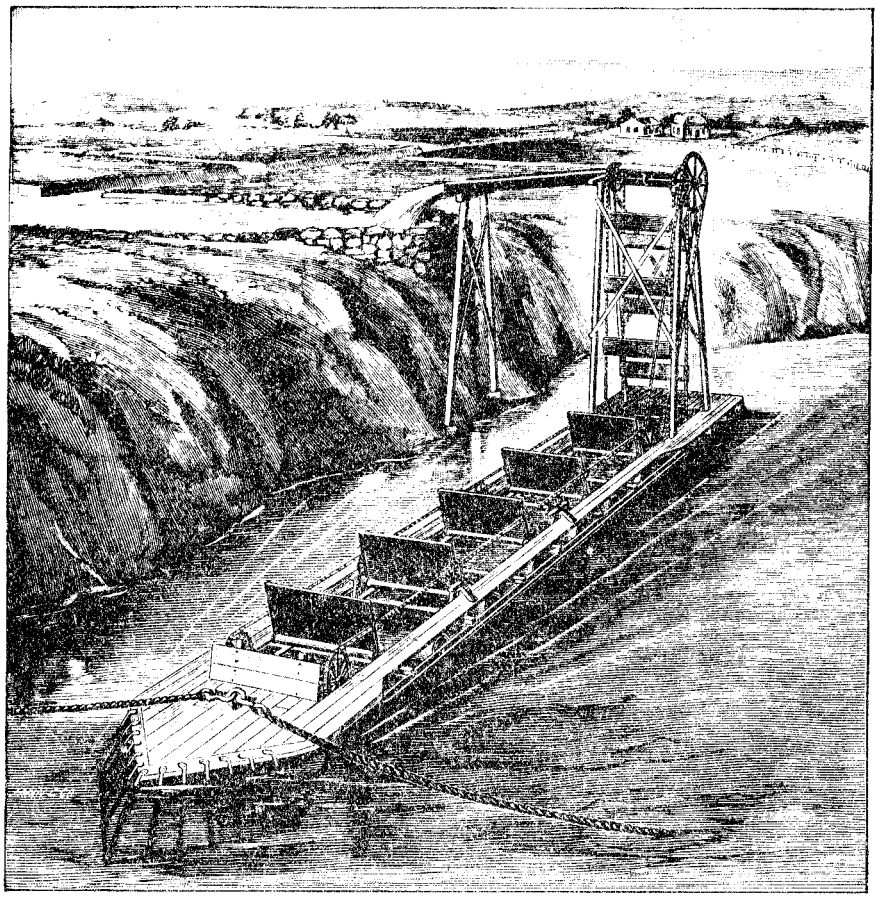
	Per Pound. s.	d.
Blasting-gelatine	3	6½
No. 1 dynamite	3	0
Ammonite	2	8½

With the rupee at 1s. 2½d. in Calcutta, the prices are:—

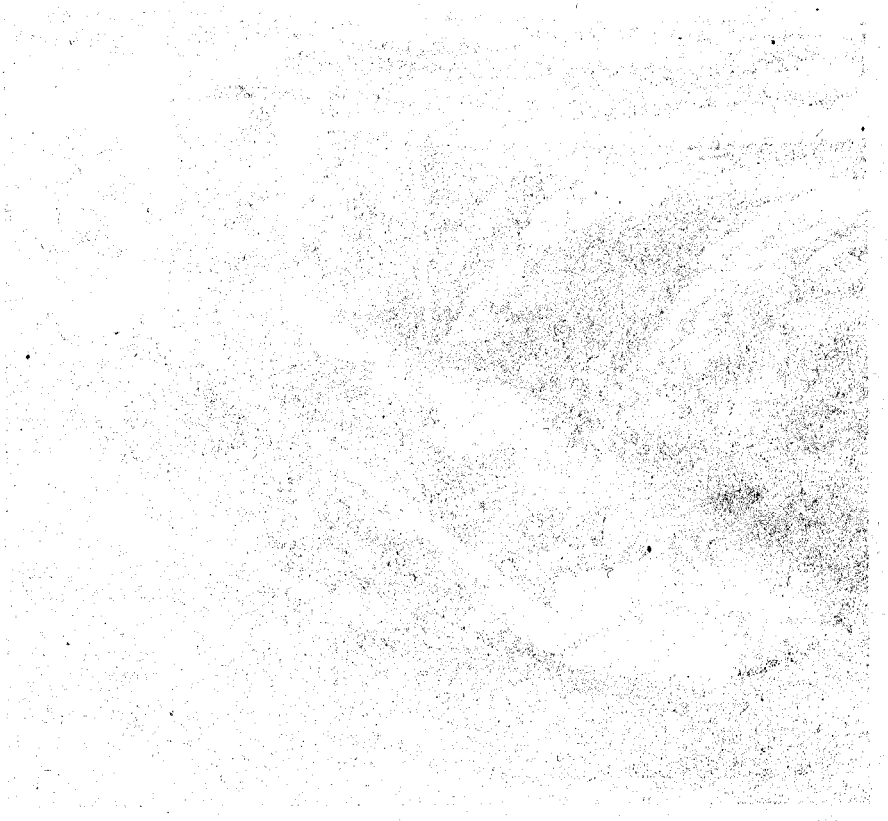
	Rs.	a.	p.
Blasting-gelatine, per pound	2	6	0
No. 1. dynamite	1	13	6
Ammonite	1	8	0
Sextuple caps, per hundred	6	0	0
Felted fuse, per coil of 24 ft.	0	13	0

In quartz, gelatine by itself did not do as much work as a mixture of gelatine and dynamite. For a 3 ft. hole, four plugs of gelatine (ten plugs to the pound), and one plug dynamite (six plugs to the pound), break the ground to the bottom of the hole. The gelatine was first inserted, and the cap, with fuse attached, imbedded in the plug of dynamite, placed above the gelatine. Dynamite,

* Read before the Institution of Mining and Metallurgy.



A NEW CURRENT MOTOR.



although not as strong as gelatine, is a quicker explosive, and, therefore, more local in its effects. It breaks up the quartz near the mouth of the bore-hole, and allows the greater ballistic (throwing) power of the gelatine to take effect. In slate, gelatine alone did more work than dynamite. Ammonite was more effective in slate and in stoping than either gelatine or dynamite, but not of so much use in hard quartz or pinched holes. In holes occurring in the angles of the shaft, double the above charges were used; in the side holes, an increase of 50 per cent. on the normal charge. The centre holes were first fired, then the side holes, and finally the corner holes.

Method of Blasting.

In sinking shaft, 12½ ft. by 6 ft., fifteen holes were drilled. 1, 2, and 3 were first fired (not by electricity), and the *débris* cleared out before the second blasting, consisting of 4, 5, 6, 7, 8, 9, 10, and 11, or such of them as were left after the first blast, as it oftened happened that some of these holes were broken out by the effects of the first firing. The shaping or angle holes at 12, 13, 14, and 15 were last blasted. Progress, about 1 ft. a day in slate, and ½ ft. a day in quartz.

Remarks.

The above method of firing, and charges of explosives, was arrived at after numerous experiments with larger and smaller charges, with each explosive by itself and with mixtures, and with holes fired in various order. It frequently happened that unexploded cartridges of gelatine were recovered from the *débris* hauled out of the mine. This never happened with ammonite or dynamite. Experience proved that this was due to a little sand or clay getting in between the plugs of gelatine. In wet holes at the bottom of the shaft it was difficult to prevent dirt getting into the holes after the rammer was withdrawn to put in another cartridge. This slight packing between two cartridges deadened the detonation and prevented the explosion of the lower cartridges. Sextuple detonators (caps) were used with dynamite and gelatine. Special caps, extra strong, were supplied by the Miners' Safety Explosive Company with their ammonite, as this explosive cannot be fired with ordinary caps. A small supply of gelignite was obtained, but its use was given up, as this explosive was found to rapidly deteriorate in the hot, damp climate of Chota Nagpur. Felted fuse was used, and found to answer admirably.

The following are details of cost, &c., of sinking shaft from the 50 ft. level to a depth of 150 ft.:—

	£ s. d.	£ s. d.
Size of shaft, 12½ ft. by 6 ft.; country-rock, slate and quartz, cost per foot of sinking		2 2 9
Explosives	1 6 6	
Labour and superintendence	0 16 3	
	2 2 9	
Number of shots		22
Explosives		7½ lb.
Fuse		3 coils.
Caps		20
Ground removed		5 tons.
Water		15,000 gallons.

A NEW CURRENT MOTOR.

The term "current motor" is applied to a mechanism that utilises the power of the stream or current of a river in such a way that it can be applied to run machinery.

A current motor, it is claimed, can be used without a dam in any location in a river where the water is deep enough to admit it. There is almost no limit, the manufacturers claim, to the use to which the power generated by a current motor can be applied. For example, it may be used for generating electricity for electric-lighting purposes; but its chief use will be in connection with irrigation and mining.

The motor herewith illustrated has been experimented with and tested, and its practicability is fully believed in by its makers, the F. C. Austin Manufacturing Company, of Chicago, who claim that the only limit to its power and amount of water that can be pumped is the dimensions of the paddles, the number of them, and the force of the current. The machine, which is represented as anchored in the river, consists of a pontoon carrying two endless chains, to which are pivotally attached at suitable distances reversible paddles, having floats at their upper ends that buoy them up in their course through the water. These paddles enter and leave the water in such a way as not to detract from the efficiency of the machinery, but calculated to rather add to it. To the wheels put in motion by these cables is attached an elevator carrying large buckets, which, when entering the water to fill themselves, it is claimed, add to the generation of power, and are so arranged that when they reach the top of the elevator they discharge their contents with little friction into a trough, there to be conveyed to the shore, where a reservoir has been constructed to collect the water and distribute it through canals and lateral ditches.

THE ACCUMULATION OF AMALGAM ON COPPER PLATES.

[Paper read before the American Institute of Mining Engineers by R. T. Bayliss, Marysville, Montana (Pittsburgh Meeting, February, 1896).]

Although every mill-man of even limited experience in the amalgamation of gold-ores is probably aware that copper plates will in time become coated by the accumulation of gold-amalgam, it may be that many do not know to what extent this accumulation occurs in the treatment of ores dissimilar to those with which they are familiar, and under conditions foreign to those with which they have to contend in any given locality. The writer, therefore, feels relieved from the necessity of offering an apology for dealing with such an elementary subject, believing that certain facts in reference thereto which have recently come under his personal observation will be interesting to many, and possibly instructive to some persons engaged in the amalgamation of gold-ores.

The facts hereinafter stated were observed in the fifty-stamp "combination"-mill, owned by the Montana Mining Company (Limited), of England, operating the Drum Lummon Mine, situated at Marysville, Montana.

The material treated in this mill consists of quartz and ores of somewhat variable character, containing gold and silver in native form, as well as in chemical union with the sulphides of iron and copper. There is also present a little lead, some arsenic and antimony, and a little zinc. The last four minerals, however, are of irregular occurrence, and but sparingly distributed throughout the ore, and yield only a trace in the analysis of the average material in this mill. The free gold, which is in a condition of fine division, and rarely visible to the naked eye, carries silver as an alloy; and the native silver, which is only occasionally observed, is present in the richer ores in wire- and in leaf-form.

Of the two precious metals, the ore worked during the past three years and ten months, the period under review, contained about $\frac{1}{2}$ oz. of gold, and from 7 oz. to 12 oz. of silver per ton of 2,000 lb.

The ore, after being crushed in the stamp-battery and passed through a thirty-mesh steel-wire screen, runs over amalgamated copper plates, and is then concentrated on Frue vanners, to the distributor of which is affixed a small copper plate for saving any amalgam escaping from the battery-plate, the tailings from the vanners being subsequently amalgamated in pans.

Amalgamation upon copper plates placed inside the mortar is not practised in this mill, better results having been obtained by amalgamation on outside or apron plates only. It is not the purpose of this paper to enter the wide field of discussion as to the relative merits of inside and outside amalgamation; but it may be observed in passing that an extended experiment upon the two methods proved that a higher percentage of saving was gained by amalgamation outside the battery than by the use of inside plates in addition to the apron-plates.

The apron-plates in use in this mill are 54 in. wide and 8 ft. long, made of $\frac{1}{8}$ in. rolled copper plate, electro-plated with 1 oz. of silver to the square foot. They are set with a fall of $2\frac{1}{4}$ in. to the foot; are cleaned up once in twenty-four hours; and dressed once every two, three, or four hours, as may be deemed necessary by reason of their surface-condition, which varies according to the mineral contents of the ore submitted to them. In dressing, a weak solution of cyanide of potassium is used when necessary. The copper plates upon the Frue vanners are 46 in. wide and 18 in. deep, made of $\frac{1}{8}$ in. rolled copper plate, electro-plated with 1 oz. of silver to the square foot, and are subjected to the same treatment as the apron-plates.

At the daily clean-up the surface of the apron-plates is first washed; then the amalgam which has collected during the preceding twenty-four hours is slightly softened and loosened by sprinkling a small quantity of mercury over the plate and rubbing the surface with a cloth or whisk-brush, after which the amalgam is removed with a stiff rubber scraper, 4 in. wide, made out of rubber belting. In this process the daily accumulation of amalgam is removed as completely as possible without the application of a steel scraper, the use of which is not permitted, except for the removal of blisters or any fixed impurity which may occasionally be found upon the plate.

The foregoing brief summary of the method employed in this mill will be sufficient to explain the general conditions surrounding the amalgamation of the free gold contained in the ore, and the treatment to which the copper plates are exposed.

To return to the special subject indicated by the title of this paper: One of the copper plates employed in this mill was recently removed, after having been in continual service for three years and ten months. During this period the battery of five stamps which it served crushed 14,942 tons of ore, yielding from amalgamation on this plate 6,426 oz. of bullion, 541·5 fine in gold, and 443·9 fine in silver, giving a standard assay-value of $11·70 per ounce, and showing the recovery of $5·03 per ton of ore crushed. In fixing the total tonnage of ore passed over this plate, and the yield in bullion therefrom, the total tonnage and production of the mill during this period has been divided by ten. As all the stamps have been operated continuously, this proportion should correctly represent the duty performed by the particular plate under consideration.

The agreeable task of removing the amalgam known to have accumulated upon this plate (which was new when put in) was then undertaken, and the accumulation or scale was removed by striking the back and front of the plate with a light hammer, a small block of wood being used to deaden and distribute the blow. By this means the plate is slightly buckled, causing the amalgam to scale off, and leaving upon the original electro-plated surface but an insignificant film or layer, which is subsequently removed with a chisel or scraper.

Other methods, such as sweating with hot water and immersing the plates in chemical solutions, have been tried, but have proved unsatisfactory; and the process of buckling the plate, although a somewhat drastic and unscientific method, has been found to effect the recovery of the highest percentage of the accumulated amalgam. After this treatment, the plate is usually so damaged as to be unfit for further service; but, notwithstanding that every visible portion of

amalgam has been removed, the copper plate is still found to carry a considerable quantity of gold and mercury, and upon being cut up and melted into a bar the value of the gold- and copper-contents amounts to more than twice the value of a new plate; hence the substitution of new plates for old is an expenditure which can be viewed without concern.

The results obtained from the foregoing treatment of the particular copper plate here specified were both interesting and of substantial value, the scale or accumulation of amalgam at the head of the plate being no less than 0·16 in. in thickness, and gradually decreasing to a bare $\frac{1}{16}$ in. at the lower end.

The total weight of the amalgam so recovered was 160 lb. avoirdupois, which, upon being retorted, yielded 60·5 lb., or 38 per cent., of crude bullion, and produced after melting a gold bar weighing 866·1 oz. troy, which, upon assay, proved to have a total fineness of 993 9, being 431·4 fine in gold and 562·5 fine in silver, and having a standard value of $9·63 per ounce; thus making the total value of bullion recovered from the accumulated amalgam upon this one plate no less than $8,340·54.

It may be remarked that the results recorded in this instance are not by any means exceptional. Other plates in this mill placed in service at the same time as the one forming the subject of this paper appear to be coated with an accumulation of amalgam of equal weight and value; and, moreover, within the writer's experience of other plates removed from this mill in past years is an instance in which one plate yielded accumulated amalgam in excess of $11,000.

An examination of the facts observed in the course of cleaning this plate, and converting the amalgam into bullion, reveals one or two interesting features which appear to be worthy of record.

As stated above, the percentage of bullion in the amalgam obtained was 38 per cent., whereas the amalgam from the daily clean-up never contains more than 20 per cent. of bullion, and frequently not more than 10 per cent. This is, no doubt, due to the circumstance that the amalgam remaining upon the surface of the plate is subjected to greater compression than that which is cleaned off, and merely strained through canvas sacks.

The accumulated amalgam obtained from the plate in the shape of scale does not appear to suffer any visible alteration in form or size during the process of retorting. A piece $\frac{1}{8}$ in. thick and 1 in. square will pass through the ordeal of retorting, and emerge as crude bullion, having preserved, without apparent loss, its original dimensions, and still retaining on its surface any ripple-marks or imperfections which it bore during its existence as amalgam.

A comparison of the fineness of bullion obtained from the accumulation of amalgam upon this plate with the average fineness of bullion produced from the daily clean-up of the plate, during its service of three years and ten months, of which one would suppose the accumulated amalgam to be a fair sample, shows that, to a striking degree, this is not the case.

The average fineness of bullion obtained from daily clean-ups during the period mentioned was Au, 541·5; Ag, 443·9—total, 985·4: whereas the fineness of bullion obtained from the accumulation upon this plate during the same period was Au, 431·4; Ag. 562·5—total, 993·9: from which it will be observed that, although the total fineness of the latter—993·9—is greater than the fineness of the former—985·4—the gold fineness is 110·1 less and the silver fineness 118·6 more.

That the total fineness of bullion from the accumulated amalgam should be higher than that obtained from the daily clean-ups is not a matter for surprise, since the amalgam gathered from the plates from day to day would naturally contain a higher percentage of impurity and base metal than the amalgam which adhered to the surface of the plate; but it does not clearly appear why the gold fineness of the latter should be so much lower than that of the former, the difference being represented by a corresponding increase in the silver fineness.

In explanation of this inconsistent feature, it has been suggested that the native silver contained in the ore has a greater tendency to accumulate upon the plates than the free gold, owing to its stronger affinity with the amalgamated surface. If theory furnishes any authority for such a statement it is rudely disproved by actual experience in this particular instance; for test-samples of the accumulated amalgam from the head and tail of this plate prove the former to be 0·020 finer in gold than the latter, with a corresponding increase in the silver fineness of the amalgam from the lower end of the plate.

Furthermore, the amalgam saved upon the copper plates forming the distributor of the Frue vanners invariably shows, upon assay, a lower gold and a higher silver fineness than the bullion recovered from the treatment of the same ore upon the battery-plate; a sample of this vanner amalgam yielding bullion assaying—Au, 380·5; Ag, 602·0: total, 982·5. In other words, the silver, instead of showing a strong affinity with the amalgamated surface, gives evidence of a persistent tendency to escape amalgamation, as proved by the foregoing assays, which show that the gold fineness of bullion is highest nearest to the battery, and gives place to a steadily-increasing silver fineness as the amalgam is deposited upon the copper plates at greater distance from the battery-discharge.

The natural conclusion to be drawn from these facts and figures would justify the expectation that the bullion derived from the accumulation of amalgam on copper plates would be of equal (if not of higher) gold fineness to that recovered from the daily clean-ups upon the plates during the period in which the accumulation was in progress. The foregoing facts, however, incontestably prove that such is not the case; and the purpose of this paper will be served if the facts herein presented, which have been prepared with due regard to accuracy, are the means of suggesting an explanation of this interesting inconsistency, which the writer most frankly confesses himself unable to supply.

CLASSIFYING TAILINGS BEFORE CONCENTRATION.

Messrs. W. Bettel and J. H. Johns have been carrying on at the Ferreira Mill some novel experiments on behalf of the Chamber of Mines, Johannesburg. It was believed that better results could be got by classifying the pulp previous to concentration; but the anticipations were not realised. The experiments were in the direction of roughly classifying by means of spitzluten and spitzkasten, and of passing that pulp alone which came from the spitzluten over the vanners. It was found that under these conditions the vanners have not caught their usual percentage of metal.

The explanation offered may be thus summarised: (1.) Overloading. (2.) To a principle which has hitherto not been recognised on these fields, but is well known on the diamond-fields—that minute particles of high specific gravity will subside through a shallower layer of pulp suspended by agitation in a turbid medium (such as a mixture of coarse and fine sand, pyrites, and clay) more readily than through a classified pulp, consisting of coarse particles suspended in clear water. This may be explained by assuming a reduction of surface tension in the former case. (3.) The proportion of fine gold escaping in sands and slimes is increased when an excess of water (over normal) is present in the pulp. (4.) With spitzluten, an increased clear-water supply carries off fine gold and floured amalgam in considerable amounts in slime-pulp. (5.) The scouring action of the coarse sands, &c., from the spitzluten (free from slimes) prevents the collection of floured amalgam on the shaking amalgamated plates on the vanners, and this amalgam so lost is not wholly recovered in the concentrates collected.

The pulp (consisting of slime and finest sands) delivered by the spitzkasten is imperfectly concentrated on the third vanner, such pulp requiring a large area equal to a very shallow layer of liquid for efficient concentration. The finest slimes (solid matter in effluent from spitzkasten) are very rich in gold. This is attributed to the presence of suspended floured amalgam and free gold of extreme tenuity, probably coated with films of grease or sulphides, which cause the particles to exert an increased surface tension sufficient to overcome the action of gravity to a very considerable extent.

The results obtained are, however, extremely interesting, and may, under other circumstances, have a distinct commercial value. When Frue vanners are used for concentration, previous classification, in the opinion of the experimenters, would not be advantageous, but where any other concentrator, not having a vanning motion, is employed they would recommend a previous classification of the battery-pulp.

GOLD-EXTRACTION FROM REFRACTORY ORES.

Mr. Hiram S. Maxim is the patentee of an improved process of extracting gold from refractory ores. He takes the advantage of the affinity existing between gold and lead when both are at a high temperature, and subjects the ore to the action of molten lead in the presence of a reducing gas or atmosphere. Whilst in the presence of a reducing gas or atmosphere the ore and molten lead are pounded, and the mass is slowly rotated or stirred. The apparatus comprises a strong rotary retort of cast iron or mild steel located in an inclined position within a furnace, and provided with a cylindrical extension, which extends through the backwall of the furnace, and is carried in bearings supported in strong pedestrals. The end of the extension is furnished with a toothed wheel, which gears with a pinion mounted on a driving-shaft revolved from any motor. In order to counterbalance the weight of the retort and its charge the cylindrical extension may be formed with a considerable mass of metal near its outer end. The mouth of the retort is provided with a cover. The earths to be acted upon are placed in the retort in a pulverised condition together with the lead. A number of loose balls of iron may be placed within the retort, together with the earths and lead. The inner surface of the retort is provided with longitudinal ribs, so that when the retort is revolved the balls will be raised by the ribs, and allowed to fall again to the mass at the bottom of the retort, thereby grinding the earth to a still finer condition and at the same time causing the molten lead to come into very intimate contact with the gold contained in the earths. During the process a current of carburretted hydrogen, such as coal-gas, or, still better, petroleum vapour, is allowed to pass into the retort through a pipe, the said gas or vapour expelling the atmospheric oxygen and also taking up any oxygen that may be set free. As the retort slowly revolves the molten lead, under the action of the heat and the pounding of the balls, is finely divided and distributed throughout the mass within the retort without becoming oxidized, and is therefore constantly brought into intimate contact with the gold contained in the earths. The process may be continued until all or nearly all of the gold has been taken up by the lead. The rotation of the retort is then arrested, the heat diminished, and the contents of the retort are discharged into water. The lead is then separated from the lighter earths by suitable means, and is then subjected to a high temperature in a furnace and in the presence of atmospheric oxygen until it becomes wholly oxidized, when a "button" containing the gold will be found in the cupel of the furnace. By this process the molten lead is always preserved in a bright metallic condition, the presence of the carburretted hydrogen completely preventing the oxidation of the surface of the lead and keeping it untarnished at a high temperature. In some cases finely-divided animal and vegetable charcoal or other carbonaceous materials may be mixed with the earths before or during their treatment with the molten lead. The cylinder may be placed at an inclination with one end partially open, and then revolved, a hot reducing flame of gas being directed into the open end of the cylinder. The contents of the cylinder will thus be heated to a higher temperature than the cylinder itself, and in the presence of a reducing flame.

CONCERNING TELLURIDES.

From the *Mining Journal, Railway and Commercial Gazette.*]

The announcement that telluride ores have lately been discovered in depth in some of the West Australian mines has attracted a considerable amount of public attention, and whilst this fact, for such it appears to be, has been made use of for the purpose of, as far as possible, "booming" the properties upon which the finds have been made, the public have not as yet shown any symptoms of desperate eagerness to rush in and buy up the shares of these vaunted telluride properties. Possibly the public have come to the conclusion that what they want is gold, that a goldfield which at the end of ten years' hard work only produces 281,000 oz. can hardly make up any deficiencies with tellurium. We remember not more than a dozen or so years ago that the chairman of a gold-mining company gravely informed his shareholders that unfortunately the assay-value in gold of the ore had been very much lower than was anticipated; but, on the other hand, analysis showed their ores to contain a considerable percentage of aluminium, the presence of which would doubtlessly recoup them for the low yield of gold. The investing and even the speculating public is getting wiser nowadays, and we look upon the general desire to know what tellurides are as a hopeful sign. It is the best thing possible when shareholders in mines begin to take a real interest in the more technical portions of their subject. We hold this view so strongly that we propose to explain to-day what tellurides are, how they are worked, and where they occur, for the benefit of our unscientific and non-technical readers, and we shall ask our mining friends to excuse this statement of facts familiar to them, though, after all, they are not compelled to read this particular column, unless they perchance wish to refresh their memories.

Tellurides, then, or telluride ore, is the general term applied by miners to a series of minerals into the composition of which the rare element tellurium enters in considerable proportion. Tellurium itself presents many analogies to sulphur, and forms with many of the metals compounds known as tellurides, strictly analogous to the sulphides. There is, however, this curious fact about tellurium: that it is the only known mineraliser of gold—that is to say, that native compounds or gold and tellurium exist although gold is not found in nature combined with any other element. We are quite aware that certain authorities consider that gold occurs in combination with sulphur, but the evidence in favour of the existence of such a compound is far from clear, and upon the whole it seems more probable that there is not a native sulphide of gold than that there is. In the matter of the telluride there is, however, no doubt possible. We have, for instance, the mineral sylvanite, also known as graphic or graphic tellurium, a tin-white to steel-grey brittle mineral, consisting of gold and tellurium only in its purest form, though it contains at times small or large quantities of silver and lead. The other important telluride minerals are: Calaverite, a yellowish-grey brittle telluride of gold; nagyagite, a soft blackish-grey mineral, consisting chiefly of tellurium, lead, and gold, and some sulphur; hessite, a telluride of silver, with some gold; petzite, a telluride of silver, with much gold; there are besides other tellurides, such as altaite, a telluride of lead; tetradymite, joseite, and wehrlite, tellurides of bismuth; and a few other minerals of less importance, such as melonite and krennerite. Whatever their composition, all this list of tellurium minerals is especially characterized by its persistent occurrence in connection with gold, and in gold-bearing veins. Not only do a large number of the above tellurides contain gold as an essential constituent, but nearly or quite all of them at times contain gold as an accidental constituent, so that any of them on assay would show more or less of the precious metal; but, besides this, they are almost invariably accompanied by free gold. In veins containing tellurides those portions that show the largest amount of these minerals are almost invariably the richest in free gold, and specimens are known of such minerals as altaite, themselves almost free from combined gold, showing well-marked plates of native gold that have been deposited between the cleavage planes of the tellurium mineral. The intimate association between tellurium and gold is too marked and obvious to be overlooked, though it would be very difficult to assign its precise genetic meaning to this phenomenon, although no one doubts that it has a very important significance if we could only interpret it aright.

As far as we know, tellurides never occur in any quantity except in this intimate connection with gold; but it by no means follows that gold always occurs in association with tellurides, certain important gold-producing districts being quite free from these minerals. In Europe tellurides are chiefly known in the very important gold-mining districts of Transylvania, at Offenbanya, and Nagyag in Siebenbürgen, Schemnitz in Hungary, &c., in various localities in the Altai, and in small quantities at the Bremnæs Mine in Norway. As far as we know, tellurides do not occur in the Mysore goldfields, and their only known Asiatic occurrence so far is in the Choukpazat Gold-mines in Upper Burmah. We have no record of the occurrence of tellurides in Africa; they have not, we believe, been identified even in small quantity in the Witwatersrand conglomerates, in spite of the large number of minerals that have now been determined in these beds. In America tellurides are widely disseminated; they occur in numerous localities along the great Mother lode of California, especially on the Stanislaus and in Calaveras County; they have been found in numerous localities along the eastern gold belt, notably in Virginia and North Carolina; also, but more rarely, in Montana; and quite recently in the now well-known Cripple Creek district of Colorado. In South America tellurides are known in Brazil. We believe that tellurides have not hitherto been found in Australasia, the recent discoveries in Western Australia being the first, and serving still more to sharply differentiate the gold occurrences of Western Australia from those of the rest of that continent. It will thus be seen that the occurrence of tellurides in gold-mines is decidedly capricious; it occurs in some very rich districts and in some decidedly poor ones, whilst some of the most productive gold regions have never produced any tellurides at all. Upon the whole, it seems as though tellurium, whilst distinctly characteristic of gold districts, is apt to be found associated with low-grade rather than with high-grade ores. This is certainly the case

with the greater majority by far of the districts in which tellurides are particularly known to occur. The treatment of tellurides for the extraction of gold depends very much upon the proportion of these substances, and upon that of the free gold associated with them. Rich tellurides are being treated at Schemnitz, in Hungary, by means of sulphuric acid, which dissolves the tellurium, this substance being afterwards reprecipitated and collected; the gold is obtained from the residues by smelting. As tellurium has, however, no special use in the arts, and is, in fact, only a chemical curiosity, it is not in the least likely that such an expensive process will find any extended application, and the tellurium in most gold-ores can only be regarded as an objectionable impurity to be got rid of as promptly as possible. The presence of tellurides appears in no wise to interfere with the amalgamation of any associated free gold; it is well known that the extraction by amalgamation of the gold-ores of the Californian Mother lode is exceedingly high, as good practice is being made there as in any part of the world, in spite of the presence of tellurides in most, if not all, of these ores. Of course, this statement applies to the free gold only; any gold in combination with tellurium is not affected by mercury, and cannot, therefore, be saved by amalgamation. The combined gold will, therefore, have to be caught by concentrating machinery, and in all the districts in which tellurides are abundant tellurium can be found in the concentrates. Unfortunately, however, most of these tellurides are very brittle minerals, and the action of the stamp-mill crushes them to the finest possible powder. Unless special precautions are taken a large proportion of these valuable tellurides is apt to be ground to an impalpable powder and lost in the slimes. Telluride ores need, therefore, the best and most accurate vanner arrangements; the mill screens should be as coarse as possible compatible with a complete amalgamation of the free gold; and the depth of discharge should similarly be kept as low as possible; the issuing pulp should be sized, and even the finer grades sent to separate vanners, so as to collect these valuable concentrates as completely as possible. All these precautions are well worth taking, because in many telluride ores a great portion of the value is locked up in the tellurides. Once obtained as concentrates there is no special difficulty in treating telluride ores. We do not know that it has yet been definitely proved whether the cyanide process is or is not capable of decomposing a telluride of gold, and of extracting the gold from it. We are inclined to think that such a reaction would not take place, and that telluride concentrates ought to be roasted before being cyanided. If this view is correct chlorination would probably prove preferable to the cyanide method of treatment, for in chlorination it is always necessary to roast the ore first. There is no special difficulty in roasting tellurides, which are completely decomposed in the calcining furnace. According to some authorities there are heavy losses of gold in calcining telluride ores, as much as 20 per cent. of the gold being thus lost according to one writer. That any such loss occurs in practice appears upon the whole quite unlikely, and it even seems questionable whether there is any abnormal loss at all in an ordinary chloridizing roast, seeing that chlorination has been most particularly successful in those two districts of the United States where telluride ores more especially occur—namely, on the Mother lode of California and on the gold belt of the south-eastern States. At any rate, it is in the highest degree improbable that any serious loss can occur if roasting is carefully conducted in a modern "Fortschaufelungsofen" (the multiple-bedded long calciners), especially if fitted with dust-chambers. As this calcination will remove the tellurium, the roasted product can of course be treated in identically the same way, whether tellurium be present or not, in the original ore. Telluride concentrates can also be treated by smelting. It is said that there is some liability to volatilisation in the smelter; and this may be true, but the difficulty can probably be overcome by suitable arrangements.

To sum up the subject in a few words, the presence of tellurides in the ores of a given gold district prove nothing as to the richness or poverty of the district, although tellurides generally characterize low-grade ores; they show that the permanent water-level has been reached, and render it probable that the character of the ore will continue from that point downwards without much change. Their treatment presents no difficulty that an experienced mill-man should not be capable of overcoming successfully.

CYANIDE PATENT.

ANALYST, Mines Department, to UNDER-SECRETARY for MINES.

SIR,— Wellington, 17th November, 1896.

As you perhaps will be aware, I have discovered that free cyanogen does not attack gold. Consequently, as Mr. Button, M.H.R., was the first to point out to me and others, the cyanide patent appears to be invalid. Now, this is a discovery the *merit* of which, though belonging to me, may go a different way, and it is to place certain evidence on record that I state this evidence now.

It so happens that Professor Black also found out that if cyanogen attacks gold it is very slowly, and it had possibly to be *partially* decomposed first.

It also happened that he was examined *before me* in the cyanide case before the Registrar of Patents, and then gave evidence of the nature I have stated.

But this scientist was set on at this investigation by Sir Robert Stout, who himself was instigated, I believe, to this by a question asked of Mr. Greenaway (the Cyanide Company's agent), which question was, "Do you think that cyanogen itself would be of any practical use in the cyanide process?" I say "*believe*," because there is no *absolute* proof of this question instigating

Sir Robert Stout, as I affirm; but it certainly appears that my affirmation is correct—viz., that the question put did instigate him as I say.

Now, Sir, *I* suggested the question to our lawyer, Mr. Button, telling him that I had good reasons for believing that cyanogen in water would not dissolve either gold or silver, and Mr. Button admits this, and has been kind enough to write me a letter stating the fact. He also says no one else suggested the question to him, or ventilated the subject in any way to him. Further, Mr. Button, anxious that I should have any credit there is due to me in the matter, asked Professor Black if this suggestion had not put him on to the investigation in question. Professor Black only gave the answer that "he did not know," when Sir Robert spoke to say that he (Professor Black) was *told* to do the experiments a week before. So, any way, here is some evidence that Professor Black did start on the work to some one's suggestion or wish.

This evidence is on record for legal purposes, but it may not, as there, be of the use it should be to me.

I feel certain that it was my suggestion that started Professor Black to his investigations in this matter.

The best chemists in England and Germany never doubted but that this gas would dissolve gold, else they probably would have torn the cyanide patent up years ago, or, any way, have made it hard for the cyanide monopolists to maintain their patents.

Sir, I have evidence twenty years old to show I was then so informed by investigations of my own as to be in that position which would enable me—nay, *force* me—to doubt the power of cyanogen to dissolve gold; and, as this evidence was only in the Transactions of the Philosophical Society here, I was practically about the only man, in this world at least, who could have *doubted* in this matter. These researches of mine led up to this doubt, but it was only when Sir Robert pressed *cyanogen* to the fore in his defence that it occurred to me to test the question.

In conclusion, I may inform you that I have papers read to the Philosophical Society here —26th August and 23rd September for this year—stating that cyanogen does not dissolve either gold or silver. I do not think the matter requires further investigation than I have made to establish the assertions I make. If cyanogen is really the only substance patented, the cyanide patent is, I think, completely broken up both here, in England, and Australia.

I have, &c.,

The Under-Secretary, Mines Department. WILLIAM SKEY.

PATENT RIGHTS GRANTED.

IMPROVEMENT IN THE CYANIDE PROCESS OF EXTRACTING GOLD.

We, Edward Holland, engineer, and George William Horn, mine-manager, both of Kuaotunu, Auckland, New Zealand, do hereby declare the nature of our invention for "Improvement in the Cyanide Process of extracting Gold," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The object of our invention is to extract the precious metals from crushed and reduced ores and from slimes with greater facility and with a reduced consumption of cyanide.

In carrying out our invention we make use of the ordinary vats filled with cyanide and water, which is allowed to soak into the ore in the usual manner. At the bottom of the said vats are placed battens 2 in. in depth, laid on the bottom of the vat at a sufficient distance apart to support laths, which are nailed to them at equal distances apart, the whole forming what is called the "filter-bed." Above the said laths, and over the filter-bed, is placed a stout piece of cloth covering the whole surface, and grouted around its edges, forming what is called the "filter-cloth."

By our invention we then pass a pipe preferably through the centre of the bottom of the vat, and lead it into a chamber placed also in the centre and above the filter-cloth, which chamber is fitted with a series of air-pipes projecting out horizontally. In these air-pipes are formed small exit-holes which are so constructed as to allow the air to impinge upon the filter-cloth at about an angle of 20° to the horizon, thus forcing the air upon the filter-cloth, and greatly assisting the percolation through the said cloth.

We prefer to draw the supply of compressed air from a compressed-air accumulator supplied with compressed air by any suitable means, such as an ordinary air-pump, the accumulator allowing the air to pass into the vat smoothly and regularly at any required pressure. The air, after impinging on the before-mentioned cloth, passes upwards through the solution of cyanide and ore, causing the cyanide to act with greater energy on the precious metal contained in the ore, thus reducing the time required for the extraction of the precious metal, and in most cases reducing the consumption of cyanide, and thus minimising the cost of the treatment; moreover, in treating fine slimes the force of the air percolating through the fine material causes the solution to come more freely in contact with the precious metal, thus facilitating its extraction.

We wish it to be understood that our invention admits of its many variations in the details of carrying it into effect.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is: In the extraction of precious metals by the use of cyanides and the like, the introduction of compressed air as and for the purposes substantially as described herein.

Dated this 1st day of June, 1896. HENRY HUGHES, F.A.I.P.A.,
Agent for the Applicants.

Improvements in the Recovery of Gold and Silver from their Solutions.

We, Carl Wilhelm Heinrich Göpner, of Canalstrasse, 46, 48, Uhlenhorst, Hamburg, Germany, chemical manufacturer, and Heinrich Ludwig Diehl, of Kl Grassbrook Vogelreth, 8, Hamburg, Germany, chemist, do hereby declare the nature of our invention for "Improvements in the Recovery of Gold and Silver from their Solutions," and in what manner the same is to be used and performed, to be particularly described and ascertained in and by the following statement:—

The leaching of auriferous ores or tailings by solutions of potassium-cyanide gives solutions containing free alkali, the gold in solution as potassium-aurocyanide, or sometimes as potassium-auricyanide, and a large excess of potassium-cyanide. When silver is present in the ores or tailings it is also found in the solution as a cyanide. This invention relates to the treatment of such solutions in such a manner as to effect precipitation of the gold and silver cyanides and regeneration of the leaching material.

For this purpose the solution resulting from the leaching has added to it cupreous cyanide, which is acted on by the potassium-cyanide, forming soluble cupreous potassic-cyanide. There is then added an acid, such as sulphuric acid, capable of decomposing potassium-cyanide, whereupon the ingredients of the solution are decomposed, forming hydrocyanic acid and potassium-sulphate, which remain in solution while auro- or auri-cyanide and cupreous cyanide are precipitated, as well as silver cyanide when there is silver in the solution treated. In the practice of the process it is of advantage to add the cupreous cyanide in excess, so as to render the precipitation of the gold as complete as possible, the precipitate consisting then of auro-cupreous cyanide and cupreous cyanide. The solution, decanted or otherwise separated from the precipitate, is slightly supersaturated with caustic potassa, so as to produce fresh potassium-cyanide, which can be used for again leaching. In order to obtain gold in the precipitate in sufficient amount to render it suitable for treatment to recover the gold the precipitate from the first operation is dissolved, wholly or partially, in a fresh quantity of the solution obtained by the leaching, and fresh cupreous cyanide is added, if necessary, and then acid to effect a fresh precipitation, and this may be repeated a number of times until sufficient gold is accumulated. When cupreous cyanide is added in considerable quantities in the first operation a number of successive precipitations may be effected without further additions of cupreous cyanide.

The process described is applicable where the solution obtained by leaching already contains copper, but in such case the quantity of cupreous cyanide added may be less than when no copper is present.

When silver as well as gold is present in the solution obtained from the leaching the process may be modified as follows: A soluble salt of silver, such as the nitrate or sulphate, is added to the solution, but not in such quantity as to effect precipitation; or a silver salt insoluble in water, such as the cyanide or the chloride, may be added, but the quantity should be such that very little of it remains undissolved in the solution. Acid is then added, and thus the silver as well as the gold is precipitated as a cyanide. The quality of silver salt added should be such that the silver in it, together with that in the solution treated, should be considerably in excess of the gold.

In the leaching and precipitation processes sodium-cyanide may be used instead of potassium-cyanide, this being regenerated by adding soda instead of potassa to the solution separated from the precipitate. Also mixtures of sodium and potassium cyanides may be used for leaching, and may be regenerated from the separated solution.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is,—

1. The herein-described process for precipitating gold and silver from their cyanide solutions by adding to these cupreous cyanide and then an acid.
2. The repetition of the process on the precipitate with fresh quantities of solution, so as to accumulate gold in the precipitate.
3. The regeneration of the leaching solution by adding caustic alkali to the solution separated from the precipitate.
4. In applying the process to solutions containing silver as well as gold, the use of a silver salt for effecting the precipitation.

Dated this 10th day of September, 1896.

C. Göpner.
L. Diehl.

An Improved Process for the Extraction of Gold and Silver from their Ores.

I, Kate Alberta May, of 42, Blyth Road, London, England, gentlewoman, do hereby declare the nature of my invention for "An Improved Process for the Extraction of Gold and Silver from their Ores," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention relates to an improved process for the extraction of gold and silver from their ores, and has for its object the removal from the crushed ore by treatment before amalgamation of deleterious compounds, such as sulphides of iron, or arsenical, antimonial, and cupric compounds which occur in some gold- or silver-ores.

To carry my process into effect the ore is first crushed in any usual manner, and the crushed ore may be treated by leaching with a solution of mixed alkaline hydrate and carbonate, either cold in the case of weakly pyritic ores, or hot in other cases, but preferably in most cases the ore is boiled for about one hour in a solution containing about 5 per cent. of an alkaline hydrate such as caustic soda, and 5 per cent. of an alkaline carbonate such as carbonate of soda. The boiling solution may be agitated with or percolated through the ore, and after one hour's boiling is allowed to stand for at least twenty-four hours.

In the case of arsenical copper or antimonial ores the solution is poured off or drained away from the ore, which is then leached with water to remove any excess of the chemical solution remaining therein. One washing is usually sufficient. These ores are then ready for treatment by amalgamation with quicksilver to collect the precious metals in any usual manner on plates, in barrels, or pans.

It will be found that the dissolution of the arsenical, cupric, and antimonial compounds by my aforesaid preliminary treatment much enhances the ease and efficiency of the usual treatment by amalgamation, preventing the flouring or sickening of the mercury employed in the said amalgamation, and giving increased extraction. In the case of the ordinary ores, or ores containing chiefly iron-pyrites and without arsenical or antimonial compounds, my solution decomposes the sulphides of iron, and such ores, after treatment with my solution, and standing as aforesaid, may be passed at once to the amalgamating-pans, barrels, or plates without draining off the solution or washing unless it is desired and practicable to again use the solution.

The total amount of my solution used in each case will vary according to the refractory or rebellious character of the ores, but may always be used in excess, in which case the partially-exhausted solution can be refortified and used again.

In the absence of carbonate of soda, soda crystals (common washing-soda) may be used in my solution with equal effect, care being taken that the necessary amount of carbonate of soda be present.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. A preliminary treatment before amalgamation of gold- or silver-ores with a mixed solution of alkaline hydrates and alkaline carbonates.

2. A treatment of gold- or silver-ores before amalgamation, consisting of the boiling of the crushed ore for at least one hour in a solution of mixed alkaline hydrate and carbonate, such as caustic soda and carbonate of soda, and the after-digesting of the ore for at least twenty-four hours in said solution, substantially as described.

3. The washing and draining-off of the solution from the ore sludge of arsenical, cupric, or antimonial ores after boiling and digesting before passing same to amalgamation, substantially as described.

4. The composition of the solution for a preliminary treatment of gold- and silver-ores, consisting of equal parts by weight of alkaline hydrate and carbonate, such as 5 per cent. of caustic soda and 5 per cent. of carbonate of soda, with 90 per cent. of water, substantially as described.

Dated this 14th day of October, 1896. KATE ALBERTA MAY.

AN IMPROVED MACHINE FOR USE IN THE EXTRACTION OF GOLD FROM AURIFEROUS MATERIAL BY THE AID OF CHEMICAL SOLVENTS.

I, Joel James Deeble, of Rae Street, Bendigo, in the Colony of Victoria, metallurgist, do hereby declare the nature of my invention for "An Improved Machine for Use in the Extraction of Gold from Auriferous Material by the Aid of Chemical Solvents," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention has been devised in order to provide a machine for use in the extraction of gold from auriferous material by the aid of chemical solvents, in order to insure the particles of auriferous material being brought into intimate contact with the cyanide or other solvent solution.

It consists of a vat or pan to receive the auriferous material to be treated having at or about its centre a vertical shaft or spindle with one or more agitators or stirrers attached to its lower end. Motion is imparted to this shaft or spindle by bevel gearing or other convenient mechanical contrivances, and means are provided for reversing the rotation and controlling the speed of the agitators, as well as for raising or lowering the agitator shaft or spindle. These means may consist of a screw-threaded lifting-rod fitted with a correspondingly threaded bevel wheel, in gear with a bevel pinion fitted with a crank-handle, whereby it may be rotated in the required direction, or, if preferred, a rack and pinion may be used for the purpose.

The inner side of the wall of this vat or pan is provided with a series of projections which produce eddies or swirls in the material under treatment as it is carried round the vat or pan.

In order to drain or draw off the gold-bearing solvent from said vat it is provided with a vertically-sliding valve, or, if preferred, a pipe or pipes might be used for this purpose. A waste discharge-valve may also be provided in the lower part of the vat or pan for the purpose of enabling the waste material to be sluiced therefrom after the gold has been dissolved and the gold-bearing solution has been drawn off through the valve above referred to.

The accompanying drawings will more clearly illustrate the construction and arrangement of my improved machine: Figure 1 represents a vertical central section of said machine; Figure 1*a*, a plan of part of the driving-gear; Figure 2, a side elevation of said machine; Figure 3, a sectional elevation; and Figure 4, a plan of a vat drawn to a smaller scale; Figure 5 is a side elevation of the vertically-sliding valve above referred to; Figure 6 is a plan thereof; Figure 7 is a horizontal section on line 7–7, Figure 5; Figure 8 is a vertical central section on line 8–8, Figure 5; and Figure 9 is a side elevation of said valve.

