SESSION II.
1921.
NEW ZEALAND.

PUBLIC WORKS STATEMENT

BY THE HON. J. G. COATES, MINISTER OF PUBLIC WORKS.

MR. SPEAKER,—

In submitting my second Public Works Statement I have to announce a very different state of affairs to that which existed twelve months ago. Last year the work of my Department was delayed and rendered unusually expensive through scarcity of material and the difficulty of procuring suitable labour. The latter circumstance was due to the fact that almost all employers of labour, who had of necessity been restricted in their operations during the war, had launched out vigorously again on various necessary works. Consequently the Department had great difficulty in making the progress which was desired. A higher rate of wages, improved conditions of living on the works, more and better mechanical appliances, and the rearrangement and encouragement of the staff were factors which helped the Department to overcome the difficulties and maintain an improved rate of progress.

Conditions now are quite different. The supply of material and labour is considerably greater than funds will permit me to utilize. Still, the improvements in working-conditions and the reorganization that has proceeded should bear fruit. Wherever possible work is being carried out on the basis of payment by results, with appreciable benefit both to the workmen and to the Department.

Last year I announced that certain departmental reorganization was considered advisable to decentralize the administration as much as possible and place more direct responsibility on the District Engineers, with the object of expediting work. This policy has been put into operation, with marked improvement in administration.

A large quantity of labour-aiding machinery has now been installed with very beneficial results. So far the staff and workmen have not reached the maximum results, but already a very large improvement in output is apparent, and, as those directly engaged with the plant become more accustomed to the altered conditions which it brings about, still better results may be confidently anticipated.

Legislation has been framed with the object of improving the construction and maintenance of the arterial roads of the Dominion. This should occupy a prominent place in future legislation, as it is a subject that demands as urgent attention here as it is now receiving in practically all the most progressive countries in the world.

I refer later on in this Statement to a new system which is proposed in connection with appropriations for roads and bridges. Under this system the money available for roads and bridges will be spent to the very best advantage, and where it is most urgently needed in the development of the Dominion.

Much attention is being given in other countries to the subject of road improvements in relation to motor traffic. With the development of this means of transport the value of good roads cannot be overestimated, and future railway construction must be considered in the light of possibilities in this respect. The experience of some countries goes to show that satisfactory communication can sometimes be provided by motors on good roads in less time and at considerably lower cost than by railways; and this new factor in the development of the country must be kept in view.

During the war period the purchase of bridge material, rails, and sleepers was restricted as much as possible, and our stocks became depleted. Heavy expenditure has therefore been necessary for large quantities of material during the year; in fact the total public-works expenditure for the twelve months has been greater than at any period in the history of New Zealand. On railways it exceeded the record of the past forty years, while on hydro-electric development it was two-and-a-half times greater than in any previous year. The present financial circumstances demand that expenditure must be reduced; work can be undertaken only according to the money available.

Last year I announced a policy of concentration in regard to railway-works. A perusal of this Statement will reveal that this principle has been followed, though not as far as I had hoped. It will be adhered to in future; and I again emphasize the necessity and wisdom of such a course. It was not possible or reasonable during the year to discontinue work on many lines; the Kaihu Valley line, the Waiuku Branch line, the Tahora Section of the Stratford–Main Trunk line, and the Otago Central line, for instance, were so nearly finished that common-sense demanded their completion. The Waipu Branch was discontinued for a time, though certain work was afterwards done there.

No work has been or will be commenced on the Waikokowai or Waipa gravel-pit access lines. The Waihi Eastwards will be suspended when Athenree is reached, but possibly financial considerations will necessitate an earlier cessation. Work from Tauranga westwards had been suspended, except in the vicinity of the wharves and station. Work on the Wairoa–Gisborne Section has been stopped, and a halt will be called at an early date on the Ngatapa Section of the Gisborne–Wairoa line, except in regard to maintenance and preliminary work on the tunnels. No further work has been opened up on the Napier end of the East Coast Railway, but efforts have been directed to finishing the first length so that work on this line also can be stopped. Work on the Waimate Branch Railway was discontinued. Otago Central Railway was completed to Cromwell and discontinued.

Thus, in accordance with the policy of concentration, work on five lines has been suspended, while on four construction was so far advanced as to enable them to be completed this year. With due regard to the money likely to be available for 1921–22, it was necessary to suspend operations on eight additional lines, though in order to make provision for possible unemployment sums will be allocated for certain works distributed over the Dominion.

The works upon which effort will be concentrated will be the Midland line, North Auckland connection, and the East Coast Main Trunk; but financial provision will also be necessary for the completion of the Waikokopu Branch (the excavation work being now nearly finished) and for the Stratford–Main Trunk as far as Matiere.

EXPENDITURE.

The expenditure for the financial year ended 31st March, 1921, under all votes and accounts appearing on the public-works appropriations was £3,866,027. If, however, the expenditure under the special accounts (which have their own ways and means) is deducted, the net charge against the Public Works Fund is £3,140,758.

A brief summary of this expenditure, as well as the total expenditure since the inception of the public-works policy to the 31st March last, is shown below in tabular form :—

Class of Work.	Expenditure.	
	Expenditure for Year ended 31st March, 1921.	Total Expenditure to 31st March, 1921.
	£	£
Railways—		
New construction	944,150	27,189,952
Additions to open lines	421,316	10,413,241
Roads	538,904	12,547,998
Public buildings	502,211	8,300,794
Immigration	*Cr.* 7,806	2,259,743
Purchase of Native lands	...	2,061,791
Lighthouses, harbour-works, and harbour-defences	4,838	1,156,779
Tourist and health resorts	19,041	286,295
Telegraph extension	336,468	4,409,446
Development of mining	2,153	883,726
Defence-works (general)	8,701	1,070,466
Departmental	143,279	1,689,930
Electric-power supply and development	...	*Cr.* 600
Irrigation and water-supply	55,345	250,179
Payment to Midland Railway bondholders	...	150,000
Lands-improvement	2,063	140,368
Minor works and services	...	312,607
Plant, material, and stores	169,911	329,206
Cost and discount, raising loans, &c.	184	1,253,257
	3,140,758	74,705,178
Wellington–Hutt Railway and Road Improvement Account { Railway	...	228,374
Wellington–Hutt Railway and Road Improvement Account { Road	...	101,658
Railways Improvement Account	...	641,275
Railways Improvement Authorization Act 1914 Account	63,078	672,519
Loans to Local Bodies Account—Roads to open up Crown lands	...	697,408
Opening up Crown Lands for Settlement Account—Roads to open up Crown lands	...	206,626
Land for Settlements Account—Roads to open up Crown lands	28,920	351,642
National Endowment Account—Roads to open up endowment lands	...	53,401
Aid to Water-power Works and Electric Supply Account	356,451	803,947
Waihou and Ohinemuri Rivers Improvement Account	62,249	189,074
Education Loans Account	214,571	214,571
Totals	3,866,027	78,865,673

WAYS AND MEANS.

	£	£
On the 1st April, 1920, the available ways and means for public-works purposes were		219,502
Additional funds were received as follows :—		
Under Finance Act, 1918 (No. 2), section 29 (aid to public works)	200,000	
Under Finance Act, 1919, section 5	750,000	
Under Finance Act, 1920, section 15 (public works)	1,940,000	
Transfer from Consolidated Fund (section 33, Appropriation Act, 1920)	500,000	
Other receipts—		
(*a.*) Recoveries on account of expenditure of previous years	19,627	
(*b.*) Special receipts in connection with the Ellesmere and Forsyth Reclamation and Akaroa Railway Trust Account	1,557	
		3,411,184
Thus making available for expenditure a gross total of		3,630,686

	£	£
The actual net expenditure on all works and services chargeable on the Public Works Fund for the year was—		
(*a.*) Under appropriations	3,140,574	
(*b.*) Under section 6, subsection (1), of the Ellesmere Land Drainage Act, 1905	439	
(*c.*) For charges and expenses of raising loans ..	184	
Making a total of		3,141,197
This left a credit balance in the Ways and Means Account at the 31st March, 1921, of		489,489
Legislative authority exists for providing further funds as follows :—		
In terms of—		
(*a.*) Finance Act, 1920 (balance)	560,000	
(*b.*) Finance Act, 1921	2,500,000	
It is proposed to make further provision this session for an additional	5,000,000	
		8,060,000
Making available for the current year a total of		£8,549,489

The estimated expenditure on public works for the current year (exclusive of accounts which have their own ways and means) is £5,490,080, which will leave a credit balance of £3,059,409 to be carried forward to next year (1922–23).

Exclusive of the before-mentioned funds, statutory authority at present exists for raising the following moneys for public undertakings which are not chargeable against the Public Works Fund, but which have their own statutory ways and means, viz. :—

	£	£
(*a.*) Aid to Water-power Works Act, 1910	..	31,000
(*b.*) Finance Act, 1919 (addition for Waihou and Ohinemuri Rivers Improvement Account)	..	82,000
(*c.*) Electric-power Works Loan, 1919	5,442,490	
(*d.*) Finance Act, 1920, section 15 (electric-power works)	3,500,000	
		8,942,490
		£9,055,490

RAILWAY-CONSTRUCTION.

Three sections of completely constructed lines were handed over to the New Zealand Railways Department for ordinary traffic during the year, viz. :—

Huarau to Maungaturoto	2 miles	5 chains.
Maungaturoto to Ranganui	4 „	25 „
Kioreroa to Portland	5 „	23 „
Total	11 „	53 „

Several other sections were sufficiently advanced to admit of goods and passengers being carried, a convenience that has been greatly appreciated not only by settlers but by the travelling public. This is particularly the case at Tauranga, where both passenger and goods traffic are carried to a regular time-table on a length of over forty miles.

The total net expenditure on construction, improvement, and maintenance for the year amounted to £1,428,544, as follows :—

	£
Construction of new lines	944,150
Additions to open lines	421,316
Railways Improvement Authorization Act 1914 Account	63,078
Total	£1,428,544

The following is a brief summary of the progress made on each line :—

Kaihu Railway Extension.

Formation, culverting, and fencing on this section have been practically completed. A certain amount of trimming, however, remains to be done when a ballast-train is available, and a few culverts also require to be built. Platelaying has been completed to Donnelly's Crossing Station yard, but the platelaying in the yard itself will not be possible until the bridge at 23 miles 58 chains has been completed. About 5,000 cubic yards of ballast is still required to complete this work.

A goods service has been in operation since September last between Tarawhati and Aranga, and recently it was extended to Donnelly's Crossing. Full advantage has been taken by the settlers of both services.

With the exception of the station buildings, this line should be in order for handing over to the New Zealand Railways Department before next winter.

North Auckland Main Trunk.

Ngapuhi Northwards.

Okaihau Section.—The last mile of formation on this section has been completed, but slips have caused much concern. Over 22,000 cubic yards have been removed, but further slips and subsidences have since occurred, which will be attended to during the drier weather.

Platelaying has been completed to 24 miles 14 chains, 10 miles of fencing have been erected, and a considerable number of culverts have been built.

Utakura Quarry has been opened up, a light line laid to it, and a crushing plant erected and is in readiness for operation.

It is hoped to put the first lift of ballast on the section between Kaikohe and Okaihau as early as possible, in order to admit of the carriage of passengers and goods. This connection will save at least 25 miles of the present circuitous coach route to Hokianga and Mongonui Counties. Its completion depends upon the Government's ability to finance it.

Okoro Section.—Very little work has been done on this section during the year, and operations have now ceased altogether. A short piece of formation was completed, some culverts were built, and a few chains of fencing erected. It is not proposed to do anything further on this line for some time, and, in view of this, substantial provision has this year been made to improve the road from Okaihau to Horeke.

Waiotira Northwards.

Only a small amount of work has been done on the Waiotira end of this section owing to the removal of men for concentration on the Waiotira Southwards section.

On the northern end work has been chiefly confined to tramway-construction from the Wairoa River to the Omana Tunnel. Formation and platelaying are being carried on from the river. The approach cutting to the northern end of the Omana Tunnel has been commenced, and a steam-shovel which is being assembled will shortly commence operations there. It is proposed to lay a tram-line over the tunnel hill to convey the steam-shovel to the southern side after the northern approach has been completed.

The reason for operating on this isolated portion is the necessity for making an early start with the Omana Tunnel, which will take a long time to drive, and would, if not started in advance, delay the final connection. Financial considerations may necessitate a modification of this programme.