The same letters of reference indicate the same or corresponding parts in all the figures. A represents a vat to contain the auriferous material to be treated, while B represents the vertical spindle which is provided in or about the centre of said vat, and which carries the agitators or stirrers C on its lower end. These latter consist by preference of projecting bars or arms, as shown, and they may be attached at their inner ends to a casting c^1 on the lower end of the spindle B, which is preferably made square, or otherwise sided in cross-section, and is passed

through a corresponding hole in a bevel wheel D, which is supported in a casting d resting upon bearers or beams d^1 extending across from side to side of the vat A.

This construction admits of rotary motion being imparted to said spindle B, and yet allows of its being raised or lowered as required. For this latter purpose a screw-threaded rod E is connected to the end of said spindle by a shackle e, and is fitted with a corresponding threaded pinion e^1, in gear with a second pinion e^2 having a crank-handle e^3. Steps f are provided leading up to a platform F in a convenient position over the centre of the vat, to enable the crank-handle e^3 to be operated. Rotary motion is imparted to the stirrers by the bevel gearing g, g, and a clutch g^1 (see Figure 1a) to connect or disconnect said gearing as required. H, H represent the projections which are provided upon the inside of the wall of the vat A for the purpose of imparting a series of eddies or swirls to the material in the vat, so as to more thoroughly bring the whole of such material in contact with the solvent solution. These projections may be made integral with said vat, or may be attached thereto. As will be readily understood, I represents the vertically-sliding valve which is used for drawing off the solvent solution from the vat A. It is arranged to be slid up and down in a frame i by means of a screw-threaded rod i^1, so that it can be opened more or less according to requirements. J, Figure 2, represents a waste discharge-valve which is fitted in the lower part of the vat, and enables the *débris* therein to be discharged after it has been treated and the gold-bearing solution has been drawn off. If preferred, a series of discharge-pipes might be used for this purpose instead of the valve, stoppers or plugs being withdrawn from said pipes as required.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. The combination and arrangement of parts constituting the herein-described machine for use in the extraction of gold from auriferous material by the aid of chemical solvents, the whole being constructed and arranged substantially as and for the purposes specified, and as illustrated in the accompanying drawings.

2. In a machine for use in the extraction of gold from auriferous material by the aid of chemical solvents, agitators or stirrers projecting from a shaft or spindle (such as B), capable of being adjusted vertically, and being rotated by suitable gearing, substantially as and for the purposes specified, and as illustrated in the accompanying drawings.

3. In a machine for use in the extraction of gold from auriferous material by the aid of chemical solvents, a vat having projections (such as H) around the inner side of its walls, substantially as and for the purposes specified, and as illustrated in the accompanying drawings.

4. In a machine for use in the extraction of gold from auriferous material by the aid of chemical solvents, a valve (such as I), together with means whereby it may be adjusted vertically in the side of the vat, substantially as and for the purpose specified, and as illustrated in the accompanying drawings.

Dated this 21st day of May, 1896. JOEL JAMES DEEBLE.

AN IMPROVED REGENERATIVE PROCESS FOR THE TREATMENT OF ARGENTIFEROUS SULPHIDE ORES.

I, Ernest Frederick Turner, of the Adelaide University, in the Province of South Australia, analytical chemist, do hereby declare the nature of my invention for "An Improved Regenerative Process for the Treatment of Argentiferous Sulphide Ores," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention relates to the treatment of argentiferous sulphide ores, and more particularly zinciferous sulphide ores, galena, and argentiferous galena, containing gold and other metals. It has for its object the extraction of the several metallic contents, together with the utilisation of certain products of the process for the regeneration of the materials employed therein, and for the obtaining of certain by-products of commercial value.

In my invention the raw sulphide ore is disintegrated by the action of hydrochloric acid (HCl), resulting in the formation of metallic chlorides, which are subsequently fused and the metals recovered, and in the production of sulphuretted hydrogen (H_2S), which is used as fuel, and the products of its combustion utilised for the production of fresh supplies of HCl. From the H_2S so produced not only are fresh supplies of HCl obtained during the process by the treatment of sodium-chloride with the sulphur-dioxide (SO_2) resulting from the use of the H_2S as fuel, but also from the sodium-chloride certain by-products in the form of caustic soda and other soda products. Portions of such products are used for the recovery of the metals from the aqueous chlorides obtained in the first part of the process, and any excess can be dealt with for commercial purposes.

In order to make my invention entirely clear I propose to explain the same by the accompanying drawings, in which is shown apparatus for carrying it into effect.

The sulphide ore as taken from the mine-floors, and without reducing it to a finely-divided state, is placed in suitable vats or digesters A, lined with copper or other suitable material capable of resisting the action of corrosive acids. These digesters A, with their accompanying appliances, as hereinafter described, are arranged in series of any suitable number, and they may be of any suitable size. They are provided with gastight lids, and their bottoms are covered with copper gratings A^1, arranged in three tiers one over the other. The openings in the gratings are graduated, the topmost being largest, so that only fine particles of ore can pass through the lowest one into a crucible B placed below. These crucibles B are provided with heating apparatus C^1, which consists preferably of gas-jets supplied from a gasometer N through the pipe C, as hereinafter more particularly described.

The digesters A having been charged with raw sulphide ore, and the gastight covers replaced, aqueous HCl is introduced from a storage-tank D, and sprayed into the upper portions of the digester A, whilst at the same time HCl gas from a generator E is discharged immediately

underneath the copper gratings A^1. By the combined action of the aqueous and gaseous HCl the ore is gradually disintegrated, and passes, with the aqueous HCl, through the gratings A^1 into the crucible B. The crucible B is constantly heated in order to maintain the aqueous HCl, which now contains metallic chlorides of lead and zinc at the boiling-point. The digesters A and crucibles B being arranged in series, the aqueous HCl is discharged from the crucible B, No. 1, and raised by any suitable means into the tank D, No. 2 of the series, leaving the gangue and any partially-undecomposed ore with the adhering silver-chloride in the crucible. From tank D, No. 2, it is sprayed as before over the ore in the No. 2 digester, and is passed in this way from one digester to another until the HCl has become neutralised and a neutral saturated solution of metallic chlorides of lead and zinc obtained. This saturated solution is then returned to crucible B, No. 1 of the series. In the meantime the whole of the ore contents of the digester A have become disintegrated, and have passed into the crucible B. The digester A, No. 1 of the series, is then disconnected, and No. 2 in the series now becomes the first, and the digester A, when refilled, the last of the series, and so on in turn, the order always changing as each digester is emptied and refilled with supplies of raw ore for treatment.

Having detailed the circulation of the aqueous HCl, and its return in the form of neutralised solution of metallic chloride of lead and zinc, before detailing its further treatment for the recovery of the metals I will explain the circulation of the gaseous HCl.

The gaseous HCl rising through the contents of the digester A, No. 1, liberates H_2S by its action upon the sulphides of the ore. The gases so formed in digester No. 1 are carried by suitable pipe-connections, and are discharged underneath the copper gratings of digester A^1, No. 2 in the series. After passing through the ore in the digester No. 2, they pass to the next in the series, and so on until the HCl gas becomes neutralised and the H_2S practically free from HCl. To eliminate any final traces of HCl the gases are conducted through a purifying-chamber S filled with crushed antimony-blende, and the pure H_2S led for storage purposes into a gasometer N of any ordinary construction. From the gasometer N the H_2S is drawn for use as fuel wherever required, it being intended that the H_2S so obtained shall be used for all purposes for which heat is required, thereby effecting a considerable saving in fuel. The products of the combustion of the H_2S as fuel, which are sulphur-dioxide (SO_2) and aqueous vapour mixed with nitrogen from the air, are collected by means of suitable flues, then passed through drying-towers F for extraction of the aqueous vapour, as hereinafter more particularly referred to, and finally discharged into cylinders R arranged conveniently to the digesters A. The cylinders R are filled with briquettes of sodium-chloride, and are maintained at a temperature of about 500° C. By the action of SO_2, together with air and steam upon the sodium-chloride in the cylinders R, HCl gas is evolved, and sodium-sulphate, or salt cake, produced as a residue or by-product. The latter is subsequently removed and heated with carbon in the ordinary way in order to produce sodium-sulphide for use in the recovery of zinc, as hereinafter described in a subsequent portion of the process, or converted by any known process into caustic soda and other soda products. The HCl gas from the generating-cylinders R is conducted into a suitable tower L, through which a continual stream of brine, obtained in the manner hereinafter described, is being passed from a reservoir K placed overhead. By the action of the gaseous HCl upon the brine sodium-chloride is precipitated, and aqueous HCl is produced. The aqueous HCl is collected in a suitable receptacle L^2 at the base of the tower, and is carried from this to the aqueous HCl storage-tank D for use in the continuance of the process the nitrogen which has passed with the gaseous HCl from the cylinders R being meanwhile drawn off by a chimney-stack, or otherwise eliminated.

Returning to the former portion of the process, the contents of the crucible B, No. 1 of the series, now consist of disintegrated particles of gangue and undecomposed ore (which may be blende, galena, or argentiferous galena), with which has remained the insoluble silver-chloride, and of the concentrated solution of aqueous zinc- and lead-chlorides, which has been returned thereto after the circulation as detailed. The temperature of the mass in the crucible is gradually raised until it reaches about 300° Celsius. The lead- and zinc-chlorides, as the heat rises, gradually fuse, and by the action of the fused zinc-chloride the silver-chloride dissolves in the fused mass. The fused mass of chlorides having a specific gravity of about 4, any particles of ore still undecomposed sink to the bottom of the crucible, and can be removed later for further treatment. The gangue meanwhile becomes suspended in the fused mass of chlorides, and the whole is removed whilst still hot to suitable closed drying-towers F. The towers F are preferably placed within a water-tank F^1, so that the heat evolved by the hydroscopic action of the zinc-chloride may be absorbed by the water, which latter is used as may be required in other parts of the process. Into the upper portion of these drying-towers F the SO_2 aqueous vapour, and other products of combustion of the H_2S, are discharged from the collecting-flues as before described. The aqueous vapour is then absorbed by and dissolves the soluble metallic chlorides, whilst at the same time any chloride of gold in the fused mass is reduced to the metal state by sulphurous anhydride. The fused mass (as the chlorides are dissolved by the aqueous vapour) passes through gratings at the bottom of the drying-towers F into a lower chamber, where it is boiled with water acidulated with HCl. The hot aqueous solution of chlorides, together with the gangue, is then drawn off into a lixiviating-tank, which forms the first of a series of precipitating-tanks. As the gangue settles the aqueous chlorides are drawn off into a second or cooling-tank. The residue of gangue left in the first tank is then washed with boiling water until free from lead-chloride. The first tank now contains gangue, metallic gold, and silver-chloride, which may be recovered by any well-known means. The liquor drawn off from the first tank, together with the washings, is now placed into a second or cooling-tank, and the lead-chloride settles out. When the liquor in the second tank has cooled down the clear liquor is removed to the third tank of the series. In this any remaining traces of lead-chloride are decomposed by means of sodium-sulphate obtained from the HCl generators R. Lead-sulphate is thus precipitated, and the sodium-sulphate contained in the solution becomes sodium-chloride. The

liquor from this third tank is conveyed to the fourth of the series, which is fitted with a revolving stirring-gear having long rods of metallic zinc whereby the whole of the copper is precipitated.

The liquor is then removed to the fifth tank in the series, where it is oxidized by any suitable means until the ferrous iron is converted into ferric iron, when it is treated with a solution of caustic soda, and boiled. By this means the whole of the remaining metallic chlorides are decomposed into hydroxides, and the sodium-chloride regenerated. The liquor, which still contains zinc and manganese, is aërated, and thereby the manganese is thrown down as manganese-dioxide, which can be used in the production of chlorine. The liquor is then removed to a sixth tank, wherein the whole of the zinc, in the form of zinc-sulphide, is precipitated by means of sodic sulphide, or recovered by any well-known means.

This sodium-sulphide has been obtained by heating with carbon the salt-cake or sodium-sulphate resulting from the regeneration of the HCl in the cylinders R, as before described.

The zinc-sulphide may, if desired, be converted into zinc-oxide for use in any zinc electrolysing tank in order to maintain the strength of the solution and to keep it neutral.

The liquor in the final tank, now only an alkaline brine, is raised by any suitable means into a brine-tank K, placed at the top of a tower L, for the production of sodium-chloride and aqueous HCl, as hereinbefore described.

In my invention as detailed herein there are, as will be perceived, three distinct circulations: Firstly, the circulation of the aqueous HCl through the series of digesters containing raw sulphide ore, and its return to the first of the series of crucibles in the form of saturated solution of lead- and zinc-chlorides for the fusion of the silver-chloride in the ore. Secondly, the circulation of the gaseous HCl through the several digesters containing crude ore until it has become neutralised, and the H_2S resulting from its action on the sulphides in the ore has after use as fuel been returned as SO_2, which by the use of sodium-chloride has been returned to the tanks as HCl, both in a gaseous and aqueous form. Thirdly, the circulation of the sodium-chloride, comprising, first, its use in generators for the production of gaseous HCl, then in the lixiviating-tanks in the form of sodium-sulphate and caustic soda for precipitation purposes, its subsequent regeneration as sodium-chloride, and final recovery in the aqueous HCl towers for fresh use in the gaseous HCl generators.

In the above description the process is detailed as relating to zinciferous sulphide ores. In the treatment of galena and argentiferous galena, zinc-chloride is first fused in the crucible, and the raw ore in a finely-divided state, either alone, but preferably mixed with lead-sulphate and lead-oxide, poured therein. The lead in the ore is reduced, and sinks to the bottom of the crucible as metallic lead, whereas the gangue, with adhering silver-chloride, rises, and becomes admixed with the fused chloride of zinc. The fused mass is then removed for the recovery of the silver and zinc, in the manner hereinbefore described, and the lead poured off into suitable cakes.

I am well aware that the various parts of my process, either singly or in certain combinations, are well known, and wish it to be well understood that I do not claim as my invention any one of them singly or specifically, or any two or more of them together in any combination whatever except in the particular combinations indicated.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. In the treatment of argentiferous sulphide ores, the within-described process, consisting of their disintegration by the combined action of aqueous and gaseous hydrochloric acid (HCl), at the same time causing the aqueous hydrochloric acid (HCl) to circulate through fresh supplies of raw ore until it has become a saturated solution of lead and zinc metallic chlorides, subsequently returning such solution to the wholly or partly disintegrated ore, and fusing by heat the whole of the chlorides in the disintegrated mass.

2. In the treatment of argentiferous sulphide ores in which the ore has been wholly or partially disintegrated by the combined action of aqueous and gaseous hydrochloric acid (HCl), the separation of the undecomposed ore for further treatment by fusing the whole of the chlorides produced in such disintegration, such fusion resulting in the admixture of the gangue with the fused mass, and the settling of the undecomposed ore to the bottom of the crucible.

3. In the treatment of argentiferous sulphide ore in which the chlorides formed by the disintegration of the ore by the action of hydrochloric acid (HCl) have been fused, as set forth in claim No. 1, the subsequent process for the recovery of the metallic contents of the fused mass, consisting in the application of aqueous vapour and sulphur-dioxide (SO_2), whereby the metallic contents are obtained as an aqueous chloride solution; subsequently boiling the same in water acidulated with hydrochloric acid (HCl); and finally precipitating the metals therefrom by any known process in suitable precipitating-tanks.

4. In the treatment of argentiferous sulphide ores, the within-described process, consisting of the production of sulphuretted hydrogen (H_2S) by the action of gaseous hydrochloric acid (HCl) upon the sulphides of the ore under treatment, the subsequent utilisation of the aqueous vapour accompanying the sulphur-dioxide (SO_2) resulting from the combustion of the sulphuretted hydrogen (H_2S) for the purposes of dissolving in a suitable drying-chamber the fused chlorides obtained in the manner as set forth in claim No. 1.

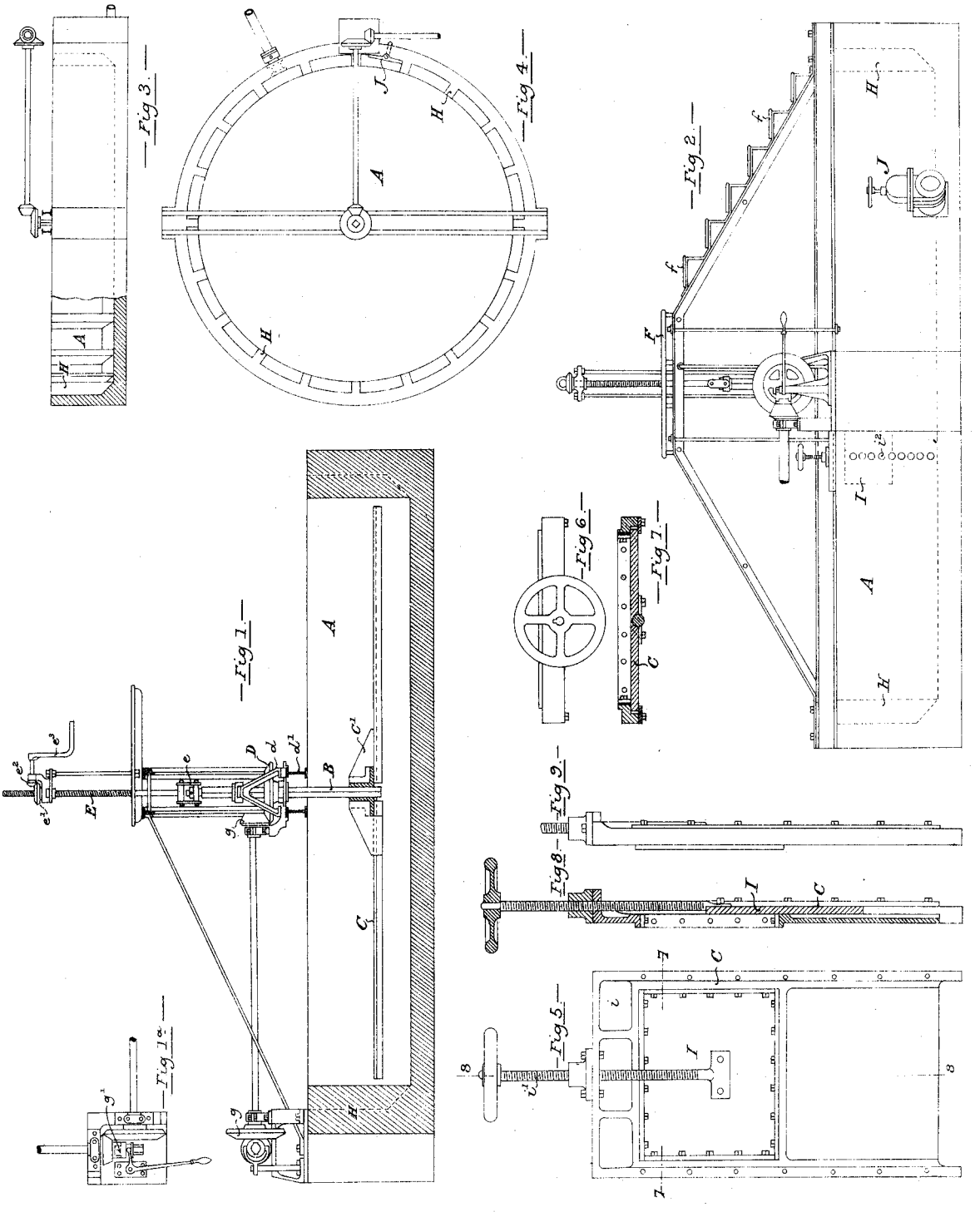
5. In the treatment of argentiferous sulphide ores, the within-described process, consisting of the production of sulphuretted hydrogen (H_2S) by the action of the gaseous hydrochloric acid (HCl) upon the sulphides of the ore under treatment, the use of the sulphuretted hydrogen (H_2S) so obtained as fuel, and the subsequent utilisation of the sulphur-dioxide (SO_2) resulting from the combustion of the same for the treatment of sodium-chloride in the production of fresh supplies of gaseous hydrochloric acid (HCl) for use in the disintegration of ore.

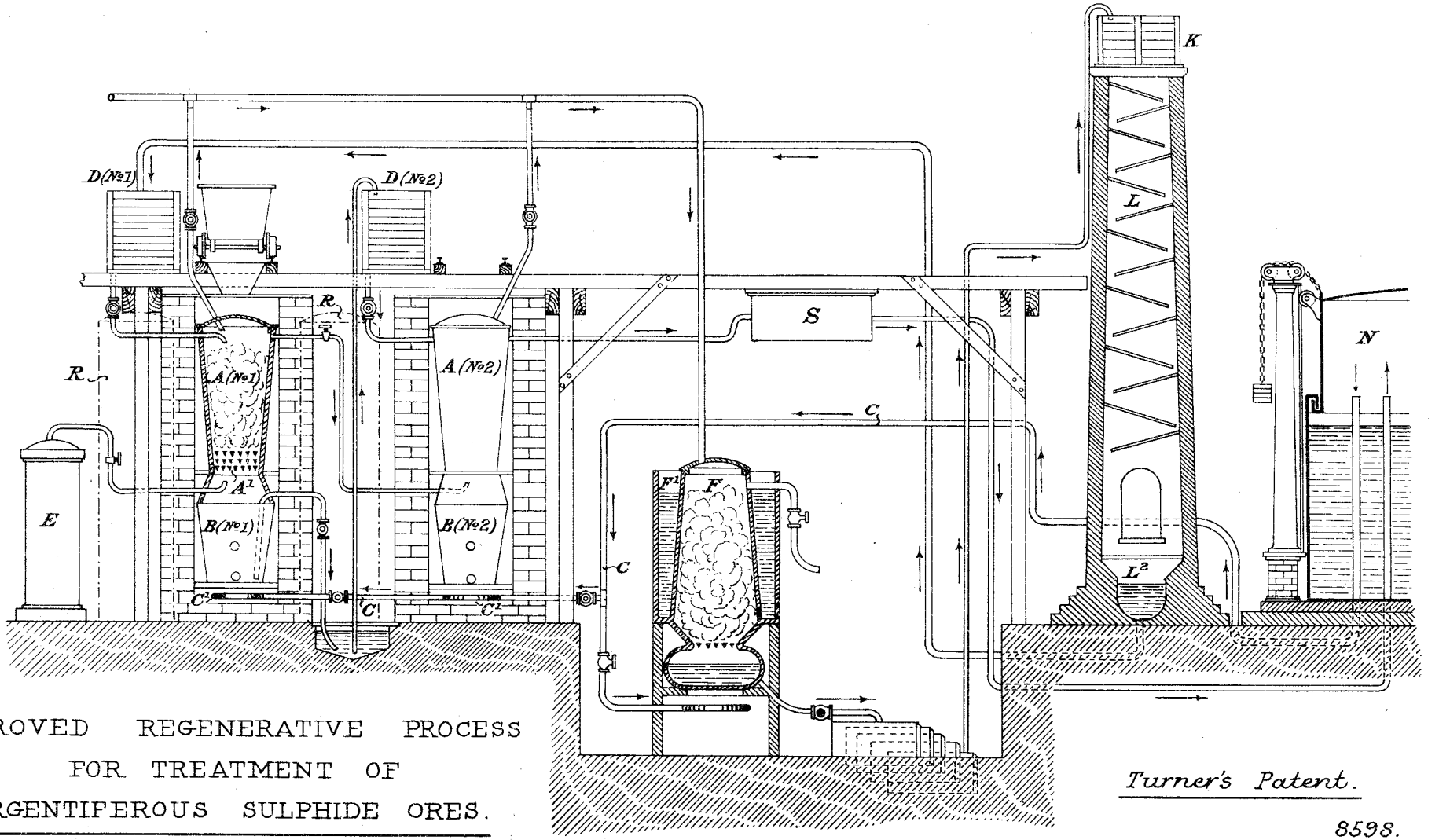
6. In the treatment of argentiferous sulphide ores, the within-described process, consisting of the obtaining of sulphur-dioxide (SO_2) by the combustion of sulphuretted hydrogen (H_2S) resulting from the action of gaseous hydrochloric acid (HCl) upon the sulphides of the ore under treat-

IMPROVED MACHINE
FOR USE IN EXTRACTION OF GOLD

Deeble's Patent.

8225.





IMPROVED REGENERATIVE PROCESS FOR TREATMENT OF ARGENTIFEROUS SULPHIDE ORES.

Turner's Patent.

8598.

ment, the subsequent treatment of sodium-chloride by the sulphur-dioxide (SO_2) so obtained for the production of gaseous hydrochloric acid (HCl), subsequently treating with the gaseous hydrochloric acid (HCl) so obtained salt brine taken from the last of the series of lixiviating-tanks, whereby aqueous hydrochloric acid (HCl) is obtained, and sodium-chloride recovered for renewed use during the process.

7. In the treatment of galena and argentiferous galena, the within-described process, consisting of pouring the raw ore in a finely-divided state, either alone, but preferably mixed with lead-sulphate and lead-oxide, into a bath of fused zinc-chloride, whereby the lead is thrown down as metallic lead, and the silver-chloride, with the gangue, becomes admixed with the fused chloride of zinc, the fused mass being subsequently removed for the recovery of the silver and zinc in the manner hereinbefore described.

Dated this 24th day of June, 1896.

W. E. Hughes,
Agent for the Applicant.

A Process for extracting Precious Metals from Refractory Ores by Means of Antimony, and for Recovery of Antimony employed.

I, James Woolford, of No. 659, Commercial Road East, in the County of London, England, metallurgist, do hereby declare the nature of my invention for "A Process for extracting Precious Metals from Refractory Ores by Means of Antimony, and for Recovery of the Antimony employed," and in what manner the same is to be used and performed, to be particularly described and ascertained by the following statement:—

My invention relates to the extraction of precious metals from refractory ores by treating with antimony-oxides, and to the recovery of the antimony employed in this treatment.

The ore, whether in its natural state or in the state of clinkers after roasting or other treatment, is crushed, and thoroughly mixed with an equal weight of antimony-trioxide, with half its weight of the residue from reduction of antimony-oxide, and with half its weight of finely-pulverised coal or charcoal. The mixture being fused in a cupola or other suitable furnace, the antimony-oxide is reduced, and the antimony forms an alloy with the precious metal. This alloy is tapped off, and treated in an oxidizing furnace the bed of which is glazed with a mixture of borax and sulphate of soda. In this furnace the antimony becomes oxidized, the oxide passing away as fumes, while the precious metal remains on the bed of the furnace.

Successive batches of the alloy may be treated until there is accumulation of the precious metal sufficient for being run off.

The combustion-gases, with the fumes of antimony-oxide, are drawn by a fan through cooling-passages and depositing-chambers, in which a large proportion of the oxide is deposited. In order to recover the last portions of the oxide, and clear the gases from it, I employ, in conjuncton with the fan which creates the draught through the cooling-passages and depositing-chambers, a nozzle furnishing a water-spray which mingles with the gases and fumes, and is effectually mixed up with them by the blades of the fan. The water, with the oxide suspended in it, is drawn away from the lower part of the fan, while the gases pass away to a chimney or elsewhere almost entirely free from fumes. Fig. 1 of the accompanying drawings is an elevation partly in section, and Fig. 2 is a transverse section of the fan and water-nozzle; A is the conduit leading the fumes from the depositing-chambers and cooling-passages to the suction-fan, B.

In the passage A is arranged a distributing-nozzle E, by which water is sent in spray to mingle with the fumes as they enter the fan, the blades of which break up the water and dash it about along with the fumes, causing separation of the particles suspended in them.

While the gases thus cleared of the suspended particles pass away by the conduit C to a chimney or other discharge, the water mixed with the solid particles collects in the lower part of the fan, and flows out to depositing-tanks D, in which the solid material is collected. Instead of sending water alone by the nozzle E, water mingled with steam may be sent into the conduit, the steam being used as an injector-jet to cause the water to leave the nozzle with great speed and in a greatly-subdivided condition.

The oxide collected in the cooling-passages and deposit-chambers, as well as that removed from the depositing-tanks D, and dried, may be used to treat fresh batches of ore, or may be reduced in any known way, so as to obtain metallic antimony.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. The herein-described process for extracting precious metals from refractory ores by fusing the crushed ore intimately mixed with antimony-oxides and pulverised fuel, thus producing an alloy of antimony with the precious metals, treating the alloy in a suitable furnace, thereby oxidizing the antimony and driving the oxide off as fumes, leaving the precious metals on the furnace-bed.

2. The herein-described method of recovering the antimony by causing the combustion-gases and fumes to pass from the oxidizing-furnace through cooling-passages and depositing-chambers by means of a fan, wherein the gases and residuary fumes are mixed with water, and whence the gases pass away, while the oxide, suspended in water, is drawn off to depositing-chambers.

Dated this 29th day of July, 1896.

James Woolford.

Improvements in Apparatus for the Recovery of Precious Metals from their Solutions.

I, Henry Livingstone Sulman, at present residing at Day Dawn, Murchison Goldfields, Western Australia, metallurgist and analytical chemist, do hereby declare the nature of my invention for

"Improvements in Apparatus for the Recovery of Precious Metals from their Solutions," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention has for its object the recovery of precious metals, such as silver, gold, platinum, &c., from solutions of the same by means of a new and improved apparatus, the apparatus being constructed to effect the deposition or "precipitation" of the precious metal or metals in solution upon a "precipitating" substance, or "precipitant," which is in a solid but more or less finely-divided state.

The apparatus, for instance, is designed to recover gold, silver, platinum, &c., from solutions of their haloid by means of the employment therein of dense but more or less finely-divided carbon, sub-sulphide of copper, or other known solid and suitable precipitant; again, also, for the recovery of the same metals from their cyanide-solutions by means of the finely-divided zinc product commercially known as "zinc fume," and generally for analogous requirements.

It is necessary that whenever the nature of the precipitant used and the degree of fineness to which it is found desirable to reduce it primarily, it shall be of greater specific gravity than the liquid or solution desired to be precipitated by it, so that the precipitant shall tend to settle from the liquor by gravitation. Further, it is necessary to my invention that the solution or liquor to be precipitated shall percolate upwards through the mass of solid finely-divided precipitant.

In an apparatus with parallel vertical sides the upward flow of liquor would tend to carry off finely-divided particles of precipitant, unless special means were taken to prevent this. Filters tend to become clogged, and are generally useless for my purpose, so that I retain the particles of the solid precipitant upon whose surfaces the precious metals are in course of deposition within my apparatus by inducing subsidence of them. This I effect by continually reducing the upward rate of liquor-flow, which is secured by constantly increasing the area of the liquor-column as it rises higher in the apparatus.

My apparatus takes the form of a funnel. The liquor enters (under a sufficient pressure or head) through the bottom orifice; it then meets with and thoroughly mixes with the mass of finely-divided precipitant in a condition of suspension in the liquor. The solid finely-divided particles do not sink against the comparatively rapid inflow, or are prevented from so doing to any extent by means of an automatic valve of ordinary type. By this intimate admixture of liquor with precipitant the deposition of the precious metal in solution in the former is effected upon the minute surfaces of the latter. It only now remains to remove the depleted liquor from the particles of the solid "precipitate" containing the gold, silver, &c.

As the liquor continues its upward flow, by virtue of the continually-diverging sides of the apparatus the area of the liquid column becomes greater and greater; the rate of the vertical upflow is thereby correspondingly reduced. This continues until a point is reached at which the upflow is so vertically slow that the finest particles are able to settle or subside against it. At any point, therefore, above this limit or zone the absolutely clear liquid may be drawn off from the apparatus free from suspended particles, and depleted of its precious-metal contents.

I do not confine myself to any special section of the funnel in a horizontal direction: it may be square or polyangular, oval, &c.; but I prefer it for many purposes circular, as giving more uniform admixture and flow throughout the whole space.

If the precipitation of the precious metals be deemed to be incomplete in one apparatus, owing to the richness of the original liquor or to other causes, the outflow may be caused to pass into a second similarly-arranged apparatus, or through two or more such apparatus placed in series; but in general one apparatus can be made to secure practically complete removal of the precious metals dissolved in a given liquor, by the use of a suitable precipitant.

If a series of two or more such apparatus be employed, the first of the series may be used to enrich quantities of precipitant which have been only partially used up to their fullest capacity of precipitating the precious metals; whilst the succeeding members of the series are supplied with the necessary amounts of less rich or quite fresh precipitant in order to remove any remaining traces of gold, silver, &c., which may escape unprecipitated in the outflow from the first apparatus. The poorer precipitates in these last apparatus are in course of time removed through the bottom of the apparatus, and transferred to the first one of the series, there to be enriched to their full capacity, whilst their place is taken by fresh quantities of poorer or quite unused precipitating agent, and so on.

When the precipitate is deemed to be sufficiently rich it is removed from the apparatus by a "three-way cock" at the bottom thereof, or any other suitable arrangement, and the precious metal it contains finally recovered by any known and suitable method, such as, in the case of the employment of a carbon precipitant, by burning, or, in case of the use of a zinc precipitant, by smelting.

The apparatus is also supplied with a small central funnel for the introduction of fresh quantities of precipitant from time to time to the point of maximum precipitating action in the apparatus—*i.e.*, near the inflow. By providing this funnel with a bell-shaped or inverted-funnel termination a sort of "chamber" is produced in the lower part of the apparatus, having an annular space for the passage of liquor between the rim of the smaller funnel and the sides of the large one. This chamber is of considerable aid in promoting the action of the precipitant by keeping the bulk of it constantly near the liquor-inflow, and securing perfect admixture by means of the vortex currents, &c., it induces.

It is further desirable to break the rapid rush of inflowing liquors at their point of entry into the apparatus, and to secure their subdivision and intimate admixture with precipitant as early as possible. This I effect by capping the end of the inlet-pipe with a small perforated cone or distributor. The perforations may be from one-quarter to one-tenth the diameter of the inlet-pipe, but their total area must be larger than that of the sectional area of the pipe. The holes may be bored

in a direction perpendicular to the cap-cone, or they may be made tangential—*i.e.*, bored at a tangent to the internal circumference of the cone, thus securing a rotary initial flow of the inflowing liquors, instead of a series of straight ones. In the majority of cases, however, perpendicular bore-holes answer equally well.

The clear precipitated liquor may be drawn off at any point above the limit of subsidence, either by a pipe or, preferably, by allowing it to flow equally over the rim-circumference of the apparatus. The latter method secures the quieter and more uniform outflow, and does not disturb the top layers of liquor, undergoing final subsidence, by establishing a quick current in one particular direction.

If desired, the rim may be encircled with a filter-screen of lawn, calico, or other filtering or straining medium, so as to retain within the apparatus any particles of precipitant which may be floated or buoyed up by bubbles of air or other gas.

The clear liquors passing over the rim and through the precautionary filter or strainer fall into and are collected by a circular trough or launder attached to the apparatus below the rim, whence they are conveyed away by a pipe. As before stated, this may lead into a storage-vat or into another similar apparatus; or, if deposition of the floating particles is not absolutely complete, into any suitable known type of apparatus (such as, for example, the slat-partitioned tank, used for freeing softened water from traces of deposit) where subsidence is finally rendered absolute. In most cases where traces of precipitant have escaped I have secured perfect final subsidence by allowing the liquors to flow through a shallow plain tank of from four to six times the area of the top of the precipitating apparatus, before passing them direct to the storage liquor-vats. Such an apparatus as I have described I term a "precipitating cone." It may be constructed of any suitable material, such as wood, stoneware, galvanised iron, &c., according to the nature of the liquor or precipitant it is designed to treat. Its action, until the charge of precipitant it contains is exhausted and requires renewal, is perfectly automatic and continuous. Its capacity, its height, the angle of its sides, the ratio of inflow-diameter pipe to top area of cone, will naturally vary with the volume of liquor to be dealt with, the rate and head of liquor-inflow, the relation of the specific gravity of the liquor to that of the finely-divided precipitant, the actual coarseness or fineness of the particles of the latter, and so on. These data may be calculated, or decided by preliminary experiment in any particular case.

As an example, however, of the application of my invention to the recovery of gold bullion from cyanide solutions, I instance the following dimensions of my apparatus: For a flow of from 600 to 800 gallons per hour I find a cone-depth of 5 ft., with a top diameter of 5 ft. also, to be amply sufficient. The diameter of the inlet-pipe is from $1\frac{1}{4}$ in. to $1\frac{3}{4}$ in., according to the head of the inlet liquor, whilst the perforations of the cap-cone, or distributor, are $\frac{3}{16}$ in. in diameter. The charge of zinc fume in such an apparatus varies from 5 lb. to 30 lb., according to requirements.

In order that my apparatus and invention may be more readily understood, I append hereto a diagram, representing a vertical section through such a precipitating cone as before described, and whereof the following are the lettered references: A, inlet-cock; B, precipitating-cone; C, perforated distributor; D, supply-funnel for precipitant; E, check-valve; F, supply for liquor or discharge for rich precipitant operated by a three-way cock; G, check-valve guide-rod, also giving independent control of valve; H, cone overflow; J, precautionary filter-screen for precipitated liquors; K, collecting-launder; L, outflow for same; M, inlet-pipe; N, cock for emptying cone after use; P, level (variable) of bulk precipitant on filling in before liquor-inflow.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. The use of a precipitating apparatus of constantly-increasing area in a vertical direction, whereby the vertical upward flow of a liquor or solution introduced at the bottom of such becomes continually slower until the deposition or subsidence of any suspended particle of solid precipitating agent becomes possible against such greatly-reduced current, substantially as described.

2. The use in combination with such apparatus of known solid precipitants, for the solutions of precious metals, when in a more or less finely-divided condition, substantially as decribed.

3. The use of two or more such apparatus placed in series for the purpose of utilising to any required degree the precipitating power or capacity of the precipitating agent used, substantially as described.

4. The combination of such apparatus with other known types of depositing or subsidence apparatus, substantially as described.

5. In such apparatus, the use of a tangentially or otherwise perforated distributing-cone for breaking up inflow-liquor, substantially as described.

6. In such apparatus, the use of a smaller cone inverted towards the greater cone, but not touching the same, providing thus a "mixing-chamber" with an annular outflow, substantially as described.

7. In such apparatus the use of a filter-screen at the top thereof to retain floating or buoyed-up particles of precipitant, substantially as described.

Dated this 21st day of August, 1896.

W. E. Hughes,
Agent for the Applicant.

An Improved Process for the Treatment of Metalliferous Ores and Products.

I, Edgar Arthur Ashcroft, of 34, Queen Street, Melbourne, in the Colony of Victoria, electrical engineer, do hereby declare the nature of my invention for "An Improved Process for the Treatment of Metalliferous Ores and Products," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the treatment of ores and products containing copper and iron, in conjunction with the combined leaching and electrolytic treatment of ores and products containing zinc.

My improved process is carried out in a manner and with apparatus very similar to my former process, as described in detail in the specification of previous Letters Patent, dated the 20th day of June, 1894, No. 6914, and the 18th day of October, 1895, No. 7985.

The essential improvements now made consist in working in conjunction with the zinc-bearing ores and products other ores and products, especially products containing copper and iron, such as are obtained from iron- and copper-pyrites or sulphide ores by means of the preliminary furnace-treatment almost universally employed in the treatment of such ores.

These products—viz., copper and iron mattes, regulus, or crude copper—can, by the method under review, be employed as a substitute for a portion of the iron anodes required in my process above referred to, and in such employment, while effecting an economy in the treatment of the zinc-bearing ores, are themselves cheaply treated for the recovery of their valuable constituents.

In carrying this improved process into effect I operate in a similar manner, and with similar apparatus, and with the same solutions as in the former patented process, with the exception that I substitute for the iron anodes (either entirely or partially) anodes consisting of the iron- and copper-bearing mattes, regulus, or crude metal above mentioned. The metals in this material may occur in various proportions to each other, but it is immaterial for the purpose of this invention what those proportions are, except in so far as may be determined by economical considerations.

In operating with anodes of this description, the gold, silver, and sulphur of the anode are set free in solid form, while iron and copper are imparted to the solution in amounts depending on the composition of the anodes. Whilst the products of the electrolysis of the anodes are being dissolved as in the formerly-patented process, pure zinc is being deposited at the cathode as before. The copper imparted to the solution may be removed therefrom by electrolysis, and ferrous salts contained in another batch of the solution may in such electrolysis be simultaneously raised to the ferric state, the electrolysis being performed in vats having insoluble anodes and copper cathodes separated by diaphragms. The copper thus produced is refined copper, and the ferric-salt solution is regenerated leaching-solution suitable for leaching zinc-bearing ores.

It will be seen that cathodes of other conducting materials than copper may be used if desired. In certain cases it may be preferred to take the whole or a part of the copper out of the solution by the simple contact of metallic iron (known as the cementation method), in which case an equivalent of iron is dissolved for the copper precipitated. In other cases copper may be deposited at the cathode whilst metallic iron anodes become dissolved, and the superabundant electromotive force then developed may be usefully employed to aid the operation of depositing zinc by connecting such vats in the same electrical circuit as the vats wherein the zinc is deposited. In cases where pure zinc is to be deposited it will be necessary to employ diaphragms, but in certain cases where products of convenient composition are being operated upon diaphragms may be dispensed with, and the proportion of the different metallic salts in solution may be maintained sufficiently constant to insure a uniform product—viz., an alloy of the different metals of a uniform composition.

It is unnecessary to more minutely describe the methods herein explained, as they will be readily understood by any person properly versed in the art to which they appertain on reference to the former patent referred to; but to facilitate reference I here incorporate certain portions of the previous specification.

The operation of leaching the zinc-bearing ore or product is the same as before—that is to say, the ore, if it contain zinc-sulphide, is first subjected to an oxidizing roast, whereby the zinc-sulphide is converted as far as possible to neutral or basic zinc-sulphate and zinc-oxide; any lead-sulphide contained also undergoing oxidation more or less completely. In the case of ores or products containing zinc only in the form of oxide, such roasting will be unnecessary.

The ore or product having been ground to extreme fineness (which may be done either before or after roasting) is then subjected in properly-proportioned quantity to the action of a leaching solution containing ferric salt, as hereinafter specified, the reaction between the finely-ground ore or product and the solution being promoted by maintaining the same in a constant state of agitation by stirring or otherwise, this operation being continued for from half an hour to two hours, and the proportional quantity of ore and solution being so calculated that the reaction with all the iron-salt in the solution will be complete when so much zinc has been extracted from the ore that the residue left is of good composition for subsequent smelting. For instance, with ores containing 30 per cent. of zinc probably some 5 per cent. would be allowed to remain in the residues, on account of the higher cost of total extraction. The solution, after being separated from the residues, may contain a small quantity of silver, gold, copper, antimony, arsenic, manganese, alumina, silica, and other foreign matters taken from the ore, also a small quantity of iron in the form of soluble ferric hydrate, which foreign matters I prefer to remove by well-known means before subjecting the solution to electrolysis.

The solution, having been brought to the condition indicated, is now to be treated in the zinc electro-depositing plant, where the zinc is recovered, and the solution is recharged with ferric salts, so as to render it fit for use again in the above-described operation of leaching.

The electro-depositing apparatus consists essentially of a number of depositing-vats provided with anodes of copper and iron, and suitable cathodes (preferably zinc plates), and a number of similar vats having anodes of insoluble material, such as carbon, the total depositing-capacity of the plates in the iron-anode vats being about twice that of the carbon-anode vats. Diaphragms of porous material are placed between the anode and the cathode plates, so as to divide each vat into a number of separate cells permitting the passage of the current without allowing the intermingling of the liquids.

IMPROVED PROCESS FOR TREATMENT OF METALLIFEROUS ORES.

Ashcroft's Patent.

Fig. 1.

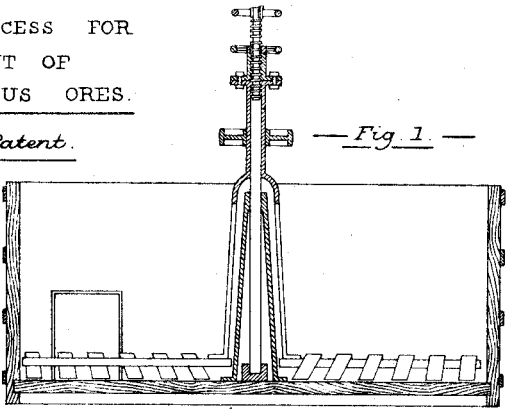


Fig. 2.

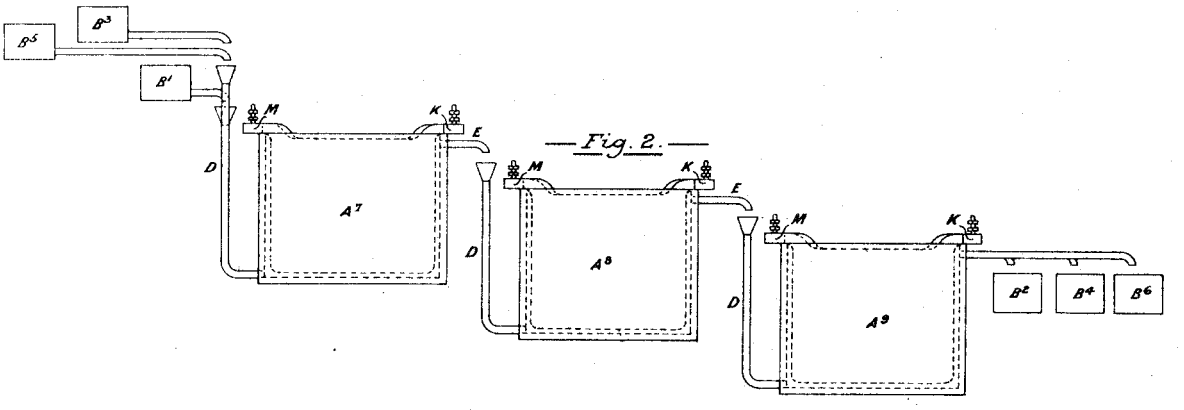
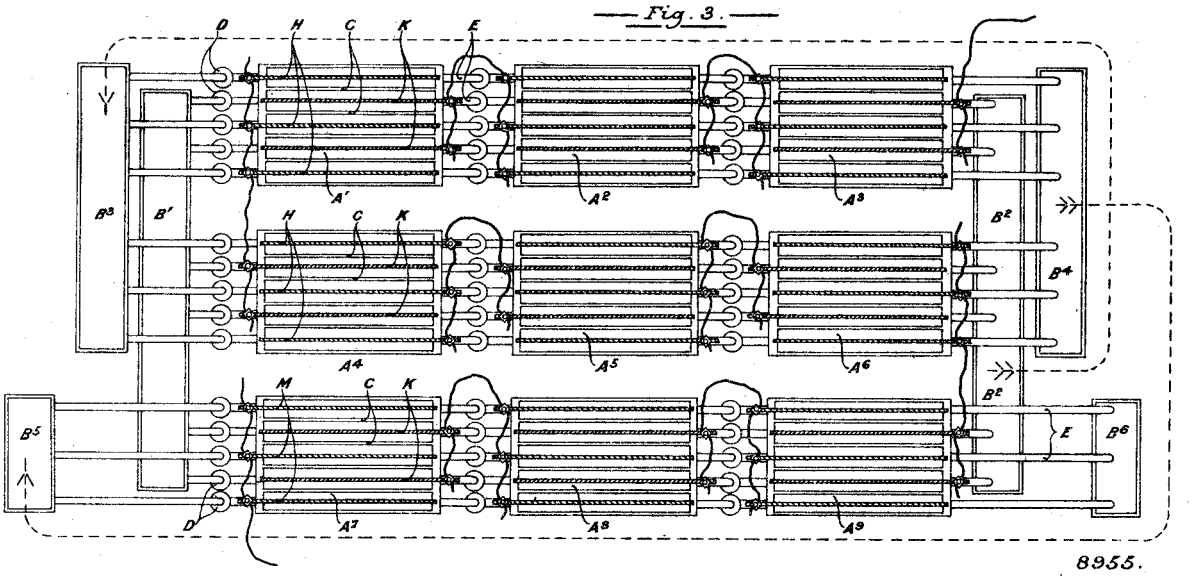


Fig. 3.



8955.

The form and arrangement of the depositing-vats is not material, but one arrangement which I have found suitable is shown in the accompanying drawings. Any suitable number of such sets of apparatus may be employed, and the connection and arrangement of the same may be varied to suit particular conditions and requirements.

Figure 1 is a section of a leaching-vat with stirrers. Figure 2 shows the arrangement of electro-depositing vats in a cascade, and the reservoir. Figure 3 is a general plan of the electrolysis plant.

The electro-depositing vats are arranged in such a manner, and with such pipe- and trough-connections between them, that a continual circulation of solution in three separate stages of progress is maintained in the system, the liquids being preferably circulated at sufficient speed to insure a brisk and continual motion at every part of the plates.

The depositing apparatus consists of a series of any number of electrolysis vats— A^1, A^2, A^3, A^4, A^5, A^6, A^7, A^8, A^9—preferably arranged as shown in Figures 2 and 3; and a number of reservoirs—B^1, B^2, B^3, B^4, B^5, B^6. Each of the vats is divided by diaphragms C of filter-cloth or other suitable material into a number of compartments, each of which has an inlet-pipe D, entering near the bottom, and an outlet-pipe E, discharging near the top. Each of the vats A^1, A^2, A^3, A^4, A^5, A^6 contains three copper and iron anodes H, and two metallic cathodes K; while each of the vats A^7, A^8, A^9, contains three carbon anodes M, and two cathodes K.

The electrical connections may be made in any suitable manner, all the plates in the same vat being connected in parallel, and the plates of successive vats being connected in series.

The reservoir B^1 has a number of exit-pipes which discharge into the inlets of the cathode compartments of the three upper vats A^1, A^4, and A^7. The outlet-pipes of these compartments discharge into the inlets of the cathode compartments of the vats A^2, A^5, and A^8. The outlet-pipes of these compartments discharge into the inlets of the cathode compartments of the vats A^3, A^6, and A^9, and the outlet-pipes of these compartments discharge into the reservoir B^2. The reservoir B^3 has a number of exit-pipes which discharge into the inlets of the anode compartments of the vats A^1 and A^4. The outlet-pipes of these compartments discharge into the inlets of the anode compartments of the next vats, A^2 and A^5. The outlet-pipes of these compartments discharge into the anode compartments of the vats A^3 and A^6, and the outlet-pipes of these compartments discharge into the reservoir B^4. The reservoir B^5 has exit-pipes which discharge into the inlets of the carbon-anode compartments of the vat A^7. The outlet-pipes of these compartments discharge into the inlets of the carbon-anode compartments of the vat A^8. The outlet-pipes of these compartments discharge into the outlets of the carbon-anode compartments of the vat A^9, and the outlet-pipes of these compartments discharge into the reservoir B^6. For the above-described operations one of several solutions of different, though analogous, compositions may be employed according to varying circumstances: No. 1, zinc-chloride mixed with sodium-, potassium-, magnesium-, or ammonium-sulphate. No. 2, zinc-chloride mixed with sodium-, potassium-, magnesium-, or ammonium-chloride. No. 3, zinc-sulphate mixed with sodium-, potassium-, magnesium-, or ammonium-sulphate. The ferric salt required in each of the above solutions in order to effect the solution of the zinc is generated in the electro-depositing plant as hereinbefore described.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. The improved process whereby a solution containing copper and iron is obtained electrolytically by employing in a zinc-depositing vat an anode consisting of the products resulting from the preliminary furnace-treatment of products or ores containing copper and iron, substantially as described.

2. The improved process whereby from a solution obtained by the process claimed in the first claim hereof the copper is deposited and the dissolved iron simultaneously raised to the ferric state by the use, in an electrolytic vat, of copper or other cathodes in conjunction with carbon or other insoluble anodes, substantially as described.

3. The improved process consisting in including in one and the same electrical circuit vats in which the electro-deposition of zinc is proceeding, and vats provided with anodes of metallic iron and cathodes of metallic copper or otherwise in which copper is being electrolytically deposited from a solution obtained by the process claimed in the first claim, substantially as described.

4. The method of preparing from copper and other mattes containing iron a solution of a ferric salt for leaching roasted zinc-ore, substantially as described.

Dated this 23rd day of October, 1896.

W. E. Hughes,
Agent for the Applicant.

Improvement in the Treatment of Compounds or Ores containing Zinc.

I, Edgar Arthur Ashcroft, of 34, Queen Street, Melbourne, in the Colony of Victoria, electrical engineer, do hereby declare the nature of my invention for "Improvement in the Treatment of Compounds or Ores containing Zinc," and in what manner the same is to be used and performed, to be particularly described and ascertained in and by the following statement:—

The object of my invention is to obtain zinc from ores or compounds containing it in a cheaper and more convenient manner than heretofore by the aid of electrolysis.

It is well known that zinc presents great difficulties in electro-deposition, inasmuch as it is liable to form irregular and spongy deposits. Acids or salts of the anode metal are set free at the anode, and must be either separated by porous diaphragms from the liquid around the cathode, or the solution must be continuously and rapidly changed in the electrolysis vats, and free acid or metal salts removed. I have discovered that the above hampering tendencies can be corrected by depositing zinc from solutions in which oxysalts are present to a sufficient amount. I have also discovered that precipitation of zinc from these solutions can be conveniently and more

economically carried out by employing the solutions at high temperatures. Also, that the oxidization of any reducing substances (such as may have been brought into the liquid during such operations as leaching the ore) prior to electrolyzing them materially assists in obtaining a good deposit, all of which matters are hereinafter more particularly set forth.

Taking the ordinary case of solutions of zinc-chloride or zinc-sulphate or mixtures of the two (perferably with alkaline sulphates or chlorides), I have found that if oxychloride or oxysulphate of zinc, or both, be present and there be no other reducing agent in the liquid the deposit is even and firm, and wholly free from spongy zinc, as long as these oxysalts are present in the solution. Also, the oxysalts, by absorbing the sulphuric acid or chlorine set free at the anode, avoid the necessity of employing separating diaphragms, and enable the solution to be operated upon for an appreciable time before it becomes unfit for the operation. The time during which a given current can be passed through the solution before it is rendered unfit for electrolysis is greatly extended by employing the solution hot, which is, no doubt, due to the greater solubility of the oxysalts in the hot solution.

I avail myself of this property of zinc by insuring that in the solution from which deposition is to take place there is a sufficiency of these oxysalts. The simplest method of obtaining this is by circulating the zinc solution hot, and mixing into it with a suitable agitator zinc-oxide, with or without zinc-sulphate or -chloride, or both, so that oxychloride or oxysulphate of zinc, or both, may be formed.

This solution is passed into the depositing-vats, where a firm and homogeneous deposit of zinc is obtained, and the acids set free at the anode are absorbed by the oxysalts. When the oxysalts are wholly or partially exhausted the solution is recharged with oxide of zinc, with or without sulphate or chloride of zinc, or both, as before, and may then be returned to the electrolysis vat, so that the process is a continuous one, the operation being preferably carried on with the solution at a high temperature.

The oxide and other salts of zinc employed may be either in a more or less pure form, having been previously removed from the ore by known processes, in which cases the zinc-oxide and salts are simply added to the solution periodically, and will in course of time completely dissolve therein, or the roasted or otherwise prepared zinc-ore may be added to the solution, when the zinc-oxide and zinc salts will be dissolved, leaving the other constituents of the ore as an insoluble residue. If the latter course be adopted, it is manifestly preferable to employ in the path of the circulating solution various other apparatus, such as settling-boxes for removing the solid residue, and zinc shaving-troughs for removing various other metals which may have gone into solution before the solution is again employed in the electrolysis vat.

From the above it will be seen that the process is a continuous one, and may be used directly or indirectly to recover zinc from any kind of ore or product.

In cases where previously-roasted ore is employed direct in the solution the ore may, if preferred, be added to the solution while still hot.

It is evident that oxychloride or oxysulphate may be made independently, and the electrolytic solution charged with them when so made, and other variations may be made in the arrangements and methods of carrying out the process without departing from the invention. My present invention can be advantageously applied in conjunction with the process for obtaining zinc-oxide from zinc-sulphate described in the specification of Hampe and Schnabel. Such process consists in subjecting an intimate mixture of finely-divided carbon and finely-divided zinc-sulphate to an even and correctly-gauged temperature of 650° C. for about two hours.

The zinc-oxide requisite for the formation of oxychloride or oxysulphate of zinc may be obtained by such process either directly from the ore, whether blende or mixed blende and galena, or from zinc-sulphate obtained from other sources. In obtaining the requisite zinc-oxide from blende or a mixed blende and galena I treat the ore, which is preferably previously roasted, with sulphuric acid, and obtain from the zinc-sulphate so formed zinc-oxide by the process described in the specification referred to.

Further, the method discovered by me, and described in the specifications of letters patent dated the 20th day of June, 1894, No. 6914, and the 18th day of October, 1895, No. 7985, whereby from a roasted zinc-ore I obtain by leaching the same with a ferric-salt solution (either ferric chloride or ferric sulphate) a zinc-bearing solution, can be advantageously employed in conjunction with my present discovery.

By applying my present discovery in combination with the processes referred to, as described in the specifications of the letters patent before mentioned, I am enabled to obtain directly from the ores, whether blende or a mixed blende and galena, a zinc-bearing solution containing the requisite quantity of oxysalt (whether oxychloride or oxysulphate) in solution. With this object in view, I leach a portion of the roasted ore with a ferric-salt solution, as described in the specification of letters patent dated the 18th day of October, 1895, No. 7985, and so obtain a zinc-bearing solution. To this solution I add from time to time, as required, zinc-oxide, obtained according to the process described in the specification of Hampe and Schnabel from other portions of the ore (preferably roasted). Having thus obtained a zinc-bearing solution and a quantity of zinc-oxide, which can be replenished from time to time, I prepare a solution of an oxysalt of zinc by the process described above in this specification. Should the ore from which the zinc-oxide is so obtained be a mixed blende and galena or an impure blende it is preferable to employ in the path of the circulating zinc-bearing solution apparatus such as settling-boxes for removing the solid residue which remains undissolved after the zinc-oxide has gone into solution.

The anodes employed may be insoluble, such as carbon, or they may be of a soluble metal, such as iron, in which case it is preferable to oxidize and remove the iron salt from the solution by use of a jet of hot or cold air, or otherwise. The acid set free can be absorbed by zinc-oxide or oxysalts, and the basic salts and oxides of iron thrown down may be collected and removed from the solution.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. The process whereby the formation of irregular or spongy deposits of zinc during the electro-deposition of that metal is prevented, consisting in dissolving in a zinc-bearing solution a quantity of zinc-oxide, substantially as described.

2. The process whereby an electrolyte consisting of a zinc-bearing solution in which an oxysalt of zinc is present in solution is prepared direct from blende or a mixed blende and galena, substantially as described.

3. The process whereby zinc can be continuously deposited from a zinc-bearing solution electrolytically, substantially as described.

Dated this 24th day of August, 1896.

W. E. Hughes,
Agent for the Applicant.

Improvement in the Treatment of Zinc- and Copper-ores.

I, William Ernest Hughes, of 54, Lambton Quay, Wellington, in the Colony of New Zealand, patent agent, do hereby declare the nature of my invention for "Improvements in the Treatment of Zinc- and Copper-ores," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention relates more particularly to the treatment of zinc- and, or, copper-bearing ores, or metallurgical products containing in the form of oxides the zinc or copper, or either of these metals alone or in combination with other metals.

For convenience the term "ore" is used in the following specification, but it is understood to include raw or roasted ore, or metallurgical products containing zinc or copper in the form of oxides or basic or neutral sulphates or sulphites.

My invention consists essentially in the conversion of the zinc-oxide (ZnO) and, or, copper-oxide (CuO) contained in such ore into sulphate of zinc ($ZnSO_4$) and, or, sulphate of copper ($CuSO_4$) by means of ammonium-sulphate ($(NH_4)_2SO_4$) and, or, ammonium-sulphamate, according to the formula: $ZnO + (NH_4)_2SO_4 = ZnSO_4 + 2\ NH_3 + H_2O$, the ammonia being given off in a gaseous form, and the ammonium-sulphate subsequently regenerated as hereinafter described. The sulphate of zinc and, or, the sulphate of copper so formed are leached out by water. Any copper present in the solution is precipitated by metallic zinc (spelter) according to the reaction: $CuSO_4 + Zn = Cu + ZnSO_4$, or by other suitable means. The ammonia (NH_3) generated in the sulphatising operation is passed through the solution carrying the sulphate of zinc, precipitating the zinc as zinc-hydrate (ZnH_2O_2) and regenerating the ammonium-sulphate for the treatment of further quantities of ore. The reaction takes place according to the following formula: $ZnSO_4 + 2\ H_2O + 2\ NH_3 = ZnH_2O_2 + (NH_4)_2SO_4$.

In carrying my invention into effect the ore is mixed with its proper proportion of ammonium-sulphate and, or, -sulphamate, which I find in practice is about two units more or less of ammonium-sulphate and, or, -sulphamate to each unit of zinc in the ore, but do not bind myself to such proportions. The ore is then treated in suitable closed vessels and with or without the addition of water or steam, the contents of such vessels being raised to a temperature approximately 300° to 500° centigrade, or other suitable temperature. The reaction indicated then takes place, the zinc and copper being coverted in soluble sulphates and free ammonia-gas being given off.

The product of this operation, consisting of sulphates of zinc and, or, copper, with gangue and, or, other insoluble residue, is leached with hot or cold water in suitable vessels. The soluble sulphates of zinc and copper are thereby dissolved, and are separated from the gangue and, or, insoluble residue, which may contain lead and, or, other metals. The gangue and, or, other insoluble residue can be treated by any well-known process for the recovery of its metallic contents.

Any copper contained in the solution is precipitated by metallic zinc or other suitable means, and removed for treatment by any well-known process before precipitation of the zinc or zinc-hydrate by the ammonia-gas. Any iron in the solution can also be precipitated, if desired, by any suitable means.

The ammonia-gas produced in the closed vessels during the first operation is recovered by being passed through suitable vats, towers, or other apparatus containing sulphate-of-zinc solution, preferably that obtained by leaching the product of the first operation. By the action of the ammonia the zinc in the solution is precipitated as zinc-hydrate (ZnH_2O_2), and ammonium-sulphate ($(NH_4)_2SO_4$) regenerated. The hydrate of zinc is separated from the solution of ammonium-sulphate by filter-presses or other suitable means, and, after washing, drying, and, or, calcining, may be used either as a pigment or zinc-ore.

The solution of ammonium-sulphate is evaporated down for recovery of ammonium-sulphate in the solid form for use in the treatment of further quantities of ore.

My process can be carried into effect in any suitable apparatus. One convenient form is shown in the accompanying drawings, but is not claimed as part of my invention.

Fig. I. is a longitudinal sectional elevation of the apparatus; Fig. II. a cross-sectional elevation of the same, upon the line X–X of Fig. I.

The ore having been mixed with the proper proportion of ammonium-sulphate and, or, -sulphamate, is placed in a hopper A having an adjustable door or opening B, by means of which the feed is regulated. From the hopper A the ore is drawn into the retort C by the action of revolving arms D carried on a shaft E. The arms D are preferably provided with adjustable shoes F, so that by altering their angle the material may be fed through the retort C at any desired rate. As the shaft E revolves the mixture is stirred and gradually carried through the retort C to the discharge-opening G. Through the discharge-opening G it falls into a closed hopper H provided with an adjustable door I, and again into a second closed hopper J having a door K. On the

hopper J being filled the door I is closed to prevent any ingress of air to retort C. The door K is then opened, and the sulphatised material discharged into a truck, such as L, or other suitable arrangement for conveying the material to the leaching apparatus (not shown).

During the operation steam or water may, if desired, be injected into the retort C through a pipe R to facilitate the reaction. The retort C is maintained at a suitable temperature, which may be from 300° to 500° centigrade, by means of a furnace such as M, or it may be provided with a jacket and heated by superheated steam.

The ammonia-gas produced during the process in the retort C passes out through an opening N, and by the action of an injector O or other suitable means is forced through a pipe P into a vat, such as Q, or other suitable vessel, containing sulphate-of-zinc solution obtained by leaching the treated ore. In order to avoid loss of ammonia-gas by leakage the injector O or other suitable means should be so regulated as to maintain a slight vacuum in the retort.

Ammonium-sulphate in solution is thereby regenerated, and can be evaporated to dryness for use in treatment of fresh quantities of ore.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. In the treatment of ores as herein mentioned, the conversion of the zinc- and, or, copper-oxides into sulphates of their respective metals by the action of sulphate and, or, sulphamate of ammonia.

2. In the treatment of ores as herein mentioned in which the zinc- and, or, copper-oxides have been converted into sulphates of their respective metals by the action of sulphate of ammonia and, or, sulphamate of ammonia, subsequently regenerating the ammonium-sulphate by passing the ammonia-gas produced during the first or sulphatising portion of the process through a solution of sulphate of zinc, substantially as specified.

3. In the treatment of ores as herein mentioned in which the zinc- and, or, copper-oxides have been converted into sulphates of their respective metals by the action of sulphate of ammonia and, or, sulphamate of ammonia, subsequently precipitating the zinc from its solution in the form of zinc-hydrate by passing through it ammonia-gas produced during the first or sulphatising portion of the process, substantially as specified.

4. In the treatment of ores as herein mentioned the within-described process, consisting in the conversion of the zinc- and, or, copper-oxides into sulphates of their respective metals by the action of sulphate and, or, sulphamate of ammonia, ammonia-gas being produced, then leaching by water the sulphates of zinc and, or, copper so obtained, and precipitatingthe copper, if any, and, or, iron, if any, by any usual means, subsequently passing the ammonia-gas produced during the sulphatising operation through the remaining solution of sulphate of zinc, whereby the zinc is precipitated as zinc-hydrate, and sulphate of ammonia is regenerated for the treatment of fresh supplies of ore, substantially as specified.

Dated this 5th day of October, 1896. W. E. Hughes.

Improvements in the Extraction of Precious Metals from their Ores or from Compounds containing the same.

I, James Mactear, of Victoria Mansions, London, England, chemical expert and engineer, do hereby declare the nature of my invention for "Improvements in the Extraction of Precious Metals from their Ores or from Compounds containing the same," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the extraction of precious metals from their ores, or from compounds containing the same, by the use of a solvent having a more economical and advantageous action than those at present in use.

The invention consists in the use, for the purpose of the invention, of a solution containing both cyanuric acid or a cyanurate and cyanide of potassium, or other cyanogen compound from which free hydrocyanic acid can be liberated by the addition of an acid or acid-salt or other substance or compound.

The proportionate quantity of the cyanuric acid relatively to that of the cyanide present in the solution will depend to a large extent upon the physical condition of the ore or compound under treatment, as, for example, in ores in which the gold is fine and free five parts of cyanuric acid to each one hundred parts of the cyanide will be found to give good results, but in some cases even a less proportionate quantity of the cyanuric acid may be used; while with more refractory ores, or those in which the gold is coarser, a larger proportionate quantity of the cyanuric acid may be used; but in very few cases will it be found necessary to use a greater proportionate quantity than twenty-five parts of the cyanuric acid to each one hundred parts of the cyanide.

The presence in a cyanide or cyanogen compound solution of cyanuric acid, free or combined, renders such solution much more active as a solvent of the precious metals than are solutions of cyanides or cyanogen compounds not containing cyanuric acid, such as have hitherto been used, and which are hereinafter referred to as "ordinary cyanide solutions," the action of the cyanuric-acid-contained cyanide solution upon the gold or silver being such as to avoid to a very considerable extent the objectionable action of ordinary cyanide solutions upon the base metal compounds commonly found in ores or other compounds containing the precious metals, and which hinders the obtainment of the precious metals; and, being much more rapid than that of ordinary cyanide solutions, with a given quantity of cyanogen in each solution, the cyanuric-acid-contained cyanide solution being also of further advantage in relation to ordinary cyanide solutions in requiring a less quantity of cyanide to effect the extraction of a given quantity of precious metal, other conditions being the same.

When the gold is fine and free I treat the ore or other compound in a crushed or powdered condition to the action of the cyanuric-acid-contained cyanide solution in suitable containing vessels such as are usually employed in wet processes of extracting the precious metals, and separate the solution from the residue and the gold or silver from the solution by any usual or suitable methods or means; but when the gold is coarse, or is partly coarse and partly fine, and water is scarce, I fit the solution-containing vessels with suitable stirring apparatus, and treat the powdered ore or compound to the action of the cyanuric-acid-contained cyanide solution in the presence of mercury or of an amalgam of mercury and sodium or potassium, whereby I obtain a ready amalgamation of the coarser particles of gold and solution of the finer particles thereof, which latter are then displaced by the sodium or potassium, and amalgamate with the mercury.

When the ores carry much silver as sulphides it is best to have the solution more alkaline than when the ores carry only gold or silver in the metallic state.

Tailings, concentrates, and refractory ores generally are especially susceptible to treatment by the cyanuric-acid-contained cyanide solution.

Having now particularly described and ascertained the nature of the said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. The extraction of precious metals from their ores, or from compounds containing the same, by the use of a solution of cyanide of potassium or other cyanide or cyanogen compound of the nature aforesaid containing cyanuric acid or a cyanurate.

2. The extraction of precious metals from their ores, or from compounds containing the same, by the use of a solution of cyanide of potassium or other cyanide or cyanogen compound of the nature aforesaid containing cyanuric acid or a cyanurate, and in the presence of mercury, or of an amalgam of mercury and sodium or potassium.

Dated this 10th day of July, 1896. JAMES MACTEAR.

PROCESS OF AND APPARATUS FOR EXTRACTING GOLD FROM ITS ORES.

I, John Glenville Murphy, mining engineer, of Middletown, County of Middlesex, State of Connecticut, United States of America, do hereby declare the nature of my invention for "Process of and Apparatus for extracting Gold from its Ores," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention is an improved process of and apparatus for extracting gold from its ores. Gold is found in ores of two kinds, which are known as "free-milling" ores and "refractory" ores. What are called the "refractory" of gold are such as contain gold sparsely disseminated throughout their bulk, mechanically surrounded or enveloped by baser material, or so united with other elements as to form chemical combinations therewith. Such ores, among others, are those which contain galena, zinc-blende, iron-pyrites, white iron (arsenical), and the ores of copper.

The free-milling ores have a large percentage of their gold in a finely-divided flake, molecular, or flour state, and much of this flour gold is wasted or lost in the process of milling, either being carried away by the force of the water necessarily used in connection with the stamp-mill, or remaining unreleased from the rock or gangue and being rejected along therewith.

The stamp-mill, which can be used only with free-milling ores, is necessarily wasteful of a large percentage of flour gold, and the smelting processes heretofore used in reducing refractory ores are expensive. In other words, ores do not in practice yield the quantities of gold which careful chemical analyses show them to contain, or, if they do, the cost of getting the gold exceeds its value. I have invented a method or process of recovering the gold from all such ores, and an apparatus or arrangement of machinery whereby this process may be made effectual, and my method and apparatus are applicable as well to refractory as to free-milling ores. I have found by actual experiments, and by practical exploitation of my invention, that, so far as the results go, it is immaterial whether the gold in ores such as I have mentioned is united to other elements, chemically, mechanically, or otherwise—the point of my discovery being that the gold may be recovered completely from such ores, and the same thereby rendered of value nearly equal to the absolute amounts of gold they contain, at a comparatively small expense.

While it may not be absolutely true that gold is chemically united with baser elements in all of the refractory ores, it would seem to be true that in some of them at least there is a quasi-chemical union existing between the gold and some one or more of the other elements or combinations of elements. Whatever the real nature of the union may be, the fact is known to all practical mining engineers and chemists that from some ores fairly rich in gold it is impossible to get reasonable returns except at great expense for transportation and smelting, whereby their commercial values are destroyed. I have discovered that all these ores may be profitably milled by reducing the entire body of gold-bearing ore uniformly and completely to an impalpable powder by gentle attrition, and treating this powder for the separation of gold by amalgamation.

That extreme comminution or progressive subdivision of a compound substance mechanically will produce chemical change may or may not be true, but it is certain that such extreme comminution renders chemical change more readily possible than it would otherwise be, other things being equal. It is also certain that if the union between elements in any substance is merely a mechanical mixture, a conglomeration, or solution, minute subdivision of such substance may be carried far enough to separate the elements themselves.

In all methods, processes, and machines heretofore devised for extracting gold from its free-milling ores there has been one defect which is wasteful of a large percentage of flake, flour, or molecular gold. This defect is written in plain characters upon the face of every apparatus and every process in use at the present day, and the practical novelty and utility of my invention appear as soon as the case is stated.

Every practical milling method treats the separation and recovery of flake, flour, or molecular gold as subsidiary and as of secondary importance to the treatment of the ore for the separation and recovery of the grosser particles of gold; whereas the only method whereby flake or flour gold can be milled without loss is to make the recovery of gold in this state the main object of the extraction process, and this can only be done by reducing the whole of the gold-bearing ore to a uniform and impalpable powder, comminution being carried to the last possible degree without hardening or hammering the ore during the process.

Smelting processes are expensive, but have heretofore been necessary for the reduction of refractory ores, as prior to my invention it was impossible to mill such ores satisfactorily. My process consists, essentially, in reducing the entire body of gold-bearing ore, whether free-milling or refractory, as well the gold or gold compounds therein as the gangue and other materials associated therewith, to a state of such fine pulverisation that there will be no distinction between one particle and another in regard to size—*i.e.*, all the free gold will be in a flour, flake, or molecular condition, and all the other materials will likewise be powdered, the reduction being accomplished without hammering, pounding, or compressive grinding. This reduction to practical uniformity in the minuteness of the particles of the whole mass will predispose to chemical change, and will prepare the mass for new chemical combinations, so that uncombined gold will the more readily be taken up and amalgamate with mercury, and gold in combinations in the minute particles will the more easily leave these combinations to form a new one by amalgamation.

In practice I find that ore-powders passing through screens having from one hundred to three hundred meshes to the linear inch are sufficiently fine, but finer states of division may be obtained, and may be necessary with some ores. All gold-ores, with the exception of such as have their gold chemically united to a baser material, contain a percentage of flour or flake gold varying from 30 per cent. to 100 per cent. of the total amount of their gold.

Many mines which show assay-values of from $18 to $34 per ton in native gold never produce any such values by practical working, for the simple reason that from 40 per cent. to 70 per cent. of their native gold is in the flour, flake, or molecular condition, and is largely lost or wasted in the methods of extraction now used. Now, the value of my process, its novelty and utility, appear in this: the saving of all, or practically all, of the gold in such ores, thereby rendering them of nearly their gross values, as indicated by chemical analyses, and, furthermore, in rendering possible the milling of refractory ores such as are ordinarily smelted. The process by which I realise these conditions and effect this saving, and the apparatus by means of which I carry out this process, will now be described, describing the one with the other for the sake of brevity.

I have illustrated the apparatus in the accompanying drawings, in which like letters of reference indicate corresponding parts, and in which—Figure 1 is a view of the essential portions of the apparatus as seen in vertical section, the figure being in the nature of a diagram; Figure 2 is a view showing in detail one of the parts; and Figure 3 is a view showing in detail the guards or gratings used to prevent the outflow of large pieces of ore from the cylinder.

In the drawings, the letter A indicates an elevator or conveyer arranged to feed broken or crushed ore from any suitable rock-breaker or ore-crusher [not shown] into a hopper B, whence it falls by gravity through the inclined chute *b* into a pulverising cylinder C. The pulverising cylinder C may be made of any suitable material, and may be mounted and operated in any convenient manner; but the arrangement shown in the drawings, and about to be described, is the one I prefer. As shown, this cylinder revolves on hollow trunnions, which open into both its closed ends, and these trunnions run in suitable boxes *d d*, secured to a supporting-frame D. The cylinder may be strengthened and further supported by rollers arranged beneath it between the trunnions. The trunnion *c* at the receiving end of the cylinder receives the neck of the chute *b* within its inner periphery at its outer end, and the joint between the two is made as close as possible in order to prevent waste. The opening in this receiving trunnion is the frustrum of a hollow cone flaring toward the interior of the cylinder, this structure facilitating the delivery of the broken or crushed ore from the hopper into the cylinder, and preventing stoppage or clogging of the ore within the trunnion.

The trunnion c^1 at the discharge end of the cylinder is provided with suitable guards or gratings c^2 of iron or steel bars at its inner end, to prevent the outflow of coarse pieces of ore or the like, while the spaces between these bars will allow the comminuted materials to escape as soon as they rise above the middle of the cylinder. This trunnion c^1 has its outer end flared to assist in the outward feed of the pulverised ore. The cylinder is provided with a man-hole c^3, by means of which access may be had to the interior, and has at or near one of its ends the gear-wheel C^1 secured to it, the said wheel meshing with a gear-wheel upon a power-shaft P. In practice I find the best results are obtained from a porcelain-lined cylinder from 8 ft. to 12 ft. in length, having a diameter of from 6 ft. to 8 ft., and I charge this cylinder with about 3 tons of loose Norway flint pebbles or large pieces of ore, ranging in size from 1 in. to 2 in. in diameter. Setting the cylinder in rotation, crushed ore is fed into it by gravity from the hopper B, and as it passes from the receiving end of the cylinder to the discharge end the ore is ground between the porcelain lining and the pebbles and between the pebbles themselves, and the pieces of ore rubbing against each other are gently worn away by self-attrition, the whole operation resembling as closely as possible the natural destruction and wearing-away of rock whereby placer deposits are formed.

It is to be noted that the friable materials used as described act by attrition upon the malleable constituents of the ore, wearing and tearing them gently and progressively. It will be seen that no ore will be discharged through the trunnion c^1 until the total mass within the cylinder rises to the level of the said trunnion, and is forced outward by the flow of crushed ore through the trunnion *c* at the receiving end.

While it is true that the cylinder, if revolved at sufficient speed, would cause the crushed ore to pulverise itself without the use of flint pebbles or large pieces of ore, still, experience proves that

by using these pebbles time and power are economised. The ore is fed continuously into the hopper B, and thence is fed by gravity into the pulverising-cylinder C, where the impact and grinding action of its own particles, combined with that of the pebbles and of the walls of the rapidly-revolving cylinder, reduce the ore to an impalpable powder, without compression of the particles, the fineness of which, before it passes through the discharge end of the cylinder at the trunnion c^1, is determined by the number of revolutions made by the cylinder and the length thereof. I find by actual test that under the feed or flow of the ore from the hopper B, the said feed being occasioned by gravity alone, the course of the particles of ore through the cylinder is approximately a spiral, beginning at the feed end of the cylinder and ending at the discharge end, and that by the time the ore has travelled this distance it is sufficiently pulverised for the purposes of my process. It will be obvious that by lengthening the cylinder, or by increasing the rate of revolution, or by prolonging the grinding, other things being equal, the fineness of the ore will be proportionately increased at the discharge end. Comminution may be had in the cylinder either in the presence of water or dry; but ordinarily the use of water is found to be of advantage. However, practice in each case must determine the particular requirements of each ore-body to be ground—whether it shall be ground wet or dry; and with some ores it may be desirable to use another lining than porcelain for the cylinder.

The comminuted ore may be tested to determine its fineness by taking a sample of discharge and passing it through a screen made of silk fibre. Platinum screens may also be used as fine as 200 wires to the linear inch, but for the finer states of comminution silk gauze is the only means of testing. This comminuted ore is discharged into an amalgamating-pan E, which, as will be seen, is of a simple and ordinary construction, but is provided with a cover E^1, having an opening for a faucet or the like, and a chute E^2, arranged at one side, which extends above the pan and embraces the out-periphery of the outer flaring end of the trunnion c^1. This arrangement of cover and chute with the flaring trunnion of the pulverising-cylinder prevents waste of the powdered product as it falls into the pan, insures the delivery of such product within the pan, and retains it therein.

In using the amalgamating-pan I avoid a flow of water, and merely admit enough water to the pan to moisten the pulverised ore and form a thin paste with it. By avoiding the use of flowing water one cause of waste is eliminated, as it can easily be seen that any flow of water would carry off some of the gold in its finely-divided state.

The pan E is provided with mullers *e*, which may be of any usual or suitable construction and material, and are driven in the usual way by a shaft geared with the power-shaft. There is an inclined well e^2 in the bottom of the pan, which is provided with a plug or tap e^3, and the entire contents of the pan may be discharged there from time to time by removing the tap or plug e^3 and washing the charge into the settler F.

From the time the ore leaves the hopper B until the ore, mercury, amalgam, and water are washed into the settler F the fine dust produced is prevented from floating in the air and from being lost thereby, or by reason of draughts, gusts of wind, or the like.

The settler F has a stirrer *f*, which consists of radial arms f^1 provided with shoes or plows f^2, and the whole is driven in any suitable manner, such as by the central shaft f^3, which is geared to the power-shaft P.

The amalgamation of the pulverised ore is accomplished by allowing a limited amount of water to flow into the pan E—just enough water to form a thin paste with the quantity of ore to be treated—say, from a ton to a ton and a half—and then adding sufficient mercury to amalgamate the gold—say, a tank of 75 lb. The discharge from the cylinder may continue or may be stopped for the time being, but if the discharge is continuous there must be a continuous supply of mercury. The muller is set in rotation at about sixty revolutions per minute, and this rate is continued until the amalgamation of the gold in the ore is completed. By panning a sample the progress of amalgamation can be easily determined. As soon as the amalgamation is completed the speed of the muller is reduced, the plug or tap e^3 is removed from the orifice of the inclined well e^2 at the bottom of the pan, and water is turned on to wash the whole mass of pulp and amalgam into the settler F. The water which washes the charge from the amalgamating-pan serves also to dilute the pulp and make it sufficiently fluid to enable the mercury and amalgam more readily to settle into the well of the settler, which is shown in the drawings as f^4. In this settler the amalgam and mercury are finally cleaned and separated from impurities, which are drawn off through the holes f^5 in the periphery of the settler, these holes being provided, of course, with plugs f^6. After sufficient cleansing by means of the revolution of the stirrer-arms and the settling of the mercury and amalgam into the well f^4, the mercury and amalgam are finally withdrawn through the said well, or through its orifice, which is provided with a plug or similar device f^7. The mercury and amalgam withdrawn from the settler are treated in the ordinary way for the recovery of the gold and the saving of the quicksilver.

It is to be understood that several amalgamating-pans and several settlers or washers may be used in connection with the pulveriser, either in series or otherwise, as may be most convenient and effective; but I find that ordinarily, with the minute and hardened pulverisation of the ore which I effect, two pans and one settler are ample in the treatment of the product, as amalgamation with pulverised and unhardened ores is rapid.

My process has been used in the treatment of telluride ores, and resulted in extracting therefrom between 25 and 33 per cent. of the entire amount of gold therein.

My process contemplates a practically continuous operation, the ore being fed forward from the hopper through the pulverising-cylinder into the amalgamating-pan, where it is treated with mercury, and from the amalgamating-pan the whole mass is washed into the settler, where the amalgam and mercury are cleaned and separated from the rest of the mass; and each and every step in this feeding-forward is accomplished by gravity alone. While this is apparent enough in

the other portions of the process from the construction of the apparatus, it might seem to need some explanation as applied to the comminuting-cylinder; but when it is considered that there is a continuous pressure at the receiving end of the cylinder, caused by the inflow of the crushed ore, and that this ore from the time it is received within the cylinder is ground and pulverised in a progressive way until the particles are separated one from another to almost the last degree, it will be seen that the pulverised dust or flour thereby produced, being in continual agitation, caused by the revolution of the cylinder and the motion of the pebbles therein, will be approximately analagous to a fluid, and subject to the law of equal pressure in all directions at the same level. This holds true whether the ore be ground wet or dry. Now, the inflow being at one end, and the only possible outflow at the opposite end, and the inflow arising from gravity alone, it follows that the outflow necessarily arises from gravity. It is of importance to note that pounded or hammered gold will resist the action of mercury for a long time, and that the so-called "rusty" gold is merely gold enveloped in a coating of some substance—a gas, a film of grease, a deposit of iron rust, or the like—and thereby protected from the action of mercury. Now, before gold that has been hammered will amalgamate readily with mercury it must be annealed, and before rusty gold can be amalgamated the coating surrounding the gold must be pierced or removed.

Further, the resistance of hammered gold to amalgamation with mercury is irrespective of mass—or, in other words, equal surfaces of gold hammered to equal degrees resist amalgamation equally, and the size and shape of the hammered particles are relatively unimportant, their total surface areas being the real things for comparison. Likewise, gold which is rusty, whether in a large mass or in a small particle, is protected from mercury as long as its envelope remains entire. Stamp-mills, ore-crushers, and the like have a hammering or consolidating effect upon gold subjected to their action, and while much of their flour or powdered gold is probably lost through waste from the great force of water used in connection with them, another large percentage of the total waste is undoubtedly due to the fact that such gold as is not lost in the first instance is lost in the latter processes by reason of its hammered condition and its consequent slowness to amalgamate with mercury. Now, the difference between the product obtained by my process and the products resulting from the processes formerly in use consists not only in the greater fineness in the reduction practised by me, but principally in the fact that this comminuted product is unhammered, uncondensed, unhardened, and also in the fact that the rusty gold is not only deprived of its coating, but that this is done without compressive grinding, and in such a way as to leave the gold in its natural and soft condition.

The pulverisation effected by my process is not only an extreme comminution of the total mass of the ore body, but it is such a comminution obtained without the tremendous pounding or compressive grinding actions used in other processes. While it is true that the crushed ore delivered into the pulverising-cylinder will have been subjected to some little grinding, pounding, or compressing in the rock-breaker or ore-crusher necessarily used for breaking it, it will be seen that this compression will be effective upon a very small portion of the mass, and that within the cylinder the pulverisation is accomplished more by attrition, wearing, gentle grinding, and the like than it is by a pounding action, a compressive action, or a hammering process. In other words, comminution is effected without condensation, hammering, or compression of the gold, and the powdered product is delivered into the amalgamating-pan not only in the finest possible condition—*i.e.*, in the condition presenting the greatest surface-area for a given quantity of gold—but the surfaces of the particles making up this greatest area are worn and scratched in such manner as to present the metal most effectively to the action of the mercury and the gold itself in its natural and soft condition. It may be noted in this connection that some degree of heat is produced in the pulverising-cylinder, though this rarely rises above 150° Fahr., and, while this would not be sufficient under ordinary circumstances to cure hammered gold, it may have some effect in preparing the infinitesimal particles produced by my process for amalgamation, especially by driving out of the pores of the gold gases, greases, and the like.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is,—

1. In an apparatus for separating gold from its ores, the combination with a pulverising-cylinder, revolving on hollow trunnions both flared in the same direction, of a hopper having an inclined chute fitting within the inner periphery of the outer end of one trunnion, and a covered amalgamating-pan having an inclined chute embracing the outer periphery of the outer flaring end of the other trunnion, substantially as and for the purpose set forth.

2. The process of separating gold from its ores which consists essentially in reducing, without compressive grinding, hammering, pounding, or the like, the entire mass of ore equally to an impalpable powder by gentle attrition of the mass in a gradually-fed revolving cylinder, whence only the thoroughly pulverised materials are permitted to escape by overflow as an impalpable powder, delivering said powder to mercury in an amalgamating-pan to which water is admitted only in quantity sufficient to form a paste, and not enough to produce a flow of the pulp; and finally, when the amalgamating action upon the ore has been completed, washing the pulp into a settler where the amalgam settles from the diluted mass while the impurities are drawn off.

3. The process of separating gold from its ores which consists essentially in reducing the ores to an impalpable powder by gentle attrition in a revolving cylinder, from which only the thoroughly pulverised materials are permitted to escape by overflow into an amalgamating-pan, amalgamating the pulverised materials within the said pan with a quantity of water neither increased nor diminished during the process of amalgamation; and, finally, when the amalgamating action upon the ore has been completed, washing and diluting the pulp into a settler where the amalgam and impurities are separated.

Dated this 17th day of August, 1896.

W. E. Hughes,
Agent for the Applicant.

AN IMPROVED PROCESS FOR THE TREATMENT OF ZINCIFEROUS ORES.

I, Ernest Frederick Turner, of the Adelaide University, Adelaide, in the Province of South Australia, analytical chemist, do hereby declare the nature of my invention for "An Improved Process for the Treatment of Zinciferous Ores," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention relates to an improved process for the treatment of zinciferous ores, and more particularly that class of ores which contains also gold, platinum, silver, or lead. The object of my invention is to remove the zinc from the ore, subsequently recovering the same in metallic form, and afterwards treating the ore-stuff for recovery of the lead and other metals contained therein.

In my invention, the ore in a suitable state of division is roasted or otherwise heated at a high temperature, either above or after being previously mixed with carbon. During the roasting or heating operation a stream of superheated steam is passed through the roaster or otherwise brought in contact with the ore under treatment. By this means the ore is oxidized and H_2S given off where the ore is being treated alone, or H_2S with hydrogen, and CO where carbon has previously been mixed with the ore. The gas so given off is collected in a suitable gasometer for use as fuel, and the products of combustion returned for treatment of the oxidized ore in the following manner: The oxidized ore, accompanied by water containing salt, is caused to fall through a suitable tower, through which at the same time a stream of SO_2, obtained as previously indicated, is constantly ascending. By this means the whole of the ZnO is converted into $ZnSO_3$ (zinc-sulphite), which is later removed from the ore by lixiviation, together with any copper which may be present. At the same time, by the action of the SO_2, the oxide of lead is partially converted into sulphite of lead, and the silver-sulphite into silver-chloride.

The liquor from the zinc lixiviating-vats is passed over copper, to remove any silver which may be in solution, and afterwards through zinc turnings for the recovery of any copper and lead. The liquor is then passed through towers through which H_2S, obtained as previously indicated, is passing, and thereby the zinc contained therein is precipitated as sulphide together with sulphur.

The ore-stuff remaining in the lixiviating-tanks after the liquor containing the zinc has been drawn off is then heated, whereby the sulphite of lead breaks up into sulphide of lead and sulphate of lead, and the two being in contact with any oxide of lead which is still undecomposed in the first operation by the action of SO_2 soft metallic lead is produced. Or, if the ore-stuff contains silver, it is mixed with zinc-chloride, either alone or with the addition of metallic zinc or other suitable metal, and then heated for the obtaining of the lead as soft metallic lead. The chlorides of silver, gold, and other metals will then still remain with the zinc-chloride, and can be separated therefrom by lixiviation or by any other suitable means.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. In the treatment of zinciferous ores, the herein-described process, consisting in, first, oxidizing the ore in a suitable roaster, then causing the oxidized ore, accompanied by water containing salt, to be acted upon by a stream of SO_2, whereby the whole of the oxide of zinc is converted into sulphite of zinc and hypo-sulphite of zinc, the oxide of lead into sulphite of lead, and the sulphite of silver (if any) into chloride of silver; subsequently extracting the sulphite of zinc by lixiviation, and treating the liquor by H_2S, whereby the zinc-sulphites are precipitated as sulphides; subsequently removing the same; and treating by any known process; at the same time taking the ore-stuff remaining after the liquor has been drawn off containing the sulphites of zinc, subsequently heating the same, either alone or with zinc-chloride alone, or with zinc-chloride and metallic zinc, or other suitable metal, whereby the sulphite of lead breaks up into sulphide of lead and sulphate of lead, and soft metallic lead is produced, the chloride of silver being subsequently separated from the zinc-chloride by lixiviation or any other suitable method.

2. In the treatment of zinciferous ores, the herein-described process, consisting in, first, oxidizing the ore in a suitable roaster, then causing the oxidized ore, accompanied by water containing salt, to be acted upon by a stream of SO_2, whereby the whole of the oxide of zinc is converted into sulphite of zinc and hypo-sulphite of zinc, subsequently extracting the sulphite and hypo-sulphite of zinc by lixiviation, and treating the liquor containing the same by H_2S, whereby the zinc-sulphites are precipitated as sulphide; subsequently recovering the same in metallic form by any known process.

3. In the treatment of zinciferous ores, the within-described process, consisting of, first, roasting the ore, then converting the oxide of lead into sulphite of lead, and the silver-sulphite into silver-chloride, preferably by the action of SO_2 or other known process; subsequently taking the ore-stuff remaining after the removal of the zinc by lixiviation and heating the same, either alone or with zinc-chloride alone, or with zinc-chloride and metallic zinc, or other suitable metal, whereby the sulphite of lead breaks up into sulphide of lead and sulphate of lead, and soft metallic lead is produced, the chloride of silver and other precious metals being subsequently separated from the zinc-chloride by lixiviation or any other suitable method.

Dated this 21st day of July, 1896. E. F. TURNER.

AN IMPROVED DREDGE.

I, George Poll, of 54, Lambton Quay, in the City of Wellington, in the Colony of New Zealand, miner, do hereby declare the nature of my invention for "An Improved Dredge," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The object of my invention is to provide a dredge for use in harbours, rivers, and the like, for raising mud or other detritus, or gold-bearing deposits, which dredge shall lift the material to be raised in a more economical and effective manner than with dredges as at present constructed.

I carry the object of my invention into effect by making a hull somewhat similar to those at present in use, but I construct therein a well passing through the hull. Above this well I erect a staging which supports guide-rods extending above and below the hull. Suitable guys steady and support the guide-rods, and the depth of the same may be varied to suit the depth at which it is required to work. The guide-rods are connected together at their ends, and stiffened by cross-rods. The bucket is secured to a vertical and hollow shaft, and revolves with the same within brackets provided with friction-wheels, which are flanged to roll upon the aforesaid guide-rods.

The bucket is made cylindrical in shape, and has its bottom provided with hinged flaps which may fall down to form a cutting edge, and with a screw-like action may scoop up material into the bucket. When the bucket is loaded, the flaps are closed by means of a shaft which passes down to the bucket through the hollow shaft before mentioned. A crank handle is used at the top of this inner shaft to revolve the same, and by means of a screw-thread formed upon the lower extremity, the said shaft engages with a nut and links which are connected to the flaps. This said nut is of peculiar construction, being made in two halves, which may be held to their work by a strap, but when this strap is lowered the two halves of the nut will separate under the action of suitable springs and thus be disengaged from the shaft.

The flaps being closed, the bucket is raised by means of a chain passing to a winch over a pulley attached to the staging, when the nut is liberated and the material allowed to fall through the flaps at the bottom of the bucket into a chute, and over the side of the vessel into an ordinary punt.

The bucket is revolved by means of a chain passing from the winch to a pulley, and bevel wheels, connected to the upper end of the hollow shaft.

In order that my invention may be most easily understood, I will now proceed to describe the same in detail, and shall for that purpose refer to the accompanying drawings, whereon Figure 1 is a side-elevation of my dredge showing the bucket lowered. Figure 2 is a plan of the same. Figure 3 is a vertical section of the bucket with its bracket. Figure 4 is a vertical elevation of the same. Figure 5 is a plan of the same. Figure 6 is a side-view of the bevel gearing, and bracket. Figure 7 is a plan of the same. Figure 8 is a side-view of the nut and attachments. Figure 9 is a plan of the same. Figure 10 is a side-view of the same. Figure 11 is a side-view of a square driving-shaft and spur gearing. Figure 12 is a view of a spliced shaft.