An endeavour will be made during the current year to give effect to the Royal Commission's recommendation regarding the completion of the Kirikopuni–Mangakahia and the Mangakahia–Kaikohe Roads. The result of this work will be that when this section of railway is completed, probably within the next few years, to Kirikopuni on the Wairoa River, the settlers northward of this point will have properly constructed access roads over which produce can be transported to the end of the finished line.

Waiotira Southwards.

Waikiekie Section.—The programme of operations for the year was the concentration of men on the completion of Waikiekie Tunnel, rail connection with, and the early commencement of, the Mareretu Tunnel.

The Waikiekie Tunnel was finished about the end of April. The work was one of great difficulty. The ground proved treacherous for the entire length, and particularly heavy and close timbering had to be resorted to. At the northern end a specially designed reinforced-concrete section had to be built before it was possible to timber and drive the rest of the tunnel. Plant and materials for works beyond this tunnel were conveyed over the ridge by means of a wire-rope tramway. This proved a very economical method, and enabled operations to be extended to the Mareretu Tunnel immediately on completion of the work at Waikiekie. Exceptionally good progress has been made, and it is hoped to complete the Mareretu Tunnel by next April. A similar tramway to that in use at Waikiekie has been built over this tunnel hill. The comfort of the men at Mareretu has been provided for by the erection of hut accommodation (120 huts), a boarding-house, and a recreation-hall, as well as the installation of an efficient water-supply.

Bridge-construction over the Mangawai River and Kikowhiti Stream is progressing satisfactorily; a fair amount of platelaying and ballasting has been done. A small stone-crushing plant is supplying metal for the tunnels. The Department's own sawmill has already cut over a quarter of a million feet of timber for workmen's huts, tunnels, temporary sleepers, &c.

Ranganui Northwards.

Paparoa Section.—All earthworks were practically completed some time ago. Paparoa Station yard has been extended, and the bank at 92 miles 10 chains raised.

Huarau Tunnel was completed about the end of January. This tunnel gave great trouble, the ground pierced being most treacherous. Similar expedients to those used at Waikiekie were necessary. Work, preparatory to platelaying the last 2 chains, was completed in April. The first lift of ballast on this length has been placed, except on the bank at 91 miles 30 chains.

Two platelayers' cottages were finally completed, and, with the exception of the Paparoa Station-yard arrangements, little work remains to be done.

Mareretu Section.—The permanent survey has been finished, and formation is complete to 93 miles 53 chains (south end of Golden Stairs Tunnel), and in hand as far as 95 miles 24 chains.

Platelaying and first lift of ballast is complete to 93 miles 41 chains. Owing to the slippery nature of the country between Paparoa Station and Golden Stairs Tunnel, an additional 40,000 cubic yards of material had to be excavated and deposited in the banks, which demonstrated the difficulty of maintaining a train transport service for the delivery of material and supplies to the Golden Stairs Tunnel.

A large amount of preliminary work had to be undertaken, such as service roads, drainage, &c., before tunnelling operations could be put in hand. These operations have been completed. Shingle-bins and bath-houses have been built, and water-supply installed at the southern end.

The total length of bottom heading driven is 7 chains, and concrete lining has been commenced. At the north end the approach cutting is in hand.

The survey of a deviation from Mareretu Station yard to 99 miles is nearly complete. This was necessary owing to the level of the record flood of last year being too near the formation-level.

Some eight steam-shovels and nine locomotives are employed on the incomplete section between Portland, on the Whangarei Branch line, and Huarau, on the North Auckland main line, and it is hoped with this plant to effect a temporary rail connection between Auckland and Whangarei before the end of next year.

WHANGAREI BRANCH.

Oakleigh Section.—With the exception of 30 chains of deviation the whole line to Portland has been laid and covered with the second lift of ballast. A concrete cottage has been erected at the Oakleigh Station, and the bridge at 7 miles 33 chains will be finally completed on the arrival of the steel girders.

Tauraroa Section.—Work on this section has been confined chiefly to maintenance (removal of slips), which has been considerable. Ballast has been obtained from Tauraroa Quarry for ballasting, road-metalling, culverting, and tunnel-lining.

Waiotira Section.—The principal operations have been the removal of slips and the completion of two small deviations. The temporary line will shortly be removed, and a commencement made with permanent platelaying.

The unstable nature of the country traversed by this line may be realized when I say that two steam-shovels and two trains have been almost continuously engaged in removing slip-material to keep the line open for works trains.

Waipu Branch.

Ruakaka Section.—A steam-shovel has recently been commissioned to complete the banks across the mud-flats. The rest of the earthworks have been completed.

Waipu Section.—Nearly all the formation over the first 2 miles of this section has been completed.

Financial considerations may necessitate a modification of this programme.

North Island Main Trunk.

Waiuku Branch.

Glenbrook Section.—Platelaying has been completed, and the second lift of ballast laid; cattle-stops built, and station buildings at Glenbrook erected. A goods service was extended to Glenbrook on the 16th May last.

Waiuku Section.—Formation has been completed, rails and first lift of ballast have been laid, and the second lift commenced. A concrete overbridge has been built, and a second one begun.

Station buildings at Pukeoware and Fernleigh, and a Stationmaster's house at Waiuku, have been erected, and the rest of the buildings are in hand. It is hoped to hand this line over to the Railway Department for regular working early in the new year.

Huntly Branch.

Earthwork formation, culvert-building, fencing, and access-road construction are in hand and progressing satisfactorily. In order to provide for a station-yard and mine-siding near the summit of the main divide, the line was relocated and pegged, and plans prepared. Formation is in hand on behalf of the mining company, which will pay for the construction of its own siding.

Waikokowai Branch.

The permanent survey 8 miles 21 chains in length has been completed. Contracts were prepared for the construction, but owing to the change in the coal situation it was decided not to proceed with the construction at present.

East Coast Main Trunk.

Waihi Eastwards.

Athenree Section.—Practically all earthwork has been completed, except fillings around abutments of bridges, and minor works at the Athenree Station yard. There are still several bridges to erect.

Katikati Section.—Earthwork has proceeded at a satisfactory rate, fencing erected, culverts built, and drains opened up over a length of 3 miles. Land-plan surveys completed from 4 miles to 12 miles. Considerable trial surveys were made between 15 miles and 18 miles, and one permanent deviation pegged between 14 miles and 15 miles. While it is hoped that finances will permit of the completion of this line to Katikati before a temporary halt is called, it may be necessary, in order to provide money for more urgent works, to discontinue work temporarily.

Tauranga Westwards.

Tauranga Section.—A commencement has been made with the erection of three platelayers' cottages at Tauranga Station, and a quarry opened up on the Wairoa River to supply stone for facing banks. Formation is in hand over a length of 4 miles, and 150 chains of fencing has been erected. Land-plan survey completed from 36 miles 32 chains to 39 miles 27 chains. Permanent location has now

been decided, and permanent-line survey completed from 35 miles back to 31 miles. No work is proposed on this section at present.

Tauranga Eastwards.

Matapihi Section.—All the cylinders for the Tauranga Bridge have been completed, and, with the exception of six, are sunk to their proper levels. Much extra labour was entailed during sinking operations on account of the soft nature of the material encountered. This necessitated the manufacture of extra lengths of cylinders. A large amount of work in the preparation of material for this bridge has been done in the Mount Workshops, such as cutting and drilling cleat angles, bracing, transome and cover plates, stiffener-angles, &c. Timber has been laid on which to erect a trial span, and a travelling gantry has been placed in position. Good progress has been made with the formation of the bank between the bridge abutment and Matapihi, and the stone protection work is practically complete to the bridge pier.

Mount–Matata.

This length of line between the Mount and Matata embraces what are known as the Mount Branch, Te Puke, Paengaroa, Pongakawa, Otamarakau, and Matata Sections, over which an efficient passenger-and-goods service has been maintained throughout the year. In the early part of the year the service was really better than the amount of traffic warranted, which led to its curtailment. The new service has proved sufficient and economical. The whole length has been properly maintained. An extension of the Mount Workshops yard has been made, and platelaying in the yard is in hand. A new mill and car-shop are almost complete, and several buildings have been erected to house additional machinery. The wharf has been strengthened, and a new water-service to supply the workshops and locomotives has been installed.

The output from the Te Puke Quarry was about 10,000 cubic yards of broken metal, about one-half of which was sold to local bodies for road-metalling purposes.

Subsidences of banks caused some trouble, but all have been brought up to standard level.

Rangitaiki Section.—Permanent rails have been laid over the whole section, although the formation is not finally completed. Five miles of fencing were erected during the year. One permanent reinforced bridge is in hand, and temporary structures over the Tarawera and Rangitaiki Rivers for traffic have been built. The latter has been decked, and now also carries road traffic. This section was opened for goods traffic in September last.

Awakeri Section.—Permanent-way has been laid over the full length, also in the siding at Awakeri Station. This section was opened for goods traffic in September, 1920.

The policy on this line has been to extend it as rapidly as funds permit, from the deep waterfront at Mount Maunganui into the fertile plains of the Bay of Plenty district. While it is recognized as very desirable that the Tauranga Section of railway should be connected with the main North Island systems via Waihi, the need for concentration requires that one or other of these desirable works should halt. The construction programme is laid out with this in view, and to dissipate energy in an effort to simultaneously effect a connection would involve a great loss of money. When the line reaches Taneatua the programme will again be reviewed.

Taneatua Section.—Earthwork has been completed on the first 3 miles, and is in hand for another $1\frac{3}{4}$ miles. Service road-bridges have been built and others repaired, and the service road itself extended over the summit cutting.

Land-plan survey has been made from 83 miles to 91 miles 20 chains. Permanent pegging of several deviations between 94 miles 40 chains and 97 miles 40 chains completed; total length, 1 mile 60 chains. The line is now permanently pegged to 97 miles 40 chains. Trial lines have been run from 98 miles to 99 miles 77 chains via upper crossing over Whakatane River. A further trial line through Waimana Gorge has been pegged and levelled from 100 miles 16 chains to 104 miles 66 chains. This work is still in hand.

Whakatane Branch Railway.—Trial survey was completed to 7 miles 50 chains, while a length of 4 miles 10 chains was permanently pegged.

Gisborne–Wairoa.

Ngatapa Section.—Ballasting to the 9½-mile peg has been completed, several culverts built, and Ngatapa Station yard raised. This raising was necessitated by the general rising of the streams and land in the vicinity as a result of slips on the hills and heavy denudation. A passenger-and-goods service has been maintained throughout the year.

Over 400 tons of lime from the Repongaere Quarry were supplied to the public during the year.

Waikura Section.—Fair progress has been made with the formation, as well as culverting, drain-cutting, stream-clearing, willow-planting, platelaying, and ballasting. One steam-shovel is constantly employed removing slips.

All except maintenance work, and preliminary work towards tunnels, will be discontinued.

Wairoa–Gisborne.

Two miles of formation has been practically completed. The approach to the Wairoa Station yard has been partly formed, and road-deviation formed and metalled. The contractor for the erection of the Stationmaster's residence and three platelayers' cottages at Wairoa Station has been hampered by the difficulty of obtaining timber-supplies. Two cottages, however, are now complete.

Nothing is proposed to be done here at present.

Napier–Wairoa.

Eskdale Section.—The first 49 chains of this section are complete except the river gap at 24-chains peg. From 49 chains to 1 mile 69 chains are under contract by the Napier Harbour Board, and are complete except river gap on main and Port lines. The balance to 10 miles 51 chains is ready for trimming and platelaying. One platelayer's cottage in concrete at Eskdale yard is complete, and two others and a Stationmaster's house are in hand.

Tutira Section.—Formation is proceeding satisfactorily, stream-diversions and drains are being made where necessary, and culverts built. The service road is being formed and metalled. Permanent-line survey has been completed from 14 miles to 30 miles, as well as various road surveys and trial lines.

The programme at present is to complete the line to Eskdale, a distance of about ten miles, before any forward move is made.

The Napier–Wairoa–Gisborne Main Road has been extensively improved by the construction of a deviation and the metalling of same on what is known as the Waikare–Mohaka Section, between Napier and Wairoa. Further extensive improvements have also been made between Wairoa and Gisborne over a bad piece of road known as Wharerata Hill. The expenditure on these works amounts to £44,000, and a further £60,810 is allocated for 1921–22. The object in view is to concentrate on the road. The reason for this is that owing to the length of line to be constructed, the character of the country to be traversed (involving as it does a number of very large viaducts), and the present financial situation, it will not be possible to make railway connection between Napier and Gisborne for a very considerable time, and it is felt that it is better to spend a substantial sum in making a through road connection available in all weathers, rather than to proceed slowly with the railway.