Referring to these views, a is the hull, having a well a^1, and a staging a^2, which supports the guide-rods b; ordinary railway rails are admirably suitable for making these rods b. Guys b^1 steady and support the guide-rods above and below the hull. The weight of the rods is taken upon chain b^2, one of which is provided on each side, and being secured to the bottom of the rods, pass over pulleys b^3, which are secured to the staging a^2, and thence to the winch c by means of pulleys b^4. When being raised by means of these pulleys and ropes, the rods b slide within brackets a^3, Figure 5, fixed to the staging. The bucket d is secured to shaft d^1, and revolves with the same, within brackets d^2, and J^6 provided with friction-wheels d^3, which roll upon guide-rods b. The shape of the bucket is cylindrical, but its bottom is formed as shown in Figures 1, 3, and 4, and is provided with hinged flaps d^4, which, when let down and revolving in the direction shown by the arrow on Figure 5, cut into the material to be lifted and raise it into the bucket. As the material rises upon the flaps it is guided by guard plate d^6 on to the fixed portion d^7 of the bottom of the bucket, and into the interior of the same. When the bucket is loaded, the flaps are closed by turning the crank-handle d^5, which will revolve shaft f, and draw up nut f^1 and links f^2, which are connected to the flaps. Nut f^1 is of special construction, as may be seen by reference to Figures 8, 9, and 10, where it is shown on a large scale. The nut proper is made in two halves f^1, screw-threaded on the inside, and having a wedge shape on the outside. The nut fits freely within a framing f^{10}, and springs f^3 tend to separate the two halves of the nut and disengage them from the screw-thread of the shaft f. A strap f^4 passes around the nut, and when forced up the wedge-shaped faces force the halves of the nut into position upon the shaft. The strap is held in place by an eye-bolt f^9, which is hinged to the strap by pin f^5. Nuts f^6 rest upon a bracket f^7 secured to frame f^{10}, and a pin f^8 prevents the eye-bolt from disengaging. As the various parts wear, the nuts f^6 may be correspondingly adjusted.

Flaps d^4 being closed, the bucket is raised by means of wire-rope or chain g attached to bucket bracket d^2, and passing over pulley g to winch c. Strap f^4 is then released to liberate the two halves of the nut f^1 and allow the flaps d^4 to fall. The material will fall through chute h into an ordinary punt.

The bucket is revolved by means of a chain J, passing from the winch by guide-pulleys J^1 to pulley J^2. A bevel-wheel J^3 is secured to pulley J^2, and gears with a large bevel-wheel J^4, which is secured to the upper end of hollow shaft d^1. Pulley J^2 and wheel J^3 are carried upon a bracket J^5, built up upon bracket J^6, which carries the upper end of hollow shaft d^1.

To raise the bucket, chain J is lifted off pulley J^2, when the bucket, shafts, d^1 and f, and brackets d^2 and J^6, will be free to rise bodily.

On Figure 11 I have shown a spur-wheel K in place of the large bevel-wheel J^4, and a pinion K^1 in place of the small bevel-wheel J^3, and a square vertical shaft K^2 in place of chain J. By this arrangement the necessity of removing the chain J in order to lift the bucket is obviated, as the shaft is driven by any suitable motor, gearing with spur-wheel K^3, which being secured to the shaft near the deck, may revolve within a bracket K^4, and pinion K^1 may slide upon the shaft K^2 whilst it is free to revolve within its bracket K^5 carried upon bracket J^6.

The upper end of the shaft may be pivoted at K^6 to revolve in any suitable bearing K^7 bolted to the staging a^2. It is obvious that I may use a circular shaft in place of the square one, and groove the same to engage with a feather secured in the pinion K^1.

Shafts d^1 and f may be spliced to suit the depth to be dredged, and for this purpose I provide couplings I, consisting of flanges secured to sections of the shaft d^1, and bolted together by bolts

I^1, and a coupling, 12, consisting of a sleeve into which the ends of sections of shaft *f* enter and are secured by pins, 13.

I wish it to be understood that I do not confine myself to the exact details hereinbefore set forth, as these may be modified in several ways without departing from the spirit of my invention.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. A dredge constructed with a well through which guide-rods may pass to support a bucket, substantially as and for the purposes set forth herein.
2. A dredge constructed with a well through which guide-rods may pass to support a bucket revolved by a chain and bevel-wheels, substantially as and for the purposes set forth herein.
3. A dredge constructed with a well through which guide-rods may pass to support a bucket revolved by a vertical shaft and spur-wheels, substantially as and for the purposes set forth herein.
4. A dredge-bucket having falling flaps and a bottom formed as shown on Figures 1, 3, and 4, substantially as and for the purposes set forth herein.
5. A dredge-bucket having falling flaps and a screwed shaft and nut, substantially as and for the purposes set forth herein.
6. In combination, a nut made in two halves, springs for separating the same, and a strap acting upon wedge-shaped faces, substantially as and for the purposes set forth herein.
7. In combination, a nut made in two halves, springs for separating same, a strap acting upon wedge-shaped faces and held in position by an adjustable eye-bolt and a pin, substantially as and for the purposes set forth herein.
8. A dredge constructed, arranged, and operating substantially as and for the purposes set forth herein and illustrated on the accompanying drawings.

Dated this 22nd day of October, 1896.

W. E. Hughes,
Agent for the Applicant.

An Improved Machine for Concentrating and Amalgamating the Precious Metals.

I, John Robinson, of Coromandel, Auckland, in the Colony of New Zealand, mine-manager, do hereby declare the nature of my invention for "An Improved Machine for Concentrating and Amalgamating the Precious Metals," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The object of my invention is to provide an apparatus by which the operations of amalgamating and concentrating the precious metals after the ore has been crushed may be performed with greater facility and with less expenditure of power, and at the same time that the machinery is much more simple and more easily maintained and repaired.

In carrying my invention into effect I make use of a circular pan, having an inner and outer channel constructed at the periphery of the said pan and concentric with one another, and I divide this circular pan into two halves or semicircles, between which semicircles I fix a powerful arm, and to which I give a reciprocating motion by any suitable power, the pan itself having a central axis upon which it oscillates. The reciprocal motion I prefer to communicate by means of a shaft revolving in suitable bearings, upon which shaft is formed a zigzag groove, into which zigzag the end of the oscillating lever, or a roller attached to the same, is fitted, and makes one oscillation to the revolution of each zigzag.

Each half of the inner circle is fed with material from the battery or crushing-mill. Openings connect the inner and outer semicircles or channels, so that the material flows from the inner to the outer semicircle by the centrifugal force produced by the oscillating motion. In each of the outer semicircles are two orifices fitted with regulating valves, one for the discharge of the water and tailings, and one for the pyrites.

In order that my invention may be more easily understood I have illustrated the same upon the accompanying drawings, whereon similar letters and figures of reference indicate like parts: Figure 1 is a plan of my apparatus. Figure 2 is an elevation of the same. Figure 3 is an elevation of the discharge ports in the outer circle. Figure 4 is an elevation of the ports in the inner circle.

Referring to the views, A is the outer channel or circle and B the inner channel or circle, which channels are divided at C into two halves or semicircles, and between these semicircles I fix a powerful arm D.

The pan has an axis E, upon which it oscillates, and reciprocal motion is imparted to arm D and the pan by any simple motive-power, but preferably by a cam F, having a zigzag groove F^1, and mounted upon driving shaft G, revolving in suitable bearings G^1. A roller D^1 is attached to arm D to reduce friction and give ease of movement.

Material from the battery or crushing-mill is fed through chutes J into each half of the inner circle B, into which a quantity of quicksilver has been placed. Openings or ports K connect the inner and outer semicircles or channels through which the material flows by the centrifugal force produced by the oscillating motion of the pan, or by the inflow of fresh material. In each of the outer circles are two openings or ports: the one, M, forming an overflow for the tailings, and N a discharge into the concentrating-tank. These openings may be provided with valves to regulate the flow.

It will be seen that material may be brought from a battery down one of chutes J and material from another battery down the other chute, and thus the returns from such batteries may be kept separate; that, as the pan is made in two halves, it is portable; and that the outer circle or channel will save heavy minerals and may be adjusted to concentrate as required.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. In a concentrating and amalgamating machine, a pan divided into two halves, and oscillated on its axis by an arm and cam, substantially and for the purpose set forth.

2. In a concentrating and amalgamating machine, an oscillating-pan formed of two circular channels concentric with one another, the inner one of which is supplied with quicksilver, and has openings to the outer channel, substantially as and for the purpose set forth.

3. In a machine for concentrating and amalgamating the precious metals, constructed, arranged, and operating substantially as and for the purpose set forth herein and illustrated on the accompanying drawings.

Dated this 13th day of July, 1896.

W. E. Hughes,
Agent for the Applicant.

Improvements in Mechanical Ore-separators.

I, John Wendell Carter, of Brooklyn, in the County of Kings, and State of New York, U.S.A., gentleman, do hereby declare the nature of my invention for "Improvements in Mechanical Ore-separators," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention has reference to certain improvements in that class of machines which are known as magnetic ore-separators, in which a number of permanent magnets are arranged in gangs one below the other, and over which the ground ore is passed by gravity, so that the magnetic particles of ore are separated from the non-magnetic particles in a quick and reliable manner.

The invention consists of an ore-separator in which a series of permanent magnets is arranged below the supply-hopper in such a manner that the lower pole ends are receding below the upper pole ends, which latter are in the path of the falling material that is conducted from the hopper over a magnetic deflecting-plate that is arranged above and at a short distance back of the upper pole ends of the magnets; so that the magnetic ore-particles are separated from the non-magnetic particles in their passage over the deflecting-plate and upper pole ends, and gradually conducted to the lower pole ends, while the non-magnetic particles are dropped by gravity and collected in a separate receptacle from the magnetic particles.

The invention consists, further, of certain details of invention which will be fully described and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side elevation of my improved magnetic ore-separator, showing the same arranged with three gangs of stationary magnets one below the other; Figure 2 is a front elevation of the same; Figures 3 and 4 are detailed vertical sections drawn on a larger scale, showing two different arrangements of the stationary magnets; and Figure 5 is a side elevation, partly in vertical section, of one gang of magnets and its supply-hopper, drawn on a still larger scale. Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents the frame of my improved ore-separating machine, on the top of which is arranged a supply-hopper B, into which ground ore is placed. From the supply-hopper B the ore passes into a second hopper C, that is arranged vertically below the supply-hopper B. The hopper C is attached by means of slotted angle-bars d, and screws d^1 to the supported frame A, the angle-bars being attached to the side walls of the hopper C and the side posts of the frame A, as shown clearly in Figures 1 and 5. Below the hopper C are arranged two series or rows of permanent magnets D, which together form a gang.

The magnets D are supported in boxes D^1, of wood or other non-magnetic material, which are guided in exterior frames D^2 that are connected by pivots d^2 at their front ends to the posts of the supporting frame. The rear ends of the supporting frames D^2 are supported by hanger-rods H, which are provided with turn-buckles H^1, said hanger-rods being suspended by means of eyes at their upper ends from horizontal cross-rods K of the supporting frame A. By means of the turn-buckles the suspending-rods H can be lengthened or shortened, so as to give to the magnet-holding frames D^2 and to the rows of permanent magnets in the same the desired degree of inclination. The boxes D in which the magnets are located are connected with the rear parts of the frames D^2 by means of screws m, so that the boxes can be adjusted longitudinally in the frames D^2, said boxes being guided in ways or other suitable manner on said frames. By the adjustment of the adjustable frames and boxes one series or row of magnets D can be so arranged relatively to the other that their pole ends are arranged in the incline plane, so that the upper pole ends of one row of magnets extend beyond the lower pole ends of the same—in other words, that the lower pole ends are located in vertical planes to the rear of the upper pole ends, as shown in Figure 3; or the pole ends of the upper series of magnets may be arranged to project over the pole ends of the lower series of magnets, so that the latter are located in vertical planes successively to the rear of those above, as shown in Figure 4.

On the top of the upper magnet-holding box D^1 of each gang of permanent magnets is arranged an inclined magnetic deflecting-plate E, which is located near the front edge of the box, and adapted to be adjusted on the same in any approved manner. Below the lower series of magnets of each gang is arranged a chute F, the upper edge of which is vertically below the edge of the upper pole ends of the upper row of magnets, so that the magnetic ore-particles that are dropped from the pole ends are collected and conducted over a second chute F^1 to a suitable collecting receptacle. At the inside of the inclined front wall of the hopper C is arranged a deflecting-plate e, which is retained by a headed pin e^1 at its upper end, and adapted to be adjusted by means of a set-screw e^2 that passes through the inclined front wall of the hopper C, so that the inclination of the deflecting-plate can be adjusted, and thereby the stream of ground-ore thrown from the hopper to a greater or less distance, according to the relative position of the deflecting-plate E from the upper pole ends of the magnets. The parts so far described constitute one gang, and are repeated in each gang, of which a plurality may be arranged one below the other, all being supported by the

IMPROVED DREDGE.

Poll's Patent.

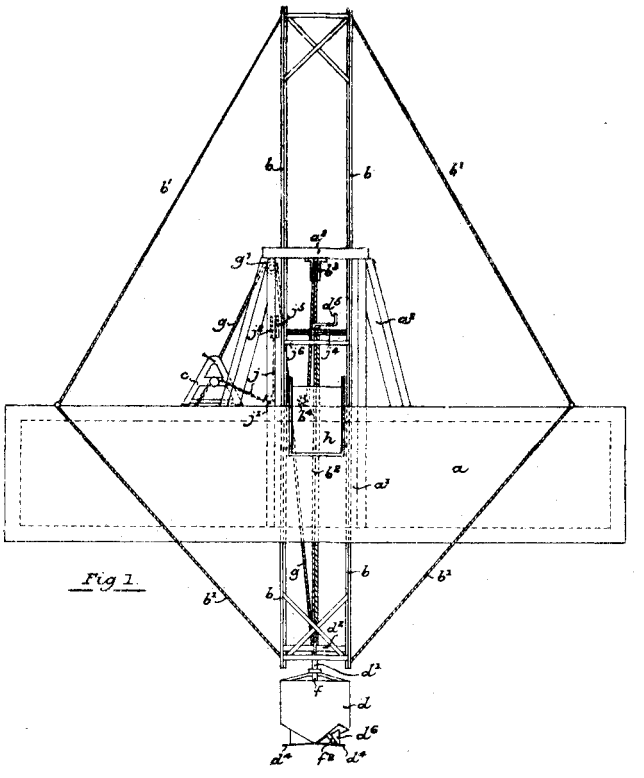


Fig 1.

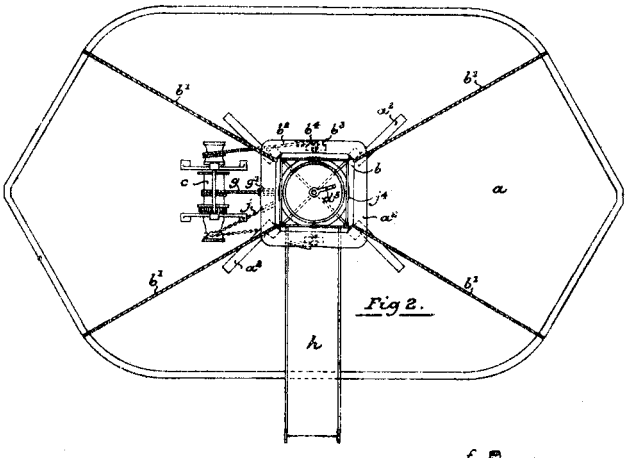


Fig 2.

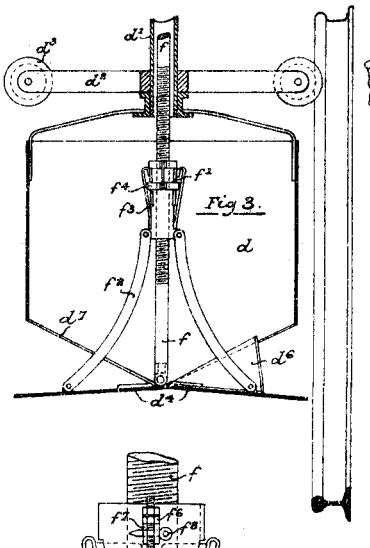


Fig 3.

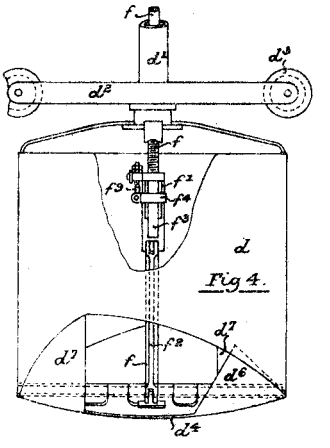


Fig 4.

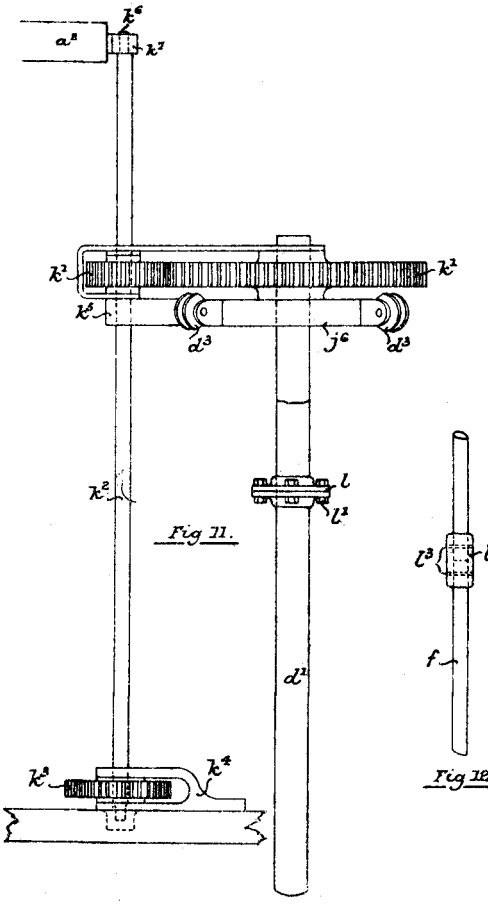


Fig 11.

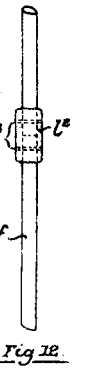


Fig 12.

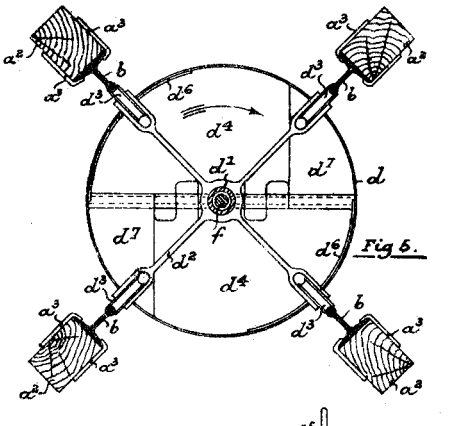


Fig 5.

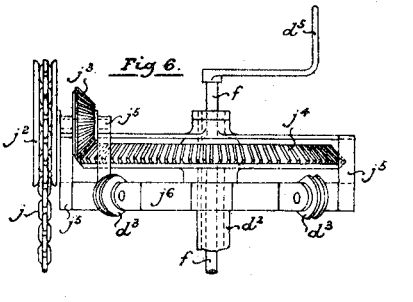


Fig 6.

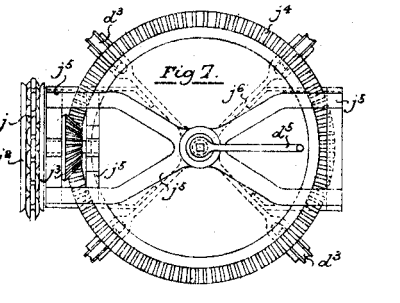


Fig 7.

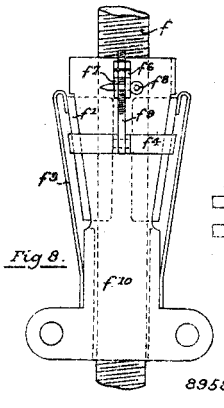


Fig 8.

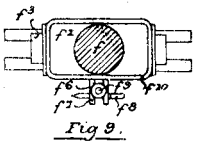


Fig 9.

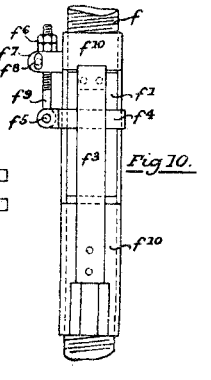
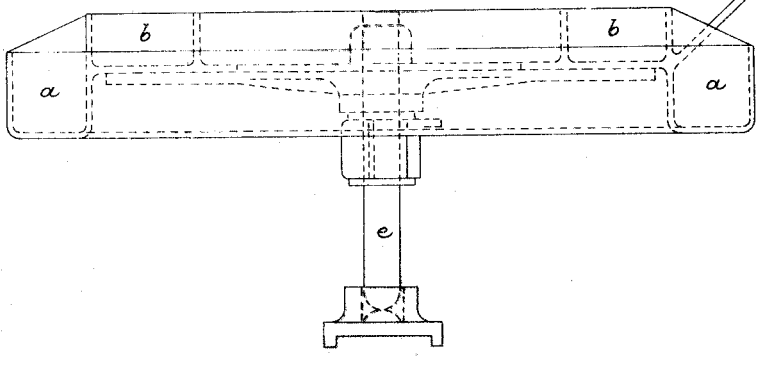


Fig 10.

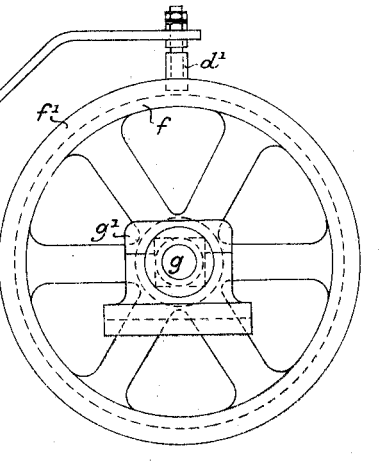
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IMPROVED CONCENTRATING AND AMALGAMATING MACHINE

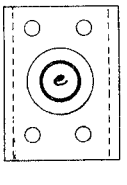
Robinson's Patent.

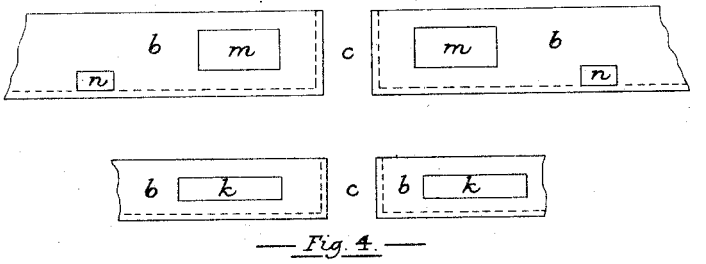


— *Fig. 2.* —

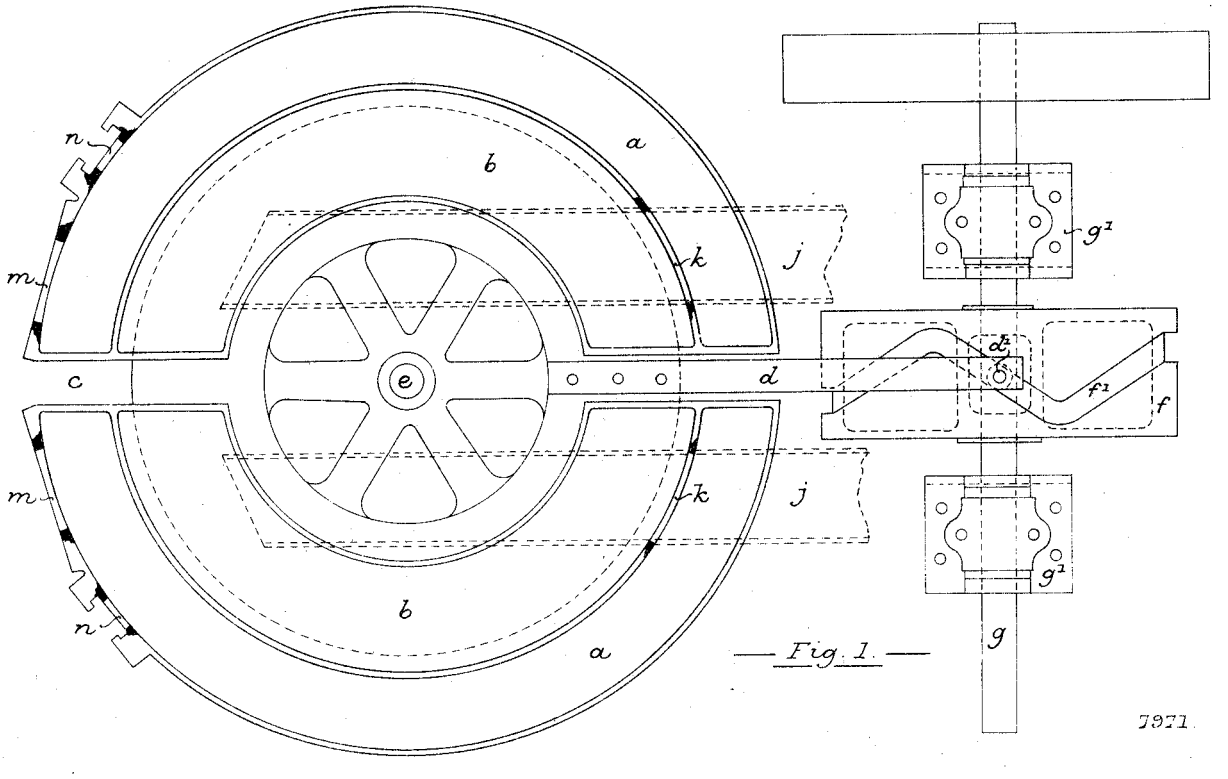


— *Fig. 3.* —





— *Fig. 4.* —

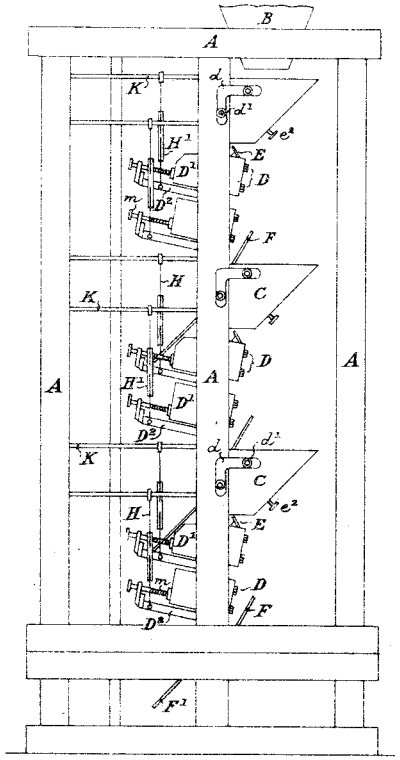


— *Fig. 1.* —

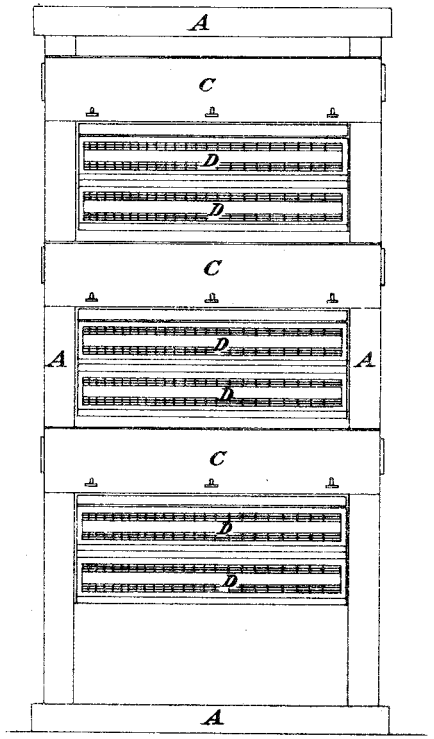
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IMPROVED MECHANICAL ORE-SEPARATOR.

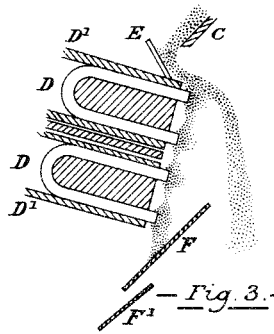
Carter's Patent.



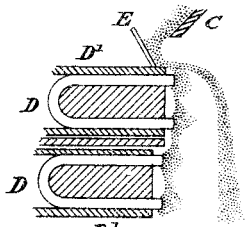
— Fig. 1. —



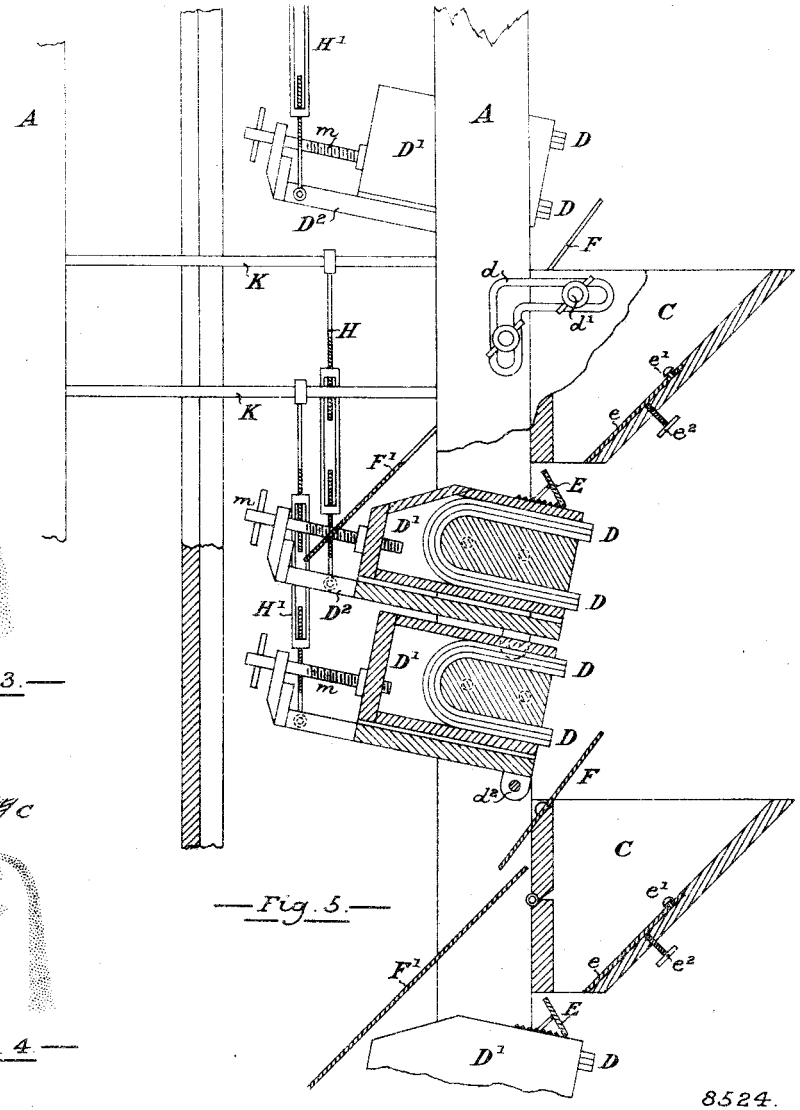
— Fig. 2. —



— Fig. 3. —



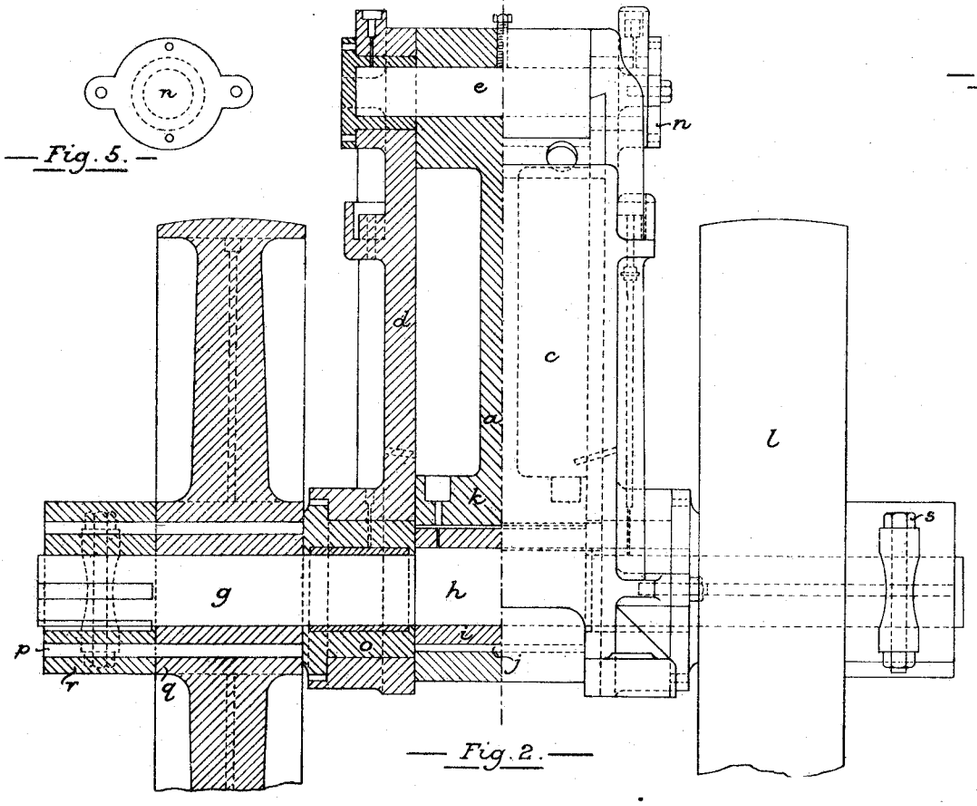
— Fig. 4. —



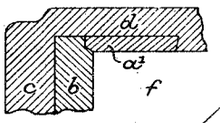
— Fig. 5. —

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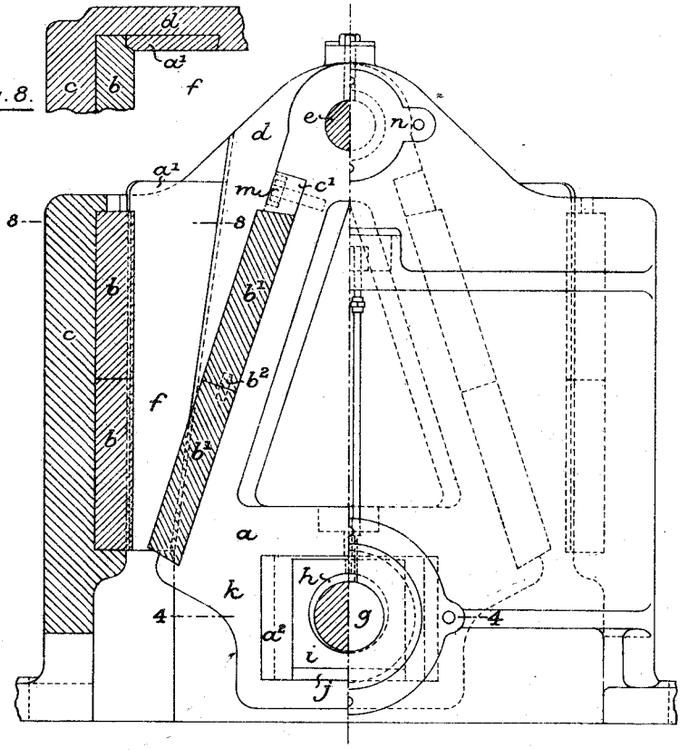
—Fig. 5.—



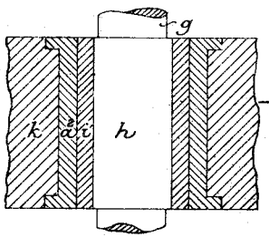
—Fig. 2.—



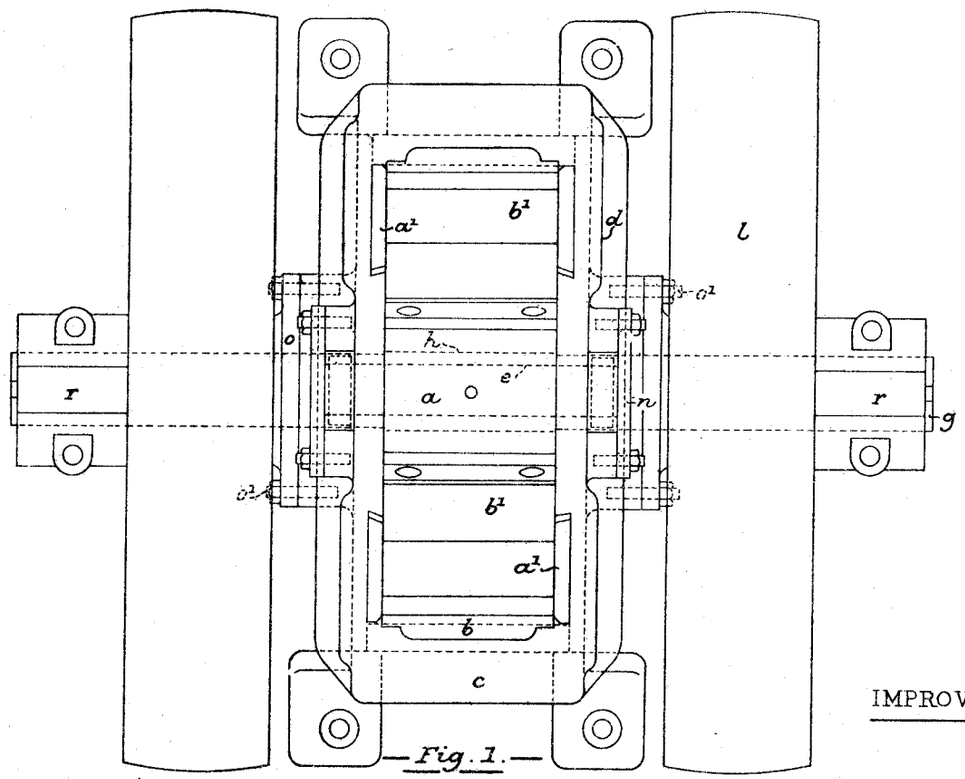
—Fig. 8.



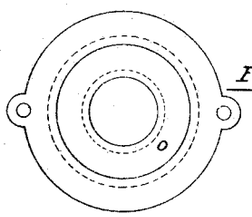
—Fig. 3.—



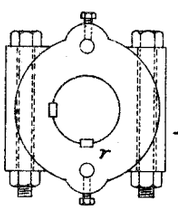
—Fig. 4.—



—Fig. 1.—



—Fig. 6.—



—Fig. 7.—

IMPROVED ORE-CRUSHER.

Hughes' Patent.

8165.

frame A, as shown clearly in Figures 1 and 2. The operation of my magnetic ore-separator is as follows: The ground ore to be separated is conducted from the supply-hopper B into the uppermost hopper C, and from the same on to the deflecting-plate E, which is of magnetic material, and to some extent under the magnetic influence of the upper series of magnets. From the deflecting-plate E the ground ore passes over the edge of the supporting-box D^1 on to the upper pole ends of the upper series of magnets. While the mass of ground ore passes over the deflecting-plate E, the magnetic ore-particles are brought within the influence of the magnets, and are slightly retarded in their motion, while the non-magnetic particles continue in their motion. The influence of the pole ends on the magnetic particles, and consequently the retardation of the latter, increases as they approach the upper pole ends of the upper series of magnets, while the non-magnetic particles, being not subject to magnetic attraction, are thrown forward with considerable velocity, so as to fall beyond the chute F and drop into the hopper C of the second gang of magnets. The magnetic ore-particles accumulate on the upper pole ends of the upper series of magnets, pass gradually from the same to the lower pole ends of the upper series, and from the same to the upper pole ends of the lower series of magnets, and then to the lower pole ends of the same. The magnetic particles accumulate gradually to such an extent as to form a continuons web or fleece-like body, which gradually permits the outermost particles to become loose, and move down by friction over the web or fleece until they are dropped on the chute F, and passed over the same into the collecting receptacle.

The particles taken up by the hopper C contain still a small quantity of magnetic particles. They are passed successively in the same manner over the pole ends of the lower gang until the entire separation of the magnetic particles from the non-magnetic is accomplished. In Figures 3 and 4 the motion of the magnetic ore-particles from pole end to pole end is represented, the magnetic ore-particles being attracted around the pole ends until a sufficient quantity is accumulated, and the magnetic influence of the pole end overcome, so that they slide downwards towards the next lower pole end, where they again accumulate, filling up the space between the pole ends and passing on to the next pole end, and so on, until they are dropped on to the chute, and conducted off. The action of the pole ends of the magnets of the lower gang on the magnetic particles that are delivered by the hopper of the second, third, &c., gang, is the same as in the first gang, all the magnets being charged, so to say, with an armature of accumulated ore-particles, whereby the remnant magnetism of the same is retained, and the very effective separation of the ore from the gauge produced without any change in the trajectory of the falling material, which continues to drop according to the law of gravity.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. The combination, with a supply-hopper, of a series of permanent magnets, the pole ends of which are located below the hopper, and an adjustable deflecting-plate located above and at a short distance back of the pole ends of said magnets, and in the path of the falling material, substantially as set forth.

2. In a magnetic ore-separator, the combination of a supply-hopper, a series of magnets having the extreme attractive or active surfaces of their uppermost poles directly in the path of discharge of the ore-particles and the attractive or active surfaces of the poles beneath out of said path, but directly in the path of that portion of the magnetic material that has been separated by said uppermost poles, and an inclined magnetic deflecting-plate located below the mouth of the hopper, and arranged above but out of contact with the attractive or active surfaces of said uppermost poles, substantially as set forth.

3. In a magnetic ore-separator, the combination of a supply-hopper for the ore-particles, two series of magnets placed one beneath the other and having the extreme attractive or active surfaces of the poles of the upper series of magnets directly in the path of discharge of the ore-particles from the supply-hopper, so as to be in direct contact with the ore-particles to be treated, and having the attractive or active surfaces of the poles of the lower series of magnets at some distance back from and out of the path of the ore-particles to be separated, but directly in the path of and in direct contact with that portion of the magnetic material that has been separated by the poles of the upper series, and an inclined magnetic deflecting-plate located below the mouth of the hopper, and arranged above and out of contact with the poles of the upper series of magnets, substantially as set forth.

4. In a magnetic ore-separator, the combination, with a supply-hopper, of a series of permanent magnets located below the hopper, a box for supporting said magnets, a pivoted frame for guiding said box, means for adjusting the box on said frame, and means for adjusting the inclination of said frame, substantially as set forth.

Dated this 22nd day of May, 1896.

HENRY HUGHES, F.A.I.P.A.,
Agent for the Applicant.

AN IMPROVED MACHINE FOR BREAKING OR CRUSHING ORE, ROCK, AND THE LIKE.

I, William Ernest Hughes, of 42, Lambton Quay, Wellington, New Zealand, registered patent agent, do hereby declare the nature of my invention for "An Improved Machine for Breaking or Crushing Ore, Rock, and the like," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a machine for breaking or crushing ore, rock, and the like, and to that class of such machine in which an oscillating jaw is employed, the object of my said invention being to construct the machine in such a manner that a continuous or constant crushing shall take place, and to improve the construction of the machine so as to permit of the wearing-parts being readily replaced.

According to this invention a double movable jaw is provided, working in conjunction with two rigid crushing-surfaces, the said double jaw being suspended in such a manner that when it is being moved towards one crushing-surface the material is dropping down between the other face of the jaw and the corresponding crushing-surface, whereby a continuous crushing is maintained.

The ends having the rigid crushing-surfaces are preferably formed in a single casting with the sides of the framing, so that the double crushing-jaw swings in a rectangular chamber open at the top and bottom to permit of the introduction of the material to be crushed and of the crushed material dropping out.

Motion is imparted to the double jaw by means of a shaft having an eccentric portion upon it and working within a block located in a recess in the lower part of the pendulous double jaw, the bearings of the shaft in the sides of the framing and the block itself in the said recess being arranged in such a manner that they can be readily removed for repairs or renewal.

The machine may be driven either directly by means of pulleys upon the main shaft or through the medium of gearing.

The crushing-surfaces both of the fixed jaws and the movable double jaw are made detachable, so that they can be readily renewed.

To enable my invention to be fully understood, I will describe the same by reference to the accompanying drawings: in which Fig. 1 is a plan of a machine for breaking or crushing ore, rock, and the like, constructed according to my invention. Fig. 2 is a view half in end elevation and half in transverse section. Fig. 3 is a view half in side elevation and half in longitudinal section. Fig. 4 is a horizontal section on line 4–4 of Fig. 3, showing the eccentric shaft, the block, and the recess in the pendulous double jaw. Fig 5 is an end elevation of one of the pivot bearings of the pendulous double jaw. Fig. 6 is a similar view of one of the eccentric shaft bearings. Fig. 7 is a similar view of one of the collars used for securing the driving pulleys on the eccentric shaft. Fig. 8 is a horizontal section on the line 8–8 of Fig. 3.

a a indicate the pendulous double movable jaw, and *b b* are the rigid crushing-surfaces or fixed jaws at the ends *c c* of the framing, formed in a single casting with the sides *d d* thereof; *e* is the pivot or fulcrum of the pendulous double jaw *a a*, which swings in the rectangular chamber *f* open at the top and bottom, and formed by the said sides and ends of the framing; *g* is the shaft, and *h* the eccentric thereon for imparting motion to the double jaw *a a*; *i* is the block within which the eccentric *h* works, and *j* is the recess in the lower part *k* of the pendulous double jaw in which the block *i* is located, the said recess being provided with liners a^2, a^2 to take the wear of the said block; *l l* are the driving-pulleys of the machine mounted on the eccentric shaft *g*.

The rigid crushing-surfaces *b b* are arranged in recesses in the ends *c c* of the framing, as clearly shown in Figures 1, 3, and 8, so that they can be easily lifted out and replaced by new ones when required, and they are secured in position by means of wedges a^1, a^1 dropped into recesses on the sides of the framing.

With a like object the crushing surfaces b^1 b^1 of the pendulous double jaw are arranged in pairs dowelled together as at b^2 in recesses in the said jaw, as shown in Figure 3, and they are also secured by means of wedges c^1 and bolts *m*.

The bearings *n n* of the pivot or fulcrum *e* are made removable, as shown in Figures 2 and 5, to allow of repairs or renewal. The bearings *o o* of the eccentric shaft *g* for a like purpose are simply slid into recesses in the framing, as shown in Figure 2, and then secured by studs o^1. The driving-pulleys *l l* are in turn secured upon the shaft *g* by means of pins *p p* passing through the bosses *q q* of the pulleys and through collars *r r* formed in halves and keyed to the shaft, and clamped together by means of bolts *s*, as clearly shown in Figures 2 and 7.

From the foregoing description it will be understood that the shaft *g* being revolved by either or both of the pulleys *l* thereon, an oscillating motion will be imparted to the pendulous double jaw *a a*. So that whilst the ore, rock, or the like material, fed between the fixed and movable crushing-surfaces *b b* b^1 b^1 is being crushed by the swing of the movable jaw to one side of the machine the said material is dropping down at the other side of the machine in position to be crushed, by the following swing of the jaw towards that side, and so on; the crushing of the material being therefore practically continuous instead of intermittent as heretofore.

Having now particularly described and ascertained the nature of my said invention, and in what matter the same is to be performed, I declare that what I claim is,—

1. A machine for breaking or crushing ore, rock, and the like, having a double pendulous movable jaw, working in conjunction with two rigid crushing-surfaces in such a manner that while one face of the jaw is moving towards its corresponding crushing-surface the other face is receding from its crushing-surface so as to allow the material to drop down into position to be crushed at the following swing of the pendulous double jaw, and so on, substantially as hereinbefore described.

2. The machines for breaking or crushing ore, rock, and the like, the combination with a pendulous double movable jaw, of fixed crushing-surfaces, arranged in recesses in the ends of the frame of the machine, and wedges adapted to enter other recesses in the said framing for securing the said crushing-surfaces, substantially as and for the purpose hereinbefore described, and as illustrated in the accompanying drawings.

3. In machines for breaking or crushing ore, rock, and the like, the combination with a pendulous double movable jaw working in conjunction with fixed crushing-surfaces of a driving-shaft, an eccentric thereon, a block in which the said eccentric revolves, and a lined recess in the pendulous double jaw in which the block moves in order to impart motion to the pendulous double jaw, substantially as hereinbefore described, and illustrated in the accompanying drawings.

4. In a machine for breaking or crushing ore, rock, and the like, the combination with a pendulous movable jaw working in conjunction with fixed crushing-surfaces, a driving-shaft, an eccentric thereon, and a block working in a recess in the said pendulous jaw, of bearings for the

said shaft removably fitted in the frame of the machine, driving-pulleys on the said shaft, and divided collars keyed and clamped to the shaft, and having pins passing through them and through the bosses of the driving-pulleys in order to secure the latter on the shaft, substantially as set forth, and as illustrated in the accompanying drawings.

Dated this 21st day of October, 1896. W. E. HUGHES.

IMPROVEMENTS IN PULVERISING-MILLS.

I, Ammi Vining Young, of the Dom Hotel, Köln, in the Empire of Germany, engineer, do hereby declare the nature of my invention for "Improvements in Pulverising-mills," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to machines for pulverising ores or other hard substances. In the accompanying drawing Figure 1 is a vertical section through the entire mill, Figure 2 a section through the upper part of the machine, and Figure 3 a plan of part of the same.

In the upper part of the mill is arranged a pulley *l*, running horizontally, and driven by a belt by steam or other convenient power. From this pulley is suspended a shaft *h* by means of a universal joint, and to the lower extremity of this shaft is rigidly secured the crushing-roll *c*, which is thus free to swing in any direction.

In the drawing, *a* is the base or pan, containing a ring or die *b*, against which the crushing-roll *c* works, and upon the inner vertical surface of which the pulverising is done. This pan has a number of openings *d* through it downward outside the ring or die, which lead into a pit or receptacle *e* below. Upon the base is secured the screen-frame *f*, which is surrounded with a sheet-iron cover, to the top of which is fastened a conical shield *g*, open at the apex, through which the shaft *h* works.

The pulverising-roll *c* is attached to the lower end of the shaft *h*, and just above the roll is the fan *i*, which is used when the mill is crushing dry, but not when crushing wet. On the underside of the crushing roll *c* are shown stirrers *k*, which are used in both. The shape of these stirrers is varied according to the nature of the work to be done.

The driving-pulley *l* revolves upon the tapered and adjustable bearing *m*, Figure 2, which is in turn supported by the frame composed of standards *n*, Figure 1. Two of these standards are extended above the pulleys to carry an arm O, in which is secured the hollow journal-pin *p*.

Within the pulley *l* (the outer part of which is made of wood) is the universal joint from which the shaft *h* is suspended, as shown in Figure 2. This joint is composed of the ball or sphere *v*, with trunnions *s s* attached thereto. These trunnions work in half-boxes, which slide up and down in recesses *t t*, Figure 3, in the pulley-head casting *u*.

The joint in the pulley is enclosed by means of the cover *v*, thus keeping the working-parts away from all dust and grit. The lubricating-oil is supplied for all parts needing it through the hollow pin *p*.

When the mill is started the pulley and the shaft revolve together, the roll *c* hanging free in the centre of the ring *b*; but if the shaft is pushed outward the crushing-roll *c* on its lower end comes in contact with the ring or die *b*, and immediately begins to travel round on its inner surface, pressing against it with a force sufficient to effectually pulverise anything that comes in its way.

When a quantity of the material to be reduced has been fed into the mill sufficient to fill the pan *a* as high as the stirrers *k* on the lower side of the crushing-roll *c* they work in it, stir it up, and throw it against the ring *b*, so that it is acted upon by the crushing-roll *c*, and when fairly in operation the whole body of loose material whirls round rapidly within the pan, and, being brought between the roll and die, is crushed, and all that is sufficiently fine passes at once through the screen *w* above the die, the coarser portion falling down to be acted upon again.

The universal joint by which the shaft is connected with the pulley allows perfect freedom of movement to the roll, so that it can easily pass over obstructions of any kind without damage. It, with its adjoining parts, is constructed as shown in Figure 2.

The ball V is carried in a spherical step *x* upon the body *u* of the pulley, the lower part of which is formed with an internal cone *y*, which fits upon a corresponding cone *z* (with the intervention of an anti-friction lining), the latter being formed with a turned-up flange at its lower end, which is screwed inside so as to be screwed upon the externally-screwed cylinder A, the upper part of which is screwed into the ring B (which is preferably split at one side to give it elasticity), a flange upon the upper end of which is carried by the upper ends of the standards *n* of the machine. The lower end of the inner conical bearing is provided with bosses C, into which are screwed set-screws (with lock-nuts) which press against the lower end of the cylinder A, and hold the bearing firmly in its place when it has been properly adjusted. Thrust-rings of steel and of anti-friction composition alternately are inserted under the lower end of the hollow revolving internal cone Y, to reduce the friction of the latter.

The upper part of the hollow body U of the pulley is closed by the cover V, and a steel ring D is fitted upon the upper part of the ball V, and is kept pressed against it by a spring E inserted between the ring and the cover.

Upon the upper part of the cover V is formed a set of hollow cone speed-pulleys F, the central bore of which turns, with the intervention of an anti-friction lining, upon the pin P, which is firmly fixed into a strong bracket G, carried by a bracket *o* upon a prolongation of the standard *n*. The pin *p* is hollow, and is provided with channels for lubrication. A second light bracket H, carried by the bracket *o*, has at its outer end a bearing in which revolves the upper end of a vertical feeding-spindle *l*, which carries cone-pulleys K, driven at the required speed by a cord from the pulleys F already described. L is a hopper, from which the material to be pulverised is fed uniformly into

the mill by means of a feeding-screw M revolving in a chamber connected with the hopper, its axle turning in a bearing carried by the hopper-support, and having fixed upon it a bevelled-toothed wheel N, gearing with a corresponding pinion O upon the spindle *l*. A shifting-clutch *p* allows the pinion O to be disengaged from the spindle *l* when desired. A sliding-door Q enables the opening from the hopper to be closed or regulated, and a movable cover R affords access when necessary to the feeding-screw M. A passage T delivers the material just inside the upper edge of the grinding-ring *b*. The pulverised material is removed from below the pan by conveyers U or other means.

By the novel methods of construction described and shown, the bearing-surfaces of the driving apparatus are completely protected from dust and dirt, and are perfectly and accurately adjustable, so as to be very durable. The material to be pulverised (after having been reduced to a certain size) is supplied regularly and uniformly, and the output is very large; and by means of the revolving fan-blades *i* a current of air is caused, which is drawn in through the conical casing *g*, and prevents any escape of dust.

In dry pulverising the fine material that passes through the screens falls downward through the openings *d* outside the ring into the receptacle *e* underneath, from which it is carried by a conveyer provided for that purpose.

The fan attached to the shaft above the roll draws air in at the top of the cone, forcing it through the screen and out into the discharge, thus effectually keeping all dust within the mill.

In wet pulverising the water is introduced with the feed, and when the mill is running the water takes the same motion as the material in the dry mill, carrying with it the ore, both coarse and fine.

The fine material, with the water, composing the pulp, passes through the screens into a surrounding trough, and is discharged on one side, whence it may be passed over plates or into an amalgamator or concentrator as desired.

In the reduction of mineral ores by the improved mill the percentage of slimes is less than from stamp-mills or from any other pulveriser, and for all processes of after-treatment the ore is left in the very best condition.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. In pulverising-mills in which a suspended revolving crushing-roll is pressed by centrifugal force against a fixed ring, the method of suspending the roll by means of a vertical shaft having a ball at its upper end and two transverse trunnions, in combination with a driving-pulley having an internal spherical bearing upon which the ball rests, and vertical recesses, and plates in which the trunnions work, a hollow conical bearing upon the pulley, a corresponding external cone carried by the frame of the mill, adjusting-screws and friction-plates for adjusting the pressure upon the cones, a spherical friction-plate above the ball, and a spring between the said friction-plate and the top of the pulley, all substantially as and for the purposes set forth and illustrated.

2. In combination with the parts claimed in claim 1, the feeding apparatus, consisting of a hopper, a chamber containing a feed-screw driving-gear, consisting of a vertical shaft driving the feed-screw by toothed bevelled wheels, and driven by cone-pulleys upon its upper end and upon the driving-pulley described in the first claim; a passage delivering the material above the ring against which the crushing-roll works; and doors for regulating the supply and affording access to the parts of the feeding apparatus, substantially as set forth and illustrated.

3. In a dry-crushing mill, in combination with the parts described and claimed in claims 1 and 2, the fans upon the driving-shaft above the crushing-roll, the perforated screens surrounding the suspended shaft, the openings surrounding the pan, and communicating with a chamber below in which a conveyer works, all substantially as set forth and illustrated.

4. In a wet-crushing mill, in combination with the parts described and claimed in claims 1 and 2, the stirrers below the crushing-roller, the perforated screens surrounding the suspended shaft, a trough surrounding the perforated screens, and a discharge-opening from the trough, all substantially as set forth.

Dated this 2nd day of January, 1896. AMMI VINING YOUNG.

IMPROVEMENTS IN STAMPING APPARATUS FOR CRUSHING ORES AND OTHER ANALOGOUS STAMPING PURPOSES.

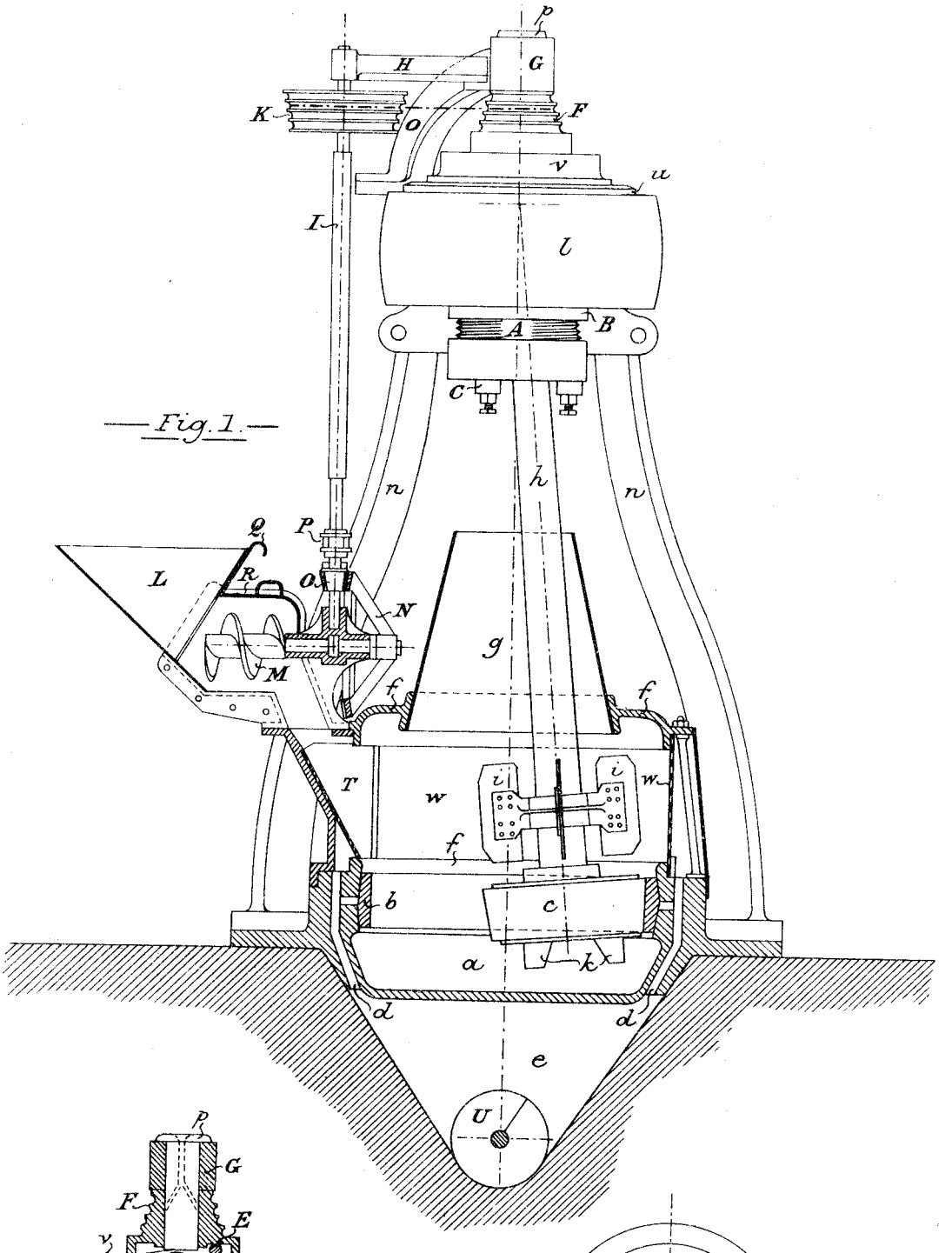
I, Donald Barns Morison, of Hartlepool, in the County of Durham, England, engineer, do hereby declare the nature of my invention for "Improvements in Stamping Apparatus for crushing Ores, and other Analogous Stamping Purposes," and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

According to this invention the downward or operative strokes of the stamps in a stamping, crushing, or hammering apparatus adapted for crushing minerals, ores such as gold-ores, and other substances, or for other purposes for which such stamping or hammering apparatus is suitable, are effected by the action of gravity and for speeds at which the number of strokes in a given time exceed what is practically obtained by gravity (less retardation due to friction). The movement due to gravity is supplemented by motion imparted by friction from positively-driven parts of the apparatus, and the return upward strokes of the stamps are effected by the rising movement of the said positively-driven parts communicated to the stamps through bodies of liquid, either alone or in combination with other elastic bodies, as will now be explained.

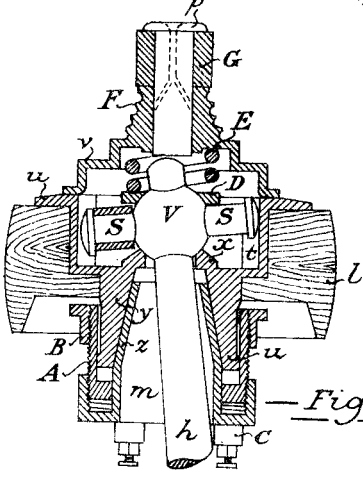
Referring to the accompanying illustrative drawings, Figure 1 shows partly in cross-section and partly in side elevation, and Figure 2 in front elevation, a stamp-head provided with one arrangement of operating mechanism according to this invention. Figure 3 is a front elevation showing a battery of ten stamps provided with such operating mechanism.

IMPROVED PULVERIZING MILL.

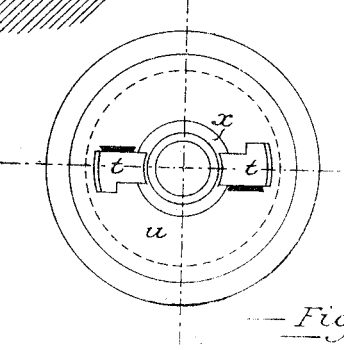
Young's Patent.



—Fig. 1.—

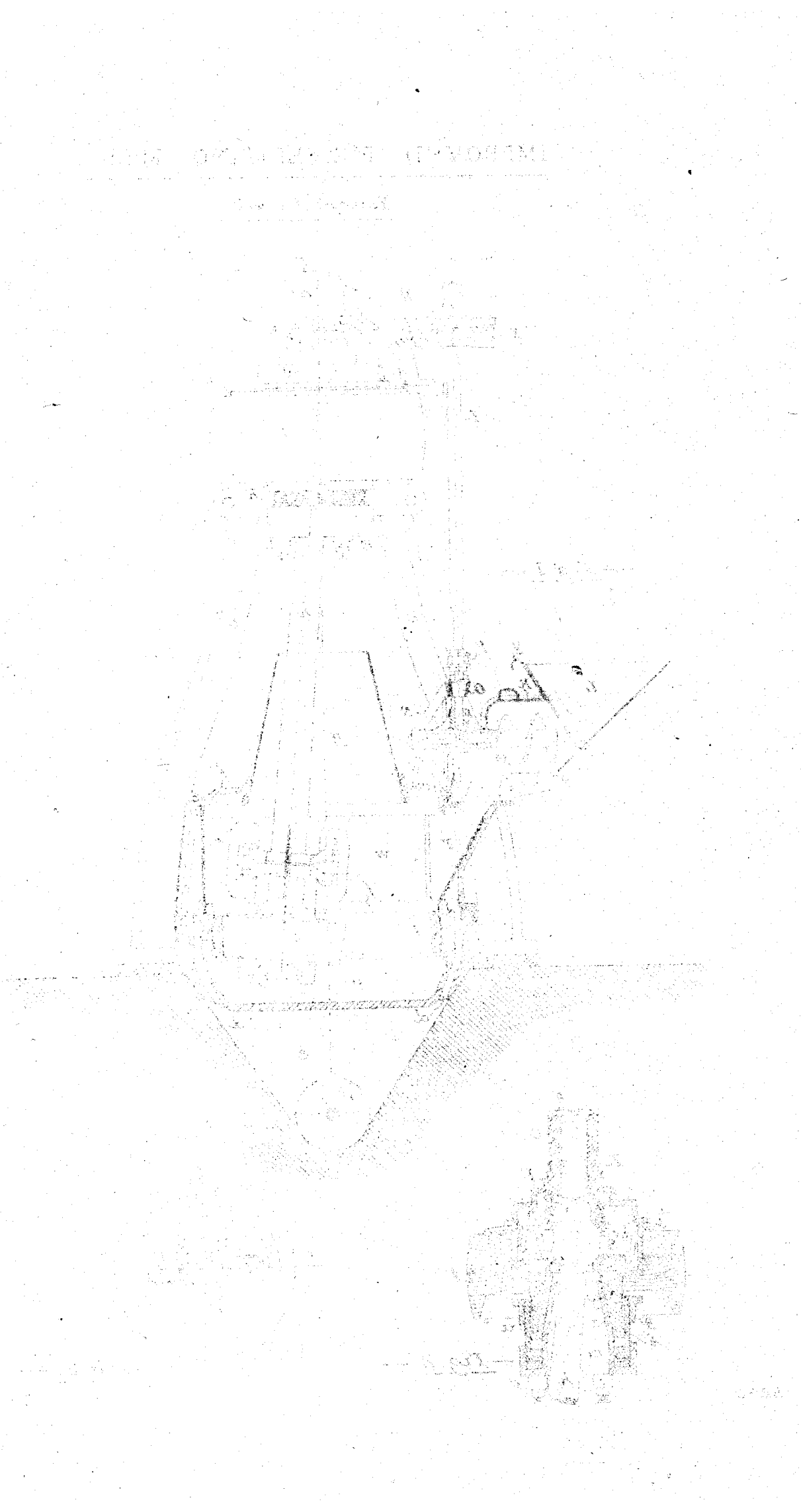


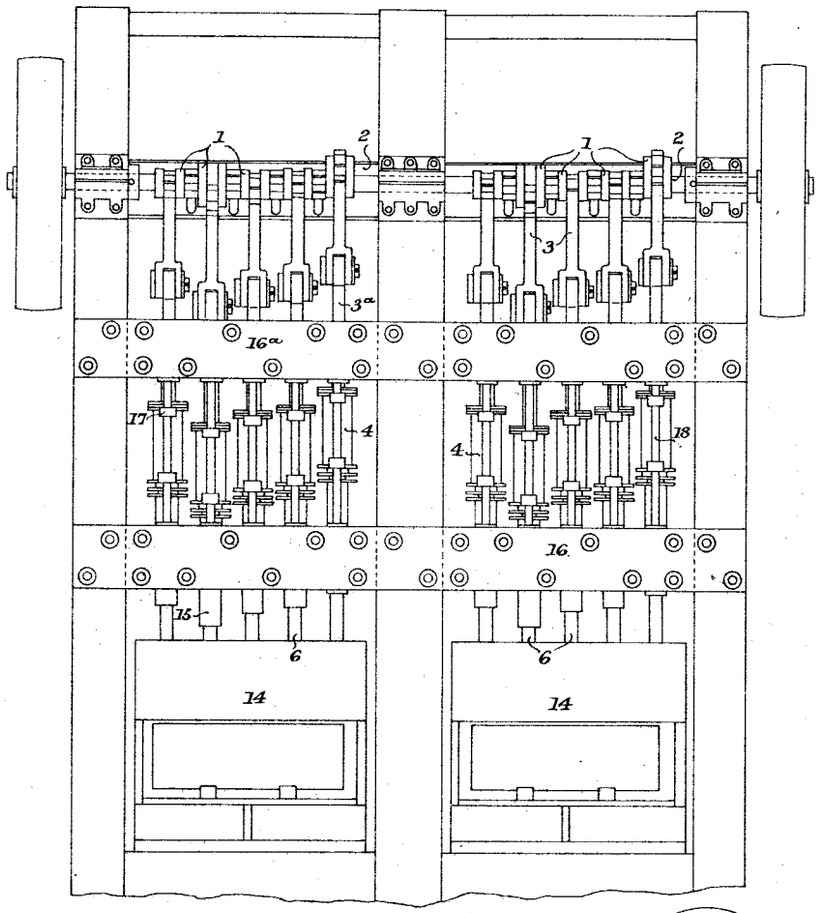
—Fig. 2.—



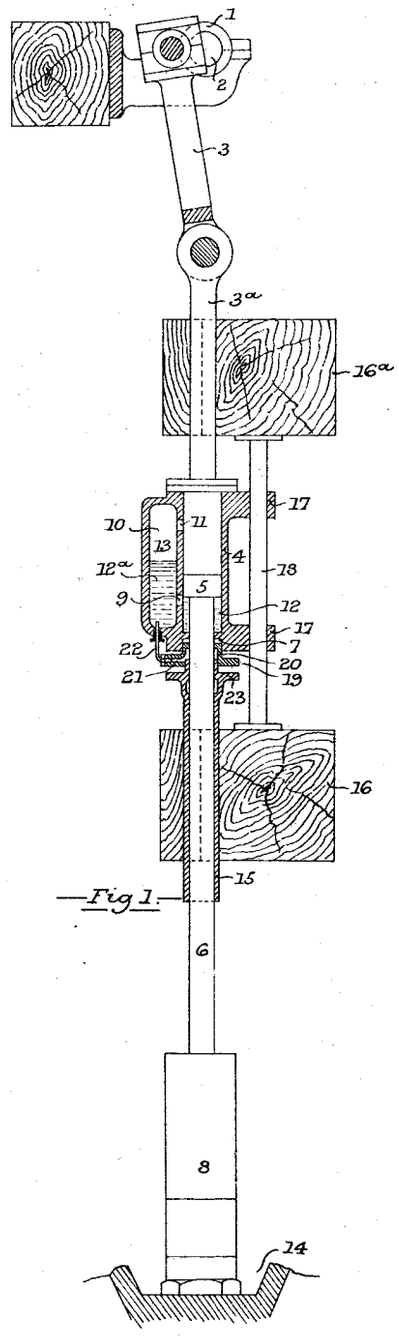
—Fig. 3.—

8290.

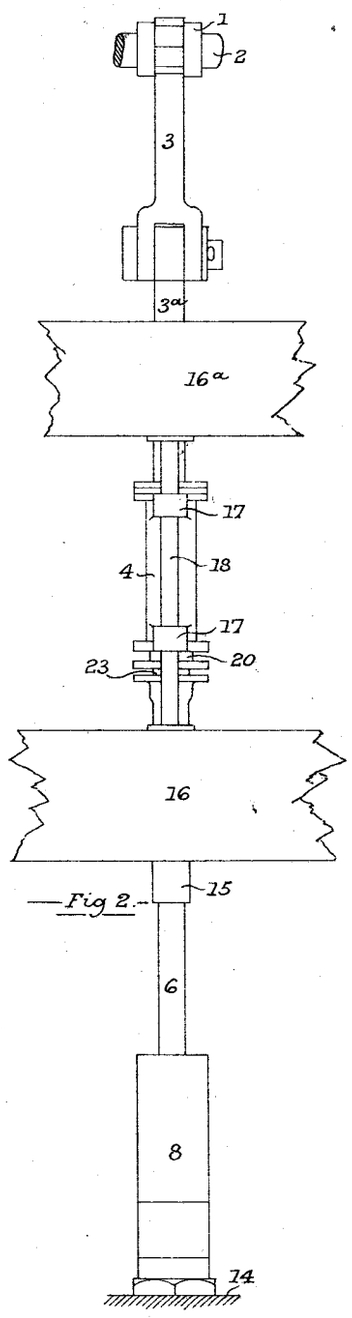




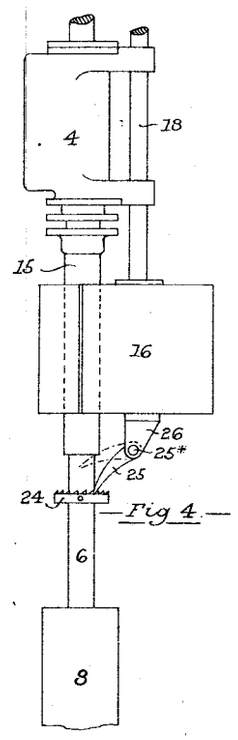
— Fig 3. —



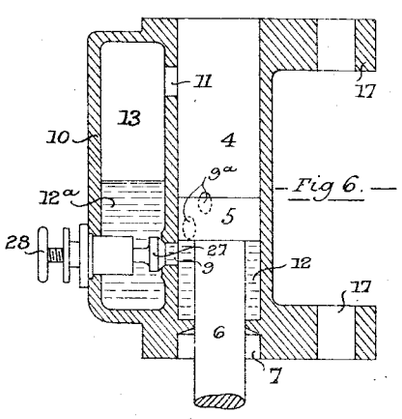
— Fig 1. —



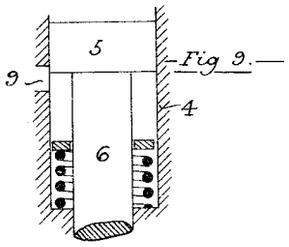
— Fig 2. —



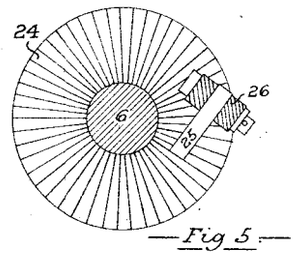
— Fig 4 —



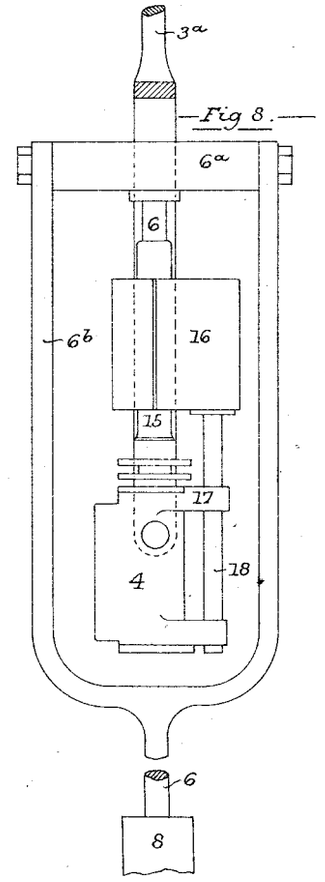
— Fig 6. —



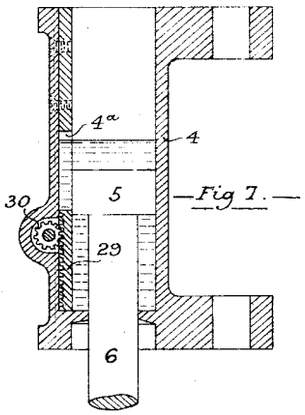
— Fig 9. —



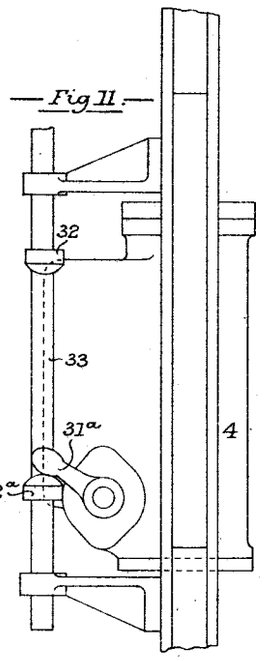
— Fig 5 —



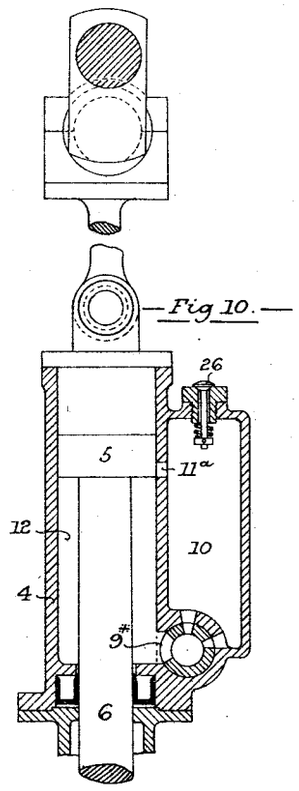
— Fig 8. —



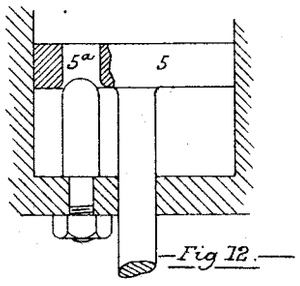
— Fig 7. —



— Fig 11. —



— Fig 10. —



— Fig 12. —

IMPROVED
STAMPING APPARATUS.

Morison's Patent.

8982.



In this arrangement, to a crank 1 (or its equivalent) on a driving-shaft 2 is attached a connecting-rod 3, jointed by a vertically-guided rod 3*a* to a cylinder 4, so that when the crank revolves the cylinder will be moved up and down in a straight line. Within the cylinder is a piston 5, the rod 6 of which passes through the cylinder-bottom and a stuffing-box 7, and constitutes the stem to which the stamp-head 8 is attached. At a distance above the bottom of the cylinder 4 there is a port 9, which communicates with a chamber 10 that is also in communication with the cylinder above the piston through a port 11. The cylinder below the lower port 9 is filled with liquid 12—for example, water—and the chamber 10 also contains liquid 12*a*, above which is an air-space 13. With this arrangement, when the bottom of the piston 5 closes the lower port 9, and the cylinder moves upwards, the piston 5 and stamp-head 8 will be supported by the cushion or buffer of the liquid 12, and if none of this escapes, and the strokes of the cylinder 4 per minute do not exceed the maximum number which the stamp-head 8 could make under the action of gravity *minus* the loss through friction, then, if the stroke of the stamp-head is equal to the stroke of the cylinder, the position of the piston 5 within the cylinder 4 will remain constant, and the liquid 12 will be practically undisturbed.

If, however, the strokes of the cylinder 4 are increased in number in a given time beyond the number of possible strokes of the stamp-head 8 due to gravity alone *minus* friction, and if the lengths of the strokes of the stamp-head and the cylinder are equal, then, the velocity of the cylinder in the early part of its stroke being, in consequence of the cylinder being driven from a crank-pin, in excess of the velocity of the falling weight due to gravity *minus* friction, it follows that the friction between the piston 5 and the wall of the cylinder 4, as well as between the packing in the stuffing-box 7 and the piston-rod 6, will increase the velocity of the falling stamp-head up to the point of synchronism—that is to say, up to the point where cylinder and stamp-head move at the same velocity; consequently, for all parts of the full stroke up to that point the velocity acquired by the stamp-head will be increased.

By increasing the length of the stroke of the cylinder beyond the length of the full stroke of the stamp-head the increased velocity imparted to the stamp-head will be still further increased. In the case of an 8 in. stroke of cylinder and a 7 in. stroke of piston and stamp-head, at the end of the down-stroke of each the position of the bottom of the piston would be higher in the cylinder than the point of cut-off, thus establishing communication between the cylinder 4 and the chamber 10 through the port 9, and allowing any deficiency of liquid through leakage or otherwise to be made up, and at the same time compensating automatically for the wearing of the shoe and die. When the stamp-head is prevented from making its full stroke by the ore in the crushing-box 14, then the piston will be still higher within the cylinder at the end of the stroke of the latter by a proportionate distance, and the volume of liquid below the piston in the cylinder will be increased. On the upstroke of the cylinder the surplus liquid will flow back into the chamber until the cut-off position is reached—that is to say, until the lower edge of the port passes the lower edge of the piston, and so closes the port, thereby reducing the shock at the point from which the piston and stamp-head are raised. To further aid in reducing the shock, the port 9 may advantageously be made of V-shape, the smallest end of the port being at the bottom.

It will be seen, therefore, that the differential motions of the cylinder and of the piston, particularly when the stroke of the cylinder is greater than the stroke of the piston, is such that a considerable increase in the number of strokes per minute can be obtained beyond those which are obtainable with the ordinary cam construction, by reason not only of the reduced friction of mechanism, but also by the assisting effect of the friction between the wall of the cylinder 4 and the piston 5, and between the packing in the stuffing-box 7 and the rod 6. It will be obvious that to obtain the greatest number of blows in a given time with this arrangement the rate of rotation of the driving-shaft 2 must be such that the velocity of the cylinder 4 in the down-stroke shall not be less than the possible velocity of the piston due to gravity *minus* friction. The retarding effect of friction to the downward movement of the stamp-head may be eliminated altogether by surrounding the piston-rod 6 with a sleeve 15 connected to the cylinder, and arranged to work in the fixed transverse guide 16, through which the said rod ordinarily works. By this means the friction of the guide will be transferred from the falling rod to the positively-driven sleeve.

The cylinder 4 may be guided vertically in its movements by providing it with extensions 17 arranged to work on a guide-rod 18 fixed to the upper and lower tranverse guides 16*a*, 16 that form part of the framing of the apparatus.

In order to minimise the leakage of liquid from the cylinder 4 through the stuffing-box 7, the latter may be fitted with a gland 19, formed with an annular recess 20 into which any liquid passing down the rod will flow, and whence it can pass back into the chamber 10 by a passage 21 and pipe 22. The tightness of the gland 19 may in this case be insured by a supplementary gland 23, which may conveniently be formed in one with the sleeve 15.

The chamber 10 may be arranged behind the cylinder 4, and, as will be seen from the drawings, can be made of a capacity which will admit of the apparatus being applied in connection with the stamp-heads of existing stamp-batteries, and which are usually pitched at a distance apart of about 10 in. from centre to centre. Figure 3 shows the apparatus applied in connection with a stamp-battery containing ten stamp-heads. The applicability of the apparatus to existing stamp-batteries is a feature of considerable practical importance.

Any suitable means may be employed for imparting an intermittent rotary movement to the stamp-head when desired. Figure 4 is an elevation, and Figure 5 a plan in section, showing an arrangement for this purpose, in which there is provided in connection with a toothed wheel 24 fixed on the rod 6 a pawl 25, carried by a bracket 26, the arrangement being such that the wheel 24 will engage the pawl 25 on the upstroke, and the pawl, turning upon the centre 25*, will revolve the piston-rod by means of the attached wheel 24 through a small portion of a revolution.

The chamber 10 is or may be fitted with a valve 26 (Figure 10) or a perforated cap, to allow for any variation of pressure in the chamber either above or below the pressure of the atmosphere.

Suitable means are provided when it is desired to be able to vary the stroke of the stamp-head. Figure 6 is a vertical section showing one arrangement for this purpose, in which additional ports 9*a* are made in the side of the cylinder 4 at levels corresponding to the length of the stroke required. The ports 9, 9*a* in such a case are each provided with a valve 27, capable of being readily controlled by a handle 28, so that ports not required for the time being can be readily closed, and that which it is desired to use can be readily opened.

Figure 7 is a vertical section showing another arrangement for this purpose, in which the cylinder 4 has formed in its inner surface a longitudinal groove 4^a, in which is an adjustable slide-bar 29, formed with a rack in gear with a pinion 30, by suitably moving which from the exterior of the cylinder the closing of the communication between the two ends of the cylinder by way of the said groove 4^a can be caused to take place at any desired part of the stroke of the piston 5 relatively to the cylinder 4.

It will be evident that (if so desired) the piston may be connected to the crank so as to be actuated thereby, in which case the stamp-stem will be attached to the cylinder, or (as represented in Figure 8) the cylinder, actuated by the crank, instead of having a hole through the bottom, may have the stuffing-box at its top, a cross-head 6^a being attached to the upper end of the piston-rod, and connected to an upwardly-extending bifurcated portion 6^3 of the stamp-stem 6. The cylinder may be prolonged below the cut-off port to such an extent that in the event of escape through leakage of the whole of the liquid from below the port the piston will not strike against the cylinder-bottom, or below the port there may be a spring adapted to act when necessary in lieu of liquid during the return or upward stroke of the positively-driven parts and stamp.

In Figure 9 there is shown a spiral spring with an annular plate above it; but there might obviously be substituted some other form of spring, such as an indiarubber buffer-spring.

If it is desired that the revolutions of the driving-shaft 2 shall be less in number than heretofore mentioned, and that the apparatus shall still embody the requirements of a gravity stamp, then, at the lower end of the cylinder 4 (Figures 10 and 11) there is placed a valve that is capable of being actuated by any suitable means (it may be an eccentric, tappets, cams, or other equivalent devices), in such a manner that communication between the interior of the cylinder and the reservoir is opened and closed as required. Figure 10 is a vertical section, and Figure 11 a side elevation, showing an arrangement of this kind, wherein 31 is a valve controlling a port 9^* arranged at the bottom of the cylinder 4 for placing the same in communication with the chamber 10. In this case the arrangement, as will be seen, is such that the piston 5 and stamp-head will be lifted through the medium of liquid 12 imprisoned below the piston, as in the arrangement shown in Figures 1 to 8, and they are allowed to fall under the action of gravity, and independent of the movement of the cylinder 4, by opening the valve 31 so as to establish free communication between the cylinder 4 and the reservoir 10. The cylinder is prolonged upwards so as to prevent its upper end coming in contact, on the down-stroke, with the piston in the event of the stamp-head being prevented from making its full down-stroke; and at that point of the upper portion of the cylinder at which the piston will be located when a full stroke of the cylinder has been made there is an opening 11^a between the cylinder and reservoir through which liquid can pass in order that the stamp-head will not be raised until the relative normal position of piston and cylinder is reached, so that the stamp-head will never be raised beyond a predetermined height, no matter what proportion of the full stroke it may have dropped. Or, in lieu of the port 11^a, there may be a port 5^a in the piston 5 which is opened and closed by a rod (see Figure 12), thus dispensing with the independent chamber. The controlling-valve 31 may be of any suitable type, such as a rotary valve having a slotted periphery as shown, and be operated at the required times through an arm 31^a on its stem by moving tappets 32, 32^a on a rod 33 worked from an eccentric on the driving-shaft or by fixed tappets.

In each arrangement any one of the rods 6 with stamp-head 8 can, when desired, be held up or out of action without interfering with the working of the remainder of the series.

Obviously this invention will enable stamps to be operated more rapidly than has been found practicable where gravity alone has been relied upon for effecting the downward strokes, because, as is well known, in stamp-batteries of the kind in which the stamp-heads are allowed to fall through a distance of about 7 in. by gravity, and are raised by cams or wipers, it has hitherto been impracticable to obtain more than from 100 to 105 blows per minute, and of the power expended a large proportion has been wasted in friction; whereas my invention renders it practicable to neutralise the retarding effect due to friction, and, when necessary, to supplement the force due to gravity, thereby rendering it possible to obtain a greater number of blows per minute and a greater crushing-capacity per stamp-head, whilst, by obviating to a large extent sudden shocks, the apparatus is also rendered less liable to break down than apparatus of the ordinary construction, and of the power expended a larger proportion may be usefully employed than heretofore has been usual.

As will be obvious, the essential feature of this apparatus renders it suitable not only for the purposes indicated, but also for operating dies, for sharpening rock-drills and the like, and for various other hammering purposes.

I reserve the right to modify details of construction to suit different requirements.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is,—

1. A stamping apparatus (for crushing minerals, gold-ores, and other crushing, stamping, or hammering purposes) characterized by the peculiarity that the downward or operative strokes of the stamps are effected by the combined action of gravity and motion imparted by friction from

positively-driven parts of the apparatus, and the return or upward strokes of the stamps are effected by a rising movement of the said positively-driven parts, communicated to the stamps through bodies of liquid.

2. A stamping apparatus of the kind referred to in claim 1, in which there are combined with the stamps and their attachments and the positively-driven parts springs adapted to act when necessary in lieu of liquid during the return or upward strokes of the positively-driven parts and stamps of the apparatus.

3. In stamping apparatus of the kind referred to in claim 1, a stamp connected by a rod to a piston which is located within a cylinder that is arranged to have a vertical reciprocating motion imparted to it, and between the bottom of which cylinder and the bottom of the piston there is a body of liquid, the arrangement being such that the rod and attached stamp-head will be lifted by the cylinder through the medium of the liquid, and during descent of the stamp-head its velocity will, when the cylinder is driven with sufficient rapidity, be increased beyond that ordinarily due to gravity (after allowing for retardation due to friction) by reason of the frictional driving-connection which will then obtain between the positively-driven parts and the parts in mechanical connection with the stamp.

4. Stamping apparatus according to claims 1 and 2, in which the stroke of the driving-cylinder 4 is made greater than that of the stamp-head 8 and connected piston 5, and there is a communication between the lower end of the cylinder and a chamber or reservoir containing liquid, so that the downward velocity of the stamp-head can be further increased beyond the ordinary velocity, and a communication will be opened between the cylinder and chamber to allow of liquid passing from the latter to the former to insure that the space between the piston and cylinder-bottom shall at all times be full of liquid, and in this way prevent undue shock when the cylinder again moves upward, besides automatically compensating in whole or in part for the wearing of the shoe and die.

5. Stamping apparatus of the kind specified in the preceding claims, in which provision is made for opening communication between the cylinder 4 and the liquid-chamber 10 at different positions of the piston 5 in the cylinder, so as to enable the stroke of the stamp-head to be varied to suit requirement.

6. An arrangement of the kind referred to in claim 4, wherein the wall between the cylinder and liquid-chamber is formed with two or more holes 9^a, arranged at different heights, and each controlled by a valve.

7. Stamping apparatus of the kind referred to in claim 2, in which the cylinder 4 has a vertical groove in its inner surface controlled by an adjustable rod capable of being operated from the exterior of the cylinder.

8. The modified construction of the stamping apparatus referred to in the preceding claims, in which the stamp-head is lifted through the medium of the liquid between the bottom of the cylinder 4 and the piston 5 connected to the stamp-head, but is allowed to descend in relation to the said cylinder by permitting the liquid to escape from the cylinder into the chamber 10, through an opening 9*, controlled by a suitably-operated valve 31.

9. Stamping apparatus constructed, arranged, and operating substantially as hereinbefore described with reference to and shown in Figures 1 and 2, or modified according to Figures 4 and 5 or according to Figure .

Dated this 4th day of September, 1896. DONALD BARNS MORISON.

MINE-MANAGERS' EXAMINATION PAPERS.

QUESTIONS USED IN EXAMINATION OF FIRST-CLASS MINING MANAGERS.

("The Mining Act, 1891.")

FIRST DAY.—TIME: 9 A.M. TO 12 NOON.

[Candidates must attempt to answer every question. All calculations to be shown in detail.]

SUBJECT A.—*On the Sinking of Shafts and Construction of Main Drives.*

1. In fixing the position of a vertical shaft to work a quartz lode that was lying at an angle of 63 degrees from the horizon to the eastward, what distance from the lode would you require to commence the shaft to strike the lode at 300ft. in depth? Show by calculation how you arrive at the result.

2. If a quartz lode was cut in a vertical shaft at a depth of 90ft., lying at an angle of 78 degrees to the westward, how far would you have to drive from the bottom of the shaft at a depth of 400ft. to cut the lode? Show how you arrive at the result by calculation.

3. Describe fully what provision you would make in commencing to sink a shaft. How would you fix the top of the shaft? In sinking through an alluvial drift, how would you commence to timber it if framed sets of timber were used? What provision would you make to keep the shaft from twisting as it is being sunk?

4. Show by sketch how you would widen a shaft at the change of lifts if the shaft was not large enough, and how you would fix bearers to carry the pumps at the change of lifts.

5. In opening out a chamber from the bottom of a shaft 300ft. in depth in alluvial drift of a loose character, describe fully how you would proceed.

6. In constructing a vertical uprise for a height of 50ft. through loose ground requiring to be close-timbered, describe fully how you would construct it.

FIRST DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT B.—*On the Timbering of Shafts, Adits, Main Drives, or Levels, Passes, Stopes, and generally on the Systems of timbering Mines, and also in filling up Old Workings.*

1. Show by sketch how you would fit timber frames for a shaft 16ft. by 8ft. 6in., also how you would slab the shaft behind the frames if the ground was loose and liable to run.
2. Show how you would fit a set of timber for a main drive. Give the dimensions of the timber, the size of the sets, and describe how you would timber the drive if the ground was liable to swell.
3. Describe how you would timber passes, giving the size of timber you would use and the dimensions of a travelling-pass, size of mullock-pass, and the distance between the travelling- and mullock-passes.
4. Show the breaking-strain on a prop, 6ft. long, of kauri, 9in. in diameter, also on a cap-piece of the same timber 14in. in diameter and 7ft. between the supports, if cap were uniformly loaded. Show by calculation how you arrive at the result.
5. Show how you timber stopes where the lode was 30ft. wide and a bad roof.
6. Show by sketch how you would set the timber in a shaft whose dimensions were 12ft. long and 5ft. wide, the planking being 3in. thick, and the shaft divided into three divisions, if neither pins nor battens were used at the corners or at centres.
7. Describe how you would timber a main level through ground liable to run; also what provision would you make to secure the timber to prevent the sets coming down in the event of one set breaking.
8. Describe how you would timber a drive and secure it in going through quicksand, and give reasons fully.