Waikokopu Branch.

Nuhaka Section.—The contractors for the large cutting at Te Uhi abandoned the work. Another contract was let, but the Department had to terminate this owing to the dangerous manner in which the work was being performed. It is now being done by day work under direct supervision of the Department. A steam-shovel is utilized, with the result that cost is lower and progress greater. In July, 1920, seventy teams and scoops were engaged between the 3-mile and 9-mile pegs, but the ground becoming too wet they were transferred to the sandhills (9–12 miles), where excellent progress was made. By September all the formation that could be worked between 9½ miles and 17 miles had been completed. From September to November little could be done beyond draining and planting marram-grass. Scoop-work was resumed in November, and the whole formation on this section (17 miles) is now almost complete.

Waikokopu Section.—In August a commencement was made on the high bank beyond the Nuhaka River, but work was only carried on under great difficulties owing to repeated floodings of the river, and in October the men were removed. Labour was difficu t to obtain, and very little work was done till January, when abour became more plentiful. By the end of March all the cuttings were fully manned up to the 21-mile peg.

Stratford – Main Trunk.

East End.

Matiere Section.—The enlarging, concrete-lining, and construction of both portals of the Okahu Tunnel were completed about December last. Two other tunnels, situated at 6 miles 12 chains and 7 miles 55 chains respectively, were also similarly completed.

A commencement was made with the erection of superstructure of the Ongarue River Bridge at 0 miles 7 chains, the steelwork being fabricated in the contractor's workshop, Auckland. Good progress was made with the construction of two other bridges over the Ohura River. Two overbridges have been built, and two subways are in hand. The approach filling at the Ongarue Bridge is in hand. The approach cuttings to the tunnels at 2 miles 20 chains (Okahu) and 8 miles 40 chains have been completed. Five miles of fencing were erected, and 20 chains of s ding laid, and it will be possible to start platelaying and ballasting very shortly.

Ohura Section.—Formation to Matiere Station yard is practically complete. Four of the five tunnels on this section are now complete; the lining only of the fifth remains to be done. Beyond Tuhua Station yard four bridges are required before platelaying can be completed to Matiere. Of these the concrete piers of one are finished, the foundations are being prepared for the second, and material is being assembled. The foundation piles only for the remaining two have been delivered on the sites. I hope to have the ballast-engine in the Ohura Valley before my next Statement is due.

West End.

Tahora Section.—Platelaying has been completed. Wing walls were erected at No. 2 tunnel, and the west end of No. 1 was faced, thus completing all tunnels on this section. Private crossings were erected, and drains completed. The stat on buildings at Tahora Station are almost finished.

A bi-weekly passenger-and-goods service connecting with New Zealand Railways service at Kohuratahi is in operation.

Raekohua Section.—Very little work has been done on this section. The permanent survey is now completed; permanent platelaying extends to 47 miles 59 chains. Borings for all proposed bridges (railway and road) to the Tangarakau Gorge have been completed, and all earthwork on the Raekohua Settlers Road has been finished.

Heao Section.—The permanent survey was completed to 54 miles, also for deviation (52 miles 70 chains to 53 miles 52 chains), and plans have been prepared.

No forward movement is proposed at present. The impossibility of obtaining the necessary ballast from the Railway Department as originally intended has necessitated the opening-up of a large quarry, with road-crushing plant, near Te Wera. As soon as this is done the completion of the ballasting will be an easy matter.

Opunake Branch.

Kapuni Section.—Although the shortage of material considerably impeded progress for some months, the Waingongoro concrete bridge has been completed and the west bank of the river protected from erosion by a stone-gabion revetment. The reinforced piles for the Kapuni Bridge have been made. Pier B has been concreted up to top of footing, and the excavation of pier E is in progress. Continued erosion of the western bank of the stream has necessitated stone-gabion facing to protect the west approach embankment. Good progress has been made with the Skeet Road overbridge.

Auroa Section.—Work on this section has been confined principally to culvert-building and formation. Mangawhero Road Station yard, also Auroa Station yard, have been completed.

Pihama Section.—Preparatory work for future operations has been commenced, workmen's huts have been erected, and a few culverts built.

Manaia Section.—Earthwork in the Manaia Station yard has been completed by the contractor. The only unfinished cutting and embankment on this section has been steadily worked and is very nearly completed. As soon as rails and sleepers now on order arrive it will be possible to proceed uninterruptedly with platelaying and ballasting from Te Roti to Manaia.

Sufficient formation work towards Opunake to absorb the unemployed will be opened up.

Midland.

Nelson End.

Kawatiri Section.—Work was commenced on this section in January last with the tunnel at 62 miles 53 chains. The excavation has been carried into the hillside for a distance of 200 ft. An air-compressing plant has been provided for drilling purposes. The Hope River has been diverted, the erection of the bridge at 62 miles 54 chains commenced, and concrete blocks for tunnel-lining are being manufactured.

Otira–Bealey.

Arthur's Pass Tunnel. — Otira End. — Day-labour principle of employment obtained while some particularly bad ground was being encountered. About the middle of September the ground improved and the co-operative contract system was reverted to; 21⅔ chains of lining was completed, and the top-heading finished early in June.

Bealey End.—With the exception of about two weeks, work has continued uninterruptedly till July, when the co-operative contract was terminated to allow the workers on the opposite end room to work through. The total advance of lining in this end was 18 chains.

The contractors for the electrification have commenced with the erection of the 6,000 cable-racks in the tunnel.

The manufacture of machinery in England was much delayed by the coal strike.

It is expected that the cleaning-up of the bottom will be completed in December, 1921, the platelaying in February, 1922, and ballasting in March, 1922.

Greymouth – Point Elizabeth.

All felling, clearing, stumping, creek-diversions, and culverts have been completed. Of the formation only about 3,600 yards remain unfinished. Only 35 chains of fencing remain to be erected, and about 5 chains of ditches to be cut, to complete these two classes of work.

The construction of two temporary bridges is in hand. Rails have been laid to 4 miles 75 chains. In a very short time transport of coal can be undertaken.

Waimate Branch Extension.

Serpentine Section.—Operations on this section consisted of earthwork only, a half-mile of formation being carried out, which leaves about 55 chains to complete. Difficulty was experienced with the bank between 1 mile 13 chains and 1 mile 22 chains. It is probable a deviation will eventually be necessary to avoid a large slip. No more than maintenance is anticipated this year.

Kelcher's Section.—Only about 60 chains of formation had been completed when work was temporarily suspended. It will not be possible to resume operations this year.

Otago Central.

Cromwell Section.—Seven concrete flood-channels under road and railway were completed. These were found necessary in order to cope with flood-water from cloud-bursts. Concrete or stone-pitched channels were constructed from all existing culverts on this section, and five additional culverts were placed. Six road-bridges were built over the newly constructed flood-channels, and one railway-bridge was erected. The final lift of ballast was laid, and the line finally trimmed throughout. A goods-and-passenger service was maintained until the section was handed over to the New Zealand Railways early in July of this year.

Balclutha – Tuapeka Mouth.

A survey party was engaged on this work from March to July, 1921. A trial survey was run from Lovell's Flat to beyond Hillend, via Stony Creek. Certain further information is still required, and is being collected, to enable the various rival routes to be compared.

Orepuki–Waiau.

Orawia Section.—Formation is in hand over a length of 6 miles. Culverts are now complete to the 54-mile peg, and 124 chains of fencing were erected. The permanent survey has been completed for a distance of about 8 miles to and including Orawia Station. It is doubtful if it will be possible to continue work on this line unless the need of finding work for unemployed continues.

Lawrence–Roxburgh.

Beaumont Section.—Formation was commenced in April of this year, and extends over about 2 miles. Several culverts have been built and workmen's huts erected. The men employed on this work are chiefly those who were engaged on the completion of Cromwell Section of Otago Central. The survey has been completed for a distance of about 6 miles.

Surveys.

A flying survey of various routes between Helensville and Shelly Beach, a distance of about 12 miles, was made to ascertain the possibility and probable cost of constructing a branch line to Deepwater, at the southern end of Kaipara Harbour.

Additions to Open Lines.

The expenditure by the New Zealand Railways Department out of the Public Works Fund under this heading amounted to £421,315. Of this sum £112,248 was expended on providing workshop machinery, additional rolling-stock, and the usual fittings therefor. The balance covered expenditure upon improvements to workshops, engine-depots, station facilities, water-services; additional dwellings; signal, tablet, and telephone installations; interlocking; gasworks extension; and purchase of land.

Railways Improvement Authorization Act, 1914.

The expenditure under the Railways Improvement Authorization Act, 1914, amounted to £63,078, for grade easements, additions to workshops, formation of new lines; signalling, interlocking, and safety appliances; and extension of terminal facilities at Auckland, Wellington, and Christchurch.

PUBLIC BUILDINGS.

General.

Government House, Wellington.—Extensive alterations were effected to this building, and additional official accommodation provided for His Excellency the Governor-General and staff by the subdivision of a number of rooms. A new porch was erected at the entrance, an additional strong-room built, and the main drive widened.

Parliament Buildings (New Buildings).—The external marble work was practically completed during the year, only the balustrade in front of the loggia remaining to be done. The following rooms were completed and furnished during the year: The Speakers' suites of both Houses; three suites for Ministers; sitting-rooms and writing-rooms for members of the Legislative Council and House of Representatives; Government and Opposition Whips' rooms; Leader of Opposition's room; Clerk and Assistant Clerks' rooms, Legislative Council; Bill Officer's room for each of two Houses; and waiting-rooms for Legislative Council.

The plastering and internal finishing of the rooms were completed, with the following exceptions: Three suites of Ministers' rooms on the ground floor; the front entrance hall on all floors, and main staircase, and the waiting, messengers', and store rooms in connection with and adjoining thereto; also the three large social rooms for members on the second or top floor. The Legislative Council chamber was entirely completed.

Departmental.

Auckland Law Court Buildings.—Alterations have been carried out to the first floor to accommodate tenants transferred from the third floor.

Christchurch Customs Offices.—The erection of this building in Carlyle Street has been commenced, and will shortly be completed.

A contract has been let and a commencement made with the erection of the Wanganui Native Land Court Building; and the Greymouth Explosives Magazine has been completed.

Courthouses.

New Courthouses are urgently required in several places, but in view of the present financial conditions only urgent repairs and necessary maintenance work of existing buildings have been carried out.

Prisons.

Progress in building-construction during the earlier part of the year was delayed to a considerable extent through shortage of timber and cement. Subsequently, when materials were more easily obtainable, a curtailment of expenditure hampered the building programme. At Auckland the expansion of quarrying operations and the erection of staff cottages were the principal works carried out. The installation of pneumatic drills, &c., has enabled the output of crushed metal to be greatly increased. Additional crushing-plant is being obtained, and bins and improved loading-facilities are to be installed. The erection of additional cottages and quarters for single officers was proceeded with at Waikeria. Similar work was carried out at Wi Tako (Trentham) Prison, where cottages removed from the Wellington Prison Reserve were re-erected, and a new residence for the officer in charge completed. The manufacture of bricks on the Mount Cook site having been discontinued some time ago, advantage has been taken of the presence of extensive clay-deposits on the Wi Tako Reserve to establish the industry there. The work of excavating and preparing the site for the brickyards, as well as the erection of plant, with the necessary buildings to house same, has been completed. A temporary kiln has been constructed in which a large proportion of the bricks required for the permanent kiln have been burnt. It is expected that this kiln will be completed and in working-order by the end of the year. Roadmaking between Waimarino and Tokaanu ceased during the year, and the prison camp was removed to Erua, where a start has been made with the reconstruction of the Ohakune–Waimarino Road—a section of the central main arterial road. At Templeton the construction of the new institutional buildings and officers' residences has been carried on, and a large supply of concrete blocks and tiles has been manufactured for use in this work, as well as for the erection of workers' homes under the Labour Department's housing scheme. The works carried out at Invercargill Borstal Institution have again been on a comprehensive scale, and in the development of the reclaimed area much work has been done in roadmaking and drainage. A massive embankment, a mile and a quarter in length, enclosing an area of 270 acres of estuary land required for a rifle range, has been completed. This area is being used for agricultural and pastoral purposes also. The erection of cottages and the new kitchen and infirmary block at the Borstal Institution has also proceeded satisfactorily.

Police-stations.

Owing to the high cost of erecting new buildings, expenditure in this respect was confined to such urgent works as could not be postponed. New police-stations were erected at Dannevirke and Hokitika, a residence for the Senior Sergeant at Palmerston North, a lock-up at Te Araroa, and a new stable at Eketahuna.

In many cases where the Department's tenancy of rented premises was terminated, or where departmental buildings had become beyond repair and unfit for habitation, suitable properties were purchased when offered at a reasonable price. As compared with the estimated cost of erecting new buildings, this was found to be the more economical means of providing the necessary accommodation without undue delay. Such properties were purchased for use as police-stations at Rongotea, Woodhaugh, Lower Riccarton, Levin, Portobello, Port Chalmers, Seatoun, Ashhurst, Millerton, Belfast, Upper Hutt, Otira, Palmerston North (Cuba Street), Fortrose, Wanganui East, Green Island, St. Kilda, Ravens-

bourne, St. John's (Wanganui), and Brooklyn (Wellington). Residences for senior officers of the Police Force were alsc purchased at the following places, where the difficulty of obtaining rented houses rendered it necessary for the Department to provide accommodation: Whangarei (Inspector's residence), Greymouth (Inspector's residence), Hamilton (sergeant's and detective's residences), Wellington (Chief Detective's residence), Invercargill (residences for senior sergeant, sergeant, and detective).

Post and Telegraph Buildings.

Owing to the difficulty experienced in procuring labour and material, and latterly to the financial stringency which demanded that only urgent and essential work should be undertaken, the expenditure during the year was not very great. The result has been that several important works involving considerable expenditure have had to be deferred. This is particularly unfortunate, as during the period of the war many new Post Office buildings and improvements in existing buildings could not be proceeded with, and at the termination of the war the Department, so far as its building programme was concerned, was practically several years in arrear. A big effort was made to overtake deferred work, but the Department was immediately faced with the problems of shortage of material and labour. Time after time no tenders were received for the erection of buildings required urgently. When conditions regarding material and labour improved, a financial position arose which made it necessary to curtail the programme already planned. It is realized that when conditions improve a very active building programme will be necessary to bring the facilities of the Department up to the pre-war standard.

During the year Post Office buildings were erected or their erection completed at Crookston, Glen Massey, Kelburn (for automatic-telephone exchange), Ormondville, Owhango, St. John's (Postmaster's residence), and Sutton; while important alterations were made to the Post Office buildings at Auckland, Dunedin, Invercargill, Rangiora, Rawene, Ruatorea, Timaru, and Wairoa.

The acute shortage in housing during the year made it difficult for officers in some places to obtain accommodation, and rendered necessary the purchase by Government of residences for Postmasters and other officers at the following places: Balclutha, Blenheim (two), Coromandel, Darfield, Eltham, Frankton Junction Railway, Greymouth, Hamilton (four), Matamata, Ohura, Pahiatua, Palmerston North, Stratford, Te Araroa, Timaru (three), Tolaga Bay, Waitara, and Waverley (two).

Agriculture.

At Ruakura Experimental Farm a building has been erected to house the electric-light plant. Additional quarters and larger kitchen accommodation have been provided on account of the extra number of returned soldiers. A store, transformer-house, and two cottages are in course of erection.

The scheme of field drainage was deferred for the time being, so also was the erection of a modern milking-shed, at the Central Development Farm at Weraroa.

The completion of the electrical installation at Ruakura (which has already been connected with Horahora power scheme) and the extension of the water-service, as well as the erection of a store at Motuihi, are amongst the proposals for the current year.

Mental Hospitals.

In addition to ordinary maintenance work, good progress has been made with the additions to the Women's Auxiliary building at Auckland. This new unit will accommodate about eighty patients, and is so constructed as to admit of their further classification. At Tokanui the Male Admission Block is well advanced and a large workshop is almost complete. Material for the Female Admission Block, the foundations of which are finished, is on the site.

The Reception-house at Nelson should be completed within the current year. The poultry-farm has been remodelled, and the necessary buildings erected.

The residence for the head attendant at Christchurch is nearing completion; as also are general additions and alterations at Hornby. A two-story addition, which will increase the day-room space of two wards in the main building, is well advanced.

Additional accommodation for sixty female patients at Seacliff is nearing completion.

Hospital and Charitable Institutions.

The principal work carried out under this heading during the year was providing more adequate accommodation and equipment at the quarantine stations at Auckland and Wellington; the establishment of a new St. Helens Hospital at Wanganui; and improving the accommodation at other similar institutions throughout the Dominion.

Some expenditure will be required during the current year for the military hospitals that have been taken over from the Defence Department to adequately equip them for the purposes for which they are intended, and to complete the quarantine stations which were commenced during the previous year but which were not entirely completed.

Education.

During the past financial year the expenditure out of loan-moneys on Education buildings was easily a record. During the war the necessity for economy led to the restriction of capital expenditure wherever possible, and consequently when peace came large arrears of work had to be overtaken. During the year 1920–21 the total expenditure on Education buildings was £459,292—£244,721 from the Public Works Fund and £214,571 from the Education Purposes Loan. Of this total £279,659 was for new primary-school buildings, £67,216 for technical schools, £43,910 for secondary schools, and £37,243 for the University colleges. At the end of the year the grants promised but not paid amounted to £825,661, as against £560,051 for the previous year. The total new authorities issued during the year amounted to no less a sum than £724,902.

Though much has thus been done to meet the pressing needs for more and more school accommodation, unfortunately, owing to the very high cost of building and to the large arrears referred to above, the provision made falls far short of the essential requirements. The present financial stringency has again necessitated a restriction of the expenditure, but the Government is fully aware of the needs of the country, and is only awaiting more favourable financial conditions to revert to its progressive building policy. In some districts where additional accommodation is urgent the residents have come to the assistance of the Government by subscribing to the Education Purposes Loan the sums required to provide the additional school buildings, and in this way buildings are being undertaken that otherwise would have been postponed for a considerable time.

Lighthouses.

The erection of the automatic fog-signal on Tiritiri Island was completed, and the fog-signal handed over to the Auckland Harbour Board.

The necessary apparatus for automatic lights on the Ninepins Rock, Gable-end Foreland, and Mercury Island Passage arrived during the year. The tower for the Ninepins light has been received, and the erection of the light-tower is now in hand.

During the year the Wigham light, in Helensville River, Kaipara Harbour, has been replaced by an automatic acetone light.

As East Cape Island has become dangerous as a site for the lighthouse, a new site on the mainland has been decided upon, and the transfer of the lighthouse from the island to the mainland will be undertaken this year.

HARBOUR-WORKS.

During the year very little has been done in the nature of works in the harbours under the control of the Government. All the buoys and beacons in the harbours under the control of the Department have, however, been regularly overhauled, cleaned, and painted, and where necessary new moorings have been put down.

TOURIST AND HEALTH RESORTS.

The total expenditure incurred during the year was £19,041, as against £6,194 for the previous year. The greater part of this expenditure was incurred at Rotorua, mainly on the completion of the work of replacing the wooden water-mains by cast-iron ones. This work, which has been completed so far as the town is con-

cerned, absorbed £10,000. The electrical works at Rotorua cost £2,311; and the bringing-in of a further supply of hot mineral water to augment that from the Rachel Spring, £2,202. This last item will provide a practically unlimited supply for many years to come.

ROAD CONSTRUCTION AND MAINTENANCE.

The sum provided on the estimates last year for road and bridge construction and maintenance was greater than that of any previous year since the inauguration of the public-works policy. The expenditure also constituted a record.

The efforts of the Department have been directed mainly in providing primary access to lands already in occupation, but the improvement, widening, and metalling of existing access roads, and the construction and renewal of bridges, have not been neglected. The greater part of the work has been undertaken by my own staff, but subsidized works, such as metalling, renewal of bridges, &c., were in most cases entrusted to the local bodies concerned. A certain amount of modern road-making plant has been purchased and used with successful results. The use of motor-lorries has cheapened the cost of haulage of metal, steam-shovels have been installed where the magnitude of the work warranted, and oil-driven road-rollers are being used in connection with metalling operations.

In the prosecution of the various activities connected with roads and bridges it is desired to utilize to the utmost all plant and machinery suitable for that purpose, whether the property of the Department or of the local authorities, so that all efforts may be co-ordinated towards the adoption of methods that would contribute towards efficiency, economy, and expedition in the carrying-out of works.

It has been recognized that where there are at present no railway facilities, nor any likely to be in the early future, it is reasonable to provide suitable roads so as to compensate as far as possible for such disabilities. In accordance with this principle particular attention has been directed to the energetic prosecution of work in the formation, metalling, and bridging of such important road connections as those between Napier and Gisborne, and between Te Kuiti and Waitara.

It is proposed that in future the appropriations for roads and bridges be based on an automatic system whereby those districts that are backward in roading and in development shall receive a greater proportion of the amounts available than will other districts that are already well roaded and well developed. The basis for adjustment will include such factors as mileage of roads unopened, areas of Crown and Native land undeveloped, areas of districts, populations, productivity, loans, and mileage of roads still requiring improvement.

Efforts have been made and will be perfected whereby local authorities will be brought into closer touch with local public-works representatives. For instance, district and resident engineers will have the advantage of discussing proposed allocations direct with local authorities. This, it is hoped, will bring about better understanding and combined purpose and effort.

TELEGRAPH EXTENSION.

During the year 46 miles of telegraph and inter-urban telephone pole-line, carrying 615 miles of wire, were erected. In connection with telephone-exchange subscribers' lines an additional 330 miles of pole-line, carrying 4,263 miles of open aerial wire, and 41 miles of cable containing 11,446 miles of wire, were made available.

The coin-in-the-slot telephone machines were increased by twenty-four during the year; telephone exchanges were increased by five, whilst twenty-five others are in various stages of completion. The number of new subscribers joined to telephone exchanges during the past year was 8,785, and this increase necessitated additional switchboard accommodation at fifty-five exchanges.

The installation of automatic exchanges is proceeding at Auckland, Palmerston North, Wanganui, Kelburn (Wellington), and Oamaru. Owing to the comparative shortage of material, the development of the automatic telephone-system has been severely handicapped, but every effort is being made to provide for all requirements as speedily as conditions will permit.

The installation of automatic printing-telegraphs has been delayed by the non-arrival of the greater part of the apparatus; but this is now coming to hand, and it is expected that an installation of this up-to-date system will be made at an early date.

The Chief Telegraph Engineer has returned from a visit abroad; and, as a result of his investigations into the telegraph and telephone systems, also methods and rates of operation, in other parts of the world, increased efficiency combined with economies in both telephone and telegraph services may be expected.

CONTINGENT DEFENCE.

Owing to the exercise of the strictest economy in the Defence Department, only £8,700 of the £15,000 appropriated last year was expended on urgent and necessary works.

The formation of a rifle range at Invercargill has been accomplished by the reclamation of an area of 270 acres. This land will be brought under cultivation by the Prisons Department, in connection with the Borstal Institution, in addition to providing a rifle range for defence purposes.

The reduction in administrative groups from twenty-one to twelve, contingent upon the reorganization of the New Zealand Military Forces, will have the effect of reducing the number of full-sized ranges to be maintained. As a consequence of this policy no further expenditure in the direction of acquisition of land for rifle ranges will be necessary.

The accommodation for military equipment and stores, and magazines for ammunition, is inadequate, while the present system of housing all reserve military stores at Wellington and Trentham is unsatisfactory and unsuited for rapid mobilization. Consideration is therefore being given to the acquisition of mobilization stores and magazines in each of the three military commands (Northern, Central, and Southern), in order that the troops in each command will be self-contained in regard to provision of their requirements on mobilization.

It is proposed to dismantle huts at Featherston and to re-erect them at various small drill centres for use as drill-halls, stores, and miniature ranges. It is also intended to convert a few of these hutments into quarters for the married permanent personnel in localities where ordinary housing facilities are not available.

LANDS IMPROVEMENT.

The roading of improved-farm settlements has been completed. A small sum is, however, being provided in the estimates this year to meet special cases as they may arise, such as the formation of deviations of roads, &c.

LANDS, MISCELLANEOUS.

The sum of £2,537 was expended on the construction of roads in the Hauraki pastoral area. The work was somewhat delayed owing to the difficulty of obtaining supplies.

The principal works of formation, widening, and reconditioning of roads in hand are the Tapu–Gumtown Road, Kaueranga–Tairua Road, Mill Creek Road, and the widening of the Port Charles to Jackson Track.