SECOND DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT E.—*Ventilation of Mines.*

1. What is meant by natural ventilation? State the principle on which it is based.
2. If you could not get natural ventilation, what means would you adopt to dilute the air in a mine which was highly charged with carbonic-acid gas?
3. What is the greatest percentage of carbonic-acid gas in a mine you consider safe to work in without injuriously affecting the health of the workmen, and how would you ascertain this percentage?
4. Give the weight of a cubic foot of atmospheric air at 32° Fahr. and at 150° Fahr.
5. What is meant by friction in air-courses, and how do you calculate it? Is there any difference of friction in an air-course 3ft. by 8ft. and one 4ft. by 6ft., each air-course being 1,000ft. long? If so, give reason why, and show the difference by calculation.
6. If you had a fan capable of producing 9,000 cubic feet of air per minute, and had to divide this quantity in three divisions from an air-course 6ft. by 5ft. and 900ft. long, first division being 3ft. by 5ft. and 1,000ft. long, second division being 4ft. by 5ft. and 800ft. long, and third division being 4ft. by 4ft. and 1,200ft. long, show by calculation the quantity of air passing in each division, the pressure in each division being the same.
7. Show by sketch how you would construct a water blast for ventilating an adit.

SECOND DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT F.—*Tapping Water in Mines, and Mode of constructing Dams in Underground Working.*

1. In sinking a shaft through rock you meet with a stratum from which a large influx of water came: state how you would dam that water back to prevent it getting down to a lower level.
2. In constructing a cross-cut from a shaft you meet a watercourse from which a larger supply of water was coming than the pumping machinery was capable of lifting: show by sketch how you would dam that water back, supposing the rock through which the cross-cut was constructed was solid rock.
3. If a dam had to be constructed in a drive which was 6ft. high and 5ft. wide to be capable of withstanding a head of water of 200ft., describe how you would construct it, and show by calculation the pressure in tons against the face of the dam.
4. In driving toward a place where there is supposed to be a lodgment of water, what precautions would you take—first, if the drive was in an alluvial drift; second, if the drive was in schistose rock? Describe fully.

SUBJECT G.—*On Blasting and the Use of Explosives.*

1. Describe examples of quick-shattering explosives, as contrasted with slow or rending explosives.
2. What is the composition of dynamite?
3. What precautions have to be taken in transporting and using dynamite cartridges at ordinary temperatures?
4. How does extreme cold affect dynamite, and what precautions have to be observed when the air-temperature is under 40° Fahr.?
5. State any advantages of ammonite and roburite over dynamite.
6. Describe fully (with details) the preparation of a shot-hole for blasting.

THIRD DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT I.—*A Knowledge of Underground Surveying, and the Making of Plans of Underground Workings, showing also the Dip or Inclination and Strike of the Reefs or Lodes.*

(*a.*) The candidate must produce a plan drawn to a scale not less than 5 chains to an inch, showing the surface boundaries of a mining claim not less than 20 acres in extent. The plan must also show the underground workings on the same plan, but in different-coloured inks. All traverse-lines on which the survey is based must be shown, with their bearings and lengths, all offsets to boundaries or other objects, together with the lines connecting the underground with the surface survey. The plan must have a north point, and the word "magnetic" or "true" written on it according to the meridian used. All traverses should be calculated from the starting-point. The plan must bear a certificate as follows: "I certify that the survey from which this plan has been drawn was done by myself, and that the plan is my own work also"; and it must be signed and dated. The area in acres must be shown.

(*b.*) The original field-notes of the survey must be produced, together with the tables of meridian and perpendicular distances (if any) for each traverse station in the survey; also produce a specimen of the method of calculations from which the positions have been derived. All of these must be signed by the candidate and dated.

(*c.*) Give a full description, in writing, of the method adopted in the survey, describing the initial point from which it was started, and show the close of the work, both in links or feet and the angular difference on closing. Describe how the inclined measurements were reduced to horizontal. State whether the true or what other meridian was used, and whether the same meridian was used both above and below ground.

(*d.*) Say what precautions were used to ascertain if the instrument was in adjustment, and how the length of the chain or tape was tested. What instrument was used for the angular measurements, and what for the linear measurements?

(*e.*) Draw a rough diagram to show how the surface and underground surveys were connected, and describe in writing the method adopted. State your opinion of the most accurate way of performing the above operation—first, when there is only one shaft; second, when there are two or more shafts.

THIRD DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT I—*continued.*

(*f.*) State whether the compass can be relied on for underground surveys, and give your reasons for the answer. If you had a choice of a compass or a theodolite, which would you use?

(*g.*) If you are obliged to make a magnetic underground survey, state what means you would use to check the correctness of the survey, and how you would know that the surface and underground survey are on the same meridian, or how you would reduce them to the same supposing one to be magnetic, the other true.

(*h.*) From the last station used in the underground survey, calculate the length and bearing of a line drawn thence to any one of the corners of the claim; or a line may be calculated from any one station of the surface survey to any one corner of the claim.

(*i.*) Describe in writing the adjustments of a plane theodolite and also of a miner's compass. (In both of these subjects the candidate will be examined by the Supervisor, who must furnish a separate report on each candidate's knowledge of the subject.)

(*j.*) Describe the method of plotting the plan, and how the area of the claim was ascertained, and what instruments were used.

(*k.*) What are the regulation marks that should define the boundaries of a claim under the Mines Act, and state sizes?

(*l.*) State where you learnt surveying, and who taught you, and how long you have had practice at surveying.

FOURTH DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT C.—*On the Drainage of Mines and Pumping Appliances.*

1. Describe any force-pump, mentioning the different parts in detail.
2. Has the depth that water is lifted anything to do with the quantity a pump will discharge?
3. What is the usual lift for plunger and draw-lift pumps?
4. How long will a double-acting pump take to pump 3,890 cubic feet of water? Diameter piston, 8in.; stroke, 12in.; revolutions, 85 per minute; 12 per cent. non-efficient.
5. What thickness of cast-iron pipe 12in. diameter head 900ft.?
6. Write down all you know of friction in pipes and work out an example by any rule you know.
7. What would be the weight of cast-iron pipe in question 5?
8. How far will a pulsometer pump force water?

SUBJECT D.—*On the Haulage in Shafts and in Underground Planes; also on the Strength of Hauling-ropes and -chains.*

1. What is the tensile strength of cast-iron, wrought iron, and steel?
2. What are the breaking-, proof-, and safe-working strains on ½in. close-link chain?
3. What is the breaking-strain and safe-working strain on a 3in. steel-wire rope made up of six strands, and twelve wires in a strand?

4. Write down your opinion as to when a steel rope should be discarded through natural tear-and-wear.
5. Describe any system of underground haulage with which you are acquainted.
6. Would you approve of employing a single-link chain for raising and lowering men in a shaft? Why?
7. Describe any safe catch, and its different parts in detail, that could be adopted for a cage.
8. What horse-power would be required to lift 200 tons per hour 1,000ft., each lift occupying 1½ minute, weight of cage, &c., 2½ tons?

FOURTH DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT H.—*The Effect that Faults, Slides, and Mullock-bars have on Lodes, and how to ascertain the Direction of Slides and Heavals.*

Give six diagrams, with fully written explanations, to illustrate the effect that is exercised on mineral lodes by faults, slides, and mullock-bars; and describe instances from your personal observations.

SUBJECT J.—*A Knowledge of the Different Rocks where Gold, Silver, Tin, Copper, Zinc, Lead, and Antimony are found, and on the Formation of Lodes and Leads.*

1. What metallic ores are usually associated with killas slate, propolyte, serpentine, and limestone respectively?
2. What is the composition of the chief ores of silver, lead, tin, antimony, copper, and zinc?

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

1. Divide 3·1416 by 0·007 and extract the cube root of the quotient to two places of decimals.
2. If four men could excavate a piece of ground 12ft. long, 10ft. wide, and 10ft. deep in two days and a quarter, working eight hours a day, how long would it take one man and one boy to do the same work, if three boys are equal to one man?
3. If an 18-carat gold chain weighs 2oz. 8dwt., and the alloy contained therein is in equal portions of silver and copper, what is the exact weight of gold, silver, and copper respectively in the chain?
4. What is the difference in the capacity of a circular vat 22ft. in diameter and 4ft. deep and of a square tank with 22ft. sides and 4ft. deep?
5. Find the cost of the following pieces of timber at the rate of 12s. 6d. per 100ft.:—

15 pieces 9ft. lengths, 12in. by 1in.
10 pieces 14ft. lengths, 16in. by 1in.
126 pieces 9ft. lengths, 9in. by 1in.
26 pieces 18ft. lengths, 4in. by 4in.
15 pieces 12ft. lengths, 3in. by 2in.

6. A gold-mining company has a capital of £80,000, and makes a profit for the year of £5,200, what percentage dividend can be declared after deducting £1,500 for depreciation of machinery?

QUESTIONS USED IN EXAMINATION OF SECOND-CLASS MINING MANAGERS.

("The Mining Act, 1891.")

FIRST DAY.—TIME: 9 A.M. TO 12 NOON.

[Candidates must attempt to answer every question. All calculations to be shown in detail.]

SUBJECT A.—*The Laying-out and Construction of Shafts, Chambers, Main Drives or Levels, Uprises, and Stopes.*

1. In laying out the position of a vertical shaft to work a lode dipping at an inclination of 60° eastward, if the outcrop of the lode was seen on the surface, state where you would sink the shaft in relation to the lode, giving your reasons fully.
2. In sinking an inclined shaft, what provision would you make for raising the excavated material to the surface, and what appliances would you use?
3. Give the dimensions of a main level or drive for a double line of rails, and also the dimensions of a chamber you would construct if there were sixty men employed in each shift below ground.
4. What is meant by a "pass"? What is its use, and how would you construct one?
5. If a quartz lode were dipping at an angle of 55°, and you were to sink a vertical shaft on the outcrop of the lode on the surface to a depth of 600 ft., what distance would you have to drive from the bottom of the shaft to cut the lode?

SUBJECT C.—*On the Ventilation of Mines.*

1. What is meant by "ventilation"? Why is it required?
2. What gases are found in quartz-mines? Give their composition, and state how you would detect their presence in a mine.
3. How is ventilation produced—(*a*) by natural means, (*b*) by mechanical means? State fully how you would produce it by both systems.
4. How would you ascertain when the air in a mine is deleterious and unfit for workmen to be employed therein?

FIRST DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT B.—*On the Timbering of Shafts, Adits, Main Drives or Levels, Passes, Stopes, and generally on the Systems of timbering Mines, and also in filling up Old Workings.*

1. Give the dimensions of timber for a main adit in heavy ground— (*a*) if for a double line of rails, (*b*) for a single line of rails. State how you would make each set, and what provision you would make if the ground was liable to swell. Give your reasons fully.

2. How far apart do you consider it most economical to have passes, and how would you timber them in heavy ground? Give dimensions of passes, and size of timbers.

3. Give the dimensions of planking you would use in timbering a shaft 4 ft. by 10 ft. in the clear; state how you would join the timber at the corners so as to make it thoroughly secure. Also give the dimensions of compartment if it were used for pumping and winding, and state how you would secure the guides for cages, and give their dimensions.

4. How would you secure the ground in stoping out a lode 6 ft. wide—(*a*) timbering the stope, (*b*) to secure the ground after being stoped out?

5. Describe how you would secure the timber in a main adit so as to prevent more than two sets of laths coming down in the event of a cap breaking. Also give your reasons why all empty spaces should be filled up on the top of the laths.

SUBJECT D.—*Tapping Water in Mines.*

1. What precaution would you take if you were conveying a drive under a place where it was known there was a lodgment of water, and not more than 10 ft. of solid ground overhead?

2. If you had to tap a lodgment of water by an uprise, what provisions would you make to secure the uprise and carry on the operations with safety?

3. In approaching a place where there was a lodgment of water by a drive or adit, and the ground was of a loose character, how would you secure it to render operations being carried on with safety? And state the precautions you would adopt in tapping the water.

SECOND DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT E.—*On Blasting and the use of Explosives.*

1. What explosive do you consider best for use in hard rock, or in stoping out a lode? Give your reasons fully.

2. What is the relative strength of dynamite, rackarock, and blasting-gelatine in comparison with blasting-powder?

3. Give the composition of the deleterious gases generated by the use of the following explosives: Blasting-powder, dynamite, rackarock, and blasting-gelatine.

4. What method would you use to thaw dynamite when in a frozen condition, and at what temperature does it freeze?

5. What explosive do you consider best to use in wet ground? Give your reasons fully.

6. If a shot were to miss fire, state what precautions you would take, and how you would proceed in blasting the rock.

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

1. If the wages of the workmen were £2 14s. per week of forty-eight hours, how much would the wages of 19 men working 2 weeks 4 days 3 hours amount to, 8 hours to be taken as a day's work?

2. If a piece of work took 1 man 22 days, who was paid at the rate of £2 12s. 6d. per week of forty-eight hours, how much would the work cost?

3. If the repairs to a main adit cost £40 16s., and took 2 men 51 days, how long would it take 7 men to accomplish the work, and what would be the difference in the cost if each of the 7 men were paid 9s. 6d. per day?

4. If the assay of ore gave 2 oz. 16 dwt. 12 gr. of gold to the ton, and only 62 per cent. of that amount was recovered in the battery treatment, how much gold would be recovered from 125 tons of ore?

5. If the average thickness of a lode were 3 ft. 2 in., and a block were left 90 ft. long and 45 ft. high, how many cubic yards would it contain?

SUBJECT G.—*A Knowledge of Part VI. of "The Mining Act, 1891."*

Oral.

QUESTIONS USED IN EXAMINATION OF FIRST-CLASS MINING MANAGERS.

("The Coal-mines Act, 1891.")

FIRST DAY.—TIME: 9 A.M. TO 12 NOON.

[Candidates must attempt to answer every question. All calculations to be shown in detail.]

SUBJECT 1.—*On the Sinking of Shafts and Construction of Main Roadways, opening out a Mine, and the Division of a Mine into Districts.*

1. Describe fully the process of timbering a 15ft. by 6ft. shaft, giving dimensions and particulars of materials used and mode of binding them together. Give a sketch of a short length of timbering to illustrate your description.

2. How would you secure the sides of a sinking pit through a thick bed of quicksand at a considerable depth from the surface? Describe briefly the various methods you might adopt.

3. In opening up a new seam of coal state fully what considerations would influence you in deciding whether to work by long-wall or pillar and stall.

4. What is meant by a ventilation district and main-haulage road?

5. What precautions would you enforce to insure safety to men when firing shots in a sinking pit?

SUBJECT 2.—*The Various Methods adopted in securing Shafts and Workings in a Mine, showing Relative Efficiency of each Class of Material used.*

1. How would you ventilate the space below the scaffold when bricking-in a sinking pit?

2. Make sketches showing the best mode of setting timber in main roads to resist top and side pressure.

3. State your experience regarding the effects of pack-walls and of solid pillars of coal on roofs or tops of different descriptions.

4. What pillar of coal would you leave for the protection of a pumping-shaft in a seam 6ft. thick, dipping 1ft. in 3ft., the depth of shaft being 1,200ft.?

5. State what, in your opinion, are the two most serious classes or sources of accidents in mines, giving reasons for same.

FIRST DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT 3.—*The Various Methods of hewing and cutting Coal of Different Classes, and securing Ground while so engaged.*

1. Give a sketch of a full-sized district—(1) Border and pillar; (2) long-wall, showing how to ventilate the working-faces.

2. With a bad roof, how would you proceed to take out chocks?

3. If necessary to build stoppings in intake and return roads to seal off a fire at the far end, how would you proceed, and what precautions would you take?

4. Describe the various modes of getting thick coal—(1) Bituminous; (2) brown coal.

5. What are the conditions and precautions under which shot-firing may be permitted in a fiery mine?

SUBJECT 4.—*Various Methods of ventilating, and Constructions of Air-ways.*

1. The barometer at the top of a shaft is 30·3in., the thermometer is 65° F., the depth of shaft 700ft., and the thermometer at the bottom stands 75° F.: say what is the difference of the pressure at the top and bottom of shaft, and the difference in the reading of the barometer?

2. What are the natural laws affecting the ventilation of mines, and how is the safety of a mine affected by the variations of the atmospheric pressure?

3. What is meant by splitting the air, and how does it affect the general ventilation of a mine, and what limit is there to practising it?

4. Describe fully the lamp you consider the safest for use in fiery mines, and state what the Act requires with respect to the "construction of safety-lamps."

5. Which is the most difficult to ventilate, an upbrow or downbrow place? What forces are against you, and what in your favour?

SECOND DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT 5.—*On Area of Airway, the Velocity and Division of Currents, and Deductions to be made for Friction.*

1. If 20,000 cubic feet of air circulate through a mine by the expenditure of 64,000 units of work, what quantity would circulate if the units of work were increased to 343,000.

2. There are three airways in a colliery—A being 3,000ft. long, 6ft. by 5ft.; B being 4,000ft. long, 6ft. by 6ft.; C being 2,000ft. long, 5ft. by 5ft.: the total quantity of air passing in the three airways is 50,000 cubic feet per minute: what quantity will each airway take?

3. In a colliery giving off CH_4 and CO_2 freely, what system of ventilation would you adopt to meet each case, and what proportion should they bear to one another?

4. Sketch furnace and dumb-drift suitable for passing 50,000 cubic feet of air per minute, marking principal dimensions thereon.

5. What is the comparative friction of the air when travelling at the same velocity through an airway 8ft. square and one 12ft. by 5ft. 4in.

SUBJECT 6.—*On the Nature and Composition of Explosives and Dangerous Gases met with in Coal-mines, and on Spontaneous Combustion.*

1. Give the composition of gelignite in detail.

2. What gases are most common in coal-mines? State their composition, and where most likely to be found.

3. Under what system would you work a mine liable to spontaneous combustion, and how would you deal with a job fire in such a mine?

4. A current of 2,000 cubic feet per minute is at explosive point: how much fresh air must be mixed with it to prevent it showing a cap?

5. What, in your opinion, is the best way of avoiding the risk of a "dust explosion" underground?

SECOND DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT 7.—*On the Drainage of Mines, and Pumping Appliances.*

1. Describe the most approved kind of pumping-engine for raising water from deep mines.
2. A pit 300ft. deep, and from the bottom of it is a rising drift 600 yards long rising 1 in 12; the pit is full of water up to the surface, but the water has been unable to rise up the drift: what is the air-pressure at the face of the drift?
3. Plunger 12in. diameter, stroke 5ft., 12 strokes per minute, depth 600ft. How many gallons per minute, and what engine-power will be required?
4. Explain the action of the "siphon," and its application in draining underground workings.
5. Describe the management of pumps while sinking.
6. Two feeders of water are met with in a sinking shaft, one near the surface and one at 20 yards above the seam of coal to be worked: what steps would you take in each case?

SUBJECT 8.—*The Haulage of Coal on Underground Planes and Shafts; also, Different Systems of such, and Horse-power required to do the Work.*

1. Describe the action and requirements of the incline plane.
2. Describe fully the different methods of underground haulage—say, first, the "endless-rope"; second, direct haulage; third, the trail-rope: and state under what circumstances each would be most economical?
3. Give a description of the latest appliances for prevention of overwinding that you consider best, with reasons.
4. Give dimensions and description of an engine suitable for drawing 800 tons of coal per day of eight hours from a pit 900ft. deep.
5. What size of steel rope suitable for last question, and weight per fathom?

THIRD DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT 9.—*The Theoretical and Effective Power of Steam-engines and Boilers; also on the Strength of Hauling-ropes and -chains.*

1. Find the horse-power of an engine whose mean steam-pressure is 15lb. and vacuum-pressure 2·4lb., the length of stroke 4ft. 6in., the diameter of cylinder 44in., and number of revolutions 31 per minute, allowing 1½lb. for friction.
2. State the respective advantages and disadvantages of the Lancashire and Cornish boilers compared with egg-ended boilers.
3. Iron ropes £2 5s. per hundredweight, steel ropes £3 12s. per hundredweight: which is cheapest for equal strength, and how much?
4. What would be the size of chain for a maximum load of 16 tons?
5. What size hauling-engine would be required to draw 80 tons per hour up an incline 1,200 yards long, gradient 1 in 8, at a speed of 4 miles an hour, the engine to be geared to the drum in the proportion of 4 to 1?

SUBJECT 10.—*The Incrustation in Steam Boilers: Causes of same, and Remedies therefor.*

1. When the water in a boiler is found to be dangerously low, what would you do?
2. How may scale be avoided in boilers? What is the effect of it?
3. What is meant by "priming"? How is it dangerous? What is the cause of it? How may it be cured?
4. What are the advantages of using hot feed-water? How may it be done? What is a feed-water heater?

THIRD DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT 11.—*Tapping Water in Mines, and Mode of constructing Dams underground.*

1. A dam 8ft. x 6ft. high, head of water 1,800ft.: what is the total pressure?
2. Sketch and describe a "frame dam," and a brick dam suitable for withstanding 600ft. vertical pressure.
3. What precautions are necessary in approaching old workings containing dangerous accumulations of water? Give three sketches—(1) with no trouble intervening; (2) with a rise trouble; (3) with a dip trouble.

SUBJECT 12.—*Blasting, and the Use of Explosives.*

1. Give a short description of what you consider the safest explosives for fiery mines, and state your opinion when and how shots should be fired.
2. Name any "high explosive" with the use of which you have had experience. Explain how it is used, and what advantages are claimed for it.
3. Give composition and specific gravity of blasting-powder, dynamite, and tonite.

SUBJECT 13.—*The Effect that Faults produce in Coal-seams, and how to ascertain Direction of a Coal-seam when severed by a Fault.*

1. In driving the west levels in a seam of coal dipping to the south at an angle of 1 in 6, an upthrow fault of 45ft. is met with: what would you do to recover the seam?
2. What is the meaning of the term "whindyke"? How may it be formed, and what is the general effect it has upon coal-seams?

3. A seam of coal dips at the rate of 4in. to the yard to a 10ft. slip, and continues to dip at the same rate on the other side of the trouble: how far will drive have to go, dipping 6in. to the yard, to cut the coal?

4. In driving against a fault, how would you ascertain whether it is a downthrow or upthrow, and the amount of displacement?

FOURTH DAY.—TIME: 9 A.M. TO 12 NOON.

SUBJECT 14.—*A Knowledge of Surface and Underground Surveying, and of making Plans showing System of Working, Inclination of Seams, Faults, and Course of Ventilation.*

1. Candidate must produce plan showing the system of working in a colliery with the surface taken up for at least 20 acres in the vicinity of the shaft, and the underground workings in different-coloured ink. He must describe how he would connect them with the surface in the event of there being only one shaft. The levels and main headways must have assumed traverse calculated in detail, and showing latitude and departure for each bearing.

2. Explain the process of loose-needle surveying, and state what precautions must be taken to avoid error. Show how the survey is booked.

3. How would you proceed in surveying with the fixed needle? and describe the process of plotting same.

4. Sketch on paper as near as you can the following bearings of a survey: (1) N. 82 E., 63 links; (2) S. 51 E., 79 links; (3) N. 20 E., 97 links; (4) N. 37 W., 87 links.

SUBJECT 15.—*A Knowledge of Arithmetic, and Method of keeping Accounts.*

1. How many gallons are there in 16 tons of water, taking the weight of one gallon at 10lb.?
2. Subtract £674 11s. 8d. from £856 9s. 3d., and divide the remainder by 6.
3. What is the difference in area of two 6in. pipes and one 12in.?
4. What weight of material will have to be raised in sinking a shaft 15ft. diameter and 450ft. deep, supposing the material to average 130lb. per cubic foot?
5. Extract the square root of 119,550,669,121.
6. Add together 1,371 tons 2qrs., 749 tons 3cwt. 3qrs., 18,321 tons 3qrs.; 1,146 tons 19cwt., 27 tons 1cwt. 3qrs.

FOURTH DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT 16.—*A Knowledge of the Character of the Different Classes of Coal, and also of the Character of the Rocks and Formation of Country where Coal is likely to be found.*

1. In which geological group is coal generally found?
2. State the generally received opinion as to how coal has been formed.
3. State the specific gravity and chemical composition of coal.
4. Give a section, showing the different seams of coal, and say what is the thickness and structure of the coal-measures in your district.
5. Enumerate the various sorts of coal and their appearance and uses.

SUBJECT 17.—*A Knowledge of the Provisions of "The Coal-mines Act, 1891."*

Oral Examination:—

1. Describe the provisions of the Coal-mines Regulation Act—(1) With regard to ventilation; (2) with regard to reporting accidents; (3) with regard to shaft-signals; (4) inspection of shafts; (5) inspection of machinery.

2. What are the principal points to be observed in the management of a fiery mine to comply with Coal-mines Regulation Act, inspection, fixed stations, use of explosives, &c.? Enumerate all the requirements of the Act with regard to survey and plans.

3. What are the provisions of the Act with regard to fencing abandoned workings, providing refuge-holes, providing second outlet, timbering of roads and places, setting of sprags while undercutting, approaching old workings?

QUESTIONS USED IN EXAMINATION OF BATTERY SUPERINTENDENTS FOR CERTIFICATES.

("The Mining Act Amendment Act, 1894.")

FIRST DAY.—TIME: 9 A.M. TO 1 P.M.

[The candidates will not be allowed any books other than logarithm tables during the time they are sitting for examination. They must attempt to answer every question, and all calculations must be shown in detail.]

SUBJECT A.—*The Different Modes of Reducing and Pulverising Ores.*

1. What is meant by rock-breakers, and how are they applied to crush auriferous and argentiferous ores? Show by sketch the different classes of rock-breakers you are acquainted with, and describe their action.

2. Give a full description of a modern stamp-mill for crushing auriferous or argentiferous ores, and all appliances in connection therewith for saving the gold and silver.

3. Show by sketch what is known as the Homestake mortar-box, giving its dimensions, and show how you would fasten copper plates inside the box for the purpose of saving the gold.

4. If you were using stamps of 1,000lb. weight each, give the dimensions and weight of the different parts—namely, the stem, tappet, head, and shoe. Describe how you would fasten the shoe to the stamp-head; also give the drop, and number of drops per minute you would recommend.

5. Give a description of an Ottis ore-crusher, and state the class of ore it is best adapted for crushing, and give your reasons why.

6. Describe the action of Krom rolls, and how these are applied for crushing ore in a finely pulverised state. Show by sketch how you would erect a plant of Krom rolls with all appliances for crushing finely pulverised ore.

7. Describe what appliances you would use to prevent the circulation of dust in a battery building where stamps were used for dry crushing.

8. If ore had to be crushed in a dry state, and afterwards treated with cyanide-solutions, what class of mill would you recommend to be adopted, and give your reasons why.

9. Describe the action of concave and convex buddles, giving their dimensions, speed, and angle of inclination. State the class of ore best adapted for treatment with buddles; and also describe how you would extract the gold from the product saved by the use of buddles.

SUBJECT B.—*Amalgamating Machines.*

1. Show by sketch a Boss, also a Wheeler pan. Describe their action and speed.

2. What is the use of settlers, and under what circumstances are they applied? Describe fully, giving their dimensions, and how they are worked.

3. In working charges of ore in a combination-pan, give the quantity of ore, in hundredweights, you would use in one charge, the time occupied by each charge, and the quantity of quicksilver you would use in the pan.

4. What is meant by amalgam-traps, also agitators, and how are they used? Describe fully.

5. Give the speed that a Watson-Denny pan requires to be worked at, the quantity of quicksilver you would use in the pan, and the horse-power required to work it.

FIRST DAY.—TIME: 2 P.M. TO 5 P.M.

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

1. Describe how you would detect and remove impurities from quicksilver.

2. How would you coat copper plates with quicksilver? Describe fully.

3. Describe how you would treat auriferous or argentiferous ores containing antimony, lead, and zinc in the form of sulphides in order to recover the gold and silver most economically.

4. Describe the method you would adopt in treating concentrates containing a large percentage of iron-pyrites for recovery of the gold.

5. What effect has salt and sulphate of copper on the recovery of gold or silver from ores when used in pan-amalgamation? Describe the chemical reaction that would take place.

SUBJECT E.—*Chlorination Process of Recovering Gold from Ores.*

1. Describe a modern chlorination plant, and give a sketch showing each portion of it in detail, marked with distinguishing letters.

2. Describe the Plattner process, and show the difference between it and the Newberry-Vautin process.

3. How is chlorine generated and applied in connection with the extraction of gold from ores? Give the proportion of the different chemicals you would use.

4. How is the gold precipitated from chlorine solutions?

5. If ore containing a large percentage of silver and gold was treated by the chlorination process, how would you recover the silver?

6. Describe a reverberatory, also a White Howell furnace, and explain fully the method of roasting ore in these furnaces, and why roasting is necessary.

SECOND DAY.—TIME: 9 A.M. TO 1 P.M.

SUBJECT D.—*Lixiviation Process of Recovering Gold and Silver from Ores.*

1. What effect (if any) has copper-sulphides on the extraction of gold and silver from ores by the Cassel process?

2. What class of auriferous and argentiferous ores are best adapted for treatment by the Cassel process? Explain your reasons fully.

3. Show by sketch how you would construct a plant for treating auriferous and argentiferous ores by cyanide-potassium solutions having three percolation vats. Show how you would place these in relation to the other appliances.

4. Describe how you would standard solutions and test the percentage of KCN they contain.

5. In making trial tests in the laboratory to determine the strength of the working solution for new ore, what materials would you use, and how would you apply them?

6. Describe the difference between the Cassel process and the Siemens-Halske process in the extraction of gold and silver from their ores.

7. How many tons of an 18-per-cent. KCN solution would be required to make up 15 tons of a 0·3-per-cent. solution, using a sump solution containing 0·1 per cent. of KCN?

8. How would you test sump solutions to ascertain what they contain in gold and silver?
9. If a vat was 23ft. in diameter, and filled with ore to a depth of 3ft. 8in., how many tons of ore would it contain? Also give the weight of solution occupying 14in. in the vat.
10. If there were 85 per cent. of fine gold and 15 per cent. of coarse gold in the ore under treatment with KCN solutions, how would you recover the coarse gold not affected to any appreciable extent by the KCN solution?
11. How many tons of a 0·55-per-cent. KCN solution would be required to make up a 0·3-per-cent. solution, using a 0·08-per-cent. solution for dilution?
12. How many tons of 0·25-per-cent. KCN solution can be obtained from 12 tons of 0·9-per-cent. solution, using a sump solution of 0·11 per cent. for dilution?
13. What per cent. of cyanide potassium would be absorbed in treating ores containing 1oz. free gold and 3oz. silver to the ton?
14. Describe how you would make silver-nitrate solutions.
15. If 9,000lb. of wash-water contained 0·06 per cent. of KCN, how many pounds of KCN would be required to make it up to a 0·45-per-cent. solution, supposing that you were using crude KCN salt containing 79 per cent. KCN?
16. What effect has acids on KCN solutions? What chemical would you use to neutralise ore containing acids?
17. In case of cyanide poisoning, what antidote would you use?

SECOND DAY.—TIME: 2 P.M. TO 5 P.M.

SUBJECT F.—*Sampling and Testing of Ores.*

1. How would you detect and estimate copper in its ores?
2. What are the tests for tin as in tin-ore?
3. Describe the easier tests for arsenic.
4. How would you test for silver and determine this metal by the wet way, also the dry way?
5. What are the tests usually applied for identifying chromic oxide in chromite?
6. Give the characteristic tests for lead and mercury.
7. State how you would determine the gold in quartzose tailings containing 20 per cent. of iron-pyrites.
8. What are the tests for antimony in stibnite?
9. How would you determine the silver in galena?

SUBJECT G.—*Knowledge of Arithmetic and Method of keeping Accounts.*

1. Divide 0·63456 by 0·793, and extract the cube root of the quotient.
2. If 2oz. 16dwt. of gold of 24 carats was worth £4 3s. 11d. per ounce, what would be the value of the same weight of gold if it were 18·9 carats?
3. If ore assays before treatment 3oz. 5dwt. 4gr. gold and 12oz. 14dwt. 5gr. silver per ton, and the gangue assays after treatment 6dwt. 6gr. gold and 2oz. 3dwt. 15gr. silver, what percentage would be saved; also show the value of the bullion recovered from 30 tons of ore, taking the gold at £4 per oz. and silver at 2s. per oz.?
4. If four men and two boys took 3 days 7 hours to do a certain piece of work, how long would it take five men and three boys to do the same amount of work, taking a boy to do three-eighths the work of a man?
5. A kauri log is 25ft. long, 6ft. 3in. diameter at one end, and 5ft. 9in. diameter at the other, how many cubic feet does it contain?
6. If the wall of a building was 20ft. high, and required a ladder to reach the top of the wall and to cross a ditch 9ft. from the base, what length of a ladder would you require?

SUBJECT H.—*A Knowledge of Part VI. of "The Mining Act, 1891."*

LIST OF MINING MANAGERS, BATTERY-SUPERINTENDENTS, AND ENGINE-DRIVERS WHO HAVE OBTAINED CERTIFICATES UNDER THE MINING AND COAL-MINES ACTS OF 1886, 1891, AND 1894.

As there have been several inquiries made as to the names of persons who hold certificates as mine-managers and engine-drivers, the annexed is a complete list of those holding certificates at the date of this report, taken from the register:—

THE MINING ACT.

FIRST-CLASS SERVICE CERTIFICATES.

Issued under "The Mining Act, 1886," without Examination.

Adams, H. H., Waiorongomai.
Anderson, P., Thames.
Andrews, T., Thames.
Andrews, R., Coromandel.
Barclay, T. H., Thames.
Bennett, J., Alexandra.
Benney, J., Coromandel.
Black, T., Waiomai.
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., Thames.
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., Thames.
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.
McCullum, J., Reefton.
McCullough, R., Thames.
McGruer, 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.
Wilcox, J., Thames.
Williams, J., Skipper's.
Wright, G., Boatman's.
Wylie, W., Ross.
Young, G., Skipper's.

First-class Mine-managers' Certificates, 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, C. E., Reefton.
Wilkie, J., Reefton.

First-class Mine-manager's Certificate, issued on Production of Certificate from a recognised Authority outside the Colony, under "The Mining Act, 1886," and "The Mining Act, 1891."

Argall, W. H., Coromandel.
Beckwith, L. H., Wellington.
Goold, A. L., Auckland.
Hailey, R. C., Dunedin.

First-class Mine-manager's Certificate, issued to Inspector of Mines by virtue of his Office, under "The Mining Act, 1886."

Binns, G. J., Dunedin.

First-class Mine-managers' Certificates, issued after Examination, under "The Mining Act, 1891."

Agnew, J. A., Thames.
Annear, William, Reefton.
Bennett, E. P., Thames.
Boydell, H. C., Coromandel.
Bray, E., Thames.
Bruce, Malcolm, Thames.
Carroll, J., Lyell.
Cartwright, E., Thames.
Fahey, P., Reefton.
Flannigan, Francis, Reefton.
Hodge, J. H., Thames.
James, T., Thames.
Lane, J., Reefton.
Lawn, C. H., Capleston.
Linck, F. W., Thames.
Marshall, F., Reefton.
McDermott, J., Thames.
McDermott, G., Thames.
McDermott, W., Thames.
McGregor, W. T., Thames.
McKenzie, H. J., Coromandel.
O'Keeffe, M. D., Thames.
Paul, Matthew, Thames.
Paltridge, Henry, Thames.
Prince, F. H., Reefton.
Robertson, D. B., Stafford.
Ross, Richard, Thames.
Shepherd, H. F., Thames.
Stanford, W. J., Macetown.
Steedman, J. G., Thames.
Sutherland, Benjamin, Reefton.
Tierney, R., Thames.
Warne, George, Thames.
White, G. H., Thames.
Williams, C., Capleston.

Second-class Mine-manager's Certificates, issued after Examination, under "The Mining Act, 1891."

Christie, William, Waitekauri.
Draffin, S., Waitekauri.
Dunkin, T., Coromandel.
Evans, H. A., Skipper's.
Gatland, V. Y., Coromandel.
McNeil, A. H., Coromandel.
White, G. H., Thames.

SECOND-CLASS SERVICE CERTIFICATES AS MINE-MANAGERS.

Issued under "The Mining Act, 1891."

Adams, W. J., Thames.
Agnew, J. A., Coromandel.
Allen, Richard, Reefton.
Argall, A. E., Coromandel.
Bennett, C. H., Coromandel.
Begley, Thomas, Reefton.
Beard, W. T., Reefton.
Bone, William, Reefton.
Bowler, John, Thames.
Blair, Thomas, Kuaotunu.
Bray, Edwin, Reefton.
Brownlee, Thomas James, Thames.
Brokenshire, James, Thames.
Bolitho, James, Reefton.
Brown, John, Macrae's.
Bremner, John, Coromandel.
Borlase, J. H., Capleston.
Bunny, Joseph, Thames.
Byrne, John, Karangahake.
Caird, Alexander McNeil, Reefton.
Campbell, J., Kuaotunu.
Climo, Noah, Coromandel.
Comer, George, Thames.
Cowan, Hugh, Kuaotunu.
Corbett, T., Paeroa.
Comer, W. W., Thames.
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.
Gill, George, Thames.
Glasgow, T. M., Thames.
Goldsworthy, Henry, Thames.
Govan, Joseph, Thames.
Griffin, Patrick, Thames.
Grimmond, Joseph, Ross.
Goldsworthy, William, Mauku, Auckland.
Gemmings, Charles, Thames.
Gribble, James, Norsewood.
Guthrie, John, Wellington.
Guy, Robert, Kuaotunu.
Harris, Richard, Thames.
Harvey, William, Reefton.
Hardman, James Edward, Thames.
Hicks, William, Thames.
Hetherington, William, Thames.
Hill, Alex. Grey, Waikakaho.
Hore, John, Wellington.
Hollis, Fred. J., Waihi.
Hornibrook, H. P., Kuaotunu.
Jamieson, John, Reefton.
Johnstone, William, Collingwood.
Jobe, James, Thames.
Johns, Thomas, Thames.
Kendall, Henry, Thames.
Kerr, George, Kamo.
Kirker, Thomas, Thames.
Laughlin, David, Thames.
Law, John, Thames.
Loughlin, S., Thames.
Lough, Henry, Thames.
McLean, James, Thames.
McLean, Alex., Coromandel.
McLean, Charles, Thames.
McCormick, Charles, Coromandel.
McQuillan, John, Reefton.
McNeill, Daniel, Thames.
McNeill, George, Upper Kuaotunu.
McCombie, John, Karangahake.
McEwen, James, Reefton.
McLoghry, Archibald, Karangahake.
Mackay, William, Nenthorn.
Martin, James, Reefton.
Meagher, John, Karangahake.
Mills, George, Thames.
Mayn, John, Coromandel.
Martin, David, Black's Point.
Morgan, William, Upper Thames.
Moorecroft, Thomas, Thames.
Milne, John, Thames.
Moyle, Thomas, Thames.
Naysmith, James, Reefton.
Newdick, Alfred, Thames.
Notman, Alexander, Reefton.
O'Keefe, M. W. D., Thames.
Page, John, Lyell.
Parkiss, Jos. W., Reefton.
Potts, W. H., Thames.
Primrose, J., Kuaotunu.
Pettigrew, Robert, Sydney.
Peebles, Alexander, Kuaotunu.
Pollock, John, Thames.
Phillips, William Henry, Thames.
Rabe, Henry, Thames.
Reid, Thomas Groat, Thames.
Richard, John, Thames.
Richards, A. H., Kuaotunu.
Radford, Thomas, Thames.
Rogers, Charles Henry, Reefton.
Rogers, William Henry, Kumara.
Ross, J., Thames.
Rowe, James, Thames.
Shaw, James, Karangahake.
Sligo, Alex., 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.
Whisker, Charles, Thames.
White, John S., Karangahake.
Wilson, James R. S., Kuaotunu.
Wilson, J. G., Thames.
Woolcock, James, Thames.
Worth, Robert, Waihi.

ENGINE-DRIVERS' SERVICE CERTIFICATES.

Issued under "The Mining Act, 1891."

Audley, F., Coromandel.
Battens, H., Coromandel.
Black, C., Reefton.
Black, G. J., Reefton.
Bridson, Mat. J., Thames.
Casley, J., Thames.
Clerkin, F., Reefton.
Crabb, J., Reefton.
Crofts, J. W., Skipper's.
Cook, W., Thames.
Craig, D., Thames.
Davies, T., Thames.
Dunstan, J., Thames.
Faithful, William, sen., Cromwell.
Faithful, William, jun., Cromwell.
FitzMaurice, Raymond, Reefton.
Grundy, T., Thames.
Harrison, R. H., Kuaotunu.
Hope, J. S., Waitekauri.
Hufton, George, Reefton.
Ivey, R., Thames.
Latimer, Alfred, Dunedin.
Lamberton, J., Reefton.
Lawn, E., Reefton.
McLean, J., Reefton.
Milne, S., Coromandel.
Murphy, A. R., Queenstown.
Morton, C., Thames.
Patterson, D., Reefton.
Patten, A. C., Reefton.
Phillips, W. H., Thames.
Ryan, J. P., Coromandel.
Roche, H., Thames.
Saunders, William, Reefton.
Smith, R., Thames.
Skilton, A. G., Westport.
Sullivan, W., Coromandel.
Titley, A. W., Black's Point.
Walding, J., sen., Coromandel.
Walding, J., jun., Coromandel.
Warne, G., Thames.
Wishart, R., Thames.
Wood, A., Thames.

Engine-drivers' Certificates, issued after Examination, under "The Mining Act, 1891."

Allen, A., Thames.
Auld, James, Reefton.
Blackadder, D., Reefton.
Cook, S., Fairfield.
Daldy, E. A., Coromandel.
Dunstan, I., Waihi.
Elliston, A. J., Reefton.
Lawn, C. H., Capleston.
McAuley, T., Reefton (for water).
Ross, M., Reefton.
Slowey, William, Reefton.
Wilson, F. H., Thames.
Wynn, M., jun., Reefton (for water).

THE COAL-MINES ACT.

FIRST-CLASS MINE-MANAGERS' CERTIFICATES.

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

Aitken, T., Wendon.
Alexander, T., Brunnerton.
Austin, J., Sheffield.
Bishop, J., Brunnerton.
Brown, T., Westport.
Brown, T., Glentunnel.
Cameron, J., Denniston.
Campbell, J. C., Fairfield.
Collins, W., Taupiri.
Dando, M., Brunnerton.
Elliott, R., Wallsend.
Ferguson, A., Whitecliffs.
Freeman, J., Green Island.
Geary, J., Kamo.
Gray, J., Abbotsford.
Harrison, J., Brunnerton.
Irving, J., Kaitangata.
Jemison, W., Waimangaroa.
Kenyon, J., Shag Point.
Kerr, G., Kamo.
Lindop, A. B., Springfield.
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., Whitecliffs.
Walker, J., Collingwood.
Williams, W. H., Shag Point.

Certificates issued after Examination under the Coal-mines Acts, 1886 and 1891.

First-class.

Armitage, F. W., Auckland.
Barclay, T., Kaitangata.
Coulthard, J., Taylorville.
Dixon, W., jun., Kaitangata.
Dunn, W., Brunnerton.
Fleming, J., Kaitangata.
Gibson, John, Westport

First-class.

Green, E. R., Abbotsford.
Green, J., Brunnerton.
Hosking, G. F., Auckland.
Jebson, D., Canterbury.
McCormack, W., Denniston.
Milligan, N., Thames.
Newsome, F., Denniston.
Tattley, E. W., Huntly.

Second-class.

Barclay, T., Kaitangata.
Dixon, W., jun., Kaitangata.
Lindsay, J. B., Orepuki.
Snow, T., Mercer.

Mine-managers' Certificates, issued on Production of English Certificate, under "The Coal-mines Act, 1886."

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.
Macalister, J., Invercargill.
Nimmo, J., Oamaru.
Straw, M., Westport.
Tattley, W., Auckland.

First-class Mine-managers' Certificates, issued to Inspectors of Mines by virtue of Office, under the Mining Acts and the Coal-mines Acts.

Cochrane, N. D., Westport.
Coutts, J., Wellington.
Gordon, H. A., Wellington.
Gow, J., Dunedin.
McLaren, J. M., Thames.
Wilson, G., Thames.

Mine-managers' Certificates, issued on Production of English Certificate, under "The Coal-mines Act, 1891."

Alison, R., Greymouth.
Frame, Joseph, Kaitangata.
Irvine, James, Dunedin.
Jordan, R. S., Kaitangata.
Lewis, W., Blackball.
Pollock, James, Green Island, Otago.
Proud, Joseph, Wanganui.
Scott, Joseph, Ngahere.
Tennent, R., Brunnerton.
Wright, E. S., Auckland.

SECOND-CLASS MINE-MANAGERS' SERVICE 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, Whitecliffs.
Lobb, Joseph, Mokau.
Love, Alexander, Orepuki.
McIntosh, Allan, Shag Point.
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.

ENGINE-DRIVERS' CERTIFICATES.

Issued under "The Coal-mines Act, 1886."

Bainbridge, William, Brunnerton.
Beirn, William H., Kaitangata.
Clark, A., Kaitangata.
Davidson, Robert, Walton Park.
Elliott, R., Denniston.
Eltringham, Stephen, Greymouth.
Foote, Thomas, Miranda.
Gall, Adam, Huntly.
Gill, Robert, Shag Point.
Gillies, D., Walton Park.
Girven, Adam, Kawakawa.
Grundy, Walter, Kamo.
Gibson, J., Denniston.
Gray, G. A., Kaitangata.
Harrison, C. F. R., Huntly.
Hazeldene, T., Denniston.
Hartley, H., Huntly.
Henderson, J., Huntly.
Hetherington, R., Huntly.
Howie, William, Walton Park.
Kelly, Peter, Kaitangata.
Leisham, G., Denniston.
Marriott, T., Huntly.
Mason, J., Springfield.
Muir, T., Huntly.
Moore, Luke Martin, Brunnerton.
McFarlane, Henry, Miranda.
McGarry, James, Brunnerton.
McGregor, Duncan, Stirling.
McIntosh, Donald, Allandale.
McVie, John, Walton Park.
O'Neil, J., Denniston.
Porter, H. R., Huntly.
Ryan, T., Huntly.
Sampson, J., Huntly.
Saunders, J., Denniston.
Shore, Joseph, Kaitangata.
Skilton, F. G., Denniston.
Skellern, R., Huntly.
Smith, J., Denniston.
Southall, James, Brunnerton.
Thomas, William, Kamo.
Troughhear, Robert, Dobson.
Turner, Henry, Kawakawa.
Vincent, James, Miranda.
Wearn, Alfred, Boatman's.
Wearn, James, Wallsend.
Williams, Llewellyn, Kawakawa.
Woods, William, Kawakawa.
Williams, F. A., Shag Point.

ENGINE-DRIVERS' SERVICE CERTIFICATES.

Issued under "The Coal-mines Act, 1891."

Archibald, W., Kaitangata.
Barlow, William John, Shag Point.
Boag, John, Shag Point.
Forrestor, Robert, Kaitangata.
Girvan, R., Kawakawa.
Greening, Luke, Springfield.
Johnstone, R. N., Kaitangata.
McVie, Gavin, Kaitangata.
Milburn, Edward, Westport.
Park, John A., Huntly.
Prentice, J., Shag Point.
Rixon, William E., Shag Point.
Todd, William, Dunedin.
Webb, Peter Oliver, Nightcaps.

Engine-drivers' Certificates, issued after Examination, under "The Coal-mines Act, 1891."

Johnston, W. P., Kaitangata.
Marshall, D., Kaitangata.
Napier, A. T., Kaitangata.
Shearer, W., Huntly.

BATTERY-SUPERINTENDENTS' CERTIFICATES.

Issued under "The Mining Act 1891 Amendment Act, 1894," without undergoing examination.