In consequence of the roadworks an early settlement of discharged soldiers is expected along the Tairua Road, and the Tapu–Gumtown works will afford access to a large area of reasonably good country in the Tapu district.

LAND FOR SETTLEMENTS ACCOUNT.

Roads to open up Crown Lands.—A sum of £252,800 was appropriated for this purpose, but labour difficulties and shortage of material retarded progress, and a comparatively small expenditure of £28,920 was incurred. A more vigorous policy of settlement is being pursued, and the construction of roads opening up the various blocks of land for settlement is being carried out as expeditiously as possible, and works involving an expenditure of £154,692 are at present in hand.

DEVELOPMENT OF MINING.

Of the £2,153 expended under this head last year the major portion was in connection with the purchase of drills for prospecting purposes.

IRRIGATION AND WATER-SUPPLY.

Ida Valley Scheme.

Syndicate Race.—This has been extended nearly 2 miles and is completed, with the exception of a few culverts, to 11 miles 76 chains.

German Hill Race.—The work of completing this race, which had been previously partially constructed, was commenced in the spring of last year, and is still in progress. A deviation to avoid a flume at Kirk's Creek has been made. The only works now remaining to be done to link up this section are a flume at Moa Creek and a weir at Poolburn.

Drainage.—The scheme for drainage of portion of the valley was extended by clearing 20 chains of Moa Creek, and the erection of one private-crossing bridge and one public-road bridge.

Irrigation.—About 40 miles of races were maintained for the supply of water during the season 1920–21. Over 4,400 acres were irrigated.

Galloway Flat.

Dip Creek Weir.—A concrete diverting-weir and measuring-device at the intake were completed.

Main Race.—The main race, 7½ miles in length, together with necessary flumes and gauge-boxes, has been completed with the exception of a few minor details. Water was used from it towards the end of the irrigation season.

Irrigation.—The previously constructed race which supplies water on the north side of the railway was cleaned out. A limited quantity of water was supplied by temporary means. About 160 acres were irrigated.

Olrig Terrace Scheme.

No construction was undertaken during the year. About 75 acres were irrigated, the water being supplied through an old existing race.

Manuherikia Scheme.

Intake Tunnel.—The remaining 1·22 chains of tunnel was driven. Lining, where necessary, over a distance of 4⅓ chains, is completed. Of the remainder about 4 chains require lining. Excavation for an inlet from the Manuherikia River to the tunnel is in progress and about three-fourths complete. Excavation for the gravel-trap at tunnel-outlet is ready for concreting.

Main Race.—Excavation of the main race has been extended to its terminus. Three deviations to avoid flumes have been made.

Chatto Creek Siphon.—A double line of 1,800 ft. of piping (22 in. to 26 in. diameter) is on the site ready for setting when the necessary Australian hardwood arrives.

Ardgour Settlement Scheme.

This is a new scheme, commenced in June last, and when completed will supply water for the irrigation of about 2,000 acres of good settled land.

Earnscleugh Scheme.

Water rights and races from the Fraser River have been purchased from the Sandy Point Gold-mining Company, and plans and estimates for a comprehensive scheme to irrigate Earnscleugh Flat with water therefrom have been completed. Water will be available for irrigators during the coming season.

After personally inspecting the arid areas proposed to be irrigated and those already irrigated I am satisfied that in irrigation will be found the salvation of Central Otago. Really wonderful results have already been achieved: 1,700 sheep carried on 300 acres, not all irrigated, is an example, while £20 clear per acre is being taken from lucerne after allowing for water rates, rent, labour, &c. While the area irrigated is still only a small proportion of that commanded, the work is

steadily increasing, and, as labour becomes easier to obtain, still will it more rapidly increase. Already the work is self-supporting, though interest is not yet covered.

It is recognized that irrigation farming, like bringing into profit bush and swamp areas, involves expense and very heavy work on the landowners. A man with a fair area of land cannot bring the whole of it into profit immediately the water is turned on, and in order to meet this difficulty and give irrigators time to bring their farms into full bearing arrangements have been made to charge for water on a graduated scale, commencing at a very low figure and increasing annually, so that at the end of five years (by which time the land should be fully developed) the full charge for water will have been reached. As this concession in the early stages will result in a certain amount of loss, this loss has been added to the capital invested for the purpose of computing the annual charges, so that eventually there will be no loss to the State.

WAIHOU AND OHINEMURI RIVERS IMPROVEMENT ACCOUNT.

Upper Waihou.—Ten chains of clearing have been done on each bank, and on the left bank Wiggin's Gap stop-bank, 27 chains in length, has been completed. 215 chains of clearing have been finished on the left bank of Tirohia–Ngararihi Section, and the river snagged for a similar distance. The final stop-bank has been completed for a distance of 81 chains. 105,000 cubic yards of sand were pumped by the dredge, and the preliminary stop-bank completed for a length of 14 chains. On the opposite or right bank 358 chains of clearing were done, and 1¼ miles of preliminary stop-bank finished. A further section, 2 miles long, is now in hand.

Lower Waihou.—On the Ngahina–Hikuraia Section clearing over a length of 3¼ miles on the left bank and 3¾ miles on the right has been finished. A drag-line excavator has done excellent work under unfavourable conditions. On the left bank the preliminary stop-bank, 2 miles in length, is complete, except temporary gaps left for drainage purposes. A further 1¼ miles is in hand. On the right bank, with the aid of tractors, ploughs, and scoops, the preliminary bank has been completed to 2 miles 60 chains, and a further mile is now in hand.

Komata Creek.—A second drag-line excavator commenced work in April last, and 10 chains of creek-diversion have been excavated, and the material deposited in the preliminary stop-bank. Clearing has been completed for a length of 20 chains.

Ohinemuri.—Willows have been ring-barked over a length of 62 chains, and the stop-bank brought up to preliminary level.

Tirohia–Rotokohu.—Over 2 miles of drains have been excavated to final depth and width by means of a dipper dredge. The output for this machine was over 37,000 cubic yards for the year.

The question of allocation of cost of this work has for some years been exercising the minds of those responsible for payment, and it was felt by all parties that the allocation made by the 1910 Act did not now represent the position. A Royal Commission was set up on which the mining and agricultural interests were represented, and their report will shortly be laid on the table of the House. Whether or not the Government will be able to carry out in full the recommendations of the Commission has not yet been definitely decided, but meanwhile work will proceed as at present.

HYDRO-ELECTRIC POWER.

Lake Coleridge Supply.

The financial result of the operation of the Lake Coleridge system for the year ending 31st March, 1921, has again been very satisfactory, and, after paying all operating, interest, and depreciation funds, has allowed the deficit on the first four years' operation to be still further reduced. The revenue for the year was £51,373, and the expenses were—

	£
Working-expenses	21,341
Interest	18,639
Depreciation	7,946
	£47,926

giving a profit of £3,447, which will be used in the reduction of the accumulated deficit on the first four years' operation.

There are, of course, in addition to the direct profit shown above, indirect benefits conferred on the district by having this source of power available, which have so increased the demand for power-supply that the plant has been run overloaded continuously throughout the year, and numbers of prospective consumers have had to be refused connections until extra plant can be installed. During the year the load on the plant reached 7,412 kilowatts, although the normal full-load rating of the machines is only 6,000 kilowatts. The fifth unit (4,000 horse-power) has been installed during the year, and the pipe-line to supply this was expected to be completed by October of this year. It is hoped that if this machine gives satisfactory trial runs it will be able to take up a share of the load before the end of the year. A further unit of the same size has also been ordered, and should be completed and in service during 1922. The level of the lake had been falling gradually as the load has exceeded 6,000 kilowatts, that has always been considered the limit of power available from the Lake-stream itself, without the addition of water from the Harper, Acheron, or Wilberforce Rivers. During the year a channel was excavated from the Harper River bed into the lake, and a temporary diversion of the river made into this channel. This has proved very successful, and the lake-level has risen consistently ever since. It is proposed during the coming summer to complete a permanent diversion of the river into this channel, which will enable the Coleridge station to be duplicated and brought up to a capacity of at least 36,000 horse-power. It is anticipated that this will meet the demands of both North and South Canterbury for some years. A start has been made with the erection of a transmission-line to give supply to South Canterbury, and it is anticipated that a limited amount of power can be supplied over this by the end of 1922, and a complete supply when the duplication of power-house, for which plans are now being prepared, is completed.

Horahora Power-station.

This power-station, which was taken over from the Waihi Company and operated on behalf of the Department for the concluding five months of the preceding year, has been operated by the Department for the past year.

As in early years of the Coleridge undertaking, the first year of operation of this plant does not show a profit after allowing for all charges. It is satisfactory, however, that the whole of the operating-expenses have been paid, together with a substantial sum towards interest and depreciation even at this early stage of operation.

The revenue for the year ending 31st March, 1921, was £14,805, and the expenses were as follows :—

	£
Operation	6,452
Interest	10,675
Depreciation	3,960
	£21,087

leaving a deficit of £6,282 on the year's operation. Next year's revenue should show a very substantial increase, as it was only towards the end of the financial year just closed that any consumers other than the Waihi Gold-mining Company were connected up. Since the close of the financial year supply has been given to the Hamilton Borough Council, and to the Thames Valley, Te Awamutu, Central, and Cambridge Power Boards, which will very considerably increase next year's revenue. A contract has been made with the Grand Junction Company to take a supply of power from our system so long as we have it to spare, and when our supply becomes limited, or in the event of a failure of supply, we can utilize the company's steam plant up to a capacity of 2,000 kilowatts to supply power back into our system. Similar contracts on a smaller scale have been made, and others are being negotiated, with some of the dairy companies in the district which already have efficient steam plants.

The maximum load on the station during the year was 3,600 kilowatts, but it is anticipated that by the end of the present year the load will have reached very nearly the limit of the present plant, 6,000 kilowatts. Tenders have been invited for two additional units of 2,000 kilowatts, which it is proposed to add to the present station, and preparations will be made for installing this plant as soon as it can be delivered.

The work of erecting the transmission-lines necessary to give supply to the different Power Boards has been pushed on vigorously during the year, and all the Boards are now in a position to take power at one or more points.

Electric-power Boards.

A large amount of work in connection with the formation of Power Boards has been done during the year, although the total number finally constituted has only increased by four. Quite a number of other districts have, however, taken steps to form Power Boards and have circulated petitions, so that this number will be considerably increased during the next twelve months.

Nine of the Power Boards at present constituted have already laid out reticulation systems and submitted loan proposals to the ratepayers. The loan proposals authorized amount to £2,950,000, equivalent to £21·6 per head of population concerned and to 6·7 per cent. of the unimproved rateable value of the districts included.

It is becoming generally recognized throughout the country that the distribution of power by means of Boards specially set up for the purpose will result in the actual consumer obtaining his power-supply on the best possible terms. Whilst it is recognized that the system adopted in Christchurch in connection with the Lake Coleridge scheme, under which supply is given by the Department to individual local authorities, has been very highly successful, and was necessary while the electric-supply business was growing and on its trial, it is now felt that better results can be obtained by deputing the whole of the business of distribution and supply in a district to one body whose special business it will be to see that the power is made available to all on the very best terms possible. With the policy of the Department supplying in bulk to a number of smaller local authorities it has been found that in many cases both the Department and the local authorities have to carry staffs and equipment to deal with this branch of the business, and that there is apt to be overlapping and duplication. It has also been felt that some of the local distributing authorities are too small, and that in consequence they have been unable to provide the special staff required to efficiently manage their electric-supply business, or, alternatively, that the staff and overhead expenses bear an excessive relation to power distributed.

My natural inclination is to let local authorities manage their own affairs; but after a very careful investigation of the proposals put forward by my expert officers, which are designed at every point to work in with the development of the most economical schemes in the interest of the country as a whole, and pay due regard to community of interest, I am convinced that it is necessary for the Government to insist on the formation of Electric-power Boards, in conformity with the scheme prepared by the Department, and not those dictated by immediate local interest vitiated to a considerable extent by existing licenses. The case is definitely one where, for the eventual good of the whole community, town and country must assist one another to finance the undertaking and to secure what is the secret of financial success in any electrical undertaking—namely, diversity of load, and distribution over as wide a load as possible of the costs of operating and management.

In the reports attached to the Public Works Statement of 1920 the Department laid down as a basis what it was considered should be the districts to be administered, in the matter of distribution of electric supply, by the various electric-power Boards constituted or to be constituted.