Adams, H. H., Waihi.
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.
Merlett, Richard Sheridan, Waitekauri.
Napier, James, Karangahake.
Noble, James R., Karangahake.
Park, James, Thames.
Shepherd, Henry Franklin, Waihi.
Walker, James A., Kuaotunu.
Wilson, Arthur E. Waihi.
Wilson, James Kitchener, Auckland

Battery-superintendents' Certificates, issued after Examination, under "The Mining Act 1891 Amendment Act, 1894."

Adams, A. A., Thames.
Allen, F. B., Thames.
Ansley, Comyn, Paeroa.
Morgan, P. G., Thames.
Robinson, J. R., Waitekauri.
Taylor, C. H., Tararu.

WINDING-ENGINE DRIVERS' CERTIFICATES OF COMPETENCY.

Issued under "The Inspection of Machinery Act 1882 Amendment Act, 1894."

Aickin, Charles James.
Bainbridge, Henry.
Bentley, John Daniel.
Bickford, Charles Frederick.
Bolitho, James.
Bowman, Charles Henry.
Budge, George Symons.
Burgess, Benjamin.
Buxton, Harry Arthur.
Bydder, Charles Alfred.
Cathey, Alexander.
Cheverton, George Henry.
Christian, Herbert.
Colligan, John.
Copeland, Joseph Barlow.
Cowie, Alexander.
Dodd, William.
Eustace, Charles Henry.
Fraser, Theodore Tinne.
Harkins, William.
Henry, Francis.
Hughes, William Henry.
Jones, Hugh Pughe.
Johnson, Thomas.
Kay, John.
Kelly, Peter George.
Langford, Samuel George.
Lyons, John.
Mackie, Edward Morrison.
Maloney, James Joseph.
McAuley, Thomas.
McIntosh, John.
McIntyre, James.
McLelland, James.
McMahan, Timothy.
Parker, Daniel.
Provan, Andrew.
Rayner, Alfred Edward.
Ryan, John Patrick.
Sargent, Henry.
Seawright, Robert E. E. M.
Scott, Walter George.
Shortt, Edward.
Skelton, John.
Slater, William.
Smith, Walter.
Taylor, Alfred Edward.
Thwaites, William.
Tills, Charles.
Todd, James.
Trembath, John.
Turner, George Frederick.
Welby, Amos Walter.
Williams, Reece.
Wilson, Daniel.
Wearne, Jaketh Joseph.

WINDING-ENGINE DRIVERS' SERVICE CERTIFICATES.

Issued under "The Inspection of Machinery Act 1882 Amendment Act, 1894."

Boswell, James.
Bruggy, Patrick M.
Buchan, George A.
Burk, Thomas.
Cassidy, James.
Clarke, George.
Cummock, John
Elmore, William H.
Ford, Arthur S.
Griffin, Jonathan.
Leece, Henry S.
McCormick, John.
McKenzie, John.
McMillan, William.
McQuade, Richard C.
Porch, John James.
Robinson, John.
Sachirthal, Edward.
Soppet, Frederic W.
Walsh, Patrick.
White, Alexander.

SUMMARY OF WORKS CONSTRUCTED.

The following statement shows the whole of the different classes of works constructed by the department, either by direct grants or by subsidies to local bodies, during the last fifteen years (the votes for this purpose having been under the control of the Hon. the Minister of Mines), for the purpose of opening up the mineral belts throughout the colony, and also for the development of the mining industry:—

Nature of Works.	Total Cost of Construction, or Amount authorised to be expended.	Expenditure, by way of Subsidy or otherwise, by Mines Department.	Amount of Liability by Mines Department on Works in Progress.
UP TO YEARS 1882-83 AND 1883-84.	£ s. d.	£ s. d.	£ s. d.
Water-races	29,252 1 11	14,853 9 5	14,398 11 6
Roads on goldfields	21,437 11 2	13,089 16 0	8,347 15 2
Roads and tracks undertaken by County Councils, subsidised by Mines Department	52,841 17 0	21,844 16 7	10,207 15 9
Works undertaken by prospecting associations, subsidised by Mines Department	13,216 13 4	3,350 0 0	3,400 0 0
Construction of drainage- and sludge-channels, subsidised by Mines Department	5,750 0 0	2,468 15 4	781 4 8
	122,498 3 5	55,606 17 4	37,135 7 1
1884-85.			
Water-races	4,846 1 9	14,596 2 9	4,648 11 6
Roads on goldfields	13,667 10 1	9,630 9 6	12,384 15 9
Roads and tracks undertaken by County Councils, subsidised by Mines Department	13,566 14 1	6,293 16 6	12,739 17 6
Roads to mines, other than gold, subsidised by Mines Department	4,594 10 0	111 19 0	2,888 1 0
Works undertaken by prospecting associations, subsidised by Mines Department	850 0 0	108 0 0	3,692 0 0
Construction of drainage- and sludge-channels, subsidised by Mines Department	4,050 0 0	1,050 0 0	1,931 4 8
Diamond and other drills	3,600 0 0	1,858 0 0	..
	45,174 15 11	33,648 7 0	38,284 10 5
1885-86.			
Water-races	3,660 4 9	6,063 2 3	6,964 4 4
Roads on goldfields	27,543 18 8	12,360 14 9	27,567 19 8
Roads undertaken by County Councils, subsidised by Mines Department	14,773 2 3	13,043 15 9	12,477 9 2
Roads to mines, other than gold, subsidised by Mines Department	1,551 19 10	4,327 0 10	490 12 8
Works undertaken by prospecting associations, subsidised by Mines Department	11,860 18 0	1,999 5 7	6,389 9
Construction of drainage- and sludge-channels, subsidised by Mines Department	10,051 14 9	3,994 16 6	6,995 9 9
Schools of Mines	2,160 9 7	1,260 9 7	900 0 0
	71,602 7 10	43,049 5 3	61,785 1 4

SUMMARY OF WORKS CONSTRUCTED—*continued.*

Nature of Works.	Total Cost of Construction, or Amount authorised to be expended.	Expenditure, by way of Subsidy or otherwise, by Mines Department.	Amount of Liability by Mines Department on Works in Progress.
1886–87.	£ s. d.	£ s. d.	£ s. d.
Water-races	..	1,928 14 4	3,466 0 8
Roads on goldfields	12,453 3 5	22,229 16 1	17,791 7 0
Roads and tracks undertaken by County Councils, subsidised by Mines Department	12,613 4 8	7,415 19 6	10,455 1 5
Roads to mines, other than gold, subsidised by Mines Department	..	306 1 0	110 13 1
Works undertaken by prospecting associations and companies, subsidised by Mines Department	15,671 19 6	4,521 7 3	4,618 4 7
Construction of drainage- and sludge-channels, subsidised by Mines Department	5,549 14 6	6,207 18 0	672 6 10
Diamond and other drills	422 15 6	422 15 6	..
Schools of Mines	3,183 7 1	3,383 7 1	700 0 0
	49,894 4 8	46,415 18 9	37,813 13 7
1887–88.			
Water-races	6 6 6	6 6 6	..
Roads on goldfields	6,860 4 3	17,281 11 3	7,370 0 0
Roads and tracks undertaken by County Councils, subsidised by Mines Department	2,998 15 0	8,012 5 2	3,942 4 2
Roads to mines, other than gold, subsidised by Mines Department	..	14 5 4	..
Works undertaken by prospecting associations and companies, subsidised by Mines Department	6,456 8 0	2,703 19 3	924 8 0
Construction of drainage- and sludge-channels, subsidised by Mines Department	..	1,110 4 11	2,054 10 6
Schools of Mines	1,859 3 7	2,221 19 4	337 4 3
Aids to treatment of ores	1,200 0 0	390 18 3	209 1 9
	19,380 17 4	31,741 10 0	14,837 8 8
1888–89.			
Roads on goldfields	10,253 5 3	4,304 3 9	13,218 11 6
Roads and tracks undertaken by County Councils, subsidised by Mines Department	7,318 1 0	2,466 16 8	5,195 6 1
Works undertaken by prospecting associations and companies, subsidised by Mines Department	474 0 0	236 0 0	687 8 0
Construction of drainage- and sludge-channels, subsidised by Mines Department	..	54 10 6	..
Wharves, contributions by Mines Department	589 19 5	96 6 0	343 13 5
Aids to treatment of ores, subsidised	..	209 1 9	..
Schools of Mines	895 16 10	1,188 6 10	44 14 3
	19,531 2 6	8,555 5 6	19,489 13 3
1889–90.			
Roads on goldfields	3,834 9 7	9,148 5 9	8,005 5 4
Roads and tracks undertaken by County Councils, subsidised by Mines Department	8,507 15 8	3,451 17 11	5,928 1 3
Works undertaken by prospecting associations and companies, subsidised by Mines Department	..	..	663 0 0
Water-races	2,200 0 0	719 0 0	681 0 0
Wharves	..	150 0 0	193 13 5
Schools of Mines	1,040 0 8	1,034 0 11	50 14 0
Aids to treatment of ores	142 8 9	142 8 9	..
Tracks to open up mineral lands	1,000 0 0	207 3 6	792 16 6
Diamond drills	425 14 5	425 14 5	..
	17,150 9 1	15,278 11 3	16,314 10 6
1890–91.			
Roads on goldfields	8,811 14 4	10,815 14 8	5,201 5 0
Roads and tracks undertaken by County Councils, subsidised by Mines Department	2,703 5 0	2,252 5 5	5,027 8 4
Works undertaken by prospecting associations and companies, subsidised by Mines Department	..	..	663 0 0
Water-races	5,542 19 8	6,234 4 6	..
Wharves	..	39 9 9	..
Schools of Mines	3,847 10 0	3,898 4 0	..
Tracks to open up mineral lands	..	78 4 7	419 19 5
	20,905 9 0	23,319 2 11	11,311 12 9
1891–92.			
Roads on goldfields	14,226 5 1	8,460 0 3	11,767 9 10
Roads and tracks undertaken by County Councils, subsidised by Mines Department	3,162 0 0	1,720 18 6	4,937 10 2
Work undertaken by prospecting associations and companies, subsidised by Mines Department	1,455 5 5	336 15 9	1,663 0 0
Water-races	2,256 13 6	2,256 13 6	..
Wharves	..	..	..
Schools of Mines	1,370 19 9	1,370 19 9	..
Tracks to open up mineral lands	40 0 0	41 16 0	418 3 7
	22,511 3 9	14,187 3 9	18,786 3 7

SUMMARY OF WORKS CONSTRUCTED—*continued.*

Nature of Works.	Total Cost of Construction, or Amount authorised to be expended.	Expenditure, by way of Subsidy or otherwise, by Mines Department.	Amount of Liability by Mines Department on Works in Progress.
1892–93.	£ s. d.	£ s. d.	£ s. d.
Roads on goldfields	15,199 2 4	17,325 10 0	9,628 6 10
Roads and tracks undertaken by County Councils, subsidised by Mines Department	550 0 0	1,033 0 0	4,831 9 10
Works undertaken by prospecting associations and companies, subsidised by Mines Department	970 4 9	865 4 3	1,768 0 6
Water-races	3,811 1 10	3,811 1 10	..
Wharves	..	..	..
Schools of Mines	1,232 4 4	1,232 4 4	..
Tracks to open up mineral lands	..	..	419 19 5
Artesian-well boring, Maniototo Plains	550 0 0	281 3 6	268 16 6
	22,312 13 3	24,548 3 11	16,916 3 1
1893–94.			
Roads on goldfields	18,418 19 2	15,056 0 11	13,013 18 5
Roads and tracks undertaken by County Councils, subsidised by Mines Department	5,038 11 6	2,718 17 8	5,576 10 7
Works undertaken by prospecting associations and companies, subsidised by Mines Department	2,245 19 4	1,709 18 5	1,027 7 11
Water-races	5,271 17 1	5,271 17 1	900 0 0
Drainage-channels	..	..	1,000 0 0
Wharves	..	..	..
Schools of Mines	1,555 19 9	1,555 19 9	..
Tracks to open up mineral lands	..	..	..
Repairing flood damages	500 0 0	500 0 0	..
Artesian-well boring, Maniototo Plains	800 0 0	518 16 6	..
	33,831 6 10	27,331 10 4	21,517 16 11
1894–95.			
Roads on goldfields	20,908 13 7	15,160 3 5	18,752 10 7
Roads and tracks undertaken by County Councils, subsidised by Mines Department	685 18 4	2,295 9 2	1,934 5 7
Works undertaken by prospecting associations and companies, subsidised by Mines Department	10,805 15 4	2,378 13 2	3,006 13 0
Water-races	4,801 19 7	2,427 10 11	2,151 18 8
Drainage-channels	1,521 0 0	673 14 10	3,647 5 2
Wharves	..	..	..
Schools of Mines	999 8 6	999 8 6	..
Tracks to open up mineral lands	..	..	..
Repairing flood damages	..	..	..
Artesian-well boring, Maniototo Plains	505 19 11	505 19 11	..
Diamond-drills	..	..	..
	40,228 15 3	24,440 19 11	29,492 13 0
1895–96.			
Roads on goldfields	14,554 0 7	19,970 6 6	14,086 4 8
Roads and tracks undertaken by County Councils, subsidised by Mines Department	4,614 11 1	1,607 8 6	4,290 16 11
Works undertaken by prospecting associations and companies, subsidised by Mines Department	3,477 7 0	1,726 4 8	10,093 3 0
Water-races	6,820 18 3	5,162 9 2	2,515 7 9
Drainage-channels	5,100 0 0	2,240 5 1	2,657 0 1
Wharves	..	..	..
Schools of Mines	999 3 0	999 3 0	..
Tracks to open up mineral lands	..	..	..
Repairing flood damages	..	..	..
Artesian-well boring, Maniototo Plains	..	..	..
Diamond-drills	216 1 6	216 1 6	..
	35,782 1 5	31,921 18 5	33,642 12 5
1896–97.			
Roads on goldfields	57,685 9 6	30,720 12 7	35,622 15 3
Roads and tracks undertaken by County Councils, subsidised by Mines Department	11,677 0 0	1,759 6 5	4,079 18 3
Works undertaken by prospecting associations and companies, subsidised by Mines Department	1,570 7 3	1,533 6 7	2,915 14 3
Water-races	3,090 11 1	3,927 18 0	1,678 0 10
Drainage-channels	1,409 0 0	2,149 3 11	2,516 16 2
Wharves	..	..	..
Schools of Mines	1,682 19 5	1,682 19 5	..
Tracks to open up mineral lands	..	..	..
Repairing flood damage	..	..	..
Artesian-well boring, Maniototo Plains	..	..	..
Resumption of land	300 0 0	300 0 0	..
Prospecting deep levels	25,500 0 0	2,697 14 5	22,802 5 7
	102,915 7 3	44,771 1 4	69,615 10 4

SUMMARY OF WORKS CONSTRUCTED—*continued.*

Nature of Works.	Total Cost of Construction, or Amount authorised to be expended.	Expenditure, by way of Subsidy or otherwise, by Mines Department.	Amount of Liability by Mines Department on Works in Progress.
SUMMARY.	£ s. d.	£ s. d.	£ s. d.
Roads on goldfields	245,854 7 0	205,553 5 5	49,708 19 11
Subsidised roads and tracks	141,050 15 7	75,916 13 9	8,370 15 2
Subsidised roads and tracks other than on goldfields ..	6,146 9 10	4,759 6 2	..
Prospecting	67,106 1 11	21,469 15 7	13,008 17 3
Water-races	71,560 15 11	67,258 10 3	4,193 8 7
Wharves	435 15 9	285 15 9	..
Schools of Mines	20,827 2 6	20,827 2 6	..
Drainage-channels	29,431 9 3	19,948 9 1	5,173 16 3
Diamond-drills	5,170 11 4	3,428 11 4	..
Treatment of ores	1,342 8 9	742 8 9	..
Tracks to open up mineral lands	325 8 1	325 8 1	..
Artesian-well boring, Maniototo Plains	800 0 0	800 0 0	..
Repairing flood damages	500 0 0	500 0 0	..
Prospecting deep levels	25,500 0 0	2,697 14 5	22,802 5 7
Resumption of land	300 0 0	300 0 0	..
	616,351 5 11	424,813 1 1	103,258 2 9

It will be seen from the foregoing statement that works to the value of £102,915 were authorised during the past year, as against £35,782 for the previous year, whilst the expenditure during the period referred to was £44,771, as against £31,922 for the year previous, leaving the liabilities on works authorised and in progress on the 31st March last to be £69,616. The actual cost of works undertaken, completed, and in progress during the last fourteen years that votes for this purpose have been under the direct control of the Mines Department for the development of the goldfields has been £616,351, out of which the Government has expended £424,813 in subsidies to local bodies and direct grants for the construction of the different works, whilst £191,538 has been contributed by local bodies and prospecting associations.

In furnishing the foregoing report it has been my endeavour to follow the lines adopted in preceding reports. In consequence of my appointment being made in the middle of the year it was beyond my power to make a personal inspection of all the mines and note the special requirements in the different districts throughout the colony. Quartz-mining having attracted the chief attention of the investing public, reports on that branch of the industry have been prominently dealt with, and I have advanced opinions based on past experience respecting the success, probable advancement, and permanency of the profitable mining and treatment of ores.

The introduction of capital, which is being devoted to further develop the mines in the more important mining districts, and to carry on explorations in the lately-discovered quartz reefs, will further extend the area of production, and the effective nature of the machinery which is being introduced, by lessening the cost of production and extraction, should increase the returns of gold.

The alluvial deposits, the river-beds, and the accumulations of auriferous drift which occupy such extensive areas throughout the west coast and the southern portions of the Middle Island will in future receive that notice their importance warrants, but to which, through force of circumstances, I have been unable to direct as much attention in the present report as I should wish.

Dredging operations are being conducted with profit in Otago and Southland, and there are numerous places where the gravels on the higher lands contain sufficient gold to pay if water were available for sluicing operations to be carried on. In order to render alluvial workings, hydraulic sluicing, and dredging more profitable an increased water-supply is necessary, and without doubt there is room for the investment of capital in the construction of water-races and dredges.

The mining industry generally would at present appear to be in a more satisfactory condition than it has been for many years past, and I fully expect that by the judicious expenditure of the capital which has been directed to this colony towards the expansion of mining it will be my pleasing duty next year to report a continued advancement in all branches of the industry in New Zealand.

I have, &c.,

GEO. WILSON,
Inspecting Engineer.

LIST of WORKS on GOLDFIELDS undertaken wholly by the Mines Department, or by Subsidies to County Councils, Local Bodies, and Prospecting Associations, in Progress on the 31st March, 1897.

Locality and Nature of Works.	Total Cost, or Amount authorised.	Amount of Contribution paid by Mines Department.	Amount due by Mines Department on Works still in Progress.
NORTH ISLAND.			
ROADS (SUBSIDISED).			
Bay of Islands County.	£ s. d.	£ s. d.	£ s. d.
Road from Taumarere Railway-station to Puhipuhi Township	482 0 0	146 0 0	95 0 0
Road-works at Ohaeawai	1,000 0 0	..	500 0 0
	1,482 0 0	146 0 0	595 0 0
Coromandel County.			
Bridge across Warekaho Creek	150 0 0	..	150 0 0
Mahikurau Creek Road	200 0 0	150 0 0	50 0 0
Carroll's Bridge	200 0 0	..	200 0 0
Horne's Bridge	100 0 0	..	100 0 0
Road from Main Kennedy Bay Road to Monte Carlo and other claims	150 0 0	..	150 0 0
	800 0 0	150 0 0	650 0 0
Thames County.			
Hape Creek Road	150 0 0	14 0 0	61 0 0
Karaka Creek Road	150 0 0	25 0 0	50 0 0
Te Papa Gully Road	100 0 0	..	50 0 0
Omahu-Tairua Road	50 0 0	42 0 0	8 0 0
	450 0 0	81 0 0	169 0 0
Thames Borough.			
Low-level tunnel, Jubilee Mine, Waitekauri (E. Kersey Cooper)	1,500 0 0	42 12 0	707 8 0
Ohinemuri County.			
Drain along Mill Road, Paeroa	123 0 0	22 10 0	100 10 0
Road from Thames Road to Netherton Punt	100 0 0	..	50 0 0
Road running south on left bank of Waihou River ..	600 0 0	..	400 0 0
Komata Creek Road	600 0 0	227 17 11	72 2 1
Drain along railway-line to Waihou River	137 10 0	..	68 15 0
Road from Paeroa Bridge to Kuaoti Bridge	400 0 0	..	133 6 8
	1,960 10 0	250 7 11	824 13 9
Te Aroha Town Board.			
Repairs, flood-damages	150 0 0	..	75 0 0
Tauranga County.			
Katikati-Waihi Road	300 0 0	100 0 0	50 0 0
Piako County.			
Repairs, Upper Premier Track, and new track towards Waitawheta	40 0 0	..	20 0 0
Matamata Road Board.			
Repairs, flood-damages	300 0 0	..	100 0 0
MIDDLE ISLAND.			
ROADS (SUBSIDISED).			
Waimea County.			
Repairs, Wangapeka Track	100 0 0	..	50 0 0
Buller County.			
Road to Piper's Flat, Addison's	150 0 0	..	75 0 0
Road to Four-mile Creek, Charleston	500 0 0	..	250 0 0
	650 0 0	..	325 0 0
Grey County.			
Marsden-Dunganville Road	100 0 0	..	50 0 0
Tuapeka County.			
Metalling road between Lawrence and Waipori	550 0 0	291 3 6	58 16 6
Miller's Flat Bridge	2,000 0 0	50 0 0	950 0 0
	2,550 0 0	341 3 6	1,008 16 6
Vincent County.			
Renewal, bridge to Bannockburn	1,200 0 0	..	600 0 0
Lake County.			
Skipper's Bridge	3,000 0 0	..	1,500 0 0
Southland County.			
Dray-road to Ferry Terrace, Nokomai	100 0 0	..	50 0 0

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost, or Amount authorised.	Amount of Contribution paid by Mines Department.	Amount due by Mines Department on Works still in Progress.
WORKS CONSTRUCTED WHOLLY BY MINES DEPARTMENT.	£ s. d.	£ s. d.	£ s. d.
Puriri to Tairua	233 0 0	207 0 0	26 0 0
Kauaeranga Valley Road	226 10 0	..	226 10 0
Waiomo to Monowai	31 6 0	..	31 6 0
Puriri to mines	100 0 0	97 2 6	2 17 6
Waitahi Village Settlement	12 1 6	..	12 1 6
Maratoto to mines	169 13 9	149 5 6	20 8 3
Wharepoa Settlement Road	379 7 5	223 16 0	155 11 5
Netherton Road	75 0 0	28 14 6	46 5 6
Whangamata Road	75 0 0	..	75 0 0
Katikati–Karangahake Track	100 0 0	11 13 4	88 6 8
Pack-track from Kirikiri	50 0 0	..	50 0 0
Track to Waitakohe Goldfield	50 0 0	..	50 0 0
Bartlett's Creek Track	200 0 0	183 10 4	16 9 8
Extending road into bush, Addison's	100 0 0	..	100 0 0
Prospecting track, Lyell to Larry's	100 0 0	15 0 0	85 0 0
Hatter's Terrace, Haupiri	200 0 0	..	200 0 0
Kinsella's land taken for Blackball Road	34 0 0	5 11 0	28 9 0
Repairs, flood-damages, South Westland	100 0 0	..	100 0 0
Track, Ross Road towards ranges	200 0 0	..	200 0 0
Repairs, pack-track to Cedar Creek	100 0 0	..	100 0 0
Thompson's Track	3,385 0 0	2,809 3 1	575 16 11
Hikutaia–Waihi	1,815 0 0	1,315 0 0	500 0 0
Upper Waitekauri Bridge	250 0 0	..	250 0 0
Paeroa to Waitoa	705 13 4	205 13 4	500 0 0
Road-formation, Waitekauri to Cross Road	300 0 0	..	300 0 0
Junction to Waihi Road to New Find	328 8 0	128 8 0	200 0 0
Waihi to Whangamata	300 0 0	..	300 0 0
Paeroa–Te Aroha Road, bridge and culverts	300 0 0	200 0 0	100 0 0
Tairua to Whenuakite	300 0 0	200 0 0	100 0 0
Tiki to Kaimarama and Gum Town	300 0 0	250 0 0	50 0 0
Mercury Bay to Whenuakite and Boat Harbour	200 0 0	150 0 0	50 0 0
Tapu Creek extension	606 1 11	446 1 11	160 0 0
Thames to Waikawau	1,350 11 7	1,185 10 4	165 1 3
Thames to Hikutaia	800 0 0	731 10 6	68 9 6
Puru Creek Road	300 0 0	..	300 0 0
Turua Road	350 0 0	100 0 0	250 0 0
Hikutaia–Whangamata–Wires Track	400 0 0	40 3 0	359 17 0
Upper Waiotahi Road	492 10 0	410 15 0	81 15 0
Inland from Omahu	400 0 0	..	400 0 0
Upper Tararu Road	370 9 9	70 9 9	300 0 0
Matatoki Road	200 0 0	59 16 0	140 4 0
Puriri to east side of range and Tairua	500 0 0	..	500 0 0
Metalling Bowentown–Waihi Road	250 0 0	..	250 0 0
Tracks, Wakamarina and Mahakipawa	100 0 0	..	100 0 0
Remetalling Wakamarina Road	500 0 0	..	500 0 0
Havelock–Tuamarina Road	300 0 0	..	300 0 0
Gravelling road through Mr. Adams's property	100 0 0	94 9 0	5 11 0
Onamalutu–Wakamarina Track	400 0 0	138 16 0	261 4 0
Gravelling Onamalutu Track	100 0 0	..	100 0 0
Bartlett's Creek Road	150 0 0	..	150 0 0
Takaka–Collingwood Inland Road	500 0 0	150 0 0	350 0 0
Bonny Doon Road	500 0 0	..	500 0 0
Collingwood to Parapara	250 0 0	..	250 0 0
Anatoki Track	100 0 0	..	100 0 0
Takaka River Footbridge	150 0 0	..	150 0 0
Scott's Creek Bridge	100 0 0	..	100 0 0
Canaan Road	200 0 0	100 0 0	100 0 0
Repairing bridges, Staunton's and Doctor's Creeks	200 0 0	160 0 0	40 0 0
Road, Seddonville to Mokihinui Mine	100 0 0	..	100 0 0
" " "	300 0 0	100 0 0	200 0 0
Granity Creek southwards	200 0 0	..	200 0 0
Four-mile Bridge	100 0 0	..	100 0 0
Fox's Bridge	100 0 0	..	100 0 0
Fairdown to Waimangaroa	250 0 0	200 0 0	50 0 0
Wilson's Lead Road	150 0 0	..	150 0 0
Millerton Road	200 0 0	..	200 0 0
Road, Lyell Bridge to Ryan's	175 0 0	100 0 0	75 0 0
Track up Four-mile and Nile Rivers	400 0 0	..	400 0 0
Charleston Nine-mile Beach	200 0 0	150 0 0	50 0 0
Road, Promised Land to Karamea	300 0 0	..	300 0 0
Karamea Bridge	3,565 19 8	3,265 19 8	300 0 0
Track to Piper's Flat, Addison's	150 0 0	75 0 0	75 0 0
Hampden to Horse Terrace	3,484 0 0	3,450 18 6	33 1 6
Approaches, Matakitaki Bridge	280 0 0	218 15 0	61 5 0
Gannon's to Painkiller	250 0 0	196 10 6	53 9 6
Snowy Creek Bridge	300 0 0	..	300 0 0
Big River Road	4,571 0 0	3,892 19 1	678 0 11
Track to Adamstown	450 4 0	375 4 0	75 0 0
Reefton to Maruia	800 0 0	288 8 6	511 11 6
Maruia Road and horse-track *viâ* Castleanie's	200 0 0	..	200 0 0
Murray Creek to Painkiller	478 4 0	178 4 0	300 0 0
Footbridge across byewash, Ngahere–Blackball Ferry	150 0 0	..	150 0 0
Grey River to Moonlight	400 0 0	..	400 0 0
Moonlight to Paparoa	100 0 0	..	100 0 0

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost, or Amount authorised.	Amount of Contribution paid by Mines Department.	Amount due by Mines Department on Works still in Progress.
WORKS CONSTRUCTED BY MINES DEPARTMENT—*continued.*	£ s. d.	£ s. d.	£ s. d.
Footbridges, Cobden–Seven-mile Road	325 0 0	..	325 0 0
Track to Healey's Gully	150 0 0	..	150 0 0
Track, Fagan's Creek to top of Paparoa Range	300 0 0	..	300 0 0
Track, Lancashire Flat to head of Clearwater Creek	50 0 0	..	50 0 0
Blackball Track to Paparoa Ranges	600 0 0	..	600 0 0
Waipuna Road	200 0 0	..	200 0 0
Footbridge, Blackwater and Greenstone	300 0 0	250 0 0	50 0 0
Granville Road	100 0 0	..	100 0 0
Ahaura Bridge	1,000 0 0	500 0 0	500 0 0
Brown's Terrace to Arnold	200 0 0	150 0 0	50 0 0
Kumara to Greymouth	250 0 0	..	250 0 0
Brunnerton to Paparoa	200 0 0	50 0 0	150 0 0
Extension of Tucker's Flat Road	150 0 0	..	150 0 0
Bridge, Butcher's Creek, Kanieri Lake Road	120 0 0	..	120 0 0
Track, Waikupakupa, Ocean Beach, to main road	100 0 0	84 8 0	15 12 0
Track, Totara River to Constitution Hill	100 0 0	40 0 0	60 0 0
Wire bridge, Kapitea Creek, Lamplough Track	100 0 0	..	100 0 0
Wire bridge, Waiho River	150 0 0	..	150 0 0
Deviation of Larrikin's Road	1,494 16 5	1,375 4 2	119 12 3
Widening Milltown Track to Humphrey's Gully	300 0 0	..	300 0 0
Renewal of Fisherman's Creek Bridge	100 0 0	..	100 0 0
Doughboy Road	300 0 0	..	300 0 0
Widening track, Kanieri Lake to Milltown	300 0 0	..	300 0 0
Pack-track, Seddon's Terrace to Eel Creek	200 0 0	..	200 0 0
Prospecting track, Totara River to Farmer's Creek	200 0 0	..	200 0 0
Widening and repairing Lamplough Track	100 0 0	..	100 0 0
New bridge, Kapitea Creek, Loop-line Road	200 0 0	..	200 0 0
Stribbing's Creek Bridge	100 0 0	..	100 0 0
Extension of Gillam's Gully Road	150 0 0	..	150 0 0
Widening Seddon's Terrace Road extension	200 0 0	..	200 0 0
Widening road, Lake Mapourika to Waiho	500 0 0	..	500 0 0
Great South Road	10,846 9 7	9,528 9 6	1,318 0 1
Garston to Nevis	250 0 0	200 0 0	50 0 0
Nevis Valley Road	400 0 0	..	400 0 0
Punt, Hawea and Wanaka districts	300 0 0	..	300 0 0
Track up Shotover River	200 0 0	..	200 0 0
Arrowtown to Macetown	900 0 0	400 0 0	500 0 0
Waipori–Berwick Gorge Road	1,000 0 0	694 17 5	305 2 7
Riversdale to Waikaia	200 0 0	..	200 0 0
Walker's Creek Bridge	150 0 0	..	150 0 0
Landing Creek Bridge	300 0 0	..	300 0 0
Granity Creek Bridge	300 0 0	..	300 0 0
Dee Creek Bridge	300 0 0	..	300 0 0
Mangle's Creek Bridge	1,000 0 0	..	1,000 0 0
Wangapeka to Wanganui	1,066 9 10	683 10 2	382 19 8
Pine-tree Road, near Kanieri	75 0 0	44 14 7	30 5 5
Wire bridge, German Gully Track	120 0 0	..	120 0 0
Stafford to Awatuna	399 10 0	252 4 6	147 5 6
Karangarua Bridge	450 0 0	2 8 0	447 12 0
Okuru River Ford Track	200 0 0	..	200 0 0
Kokatahi Road	506 6 6	248 4 6	258 2 0
Reefton–Hokitika–Ross	3,540 0 0	3,266 5 2	273 14 10
Okarito River Bridge	300 0 0	276 13 4	23 6 8
Waiau to Preservation Inlet	1,000 0 0	..	1,000 0 0
Wangapeka Track, Rolling River to Kiwi Creek	150 0 0	3 10 4	146 9 8
Continuation, Wataroa–Bluff Track	200 0 0	..	200 0 0
Orepuki, Block I., Longwood	500 0 0	..	500 0 0
Drainage, Stafford Township	200 0 0	..	200 0 0
Widening Cook's River Flat Road	400 0 0	..	400 0 0
Tracks, Stewart Island	450 8 0	200 8 0	250 0 0
Table-land Horse-track	200 0 0	..	200 0 0
Gordon Settlement to Waharoa	600 0 0	..	600 0 0
Waiorongomai Road	300 0 0	..	300 0 0
Approach to railway-bridge, Te Aroha	150 0 0	..	150 0 0
	73,538 1 3	40,610 6 0	32,927 15 3
SCHOOLS OF MINES.			
Schools of Mines	14,577 2 6	14,577 2 6	..
Schools of Mines (Otago University)	6,250 0 0	6,250 0 0	..
	20,827 2 6	20,827 2 6	..
PROSPECTING SUBSIDIES.			
Miners' Association, Lowburn (E. Murrell)	20 0 0	13 5 0	6 15 0
Miners' Association, Lowburn (Scoles and party)	75 0 0	..	37 10 0
Miners' Association, Lowburn (Tillman and party)	57 10 0	..	57 10 0
Kapanga Gold-mining Company (Limited)	20,600 0 0	1,231 17 0	368 3 0
Puhipuhi Prospecting Association	200 0 0	13 15 0	86 5 0
Longwood Sluicing Company, Riverton	300 0 0	63 6 0	86 14 0
Thames County (F. and J. Wallis)	97 10 0	35 19 2	18 8 4
Thames County (Sheridan Company's tunnel, Tapu)	180 10 0	30 5 0	60 0 0
Thames County (Kelly and party)	100 0 0	..	50 0 0
Cinnabar Mining Company, Auckland (£1 for £1 10s.)	500 0 0	108 11 2	91 8 10

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost, or Amount authorised.	Amount of Contribution paid by Mines Department.	Amount due by Mines Department on Works still in Progress.
PROSPECTING SUBSIDIES—*continued.*	£ s. d.	£ s. d.	£ s. d.
H. H. Adams, Waiorongomai	250 0 0	48 3 9	76 16 3
Miners' Association, Ross (C. Porter)	226 0 0	125 3 0	2 17 0
Miners' Association, Ross (Coffey and party)	100 0 0	..	50 0 0
Miners' Association, Ross (Moye and Son)	15 10 0	6 10 6	8 19 6
Miners' Association, Ross (Gagliardi and party)	60 0 0	47 8 0	12 12 0
Drainage-tunnel, Dunedin Flat (£ for £)	1,800 0 0	837 10 4	221 13 11
Westland County, prospecting, Rimu	1,862 13 0	995 9 8	..
Westland County, prospecting, Kanieri	..	93 11 0	..
Westland County, prospecting (J. Staines)	96 0 0	4 10 0	43 10 0
Westland County, prospecting (O'Brien and Glynn)	40 0 0	36 10 6	3 9 6
Collingwood Prospecting Association	200 0 0	..	100 0 0
Te Aroha Town Board	100 0 0	32 5 0	17 15 0
Wairau Miners' Association	50 0 0	13 17 6	36 2 6
Upper Moutere Road Board	40 0 0	1 16 0	18 4 0
Buller County (Mohan and party)	220 0 0	71 8 6	38 11 6
Buller County (Samuel and party)	100 0 0	..	100 0 0
Buller County (Gardiner and McKay)	56 0 0	24 0 0	5 0 0
Buller County (Reaney and Rasmussen)	60 0 0	10 15 0	19 5 0
Buller County (Negri and others)	43 0 0	29 1 3	13 18 9
Buller County (N. Johnstone)	71 9 0	..	71 9 0
Buller County (Spence and party)	19 10 0	..	19 10 0
Buller County (Newton and party)	7 15 0	..	7 15 0
Buller County (Scarlett and McHarrie)	39 0 0	18 0 0	1 10 0
Tauranga County, Borrell Prospecting Association	52 0 0	10 0 0	16 0 0
Kumara Miners' Association (Scatterini and Anderson)	124 0 0	6 13 6	55 6 6
Kumara Miners' Association	40 0 0	..	20 0 0
Kumara Miners' Association (Henley and party)	58 14 0	2 8 0	26 19 0
Kumara Miners' Association (M. Manton)	57 10 0	3 18 9	24 16 3
Kumara Miners' Association (Rogers and Block)	75 0 0	35 6 6	3 13 6
J. Bowlker, Christchurch, Hororata district	42 0 0	15 0 0	6 0 0
Gold-mining League, Westport (McFarlane and others)	19 10 0	..	19 10 0
Frying-pan Tail-race	600 0 0	161 11 3	138 8 9
Prospecting Association, Mokihinui (French and others)	58 10 0	11 5 0	18 0 0
Prospecting Association, Westport	432 6 0	197 9 8	18 13 4
Dyer and party, Kuaotunu	120 0 0	37 16 0	22 4 0
Gillam's Gully Prospecting Association (Bramhall and party)	60 0 0	12 3 0	17 17 0
Miners' Association, Riverton	100 0 0	32 0 0	18 0 0
Kennedy-Waikaia Miners' Association, Invercargill	100 0 0	9 0 0	41 0 0
Inangahua District Miners' Association	100 0 0	25 17 6	24 2 6
T. Begg, Dunedin (Hindon Mines)	50 0 0	..	25 0 0
Tapanui Prospecting Association	40 0 0	6 10 0	23 10 0
New El Dorado Sluicing Company, Fat Boys, Criffel	300 0 0	94 4 9	55 15 3
Miners' Association, Greenstone (O'Donnell and party, and J. Pope)	75 0 0	30 4 3	7 5 9
Miners' Association, Greenstone (Crawford and party)	92 10 0	..	46 5 0
Miners' Association, Greenstone (Black and party)	13 10 0	9 0 0	4 10 0
Miners' Association, Fairlie	40 0 0	..	20 0 0
South British Prospecting Association, Lyell	135 0 0	6 15 0	60 15 0
Tinkers Miners' Association, Matakanui	60 0 0	3 0 0	27 0 0
Kanieri Prospecting Association	50 0 0	..	25 0 0
Prospecting tunnel, Boatman's (Walker and others)	302 10 0	40 4 3	114 15 9
Adit level, Maungatawhiri (G. B. Osmond)	120 0 0	52 2 6	22 17 6
Tunnel between Chatterbox and Patten's Creek (G. Clapton)	75 0 0	2 17 9	34 12 3
Miners' Association, Charleston	110 0 0	13 8 6	41 11 6
Port Charles Prospecting Association	20 0 0	11 8 0	8 12 0
Prospecting Association, Coromandel (Leahy and others)	200 0 0	88 0 0	12 0 0
Bay of Islands County, Puke Pokaka (G. Field)	112 13 0	90 3 0	22 10 0
Lake Mapourika Miners' Association	17 4 0	7 13 3	9 10 9
Cardrona Miners' Association	40 0 0	30 0 0	10 0 0
Pitchers and Kitto, Anderson's Flat	100 0 0	20 5 11	29 14 1
Miners' Association, Nelson Creek (Kelly and party)	23 5 0	9 18 0	13 7 0
Miners' Association, Nelson Creek (T. Potts)	45 0 0	37 10 0	7 10 0
Miners' Association, Dillman's	25 10 0	..	25 10 0
Miners' Association, Dillman's	7 10 0	..	7 10 0
Miners' Association, Upper Waikaia	19 10 0	7 0 0	12 10 0
Waimea County	16 3 6	..	16 3 6
Prospecting Association, Ngaruawhia	26 0 0	..	26 0 0
Merrie England Tunnel (Salter and party)	3 15 0	..	3 15 0
	31,746 17 6	5,013 12 8	2,915 14 3
PROSPECTING DEEP LEVELS.			
Thames-Hauraki Goldfields (Limited), Queen of Beauty shaft	25,000 0 0	2,593 11 1	22,406 8 11
Thames-Hauraki Goldfields (Limited), Queen of Beauty shaft, inspector's fee	500 0 0	104 3 4	395 16 8
	25,500 0 0	2,697 14 5	22,802 5 7

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost, or Amount authorised.	Amount of Contribution paid by Mines Department.	Amount due by Mines Department on Works still in Progress.
WATER-RACES.	£ s. d.	£ s. d.	£ s. d.
Survey, water-race, Ninety-mile Beach	67 0 0	23 11 11	43 8 1
Waimea–Kumara Water-race	30,895 5 5	29,907 3 9	988 1 8
Mount Ida Water-race	8,399 19 5	8,399 19 5	..
Improving water-supply, Oamaru	1,250 0 0	1,150 7 2	99 12 10
Gentle Annie Creek, Mata, R. Kelly	200 0 0	40 0 0	60 0 0
Finlay McLiver	400 0 0	34 5 4	165 14 8
Roaring Meg, Jones, Baxter and party	1,600 0 0	478 16 5	321 3 7
Argyle Water-race	400 0 0	200 0 0	..
	43,212 4 10	40,234 4 0	1,678 0 10
DRAINAGE- AND TAILINGS-CHANNELS.			
Kumara Sludge-channel No. 5	3,346 10 0	2,463 5 9	883 4 3
Rimu Drainage-channel	500 0 0	191 19 6	58 0 6
Trustees' Main Tail-race, Waimea	1,000 0 0	885 19 1	114 0 11
Kelly's Terrace Tunnel	1,562 10 0	113 16 3	1,448 13 9
Branch tail-race, No. 4 Channel (Payne and party) ..	100 0 0	87 3 3	12 16 9
	6,509 0 0	3,742 3 10	2,516 16 2

Summary of Works.

	£ s. d.	£ s. d.	£ s. d.
Roads (subsidised)—			
Bay of Islands County	1,482 0 0	146 0 0	595 0 0
Coromandel County	800 0 0	150 0 0	650 0 0
Thames County	450 0 0	81 0 0	169 0 0
Thames Borough	1,500 0 0	42 12 0	707 8 0
Ohinemuri County	1,960 10 0	250 7 11	824 13 9
Te Aroha Town Board	150 0 0	..	75 0 0
Tauranga County	300 0 0	100 0 0	50 0 0
Piako County	40 0 0	..	20 0 0
Matamata Road Board	300 0 0	..	100 0 0
Waimea County	100 0 0	..	50 0 0
Buller County	650 0 0	..	325 0 0
Grey County	100 0 0	..	50 0 0
Lake County	3,000 0 0	..	1,500 0 0
Tuapeka County	2,550 0 0	341 3 6	1,008 16 6
Southland County	100 0 0	..	50 0 0
Vincent	1,200 0 0	..	600 0 0
	14,682 10 0	1,111 3 5	6,774 18 3
Works constructed wholly by Mines Department ..	73,538 1 3	40,610 6 0	32,927 15 3
Schools of Mines	20,827 2 6	20,827 2 6	..
Prospecting subsidies	31,746 17 6	5,013 12 8	2,915 14 3
Water-races	43,212 4 10	40,234 4 0	1,678 0 10
Drainage- and tailings-channels	6,509 0 0	3,742 3 10	2,516 16 2
Prospecting deep levels	25,500 0 0	2,697 14 5	22,802 5 7
Total	216,015 16 1	114,236 6 10	69,615 10 4

LIST of WORKS on GOLDFIELDS constructed wholly by the Mines Department, or by Subsidies to County Councils, Local Bodies, and Prospecting Associations, and completed prior to the 31st March, 1897.