It is essential, for the final and best success of the Power Board's scheme, that the primary matter of development of electric power, and the secondary matter of its distribution, should be considered and dealt with in its initial stages not from the point of view of immediate or local circumstances, but from the point of view of ensuring that final development and organization will be on the lines to secure to the Dominion as a whole the most economical and successful means of development of power and its distribution. The great objective is the development and distribution of electric power to the consumers at the cheapest possible rate. The only possible way to achieve that end is to plan from the beginning the eventual scheme of development, and to eliminate the minor considerations and influences dictated by circumstances of temporary expedient and local influence.

Prior to the coming into operation of the Electric-power Boards Act, in the matter of development of electric power and its reticulation and supply to the people (apart, in the matter of development, from the Coleridge scheme, which was largely educational), the organization of existing local authorities had to be utilized.

An existing local authority, other than an electric-power Board, has many interests, only one of which may be the distribution of electric power. Because hydro-electric power and light, unless in most exceptional circumstances, are so much cheaper than any other form of development, the public pays, without cavil, the price demanded by the distributing authority. The perfectly natural tendency of such a distributing local authority is to make all the profit it can out of such a

service; and because the charge on the individual consumer is something less than the price at which he could obtain a similar service from elsewhere, he pays without demur. The result is that the consumer is paying more than he should, and the profit is being utilized in reduction of the cost to ratepayers of other works and services which should be financed on their own ways and means. This, it must be understood, is a general statement having particular reference to hydro-electrically-developed power distributed by local authorities other than Power Boards.

An Electric-power Board, having only one interest, has no object other than to supply the consumers at the cheapest possible rate, and is therefore to be infinitely preferred as a distributing medium.

It is to be regretted that some local authorities, particularly certain municipalities who hold licenses to distribute power developed from existing plants, are showing a tendency to stand out of Power Board schemes, hoping, no doubt, to carry on with their own power development (meantime making what profit they can out of the sale of power) and later on to take power in bulk from any scheme developed by the Government, or to bargain with a Power Board developing its own power, and continue, in the event of a satisfactory bargain with either party, making a considerable profit out of the retailing of power and light. This is not in the interest of the consumer.

Other Local Electric-supply Authorities.

Several of the existing local electric-supply authorities are making arrangements to extend their plants and have works under construction, but, following on the difficulty of obtaining supplies during the war period, they now find the existing financial stringency hindering them considerably in some of the works contemplated. Seven additional licenses to erect plants have been issued, mainly to isolated districts which cannot hope to be connected to the general Government supply for some time, but no new plants have been put into operation during the year. Care is taken in all these cases to see that the works and plant are being designed on lines which will allow of these undertakings working in with the Government supply when available.

Government Hydro-electric Proposals.

The Government has adopted a general scheme of power-supply to the North Island as laid down in a report (1918) by Mr. Parry, previously Chief Electrical Engineer, which provided for three main generating-stations, at Mangahao (24,000 h.p.), Arapuni (96,000 h.p., capable of extension to 162,000 h.p.), and Waikaremoana (40,000 h.p., capable of extension to 136,000 h.p.). This scheme was adopted after consideration of many alternatives of a general supply from a number of smaller stations, or of an initial supply from one large central generating-station, as being the one best suited to fill the conditions which are likely to arise within the next few years, without unduly loading the cost of initial development, or without causing the prospect of having to incur further heavy liabilities at a later date when the supply from smaller sources should become overtaxed.

The cost of operation and organization for delivery of power to Power Boards are practically the same for a 50,000 h.p. delivery as they are for a 5,000 h.p. delivery; and let it be borne in mind that in actual working these are the costs that count and for which the consumer pays.

I am aware that an attempt is now being made, by parties not wholly disinterested, to induce the general public to believe that it is better to go ahead with a large number of small schemes than to await the development of the main Government schemes.

The measure of development of Government schemes must be dictated by the ability of the country to finance them. The Government's margin of credit and security is immeasurably greater than that of any local effort.

If the public is convinced by the agitation to which I have referred, then it must believe that fifty power schemes can be financed, constructed, organized, and run, and supply the same amount of power, as five power schemes developing an equivalent amount of power. Such a conclusion is, to my mind, unsound, and I feel assured that the public will realize it before they enter into commitments for which they will pay for all time, or, alternatively, have to scrap their plants and cut the loss incurred by impatience.

Provision for the raising of the necessary loans to carry out the three main schemes above was made in the Electric-power Works Loan Act, 1919, and in the Finance Act of 1920, but owing to the difficulty of obtaining labour or material at a reasonable cost during the period immediately following the war, and owing to the high rates of interest now ruling, it has been decided as inadvisable to proceed with the active construction of the whole of these works at the present time.

It may be unfortunate that I have to preach this doctrine at a time when financial stringency compels the Government, and should, but apparently does not, similarly compel local organizations, to hasten slowly with a view to securing development at lowest possible capital cost.

If local organizations would calculate with the same exactitude that my Department has done the eventual cost to the consumer of the various schemes which they propose to carry out at existing costs as against the cost of bigger schemes taken in hand and pushed through in the minimum time, once the money required to carry them out is definitely available, they would realize the wisdom of the Department's view.

It must be remembered that in large electric-power works, of the total cost of power as delivered to our consumers from 70 to 80 per cent. is due to capital charges, interest, depreciation, and sinking funds. It is essential, therefore, that the works, when undertaken, must be carried out in the most economical manner that is consistent with good work and proper provision for extensions and for the future, if these capital charges are to be kept down, and power to be sold at the lowest possible rate. To reduce the interest charges during construction also it is essential that, once started, the works must be carried along on businesslike lines, so that they may reach a revenue-producing stage as early as possible. When it is realized that a reduction of 1 per cent. in the rate of interest payable on the loan-moneys means that the cost of power supplied can be reduced at least 11 per cent., apart from any reduction due to the general reduction in cost of material that would naturally follow a reduction in interest, it is evident that we should very carefully consider embarking on any undertaking involving large capital expenditure if there is any early prospect of a drop in the money-market, unless by delay we are seriously retarding the industries of the country.

Though the full programme of development which it was hoped to carry out when the scheme outlined above was adopted has not been started, yet the Department's activities in hydro-electric development have been greater than in any other year in the history of the Dominion. The expenditure on extensions to existing schemes and in the development of new ones amounted to £325,234. To carry on the schemes to which the Department is already committed and on which work has commenced means the expenditure of the following sums during the next few years :—

——	Spent up to 31st March, 1921.	Commitments, 31st March, 1922.	Commitments, 31st March, 1923.	Commitments, 31st March, 1924.
	£	£	£	£
Southland	200,000	50,000	..	..
Lake Coleridge—				
Headworks	568,000	56,500	150,000	200,000
Transmission		60,000	60,000	60,000
Horahora—				
Headworks	295,000	50,000	50,000	..
Transmission		150,000	150,000	..
Mangahao—				
Headworks	143,000	275,000	300,000	200,000
Transmission		75,000	100,000	125,000
Waikaremoana	3,000	60,000	50,000	..
Otago—				
Headworks	..	50,000	150,000	100,000
Transmission	..	30,000	120,000	100,000

which sums total over three millions and a quarter commitments for development to end of 1923–24, or total to 1929 of £4,715,500.

Were the whole scheme gone on with these expenditures would grow considerably, and the country would be faced with the following expenditure to complete these in the time that is desirable if the work is to be done in the most economical manner :—

Full Development (260,000 h.p.) in accordance with Mr. Parry's Report for the North Island (160,000 h.p.) and a Corresponding Interconnected Scheme for South Island (100,000 h.p.), excluding Waipori (28,000 h.p.) and Monowai (12,000 h.p.).

Schemes.	Amount expended to 31st March, 1921.	Estimated Expenditure to 31st March, 1922.	1923.	1924.	1925.	1926.	1927.	1928.	1929.	Later Expenditure.	Total Amount.
	£	£	£	£	£	£	£	£	£	£	£
Surveys	13,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	2,000	..	43,000
Lake Coleridge—											
Headworks	568,000	56,500	..	150,000	200,000	150,000	..	..	..	..	1,464,500
Transmission		60,000	60,000	60,000	100,000	60,000					
Horahora—											
Headworks	295,000	50,000	50,000	..	..	..	..	..	..	..	645,000
Transmission		150,000	100,000								
Mangahao—											
Headworks	143,000	275,000	300,000	200,000	82,000	..	..	..	..	..	1,700,000
Transmission		75,000	100,000	125,000	100,000	100,000	100,000	100,000			
Arapuni—											
Headworks	11,000	60,000	182,000	218,000	287,000	497,000	138,000	..	..	307,000	1,700,000
Transmission	..	..	50,000	50,000	200,000	300,000	300,000	300,000	300,000	300,000	1,800,000
Waikaremoana—											
Headworks	3,000	60,000	100,000	250,000	350,000	150,000	..	..	100,000	317,000	1,330,000
Transmission			50,000	100,000	100,000	150,000	200,000	200,000	200,000	300,000	1,300,000
Otago—											
Headworks	..	..	..	80,000	100,000	100,000	100,000	100,000	100,000	120,000	700,000
Transmission	..	30,000	120,000	100,000	100,000	100,000	100,000	80,000	50,000	20,000	700,000
Westland—											
Headworks	..	..	20,000	100,000	100,000	100,000	..	..	..	..	320,000
Transmission	..	..	10,000	100,000	100,000	50,000	50,000	50,000	40,000	..	400,000
Marlborough, Nelson, and Buller—											
Headworks	..	5,000	20,000	100,000	100,000	105,000	70,000	..	..	..	400,000
Transmission	..	..	..	..	100,000	100,000	50,000	50,000	50,000	50,000	400,000
Totals	1,033,000	825,000	1,166,000	1,637,000	2,023,000	1,966,000	1,112,000	884,000	842,000	1,414,000	12,902,000

With these figures in mind, and considering the arguments above in regard to costs in relation to interest rates, it is evident that the best results to the country will be obtained by holding back as much of this expenditure as is possible at the present time; and then, when conditions are more favourable, embarking upon a concentrated and vigorous scheme of construction, on carefully considered plans, that will give the country a supply of electricity that will not be loaded for years to come with high charges consequent on the abnormal costs of construction at the present time.

This is applicable not only in the case of large generating-stations proposed by the Government, but also to various alternative local schemes proposed at various times, which in the aggregate would amount to an even larger expenditure than is involved in the Government proposals, and which if rushed into now would only load the country with unduly expensive power for years to come.

Construction work at the Mangahao scheme, which is to supply power to the Wellington District, has been actively pushed on during the year. The necessary roadworks have been completed, and considerable lengths of each of the two tunnels excavated. It is hoped during the coming summer to start active construction work on the two dams. Some difficulties were experienced in connection with the foundations of these, but new designs have been prepared which will overcome these and give absolutely satisfactory structures, though at increased cost. Tenders were received for the main pipe-lines, but owing to the very high prices ruling at the time it was decided to invite fresh offers, which are closing in November, and we will undoubtedly save several thousand pounds on this item alone, consequent on the fall in prices that has occurred. Tenders for the main generating plant have been invited, and will be opened and considered shortly. At Arapuni, the proposed main supply for the Auckland Province, a vast amount of information has been collected during the year, and the results of this were submitted to a commission of engineers who visited and inspected the site of the proposed dam. These gentlemen decided that to make the dam doubly safe it would be advisable to amend the design somewhat, with a resulting increase in cost. The question of alternative sources was again very carefully gone into by my expert advisers in the light of revised costs, but the conclusions reached were that with any type of dam Arapuni was undoubtedly the most suitable source of power to develop for the Auckland District. At Waikaremoana contracts have been let for the supply of a plant of 1,000 horse-power capacity, and delivery of most of this plant is expected by the end of this year, and it is hoped to have it in operation before the end of 1922. This plant is part of the main generating plant, and will be used in part for the construction of the main scheme when started, and part for the supply of the Wairoa Power Board.

For the general supply to the whole of the South Island a complete scheme has not yet been laid down. Schemes of supply from new proposed generating-stations at Lake Hawea or at the Teviot River have been considered in detail, but it has been decided that for some time to come the supply to Otago, Southland, and Canterbury can best be met by linking up and developing to their economic limit the existing developments at Monowai (Southland Power Board), and Waipori (Dunedin City Corporation), with the Government scheme at Lake Coleridge. Negotiations are now proceeding with the Dunedin City Council under which, if satisfactorily completed, they will further develop Waipori, and sell power in bulk to the Department for transmission to the various Power Boards proposed in the Otago District, and to join up with the Department's supply from Lake Coleridge at Timaru.