Locality and Nature of Works.	Total Cost.	Amount of Contribution paid by Mines Department.
NORTH ISLAND.		
ROADS (SUBSIDISED).		
Bay of Islands County.	£ s. d.	£ s. d.
Tiriwhanga Gorge to Galbraith's Road, Puhipuhi	237 0 0	118 10 0
Air-line Road to battery-site, Puhipuhi	73 0 0	36 10 0
Tiriwhanga Gorge to Puhipuhi	800 0 0	800 0 0
New Bay of Islands Coal Company	500 0 0	250 0 0
	1,610 0 0	1,205 0 0
Coromandel County.		
Improving road to Iona and Just in Time Companies' mines	200 0 0	133 6 8
Making and improving track from Tokatea towards Kennedy Bay	320 0 0	213 6 8
Golden Belt Track	100 0 0	50 0 0
Tokatea Road (repairs)	300 0 0	150 0 0
Making and improving track from Golden Belt to Tiki	239 3 3	159 8 10

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost.			Amount of Contribution paid by Mines Department.		
Coromandel County—continued.	£	s.	d.	£	s.	d.
Making road from Ring's Bridge to Kapanga Mine	150	0	0	100	0	0
Making road to Kapanga Mine	132	0	0	88	0	0
Temporary track from Tokatea Saddle to Waikoromiko	50	0	0	33	6	8
Continuation of track from Success Company's mine to top of main range	80	0	0	53	6	8
Completion of road from Tokatea Saddle to Tokatea Battery	50	0	0	33	6	8
Widening road from Matawai to Vaughan's claim	357	0	0	238	0	0
Improving track, Mercury Bay to Waitai	100	0	0	66	13	4
Continuation and improving Waikoromiko Track	150	0	0	100	0	0
Emily Battery to Rocky Creek	60	0	0	40	0	0
Track, Bismarck Battery to Kennedy Bay	200	0	0	133	6	8
Road up Manaia	675	10	6	450	7	0
Extension of Vaughan's and Vizard's Tracks	150	0	0	100	0	0
Vizard's towards Marebel	200	0	0	133	6	8
Extending and widening Waitaia Road	100	0	0	66	13	4
Makarau to Waiau	1,600	0	0	1,066	13	4
Waikawau to Tiki	500	0	0	333	6	8
Paul's Creek to Cabbage Bay	200	0	0	133	6	8
Waikawau Creek Track	100	0	0	50	0	0
McLaughlin's Road	100	0	0	50	0	0
Manaia to McGregor's new find	100	0	0	50	0	0
Manaia to Tiki	500	0	0	250	0	0
Old sawmill towards Matawai	200	0	0	100	0	0
Extension of Paul's Creek Track	300	0	0	150	0	0
Matarangi Track	400	0	0	200	0	0
Thames–Coromandel Road, *viâ* Manaia	300	0	0	150	0	0
Harbour View extension	210	0	0	105	0	0
Kapanga to Paul's Creek	200	0	0	100	0	0
Mercury Bay to Kuaotunu	360	0	0	180	0	0
Wainara to Kuaotunu	450	0	0	225	0	0
Sea-beach to Kuaotunu	1,650	0	0	1,450	0	0
Just in Time Road, extension to Coromandel	450	0	0	225	0	0
Road, Waikawau Bridge to McLaughlin's	67	10	0	45	0	0
Mercury Bay Road	990	0	0	495	0	0
Bridge to Dugend's store, and widening and metalling road from bridge to Log Hut	450	0	0	300	0	0
Road from junction of Red Mercury battery up Pumpkin Flat to Waitaia	345	0	0	230	0	0
To connect road from Log Hut to commencement of contract of Kuaotunu–Mercury Bay Road	150	0	0	100	0	0
Road, with culverts and bridge, from Kapanga Hill to Scotty's Gold-mining Company's mine	200	0	0	150	0	0
Pumpkin Flat–Just in Time Road	310	0	0	170	0	0
Lower road from Great Mercury battery to Kapai low level and battery-site	450	0	0	300	0	0
Road from main road, Kapanga to Success Mine	600	0	0	300	0	0
Cemetery Road and Bridge, Kuaotunu	100	0	0	75	0	0
Road from Coromandel–Kennedy Bay Main Road to Wareroa Creek	300	0	0	150	0	0
Leading Wind Mine Road	100	0	0	50	0	0
	15,296	3	9	9,525	15	10
Te Aroha Town Board.						
Road to connect with railway-station	120	0	0	60	0	0
Lipsey's Bridge	64	0	0	32	0	0
	184	0	0	92	0	0
Thames County.						
Making new road from Ohinemuri River to Karangahake Quartz-mine	650	0	0	433	6	8
Dray-road to connect Otanui Mines with crushing-battery at Maungawherawhera Creek	710	0	0	473	6	8
Improving roads from Waitekauri Road to Katikati Road	250	0	0	166	13	4
Improving road up Karaka Creek to Lucky Hit Company's mine	263	1	0	175	7	4
Improving road to upper mines, Waitahi	258	18	10	172	12	7
Karangahake to battery	300	0	0	200	0	0
Ralph's Battery, Waitekauri	399	1	0	199	10	6
Otanui Road to mines	299	18	0	199	18	8
Road to Wick's Battery	70	0	0	46	13	4
Rocky Point Road, Tararu	300	0	0	200	0	0
Thames Borough boundary to hæmatite-mine	350	0	0	233	6	8
Widening road from bridge over Hape Creek to Otanui Mines	183	17	0	122	11	4
Track, Karangahake Goldfield	784	1	0	522	14	0
Kauaeranga Valley to Otanui	470	7	0	313	11	4
Tapu Road to mines	81	17	9	54	11	10
Tauranga Road to Karangahake Bridge site	341	5	0	227	10	0
Karangahake Bridge	229	6	6	152	17	8
Track up Maungakerikeri Creek	93	4	4	62	2	11
Thames Borough boundary to Hape Creek No. 2	600	0	0	300	0	0
Upper Karaka Road	179	13	0	119	15	4
Repairing flood-damages, Waiotahi, Moanataiari, Karaka, and Collarbone Roads	350	0	0	175	0	0
Sea-beach to Waiomo	750	0	0	375	0	0
Te Papa Gully Road	75	0	0	37	10	0

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost.	Amount of Contribution paid by Mines Department.
Thames County—continued.	£ s. d.	£ s. d.
New Find to Waiomo Battery	110 0 0	55 0 0
Rocky Point Road	429 11 10	214 15 11
Waiotahi towards Mercury Bay	522 11 0	261 5 6
Te Mata Road	178 17 6	89 8 9
Waiomo Creek to Tapu	1,499 0 0	749 10 0
Alabama Creek Track	100 0 0	50 0 0
Road from Prospectors' Mine, Puriri, to battery	50 0 0	25 0 0
Karaka Creek to Lucky Hit	365 0 0	182 10 0
Bullion Mine, Tapu, to battery	36 5 0	18 2 6
Track to Hikutaia Goldfield	147 15 2	73 17 7
Upper Tararu Road to Sylvia Mine	684 7 0	342 3 6
Road to Puriri Battery	11 13 0	5 16 6
Thames–Waikawau Road	37 10 0	18 15 0
Track from Tararu Creek Road to McDermot's Claim	45 0 0	22 10 0
Track to Try Fluke Claim, Tapu	94 15 0	47 7 6
Waiomo to Puhoi Creek	33 0 0	16 10 0
Waiokaraka Road, Bella Street, and Campbell Street to Moanataiari Creek	200 0 0	100 0 0
Moanataiari Creek Road	100 0 0	50 0 0
Tararu Creek Road and Tararu Road	150 0 0	75 0 0
	12,784 15 11	7,361 12 11
Ohinemuri County.		
Jubilee Mine Track	118 0 0	59 0 0
Track up Tui Creek	306 0 0	153 0 0
Prospecting track, Whangamata and Waitekauri	200 0 0	166 13 4
Tramway, Karangahake to Railey's reduction-works	400 0 0	200 0 0
Strengthening bridges, Waihi Road	200 0 0	133 6 8
Paeroa to Hikutaia	400 0 0	200 0 0
Repairs, flood-damages	34 13 8	17 6 10
Hikutaia River to Marototo Mine	180 15 0	90 7 6
Karangahake through Gorge (bridge and culverts)	200 0 0	100 0 0
Waitekauri Lower Road	360 0 0	189 2 8
Metalling Karangahake Gorge Road	170 0 0	85 0 0
Karangahake and Waihi Road	237 10 0	118 15 0
Karangahake Hill Track	87 4 0	43 12 0
Bridge over Ohinemuri River at Karangahake	12 11 0	6 5 6
Hikutaia–Paeroa Road	500 0 0	250 0 0
Paeroa–Te Aroha Road	200 0 0	100 0 0
Tui Creek Track	129 18 6	64 19 3
Waitekauri to Lowrie's and Birnie's	200 0 0	100 0 0
Road, Karangahake to Waihi	246 12 3	164 8 2
Lower Waitekauri Road	347 13 4	230 16 4
	4,530 17 9	2,472 13 3
Piako County.		
Extension and completion of Te Aroha Tramway	18,000 0 0	12,000 0 0
Tramway to Fergusson's Battery, Waiorongomai	1,500 0 0	1,000 0 0
Road, Waiorongomai	497 17 0	331 18 0
Track to claims at Buck's Reef	55 5 6	36 17 0
Track, Fern Spur to Butler's Spur	231 17 9	154 11 10
Tracks up Stony Creek, Te Aroha Goldfield, &c.	54 0 0	36 0 0
	20,339 0 3	13,559 6 10
Hutt County.		
Road to connect Otorongo Bay with Albion Company's battery, also to connect Terawhiti Quartz-mine with battery	509 16 6	210 17 0
Road, Makara Junction to Terawhiti	450 0 0	225 0 0
	959 16 6	435 17 0
SOUTH ISLAND.		
(ROADS SUBSIDISED).		
Marlborough County.		
Track, Deep Creek to Dead Horse Creek	68 0 0	45 6 8
Mouth of Gorge to Forks, Cullensville to Mahakipawa Diggings	450 0 0	225 0 0
Formation of road at Cullensville, Mahakipawa	217 4 0	108 12 0
Havelock–Mahakipawa Road	905 0 0	505 0 0
Dead Horse Creek to Sunnyside	75 0 0	50 0 0
	1,715 4 0	933 18 8
Waimea County.		
Road to open up Table Diggings	260 0 0	130 0 0
Punt over Motueka River	100 0 0	50 0 0
Repairing Baton to Table-land Track	40 0 0	20 0 0
Dove River to Baton Saddle, and from Rolling River to Wangapeka Saddle	120 0 0	60 0 0
	520 0 0	260 0 0

LIST of WORKS on GOLDFIELDS, &c.—*continued*.

Locality and Nature of Works.	Total Cost.			Amount of Contribution paid by Mines Department.		
Collingwood County.	£	s.	d.	£	s.	d.
Road, West Wanganui	300	0	0	200	0	0
Bridge over Aorere River	173	14	0	115	16	0
Extending Anatoki Bridle-track	160	0	0	80	0	0
Bridge over Takaka River at Pain's Ford	1,597	7	8	798	13	10
	2,231	1	8	1,194	9	10
Buller County.						
Deviation of road from Candlelight Flat to Deep Creek, Charleston	370	0	0	246	13	4
Road from Orowaiti Lagoon to North Terrace	256	18	6	171	5	8
Prospecting track from Razorback to Paparoa Range	100	0	0	66	13	4
Track from Seatonville to Larrikin's	438	9	6	292	6	4
Waimangaroa to Denniston	787	0	0	393	10	0
Road to connect alluvial workings with Charleston Road	400	0	0	266	13	4
Track, Four-mile Creek towards Grey Valley	300	0	0	200	0	0
Road to connect alluvial diggings north of Deadman's Creek	278	0	0	185	6	8
Ngakawau to Mokihinui, *viâ* beaches	100	0	0	66	13	4
Road to connect Ngakawau Railway with Mokihinui Coal Company's workings	193	0	0	128	13	4
Lyell Bluff to Victor Emmanuel Claim	650	0	0	433	6	8
Beach, Little Wanganui to Mokihinui	300	0	0	100	0	0
Cape Foulwind Road	450	0	0	300	0	0
Road up Nile Valley	56	16	4	28	8	2
Denniston extension	850	0	0	425	0	0
Promised Land towards Motueka	380	0	0	190	0	0
Road over Gentle Annie	200	0	0	100	0	0
Extension, Lyell Creek to Low-level Tunnel	60	0	0	30	0	0
Extension of track 50 chains south of Brighton	140	0	0	70	0	0
Continuation of road, Deadman's Creek	437	17	0	218	18	6
Ngakawau Railway-station to Mokihinui	50	0	0	25	0	0
Addison's Flat towards ranges	20	0	0	10	0	0
North Terrace to Oparara Diggings	500	0	0	333	6	8
Extension of Croninville Road	100	0	0	50	0	0
Waimangaroa to sea-beach	80	0	0	40	0	0
Extension of track, Oparara to Fenian Creek	100	0	0	50	0	0
Con's Creek to Beaconsfield	80	0	0	40	0	0
Addison's Flat to Caroline Terrace	200	0	0	100	0	0
Waimangaroa to sea-beach extension	390	0	0	195	0	0
Addison's Flat to Gallagher's Lead	50	0	0	25	0	0
Road to Swanston's Gold-mining Company	50	0	0	25	0	0
Repairs to roads at Lyell	200	0	0	100	0	0
Track, Fairdown from North Terrace	150	0	0	97	8	0
	8,718	1	4	5,004	3	4
Inangahua County.						
Dray-road from Soldier's Creek to Devil's Creek	647	0	0	431	6	8
Dray-road from Inangahua to Rainy Creek Battery	900	10	0	606	6	8
Dray-road from Capleston up Little Boatman's Creek	379	0	0	252	13	4
Dray-road from Capleston up Main Boatman's Creek	697	0	0	464	13	4
Dray-road from Westport Road to Inangahua River	224	5	0	149	10	0
Track from Devil's Creek to Big River	134	3	6	89	9	0
Track from Waitahu River to Capleston	358	0	0	238	13	4
Survey and expenses	250	0	0	166	13	4
Track from Cariboo to Big River	728	0	0	364	0	0
Dray-road up Murray Creek to United Inglewood Claim	3,472	0	0	2,314	17	4
Road from Reefton to Big River, *viâ* Devil's Creek	614	0	0	307	0	0
Road up Big River	922	19	0	615	6	0
Continuation of dray-road up Little Boatman's Creek	169	7	6	112	18	4
Road from Capleston to Larry's Creek	640	0	0	426	13	4
Track to connect Capleston with Lone Star	75	0	0	50	0	0
Crushington to Globe Company's workings	403	0	0	201	10	0
Snowy Creek Track	85	15	0	42	17	6
Reefton to Big River	1,792	0	0	1,194	13	4
Glenroy to Horse Terrace	254	0	0	122	10	0
Devil's Creek to Globe Hill	917	6	2	458	13	1
Extension of dray-road to Boatman's *viâ* Painkiller	53	17	6	26	18	9
Mangles Valley to McGregor's Station	600	0	0	300	0	0
Globe Hill to Merrijigs	1,397	6	0	698	13	0
Larry's Creek to Lyell	1,061	15	0	530	17	6
Widening Larry's Creek Road	118	10	0	59	5	0
Road up Burke's Creek, Little Boatman's	149	0	0	74	10	0
	17,052	14	8	10,309	8	10
Grey County.						
Road from No Town to Deep Creek	1,100	0	0	550	0	0
Road from Langdon's to Moonlight	1,600	0	0	800	0	0
Contribution from goldfields vote towards main road	2,296	6	6	2,296	6	6
Track, Waipuna to Clarke's River	1,200	0	0	800	0	0
Track, Cameron's to Cape Terrace	700	0	0	466	13	4
Road, Limestone to Maori Creek	800	0	0	533	6	8
Red Jack's to Nelson Creek	601	17	6	401	5	0
Barrytown to Deadman's	2,240	0	0	1,493	6	8

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost.	Amount of Contribution paid by Mines Department.
Grey County—continued.	£ s. d.	£ s. d.
German Gully to Arnold's Flat	120 0 0	60 0 0
Baird's Terrace to Lake Brunner	400 0 0	200 0 0
Hatter's Terrace Road	1,000 0 0	500 0 0
Irishman's to Lake Brunner	2,400 0 0	1,200 0 0
Hatter's Terrace	600 0 0	400 0 0
Track, Baird's Terrace to Irishman's	250 0 0	125 0 0
Deep Creek to Bell Hill	1,331 0 0	665 10 0
Track to Blackball Diggings	790 0 0	395 0 0
Track from Ahaura, Kapara, Reese's Flat, to new rush on banks of Ahaura River	20 0 0	10 0 0
Renewal, bridge over Nelson Creek, Marsden–Dunganville Road	38 0 0	19 0 0
Repairs (corduroying), Cobden–Seven-mile Road	36 0 0	18 0 0
Repairs, Cobden–Point Elizabeth Road	30 0 0	15 0 0
	17,553 4 0	10,948 8 2
Westland County.		
Improving track, Butcher's Creek to Gentle Annie Terrace	225 10 0	163 13 4
Bridle-track to Kanieri Lake	719 11 0	350 5 6
Bridle-track to Eel Creek	168 9 0	84 4 6
Tunnel-track, Galway Beach to Gillespie's Beach	437 5 0	218 12 6
Road from Duffer's Creek, Greenstone Road, to fifteen-mile peg, Christchurch Road	726 9 0	480 4 6
Continuation of track, Back Creek to Eel Creek	249 4 0	166 3 4
Bridle-track, Duffer's Creek, Bowen and Okarito Road, to sea-beach	333 18 0	222 12 0
Ross Borough boundary to Mount Greenland	1,280 15 0	853 16 8
Track, Kanieri Lake to Humphrey's Gully	279 2 0	186 1 4
Track, Larrikin's to Loop-line Dam	449 11 0	299 14 0
Rough Wainihinihi to Upper Dam	450 0 0	300 0 0
Browning's Pass to Reefs	3,311 6 0	2,207 10 8
Okarito Forks to Teal Creek	600 0 0	400 0 0
Road, Christchurch to Baldhill Range reefs	500 0 0	250 0 0
Extension of Tucker's Flat Road to New Rush	170 19 6	85 9 9
Hokitika Borough boundary (Reefton) to Shotover Rush	120 0 0	60 0 0
Track to New Rush, Back Creek	100 0 0	50 0 0
Repairing old track round Wataroa Bluff	50 0 0	25 0 0
New Rush, south side of Hokitika River	37 18 6	18 19 3
Cedar Creek Road to Farmer's Creek	55 7 0	27 13 6
Road to gold discovery near Blue Spur	75 0 0	37 10 0
Widening Seddon's Terrace Track	150 0 0	65 10 0
	10,490 5 0	6,562 0 10
Taieri County.		
Mullocky Gully to Silver Peak	499 15 0	333 3 4
Lake County.		
Track, Skipper's to Phœnix and Scandinavian Reefs	292 2 3	194 14 10
Track to connect scheelite-mine with Lake Wakatipu	225 0 0	150 0 0
Arrowtown to Macetown, construction	225 0 0	150 0 0
Arrowtown to Macetown, maintenance	150 0 0	100 0 0
Invincible Quartz-reef Track, Rees River	300 0 0	200 0 0
Rees Valley to company's workings	61 7 6	30 13 9
Pack-track, Criffel Diggings	50 6 6	33 11 0
Left-hand Branch Road, Skipper's	63 9 10	31 14 11
Old Morven Ferry Road	289 0 0	144 10 0
Road to workings above Cardrona	70 0 0	35 0 0
Piers, Victoria Bridge	725 0 0	362 10 0
Skipper's Road Saddle to Deep Creek	200 0 0	100 0 0
	2,651 6 1	1,532 14 6
Tuapeka County.		
Making road from top of Terrace to Waipori Bush	300 0 0	200 0 0
Road, Beaumont to Remarkable Bush	300 0 0	200 0 0
Improving road from Waipori Township to antimony-mines, Lammerlaw Ranges	200 0 0	133 6 8
Waipori Township to Waipori Bush	200 0 0	133 6 8
Clutha River to Campbell's	76 9 0	50 19 4
Waitahuna to copper-mine	200 0 0	133 6 8
Road to open up quarry for Waitahuna Bridge	160 9 10	106 19 11
Waipori Road, *vid* Bungtown	566 8 10	283 4 5
	2,003 7 8	1,241 3 8
Wallace County.		
Track, Colac Bay to Round Hill	200 0 0	133 6 8
Pack-track to Round Hill, Colac, and Orepuki	1,050 0 0	500 0 0
Cutting tracks, Longwood	59 6 0	29 13 0
	1,309 6 0	662 19 8

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost.	Amount of Contribution paid by Mines Department.
	£ s. d.	£ s. d.
Maniototo County.		
Road to Serpentine Diggings	136 10 0	91 0 0
Pig and Whistle to Clarke's Diggings	200 0 0	133 6 8
Shepherd's Hut Flat to Vinegar Hill	100 0 0	66 13 4
Kyeburn Peninsula to main road	82 0 0	41 0 0
	518 10 0	332 0 0
Fiord County.		
Dusky Sound, tracks	300 0 0	200 0 0
Waitaki County.		
Road, Naseby to Livingstone	41 12 0	20 16 0
Southland County.		
Improving tracks from Mataura to Nokomai	75 0 0	50 0 0
Improving road, Waikaka to Leatham	150 0 0	100 0 0
Improving road from Waikaka Township to Leatham Creek	30 0 0	20 0 0
Improving road from Waikaka to Waikaka railway-siding	150 0 0	100 0 0
Widening and improving bush-track to Waikawa	150 0 0	100 0 0
Waikaka to Switzer's	150 0 0	100 0 0
Road near Waikaka Township	150 0 0	100 0 0
Waikaia to Whitcombe	311 6 8	180 13 4
Waipapa to Six-mile Beach	175 0 0	87 10 0
Repairing bridges, Waikaia Bush	38 13 4	13 4 0
	1,380 0 0	851 7 4
DIAMOND AND OTHER DRILLS.		
Inangahua County Council (diamond)	2,000 0 0	1,000 0 0
Springfield Colliery Company (diamond)	1,250 0 0	625 0 0
Westland County Council (tiffin)	350 0 0	233 0 0
Diamond drills for prospecting purposes	1,570 11 4	1,570 11 4
	5,170 11 4	3,428 11 4
WHARVES.		
Repairs to wharf, Coromandel	300 0 0	150 0 0
Anikiwi Jetty, Marlborough	135 15 9	135 15 9
	435 15 9	285 15 9
AIDS TO PROSPECTING.		
Construction of low-level tunnel, Terawhiti	750 0 0	150 0 0
Queen of Beauty Company, prospecting deep levels	300 0 0	150 0 0
Caledonian Low-level Company, prospecting deep levels	300 0 0	150 0 0
Red Hill Gold-mining Company, prospecting deep levels	600 0 0	300 0 0
Caledonian Low-level Company, low-level tunnel	2,700 0 0	300 0 0
Lyell Creek Extended Company, low-level tunnel	300 0 0	150 0 0
New Cromwell Gold-mining Company	250 0 0	100 0 0
Deep-level Association, Waipori	450 0 0	300 0 0
Little Boatman's deep-level tunnel	600 0 0	300 0 0
Oterongia Prospecting Association	198 17 2	99 8 7
Vincent County	137 9 0	68 14 6
Tapanui Prospecting Association	25 0 0	12 10 0
Tuapeka County	12 0 0	6 0 0
Maniototo County	500 0 0	250 0 0
Pullar, Shelmerdine, and Basan	400 0 0	200 0 0
Royal Oak Association	300 0 0	150 0 0
Star of the East Quartz-mining Company	150 0 0	75 0 0
West Coast Prospecting Association	300 0 0	150 0 0
McBride and party	169 2 2	84 11 1
McLean and party	66 0 0	33 0 0
Deep-level Tunnel, Tokatea	700 0 0	350 0 0
Deep-level Tunnel, Owharoa	300 8 0	200 5 4
Deep-level Tunnel, Tapu	1,200 0 0	600 0 0
Deep-level Tunnel, Cedar Creek	1,207 10 0	603 15 0
Manuka Flat Prospecting Association	200 0 0	100 0 0
Red Hill Minerals Company	437 19 10	218 19 11
Tuapeka Prospecting Association	277 0 0	138 10 0
Cardrona Prospecting Association	800 0 0	400 0 0
Cromwell Prospecting Association	500 0 0	250 0 0
Coromandel County	550 0 0	275 0 0
Thames County	309 18 0	154 19 0
Thames Borough	200 0 0	100 0 0
Buller County	146 12 6	73 6 3
Inangahua County	488 7 0	244 3 6
Westland County	1,236 19 4	618 9 8
Grey County	871 15 2	435 17 7
Deep-level Prospecting Association, Waipori	432 9 8	216 4 10
Waipu Prospecting Association	180 0 0	90 0 0
Hokianga County	100 0 0	50 0 0

List of Works on Goldfields, &c.—*continued.*

Locality and Nature of Works.	Total Cost.			Amount of Contribution paid by Mines Department.		
Aids to Prospecting—*continued.*	£	s.	d.	£	s.	d.
Vulcan Smelting Works, Onehunga	30	0	0	15	0	0
Ohinemuri County	100	0	0	50	0	0
Waitaki County	29	5	0	14	12	6
Waihemo County	85	9	0	42	14	6
William Fox and party	711	1	8	355	10	10
Kirk and party	176	0	10	88	4	11
Hodge and party	98	13	8	49	6	10
Carey and Hyndman	441	9	4	220	14	8
Don, Boyce, and party	107	16	0	53	18	0
Quentin McKinnon	58	10	0	29	5	0
Bullion Mine, Deep-level Tunnel	300	0	0	150	0	0
Sutherland and party	30	0	0	15	0	0
Inangahua Low-level Tunnel	6,966	0	0	3,000	0	0
Deep-level Tunnel, Manaia	451	4	0	225	12	0
Waimea Miners' Association, prospecting at Callaghan's	50	0	0	50	0	0
Totara Miners' Association, Ross	51	3	6	51	3	6
Antonio Zala	4	10	0	4	10	0
Ross, Cunningham, and another	9	0	0	9	0	0
Wm. Thompson, stores from Benmore Station	2	1	10	2	1	10
Totara Miners' Association, Ross	8	6	6	8	6	6
Harris, Davidson, and party	27	7	6	27	7	6
Boatman's Tailings Company	150	0	0	150	0	0
Boys's Tunnel, Bluespur	94	12	3	94	12	3
Totara Miners' Association, Ross, Montina and party	246	10	0	246	10	0
Gillam's Gully Prospecting Association	94	15	0	94	15	0
Deep-level Prospecting Committee, Dillmanstown	407	0	3	407	0	3
Westport Prospecting Association	25	0	0	25	0	0
Te Aroha Prospecting Association	20	12	6	20	12	6
Robert Richie, Kuaotunu	72	3	0	36	1	6
Owharoa Tunnel, Lindsay Jackson	325	0	0	162	10	0
Coromandel County (£ for £)	200	0	0	100	0	0
Mr. G. Rehay, Arahura	98	15	0	49	7	6
Hyndman and party, Callaghan's Flat	552	14	6	276	7	3
Lakes Mapourika, Waiho, and Wataroa Miners' Association	53	12	0	26	16	0
Kumara Miners' Association	22	10	0	11	5	0
Thames Miners' Union	75	15	0	37	17	6
Star of Canterbury Miners' Association	38	5	0	19	2	6
Miners' Association, Rimu	16	0	0	8	0	0
Buller County, Messrs. Negri and others	27	0	0	13	10	0
Johnson and party, tunnel at Callaghan's Flat	90	0	0	45	0	0
W. L. Webb, Nelson	24	0	0	12	0	0
Kumara Miners' Association, Solberg, Stewart, and party	64	15	0	32	7	6
Buller County, between head of Fox's River, Brighton, and Deadman's Creek	29	5	0	14	12	6
Welcome United Gold-mining Company, Greymouth	245	12	6	122	16	3
Orepuki Miners' Association	90	0	0	45	0	0
Totara Miners' Association, Gagliardi and party	12	10	0	6	5	0
Contingencies	484	15	10	242	7	11
Antonio Zala, Ross	39	0	0	19	10	0
Halligan and party (tunnel at Cedar Creek)	198	1	10	99	0	11
Totara Miners' Association (Chamberlain and party)	208	10	0	104	5	0
Miners' Association, Greenstone	59	0	0	29	10	0
Westland County, T. Radonicki and party	40	0	0	20	0	0
Waimea Miners' Association (Lot, Keir, and party)	90	0	0	45	0	0
Cardrona Prospecting Association	140	5	4	70	2	8
Waimea Miners' Association, Stafford	113	1	0	56	10	6
H. Crossan, Beaumont	28	0	0	14	0	0
Prospecting Association, Westport	39	0	0	19	10	0
Cape Colville Prospecting Syndicate	32	0	0	16	0	0
Port Charles Prospecting Association	28	0	0	14	0	0
Totara Miners' Association, Ross	24	0	0	12	0	0
Lake Mapourika Miners' Association	12	0	0	6	0	0
Lister and Robertson, Karamea	13	0	0	13	0	0
Coromandel County (Meikle and Moriarty)	100	0	0	50	0	0
Canada Reefs Tunnel	187	10	0	93	15	0
Otago Miners' Association	600	0	0	291	8	2
Westland County (Goudie and party)	215	19	9	107	19	6
Kuaotunu Prospecting Association	52	0	0	26	0	0
Paparata Road Board	26	0	0	13	0	0
Tauranga County, Te Puke Prospecting Association	50	0	0	25	0	0
Havelock Miners' Association	78	0	0	39	0	0
Ohinemuri County	200	0	0	6	0	0
Mr. Olderog, Arahura	54	18	0	16	4	0
Miners' Association, Ross (J. Smith and party)	135	0	0	61	7	6
Extension of low-level tunnel, Boatman's	300	0	0	137	7	11
Prospecting tunnel, south side Inangahua River	60	0	0	25	0	0
Prospecting Association, Mokihinui	40	0	0	15	0	0
Miners' Association, Kumara (John Kane)	9	0	0	1	2	6
Prospecting Association, Invercargill	150	0	0	68	13	6
Miners' Association, Kuaotunu	40	0	0	13	2	6
Miners' Association, Ross (Waylen and party)	50	0	0	16	13	0
	35,359	4	5	16,456	2	11

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost.			Amount of Contribution paid by Mines Department.		
WATER-RACES.	£	s.	d.	£	s.	d.
Water-main, Bull's Battery	350	0	0	100	0	0
Round Hill Water-race	200	19	0	133	19	4
Tomkiss's Water-race	100	0	0	100	0	0
Cardrona Sludge-channel	100	0	0	50	0	0
New water-mains, Thames Water-race	1,479	10	4	739	15	2
Argyle Water-race	8,103	15	1	8,103	15	1
Nelson Creek	957	16	9	957	16	9
Mikonui Water-race	14,279	16	4	14,279	16	4
Brown and party, Kumara	90	0	0	22	10	0
Randall Creek Water-race	222	2	3	222	2	3
Thames Water-race	1,250	0	0	1,250	0	0
Contingencies	659	12	8	659	12	8
Randall Creek Water-race	100	15	0	100	15	0
Quinn's Creek Water-race	70	0	0	70	0	0
Sulky Gully (Wills and party)	300	0	0	150	0	0
Wainihinihi Water-race	84	3	8	84	3	8
	28,348	11	1	27,024	6	3
DRAINAGE- AND TAILINGS-CHANNELS.						
Drainage-channel, Lawrence (total cost, approximate)	3,000	0	0	2,000	0	0
Subsidy towards purchase of Messrs. Laidlaw and Crawford's freehold in Spotti's Creek, to allow tailings to be deposited (Tinker's Diggings)	500	0	0	400	0	0
Damage by floods, Thames	1,000	0	0	500	0	0
Sludge-channel, Smith's Gully, Bannockburn	1,000	0	0	251	1	0
Round Hill Sludge-channel survey	52	19	7	52	19	7
Compensation to J. Costello, damage done by tailings	788	0	0	788	0	0
Long Gully Sludge-channel	150	0	0	100	0	0
New Pipeclay Gully Sludge-channel	1,547	18	0	773	19	0
Kumara Sludge-channel No. 2	2,762	17	2	2,762	17	2
Ophir Tail-race	2,300	0	0	1,150	0	0
Lawrence Drainage-channel	1,150	0	0	956	14	0
Muddy Creek Channel	2,000	0	0	1,000	0	0
St. Bathan's Channel	2,000	0	0	1,000	0	0
Tailings-outlet, Maerewhenua	1,595	4	0	1,595	4	0
Ross Sludge- and Storm-water-channel	1,675	10	6	1,675	10	6
Kumara Sludge-channel No. 4	1,000	0	0	1,000	0	0
Kuaotunu Sludge-channel (£ for £)	400	0	0	200	0	0
	22,922	9	3	16,206	5	3
AID TOWARDS THE TREATMENT OF ORES.						
Testing-plant, School of Mines, Thames	1,200	0	0	600	0	0
Testing minerals, Dunedin Exhibition	142	8	9	142	8	9
	1,342	8	9	742	8	9
WORKS WHOLLY CONSTRUCTED BY MINES DEPARTMENT.						
Construction of road, Arrowtown to Macetown	9,270	6	8	9,270	6	8
Road to open up Woodstock Goldfield	1,000	0	0	1,000	0	0
Ahaura to Amuri	2,504	19	7	2,504	19	7
Waikaia Bush Road	1,000	0	0	1,000	0	0
Waitahuna Bridge	750	0	0	750	0	0
Merrivale tracks	500	0	0	500	0	0
Mokihinui to Specimen Creek	1,238	7	5	1,238	7	5
Wilberforce Quartz-reef Road	1,830	17	7	1,830	17	7
Opening Mokau River	552	8	0	552	8	0
Lyell to Mokihinui	5,098	8	6	5,098	8	6
Brighton to Seventeen-mile Beach	1,789	7	2	1,789	7	2
Whangapeka to Karamea	2,000	0	0	2,000	0	0
Hatter's Terrace to Bell Hill	500	0	0	500	0	0
Cedar Creek Road	3,000	0	0	3,000	0	0
Owen Valley Road	2,208	9	2	2,208	9	2
Cobden to Seventeen-mile Beach	3,036	1	4	3,036	1	4
Cedar Creek Road	1,500	0	0	1,500	0	0
Bridle-track to Upper Anatoki	722	8	0	722	8	0
Whangamata Road	141	10	6	141	10	6
Karangahake through Gorge	1,000	0	0	1,000	0	0
Arthur's Point to Skipper's	12,167	4	1	12,167	4	1
Tracks to Coal Island	54	6	3	54	6	3
Grey Valley to Teremakau	900	0	0	900	0	0
Rimu to New Rush	829	17	9	829	17	9
Tapu to Waikawau	750	10	0	750	10	0
Puhipuhi Road	1,396	17	9	1,396	17	9
Jackson's Bay to Cascade and George River district	5,310	10	11	5,310	10	11
Improving roads and tracks, Collingwood to Takaka and Motueka	10,905	8	11	10,905	8	11
Tramway from New Find to Waitekauri	100	0	0	100	0	0
Havelock–Mahakipawa Dray-road	1,311	9	0	1,311	9	0
Mokihinui to Wanganui	200	0	0	200	0	0
Burnett's Face to Coalbrookdale	200	0	0	200	0	0
Deadman's to Christmas Terrace	20	0	0	20	0	0
Low-level Alpine Claim, Lyell	80	0	0	80	0	0
Bowen Road to Salt-water Beach	60	0	0	60	0	0

List of Works on Goldfields, &c.—*continued.*

Locality and Nature of Works.	Total Cost.			Amount of Contributions paid by Mines Department.		
Works wholly constructed by Mines Department—*continued.*	£	s.	d.	£	s.	d.
Repairing damage done by floods, Westland County	100	0	0	100	0	0
Deviation of road at Kanieri Forks	140	0	0	140	0	0
Road up Dart River	200	0	0	200	0	0
Kuaotunu to Mercury Bay	350	0	0	350	0	0
Thames to Manaia	500	0	0	500	0	0
Cobden to Seventeen-mile Beach	400	0	0	400	0	0
Bridge over Mahinapua Creek	503	16	10	503	16	10
Track up Waiho River	105	0	0	105	0	0
Haast Ferry to Glue-pot	126	0	0	126	0	0
Paeroa–Waihi Road	114	0	0	114	0	0
Waitekauri to New Find	250	0	0	250	0	0
Mahakipawa to Waikakaho	183	12	1	183	12	1
Oparara through gorge to gold-workings	150	0	0	150	0	0
Okira Bridge, at Dirty Mary's Creek	100	0	0	100	0	0
Lagoon Bridge	100	0	0	100	0	0
Widening Cape Terrace Road	100	0	0	100	0	0
Deviation, Granville Road	70	0	0	70	0	0
Tucker's Flat Road	247	18	7	247	18	7
Dillman's–Larrikin's Road	125	15	0	125	15	0
Track at Kanieri Lake and McIntosh Falls, Lake Mahinapua	195	4	6	195	4	6
Extension of road, Rimu to Shallow Rush	150	0	0	150	0	0
Gillam's Gully Track	149	16	0	149	16	0
McKay's Creek, Kokatahi Track	100	0	0	100	0	0
Aorere Valley to Karamea and Mokihinui	29,938	1	2	29,938	1	2
Arrowtown to Macetown	450	0	0	450	0	0
Nelson Creek Bridge	100	0	0	100	0	0
Cascade to Barn Bay Road	411	7	0	411	7	0
Repairs to decking, Tapu Wharf	100	0	0	100	0	0
Waitekauri Battery from Junction–Waihi Road	150	0	0	150	0	0
Deep Creek, Wakamarina, to Empire City Company's claim	50	0	0	50	0	0
Track to diggings at Cape Foulwind	497	11	0	497	11	0
Bridge over Fox's River at Brighton	100	0	0	100	0	0
Totara Bridge	255	0	0	255	0	0
Road from Mokihinui Bridge to gold-workings	75	0	0	75	0	0
Clearing two miles of old track from right-hand branch of Kanieri River to Gentle Annie Terrace	13	0	0	13	0	0
Extending horse-track to Blackball Creek	500	0	0	500	0	0
Matawai to Kaimarama	150	0	0	150	0	0
Tiki to Mahakirau	250	0	0	250	0	0
Karangahake Gorge to Waihi	350	0	0	350	0	0
Upper Tararu Road	471	10	3	471	10	3
Red Hill Road	249	8	1	249	8	1
Repairs, Nile Bridge	1,131	2	6	1,131	2	6
Miller's Flat to Skipper's	580	0	0	580	0	0
Cobden to Coal Creek	375	0	0	375	0	0
Track to New Find, Tairua	47	11	6	47	11	6
Cedar Creek Dray-road	466	11	2	466	11	2
Road to Matarangi Goldfield	75	0	0	75	0	0
Repairs, Manaia Track	90	0	0	90	0	0
Upper Township School Bridge	50	0	0	50	0	0
Tiki Bridge across Waiau	256	0	0	256	0	0
Scott's Bridge	175	0	0	175	0	0
Oteau Bridge	150	0	0	150	0	0
Mercury Bay–Kaimarama Road	50	0	0	50	0	0
Stoney Creek Track	15	0	0	15	0	0
Road to mines, Waiomo	50	0	0	50	0	0
Upper Hill Track to branch track, Waiorongomai	30	0	0	30	0	0
Canadian Gully Bridge, and repairs to tunnel on horse-grade, Waiorongomai	70	0	0	70	0	0
Waiorongomai Road	100	0	0	100	0	0
Track from Slate River to Rocky	225	0	0	225	0	0
Pack-track to Killdevil	100	0	0	100	0	0
Repairs, Wangapeka Road towards Crow Diggings	153	0	7	153	0	7
Repairing flood-damages, Grey County	370	0	0	370	0	0
Taipo Track to Seven-mile	194	5	8	194	5	8
Repairs, Totara Bridge	336	0	0	336	0	0
Repairs, Kanieri Lake Road	80	0	0	80	0	0
Mercury Bay to Whenuakite and Boat Harbour	150	0	0	150	0	0
Tiki to Gum Town, *viâ* Kaimarama	160	0	0	160	0	0
Driving Creek to Cabbage Bay and Driving Creek to Cape Colville	660	0	0	660	0	0
Tiki to Waikawau	600	0	0	600	0	0
Paeroa to Te Aroha	365	0	0	365	0	0
Puriri to east side of range	596	19	6	596	19	6
Onamalutu to Wakamarina Forks	400	0	0	400	0	0
Waimangaroa to Denniston	100	0	0	100	0	0
Road to Lyell's Creek Extended Company's tunnel	200	0	0	200	0	0
Jackson's Bay to Cascade	1,110	8	1	1,110	8	1
Bridge over Ogilvie's Creek	150	0	0	150	0	0
Gillam's Gully Track	220	0	0	220	0	0
Bridge over Kanieri River at Kokatahi	467	10	10	467	10	10
Road to Oparara Diggings	100	0	0	100	0	0
Millarton Road	249	0	3	249	0	3
Waiau to Preservation Inlet	7,961	19	6	7,961	19	6
Hatter's Terrace to Haupiri	1,650	0	0	1,650	0	0
Grey River to Moonlight	530	0	0	530	0	0

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost.			Amount of Contribution paid by Mines Department.		
WORKS WHOLLY CONSTRUCTED BY MINES DEPARTMENT—*continued.*	£	s.	d.	£	s.	d.
Blackball Track	1,185	12	5	1,185	12	5
Ahaura–Kopara Road	400	0	0	400	0	0
Mackley's to Waipuna Terrace	100	0	0	100	0	0
Footbridge over Blackball Creek	150	0	0	150	0	0
Waipapa to Waikawa	200	0	0	200	0	0
Waipapa to Six-mile	100	0	0	100	0	0
Drain at Adamson's	50	0	0	50	0	0
Maruia Track, between Reefton and Maruia	50	0	0	50	0	0
Sledge-track to Langdon Reefs	30	0	0	30	0	0
Track to Blackball Township, repairs	40	0	0	40	0	0
Track, Old Man Range	50	0	0	50	0	0
Road to gold discovery near Blue Spur	45	0	0	45	0	0
Bartlett's Creek Track	200	0	0	200	0	0
Prospecting track, Brunnerton to Paparoa	125	0	0	125	0	0
Extension Seddon's Terrace Track to new claim	208	10	6	208	10	6
West Tokatea Road	50	0	0	50	0	0
Waitaia Battery Road	150	0	0	150	0	0
Preece's Point Road	150	0	0	150	0	0
Tokatea–Kennedy Bay Road	100	0	0	100	0	0
Main Cabbage Bay Road	50	0	0	50	0	0
Hooker's to Mercury Bay	100	0	0	100	0	0
Opeto Road	100	0	0	100	0	0
Blagrove's Road	400	0	0	400	0	0
Cemetery–Cabbage Bay Road	100	0	0	100	0	0
Rails for Coromandel Wharf	31	5	0	31	5	0
Culverts, Tiki Road	100	0	0	100	0	0
Soldier's Creek Road	198	5	0	198	5	0
Road to Barrytown	300	0	0	300	0	0
Tracks to Western Sounds	7,307	17	11	7,307	17	11
Road to R. Kelly's Claim, Gentle Annie Creek	100	0	0	100	0	0
Waitekauri to New Find	250	0	0	250	0	0
Paeroa Mill Road	50	0	0	50	0	0
Owharoa to Waitawheta	50	0	0	50	0	0
Deviation Road, Earl's Hill	200	0	0	200	0	0
Waihi to Katikati	75	0	0	75	0	0
Bridge over Slate River	50	0	0	50	0	0
Pack-track to Glover's Flat, Lower Anatoki	50	0	0	50	0	0
Clearing Karaka Creek of flood-damage	50	0	0	50	0	0
Track up right-hand branch of Cullen's Creek	25	0	0	25	0	0
Footbridge, Waimangaroa River	50	0	0	50	0	0
Track to New Find, Victoria Range	250	0	0	250	0	0
Track up Collery Branch, Waiho River	70	0	0	70	0	0
Converting Wilson's Lead Track, Addison's, into a dray-road	400	0	0	400	0	0
Cabbage Bay to Port Charles and Cape Colville	1,200	0	0	1,200	0	0
Cabbage Bay to mines	400	0	0	400	0	0
Coromandel to Cabbage Bay	250	0	0	250	0	0
Tokatea to Kennedy Bay	200	0	0	200	0	0
Coromandel to Kuaotunu	2,070	0	0	2,070	0	0
Tiki to Manaia	300	0	0	300	0	0
Manaia to Waikawau	1,500	0	0	1,500	0	0
Kuaotunu to Mercury Bay	750	0	0	750	0	0
Manaia to mines	100	0	0	100	0	0
Whitianga to Mahikirau	300	0	0	300	0	0
Whangapoua Mill Road	100	0	0	100	0	0
Kuaotunu Bridge	200	0	0	200	0	0
Richmond to Collingwood	250	0	0	250	0	0
Ferntown to Pakawau	150	0	0	150	0	0
Granity Creek to Ngakawau	100	0	0	100	0	0
Crow Diggings Track	527	8	2	527	8	2
Road to diggings, Cape Foulwind	100	0	0	100	0	0
Ngahere to Blackball	600	0	0	600	0	0
Ahaura to Haupiri	200	0	0	200	0	0
Fencing land, Blackball Road	110	0	0	110	0	0
Prospecting track, Greek's Gully to Kanieri Forks	150	0	0	150	0	0
Repairing Jones's Creek and Donohue's Storm-channels	100	0	0	100	0	0
Clyde to Queenstown	250	0	0	250	0	0
Deviation, Pleasant Creek Track	130	0	0	130	0	0
Garston to Nevis	1,715	17	2	1,715	17	2
Lawrence to Clyde	500	0	0	500	0	0
Mud Flat, Karamea, Oparara	112	13	6	112	13	6
Belgrove, Westport, Reefton	3,750	0	0	3,750	0	0
Hokitika to Jackson's	875	0	0	875	0	0
Contingencies	644	1	5	644	1	5
	164,718	9	9	164,718	9	9
ROADS TO OPEN UP MINES OTHER THAN GOLD.						
Aniseed Valley to Champion Copper-mine	4,963	10	6	4,116	10	6
Richmond Hill to copper-mine	315	16	0	209	4	0
Track, Ohinemuri Coal-seam	267	3	4	133	11	8
Road, Kanieri Coalfield	600	0	0	300	0	0
	6,146	9	10	4,759	6	2

LIST of WORKS on GOLDFIELDS, &c.—*continued.*

Locality and Nature of Works.	Total Cost.	Amount of Contributions paid by Mines Department.
TRACKS TO OPEN UP MINERAL LANDS.	£ s. d.	£ s. d.
Glory Harbour to Kopack	50 0 0	50 0 0
Port Pegasus Track	155 7 6	155 7 6
Removing snags and felling timber, Mokau River	40 0 0	40 0 0
Ngakawau Footbridge	80 0 7	80 0 7
	325 8 1	325 8 1
REPAIRING FLOOD-DAMAGES.		
Thames Borough	500 0 0	500 0 0
ARTESIAN-WELL BORING.		
Maniototo Plains	800 0 0	800 0 0
RESUMPTION OF LAND FOR MINING.		
Resumption of J. Holmes's land at Kumara for a tailings-site	300 0 0	300 0 0

Summary of Works.

	£ s. d.	£ s. d.
Roads (subsidised)—		
Bay of Islands County	1,610 0 0	1,205 0 0
Coromandel County	15,296 3 9	9,525 15 10
Te Aroha Town Board	184 0 0	92 0 0
Thames County	12,784 15 11	7,361 12 11
Ohinemuri County	4,530 17 9	2,472 13 3
Piako County	20,339 0 3	13,559 6 10
Hutt County	959 16 6	435 17 0
Marlborough County	1,715 4 0	933 18 8
Waimea County	520 0 0	260 0 0
Collingwood County	2,231 1 8	1,194 9 10
Buller County	8,718 1 4	5,004 3 4
Inangahua County	17,052 14 8	10,300 8 10
Grey County	17,553 4 0	10,948 8 2
Westland County	10,490 5 0	6,562 0 10
Taieri County	499 15 0	333 3 4
Lake County	2,651 6 1	1,532 14 6
Tuapeka County	2,003 7 8	1,241 3 8
Wallace County	1,309 6 0	662 19 8
Maniototo County	518 10 0	332 0 0
Fiord County	300 0 0	200 0 0
Waitaki County	41 12 0	20 16 0
Southland County	1,380 0 0	851 7 4
	122,689 1 7	75,030 0 0
Diamond and other drills	5,170 11 4	3,428 11 4
Wharves	435 15 9	285 15 9
Aids to prospecting	35,359 4 5	16,456 2 11
Water-races	28,348 11 1	27,024 6 3
Drainage- and sludge-channels	22,922 9 3	16,206 5 3
Aid towards treatment of ores	1,342 8 9	742 8 9
Roads wholly constructed by Mines Department	164,718 9 9	164,718 9 9
Roads to open up mines other than gold	6,146 9 10	4,759 6 2
Tracks to open up mineral lands	325 8 1	325 8 1
Repairing flood-damages	500 0 0	500 0 0
Artesian-well boring, Maniototo Plains	800 0 0	800 0 0
Resumption of land for mining	300 0 0	300 0 0
	389,058 9 10	310,576 14 3

GEORGE WILSON, Inspecting Engineer.

RETURN showing the VALUE of the SALES of WATER, and EXPENDITURE on, and COLLATERAL ADVANTAGES derived from, the Working of the WATER-RACES constructed and maintained by GOVERNMENT during the Year ending 31st March, 1897.

Name of Water-race.	Value of Sales of Water and Channel-fees.	Expenditure on Maintenance.	Profit or Loss.	Cost of Construction.	Total Cost of Construction.	Percentage on Capital invested.	Average Number of Men employed.	Approximate Amount of Gold obtained.	Value of Gold obtained.	Average Weekly Earnings of Men after deducting Value of Sales of Water and Channel-fees.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.			Oz.	£ s. d.	£ s. d.
Waimea	776 19 5	669 6 3	107 13 2	137,283 11 8		..	66	2,133	8,318 14 0	2 3 5
Kumara	3,502 17 0	1,786 15 9	1,716 1 3	41,463 16 0	200,712 5 10	..	90	5,455	21,264 10 0	3 15 0
Kumara Sludge-channel	..	..	..	21,964 18 2		..	..	..	..	..
Nelson Creek	..	..	..	..	90,722 10 8	..	..	..	..	..
Argyle	..	..	..	..	15,151 15 3	..	..	..	..	..
Mikonui	..	..	..	..	25,927 4 6	..	..	..	..	..
Mount Ida	1,333 11 6	1,316 15 6	*16 16 0	69,644 4 9	69,756 9 6	..	66	3,157	12,154 9 0	3 3 7
Blackstone Hill	115 19 3	5 8 6	110 10 9			..	8	183	704 11 0	1 8 6
Callaghan's	42 15 0	25 15 0	17 0 0	5,948 18 8	..	..	12	110	429 0 0	..
Totals	5,772 2 2	3,804 1 0	1,968 1 2	276,305 9 3	402,270 5 9	..	..	11,038	42,871 4 0	..

* Loss.

GEORGE WILSON, Inspecting Engineer.

Approximate Cost of Paper.—Preparation, not given; printing (3,175 copies) £234 2s., exclusive of plans.

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