For the supply to the northern end of the Island surveys have been made on the Clarence River, Waihopai River, Rotoroa (Gowan River), and Rotoiti Lakes, and other minor sources, and preliminary reports on these schemes prepared. Pending further survey and investigation work to be done in the Buller and Westland districts it is impossible to definitely lay down a general scheme, but the indications are that as soon as sufficient load develops a fairly economical scheme for the supply of Nelson and Marlborough can be developed on the Gowan River, the outlet of Lake Rotoroa.

Owing to the financial conditions prevailing and the consequent curtailment of some of the activities contemplated in my previous report the appointment of the special advisory Board mentioned therein has been held over pending the more active prosecution of hydro-electric development. Meanwhile the whole of the work of operation and management of the Department's existing plants, the investigation and design of new works and plant, and the construction of new works is being carried on by the staff of the Public Works Department, to whom I am indebted for their loyalty and energetic support during the last year.

CONCLUSION.

In conclusion, while regretting that the financial situation will not permit my carrying out all the work which the present favourable state of organization and supply of labour and material would permit, it has been my aim in drawing up my proposals to so allocate the available funds as to ensure prosecution of the projects which will lead to maximum production and generally produce the greatest good for the greatest number.

PUBLIC WORKS STATEMENT, 1921.

INDEX.

TABLES.

APPENDICES.

TABLE No. 1.

SUMMARY SHOWING THE TOTAL EXPENDITURE ON PUBLIC WORKS AND OTHER SERVICES OUT OF PUBLIC WORKS FUND TO 31ST MARCH, 1921, AND THE LIABILITIES ON THAT DATE.

Number of Table containing Details.	Works.	Total Net Expenditure to 31st March, 1920.	Expenditure during Twelve Months ended 31st March, 1921.	Recoveries on Account of Services of Previous Years.	Total Net Expenditure to 31st March, 1921.	Liabilities on 31st March, 1921.	Total Net Expenditure and Liabilities.	Works.
		£	£	£	£	£	£	
3	Railways*	36,238,115	1,365,466	388	37,603,193	818,593	38,421,786	Railways.
..	Roads	12,009,175	538,904	81	12,547,998	393,226	12,941,224	Roads.
..	Development of mining	833,179	2,153	1,606	833,726	682	834,408	Development of mining.
..	Telegraphs	4,072,978	336,468	..	4,409,446	463,843	4,873,289	Telegraphs.
..	Public buildings	7,799,943	502,211	1,360	8,300,794	112,904	8,413,698	Public buildings.
..	Lighthouses, harbour-works, and harbour-defences	1,151,941	4,838	..	1,156,779	49	1,156,828	Lighthouses, harbour-works, and harbour-defences.
..	Departmental	1,552,931	143,279	6,280	1,689,930	..	1,689,930	Departmental.
..	Electric-power supply and development	9,254	..	9,854	*Cr.* 600	..	*Cr.* 600	Electric-power supply and development.
18 of 1878	Coal-exploration and mine-development	10,835	..	..	10,835	..	10,835	Coal-exploration and mine-development.
11 of 1877	Aiding works on Thames goldfields ..	50,000	..	..	50,000	..	50,000	Aiding works on Thames goldfields.
..	Immigration	2,267,549	*Cr.* 7,806	..	2,259,743	..	2,259,743	Immigration.
..	Purchase of Native lands	2,061,849	..	58	2,061,791	..	2,061,791	Purchase of Native lands.
..	Defence	1,061,765	8,701	..	1,070,466	..	1,070,466	Defence.
..	Charges and expenses of raising loans ..	1,253,073	184	..	1,253,257	..	1,253,257	Charges and expenses of raising loans.
..	Interest and sinking fund	218,500	..	..	218,500	..	218,500	Interest and sinking fund.
..	Rates on Native lands	68,671	..	..	68,672	..	68,672	Rates on Native lands.
..	Thermal springs	14,600	..	..	14,600	..	14,600	Thermal springs.
..	Tourist and health resorts	267,254	19,041	..	286,295	2,182	288,477	Tourist and health resorts.
..	Lands improvement	138,304	2,064	..	140,368	..	140,368	Lands improvement.
..	Payment to Midland Railway bondholders	150,000	..	..	150,000	..	150,000	Payment to Midland Railway bondholders.
..	Irrigation and water-supply† ..	194,835	55,345	..	250,179	3,257	253,436	Irrigation and water-supply.
..	Plant, material, and stores	159,296	169,910	..	329,206	138,698	467,904	Plant, material, and stores.
	Totals	71,584,047	3,140,758	19,627	74,705,178	1,933,434	76,638,612	Totals.

* Exclusive of expenditure on Hutt Railway and Road Improvement and Railways Improvement Accounts.

† Includes £115,000 previously expended under Irrigation and Water-supply Account 1911–12 to 1915–16 and part 1917–18, now included in Public Works Fund.

TABLE No. 2.

GENERAL SUMMARY.

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND, 1899–1900 to 1920–21.

N.B.—The figures in italics, prefixed by "*Cr.*," are either recoveries on account of services of previous years or receipts-in-aid applied in reduction of expenditure.
Expenditure from 1892–93 to 1896–97, inclusive, includes expenditure under Native Lands Purchase Account; and from 1894–95 to 1896–97, inclusive, expenditure under Lands Improvement Account.

Description of Services.	Total Net Expenditure to 31st March, 1899.	Expenditure.										
		1899–1900.	1900–1.	1901–2.	1902–3.	1903–4.	1904–5.	1905–6.	1906–7.	1907–8.	1908–9.	1909–10.
	£	£	£	£	£	£	£	£	£	£	£	£
Immigration	2,147,120	385	214	139	142	*Cr.* 7	6,481	8,753	14,353	9,132	15,075	17,003
Public Works, Departmental	433,812	12,572	12,932	17,771	13,949	16,088	12,814	13,517	16,710	18,219	24,512	41,176
Development of Water-power	..	..	..	..	..	..	468	2,901	4,664	315	..	..
Irrigation and Water-supply	..	..	..	..	..	..	..	..	..	..	..	..
Railways	16,032,366	417,937	717,723	1,333,940	759,752	828,704	779,891	1,021,265	1,227,880	1,093,535	1,116,184	1,128,400
Payment to Midland Railway Bondholders	..	..	..	..	..	150,000	..	..	..	..	..	..
Roads :—												
Miscellaneous Roads and Bridges	4,254,739	237,351 *Cr. 347*	267,374	354,687	230,349	316,248	202,850	306,065	308,500	285,248	422,174	297,932
Roads on Goldfields	391,423	48,039	48,417	47,573	51,690	45,594	26,112	45,139	38,970	38,494	47,375	40,830
Development of Thermal Springs and Natural Scenery ..	16,023	..	..	..	..	..	..	..	..	..	..	..
Lands Improvement Account*	300,930	..	..	..	..	..	..	..	..	..	..	..
Total, Roads	4,963,115	285,043	315,791	402,260	282,039	361,842	228,962	351,204	347,470	323,742	469,549	338,762
Development of Mining	648,631	21,815	15,907	15,326	24,213	16,278	6,258	18,533	11,064	8,633	32,859	18,597 *Cr. 1,000*
Purchase of Native Lands	1,412,277	32,025	28,688	18,261	15,782	5,352	6,281	13,777	9,135	2,190	2,099	30,567
Native Lands Purchase Account	491,980	..	..	..	..	..	..	..	..	..	..	..
Total, Land Purchases	1,904,257	32,025	28,688	18,261	15,782	5,352	6,281	13,777	9,135	2,190	2,099	30,567
Telegraph Extension	829,286	26,771	50,101	31,729	68,578	47,228	79,298	77,186	114,068	155,491	163,032	123,423

* Subsequent expenditure under separate class "Lands Improvement," see next page.

Continued on page 4.

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing Net Yearly Expenditure out of Public Works Fund, 1899–1900 to 1920–21—*continued.*

Description of Services.	Total Net Expenditure to 31st March, 1899.	Expenditure.										
		1899–1900.	1900–1.	1901–2.	1902–3.	1903–4.	1904–5.	1905–6.	1906–7.	1907–8.	1908–9.	1909–10.
Public Buildings:—	£	£	£	£	£	£	£	£	£	£	£	£
General (including Miscellaneous)	234,372	3,957	5,594	12,513	9,031	10,964	9,021	2,231	14,216	16,260	39,635	41,964
Parliamentary	42,104	9,883	3,039	4,424	1,503	602	697	71	1,047	4,119	5,172	3,157
Judicial	360,815	19,682	29,630	28,728	33,224	25,978	13,083	15,899	35,192	28,938	37,211	31,606
Post and Telegraph	182,888	13,483	20,954	40,361	74,686	53,918	16,008	38,419	43,918	43,724	62,262	68,574
Customs	6,920	107	875	2,066	6,630	8,719	13,018	7,903	414	47	2,507	233
Quarantine Stations	3,834	..	2,607	424	..	..	..	..	..	..	..	..
Mental Hospitals	422,268	17,712	18,872	16,743	10,167	15,812	15,949	16,235	8,049	7,987	15,296	19,839
Public Health	..	..	..	..	..	6,315	4,265	7,926	1,765	7,497	4,402	319
Hospitals and Charitable Institutions	48,444	899	5,141	1,200	3,540	4,291	1,204	4,786	10,259	15,576	11,153	7,259
School Buildings	966,424	49,256	33,681	38,606	57,790	87,089	42,721	69,223	109,459	100,197	102,340	98,103
Agricultural	4,791	447	971	535	883	2,504	1,362	2,618	2,707	1,690	5,543	6,103
Workers' Dwellings	..	..	..	..	..	..	..	..	..	..	..	..
Total, Public Buildings	2,272,860	115,426	121,364	145,600	197,454	216,192	117,328	165,311	227,026	226,035	285,521	277,157
Lighthouses, Harbour-works, and Harbour-defences:—												
Lighthouses	141,028	3,333	1,017	2,060	6,082	6,206	2,167	962	..	1,417	7,481	6,762
Harbour-works	317,829	365	1,540	3,421	1,373	1,773	1,308	2,684	2,963	2,867	4,439	4,548
Harbour-defences	491,213	5,328	3,960	6,678	6,126	2,885	2,515	1,300	1,541	2,579	7,297	5,372
Total, Lighthouses, &c.	950,070	9,026	6,517	12,159	13,581	10,864	5,990	4,946	4,504	6,863	19,217	16,682
Rates on Native Lands	62,809	744	673	571	471	666	631	548	695	837	27	..
Contingent Defence	469,500	42,810	37,650	146,875	37,005	38,723	46,588	35,569	14,874	18,574	10,766	4,977
Tourist and Health Resorts	..	..	..	11,260	10,949	15,643	17,508	15,888	42,271	45,048	24,286	14,507
Lands Improvement*	..	..	..	1,741	2,349	2,019	2,248	1,052	5,605	9,561	19,542	6,910
Charges and Expenses of raising Loans	1,027,989	28,322	1,460	5,620 *Cr. 516*	88,180	87,249	10,764	236	*Cr. 5,175*	*Cr. 8,487*	575	17,715 *Cr. 12,000*
Interest and Sinking Funds	218,500	..	..	..	..	..	..	..	..	..	..	..
Coal-exploration and Mine-development	10,835	..	..	..	..	..	..	..	..	..	..	..
Thermal Springs	14,600	..	..	..	..	..	..	..	..	..	..	..
Total Ways and Means Credits	..	*347*	..	*516*	..	*7*	..	..	*5,175*	*8,487*	..	..
Grand Total—Net Expenditure	31,985,750	992,876	1,309,020	2,142,736	1,514,444	1,796,841	1,321,510	1,730,686	2,035,144	1,909,688	2,183,245	2,022,876

* For previous expenditure see Roads Class.

[*Continued on page 5.*

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND, 1899–1900 to 1920–21—*continued.*

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1921.
	1910–11.	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.	1917–18.	1918–19.	1919–20.	1920–21.	
	£	£	£	£	£	£	£	£	£	£	£	£
Immigration	9,441	11,681	14,694	33,914	33,219	10,010 *Cr. 10*	6,533	3,856	*Cr. 12,018*	*Cr. 62,561*	*Cr. 7,806*	2,259,743
Public Works, Departmental	42,733	49,864	57,426	66,650	100,719	111,489	131,701	127,962 *Cr. 2,662*	115,419 *Cr. 4,119*	121,677	143,280 *Cr. 6,281*	1,689,930
Development of Water-power	1,021	9,082	..	..	..	..	..	*Cr. 18,451*	9,254	..	*Cr. 9,854*	*Cr. 600*
Irrigation and Water-supply*	1,562	2,794	14,689	33,602	32,090	29,874	20,794	11,650	13,665	34,115	55,344	250,179
Railways	1,104,071 *Cr. 652*	1,125,905 *Cr. 6,987*	1,148,832 *Cr. 29,528*	1,104,897 *Cr. 5,485*	2,146,753† *Cr. 6,022*	1,065,171 *Cr. 4,633*	620,947 *Cr. 4,845*	495,771 *Cr. 110*	387,923 *Cr. 4,924*	748,649 *Cr. 105,196*	1,365,466 *Cr. 388*	37,603,193
Payment to Midland Railway Bondholders	..	..	..	..	..	..	..	..	..	..	..	150,000
Roads:—												
Miscellaneous Roads and Bridges	229,537	383,511	337,584	353,836 *Cr. 515*	484,365	400,062	203,746	128,730 *Cr. 600*	221,887 *Cr. 997*	376,097 *Cr. 603*	527,854 *Cr. 81*	..
Roads on Goldfields	25,626	41,067	36,761	24,143	30,065	24,432	17,099	6,912	4,186	12,465	11,050	..
Development of Thermal Springs and Natural Scenery ..	..	..	..	..	..	..	..	..	..	..	..	..
Lands Improvement Account	..	..	..	..	..	..	..	..	..	..	..	..
Total, Roads	255,163	424,578	374,345	377,464	514,430	424,494	220,845	135,042	225,076	387,959	538,823	12,547,998
Development of Mining	10,845 *Cr. 1,000*	21,244 *Cr. 30*	10,644 *Cr. 1,015*	4,889	2,384 *Cr. 255*	6,602	4,592	27 *Cr. 6,545*	518 *Cr. 1,000*	1,173 *Cr. 7,008*	2,153 *Cr. 1,606*	883,726
Purchase of Native Lands	2,976 *Cr. 2,286*	*Cr. 2,466*	*Cr. 917*	*Cr. 857*	*Cr. 1,060*	*Cr. 972*	*Cr. 868*	*Cr. 57*	..	*Cr. 57*	*Cr. 57*	..
Native Lands Purchase Account	..	..	..	..	..	..	..	..	..	..	..	..
Total, Land Purchases	690	*Cr. 2,466*	*Cr. 917*	*Cr. 857*	*Cr. 1,060*	*Cr. 972*	*Cr. 868*	*Cr. 57*	..	*Cr. 57*	*Cr. 57*	2,061,792
Telegraph Extension	111,867	147,692	251,375	392,648	288,395	249,554	203,311	213,955	198,611	249,379	336,468	4,409,446

* Previously included under Lands Improvement.

† Includes £1,000,000 expended 1908–9 and 1909–10 under Wellington–Manawatu Railway Purchase Account.

[*Continued on page 6.*

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND, 1899–1900 to 1920–21—*continued.*

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1921.
	1910–11.	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.	1917–18.	1918–19.	1919–20.	1920–21.	
Public Buildings :—	£	£	£	£	£	£	£	£	£	£	£	£
General (including Miscellaneous)	44,044	34,721	44,719	43,199	52,239	22,050	12,648	11,646 *Cr. 15,067*	43,168	64,207	39,504	..
Parliamentary	237	2,004	18,806	23,612	31,478	17,133	22,586	37,233	..	..	..	..
Judicial { Courthouses						4,902	299	21	..	868	1,400	..
Judicial { Prisons	22,295	44,133	45,431	28,445	38,808	17,786	15,685	13,195	16,299	20,981	30,038 *Cr. 800*	..
Judicial { Police-stations						25,484	21,147	18,814	6,157	24,944	36,843	..
Post and Telegraph	117,815	130,815	122,999	78,815	60,838	35,258	22,744	33,525	26,072	66,543	93,364 *Cr. 560*	..
Customs	..	..	..	..	..	..	..	..	..	..	..	..
Quarantine Stations	..	..	..	..	..	..	..	..	..	..	..	..
Mental Hospitals	12,707	8,809	46,181	26,001	53,996	54,898 *Cr. 15*	44,602	26,502	14,640	18,277	27,368	..
Public Health	..	..	376	..	..	..	..	..	..	..	..	..
Hospitals and Charitable Institutions	1,484	12,745	8,750	1,435	998	1,426	7,570	4,080	2,332	43,974	19,627	..
School Buildings	124,926	90,535	105,000	121,954	122,940	97,972	70,367	63,082	115,656	195,500	244,722	..
Agricultural	1,160	3,684	6,475	4,398	2,428 *Cr. 34*	2,972	3,046	5,685	4,229	7,227	9,345	..
Workers' Dwellings	..	22,644	46,455	41,741	68,275	55,893	35,437	15,505	7,293	26,674	..	..
Total, Public Buildings	324,668	350,090	445,192	369,600	431,966	335,759	256,131	214,221	235,846	469,195	500,851	8,300,793
Lighthouses, Harbour-works, and Harbour-defences :—												
Lighthouses	1,470	5,428	9,031	5,174	3,887	1,415	449	561	1,663	253	758	..
Harbour-works	4,092	6,004	7,415	3,346 *Cr. 1,462*	12,563	9,355	2,280	2,359	3,729	3,245	4,080	..
Harbour-defences	2,865	1,144	339	539 *Cr. 300*	681	2,903	1,038	56	..	..	..	..
Total, Lighthouses, &c.	8,427	12,576	16,785	7,297	17,131	13,673	3,767	2,976	5,392	3,498	4,838	1,156,779
Rates on Native Lands	..	..	..	..	..	..	..	..	..	..	..	68,672
Contingent Defence	6,071	10,437	23,790	30,186	15,221	37,619	9,742	6,714	8,809 *Cr. 922*	10,187	8,701	1,070,466
Tourist and Health Resorts	5,912	13,361	12,906	14,989	8,232 *Cr. 12*	5,167 *Cr. 500*	1,094	931	1,620	6,194	19,041	286,295
Lands Improvement*	11,125	20,394	22,550 *Cr. 383*	16,996 *Cr. 432*	13,810 *Cr. 522*	5,936	*Cr. 2,731*	1,838	*Cr. 4,268*	2,964	2,064	140,368
Charges and Expenses of raising Loans	66,367 *Cr. 66,392*	67,470 *Cr. 66,954*	72,950 *Cr. 71,681*	105,449 *Cr. 96,741*	35,495 *Cr. 34,865*	5,037 *Cr. 5,030*	35	1	..	..	184	1,253,257
Interest and Sinking Funds	..	..	..	..	..	..	..	..	..	..	..	218,500
Coal-exploration and Mine-development	..	..	..	..	..	..	..	..	..	..	..	10,835
Thermal Springs	..	..	..	..	..	..	..	..	..	..	..	14,600
Plant, Material, and Stores	..	..	..	..	..	74,418	9,778	6,811	20,638 *Cr. 31*	47,682	169,910	329,206
Total Ways and Means Credits	..	*10,530*	*103,524*	*105,792*	*43,400*	*11,160*	*5,713*	*43,492*	*11,993*	*112,864*	*19,627*	..
Grand Total—Net Expenditure	1,891,918	2,190,731	2,362,654	2,455,066	2,597,109	2,363,658	1,502,588	1,237,422	1,207,482	2,020,714	3,121,131	74,705,178

* Includes expenditure on Irrigation and Water-supply—1905–6, £22; 1906–7, £750; 1907–8, £1,554; 1908–9, £1,966.

TABLE No. 3.

Expenditure on Railways to 31st March, 1921.

Lines of Railway.	Total Expenditure by General Government to 31st March, 1920.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1920–21.					Expenditure under Special Acts during Year 1920–21.*	Amounts previously charged to "Surveys of New Lines" now charged to Individual Lines.	Total Expenditure by General Government to 31st March, 1921.	Valuation of Works constructed by Provinces and Midland Railway Company.
			New Works.			Work on Open Lines.	Land Claims and other Old Liabilities.				
			Construction and Surveys.	Permanent-way.	Total New Works.						
	£	£	£	£	£	£	£	£	£	£	£
Kaihu Valley	121,803	..	15,983	7,052	23,035	197	..	..	..	145,035	..
Opua Wharf to Whangarei and Onerahi	523,636	..	..	..	..	1,897	..	238	..	525,771	..
Otiria to Ngapuhi	125,771	..	..	..	..	..	..	..	..	125,771	..
Whangarei (Kioreroa) to Waiotira	281,837	..	32,711	3,343	36,054	..	..	..	..	317,891	..
Waipu Branch	9,778	..	6,666	..	6,666	..	..	..	..	16,444	..
North Auckland Main Trunk—											
Ngapuhi Northwards	146,332	..	32,815	12,955	45,770	..	..	..	..	192,102	..
Helensville Northwards	1,001,019	..	175,213	662	175,875	..	..	..	..	1,176,894	..
North Auckland Main Trunk to Dargaville	..	..	474	..	474	..	..	..	..	474	..
Helensville to Te Awamutu	2,411,935	..	..	..	..	33,665	..	43,386	..	2,488,986	..
Waiuku Branch (Paerata to Waiuku)	116,589	..	26,044	21,697	47,741	..	..	..	..	164,330	..
Huntly to Awaroa	108,970	..	12,493	..	12,493	556	..	..	..	122,019	..
Waikokowai Branch	52	..	2,800	..	2,800	..	..	..	..	2,852	..
Waipa Gravel Access Branch	90	..	27	..	27	..	..	..	..	117	..
Frankton to Thames	364,660	..	..	..	..	588	..	187	..	365,435	..
Cambridge Branch (Ruakura Junction to Cambridge)	51,843	..	..	..	..	135	..	..	..	51,978	..
Morrinsville to Rotorua	373,057	..	..	..	..	3,522	..	..	..	376,579	..
Marton to Te Awamutu	2,754,411	5	..	..	..	27,543	..	1,634	..	2,783,583	..
Raetihi Branch	84,151	..	..	..	..	314	14	..	..	84,479	..
Paeroa to Waihi and Tauranga	218,102	..	33,616	..	33,616	..	..	..	..	251,718	..
Tauranga to Taneatua, including Te Maunga to Maunganui Branch	478,723	..	129,606	20,767	150,373	..	..	..	..	629,096	..
Gisborne to Motu	623,330	..	..	..	..	218	332	..	..	623,880	..
Gisborne to Ormond Tramway	4,975	..	..	..	..	..	..	..	..	4,975	..
Napier to Gisborne—											
Gisborne Southwards	203,822	..	16,444	338	16,782	..	..	..	..	220,604	..
Wairoa Northwards	7,354	..	8,402	..	8,402	..	..	..	..	15,756	..
Napier Northwards	73,209	..	53,386	..	53,386	..	..	..	..	126,595	..
Waikokopu Branch	1,775	..	54,940	..	54,940	..	..	..	..	56,715	..
Wellington to Napier—											
Napier to Woodville and Palmerston North	932,408	..	..	..	..	2,182	..	5,812	..	940,402	..
Wellington to Woodville, including Te Aro Extension	1,647,439	..	..	..	..	55,738	..	2,765	..	1,705,942	..
Featherston to Martinborough	399	..	..	..	..	..	..	..	..	399	..
Wellington to Waitara—											
Wellington to Longburn	1,020,614	..	..	..	..	6,280	..	1,400	..	1,028,294	..
Foxton to Waitara and Moturoa	1,571,720	233	..	..	..	4,734	..	4,389	..	1,580,610	..
Mount Egmont Branch	72,080	..	*Cr.* 10	..	*Cr.* 10	..	..	..	..	72,070	..
Moturoa to Opunake	754	..	5	..	5	..	..	..	..	759	..
Opunake Branch (Te Roti to Opunake)	64,798†	..	19,394	..	19,394	..	..	..	..	84,192	..
Manaia Branch (Kapuni to Manaia)	8,491†	..	2,893	..	2,893	..	..	..	..	11,384	..
Rangitikei River Quarry Line	206	..	..	..	..	..	..	..	..	206	..

* Railways Improvement Authorization Act 1914 Account.

† Adjustment of expenditure incorrectly shown in year 1919–20.

TABLE No. 3—*continued.*

Expenditure on Railways to 31st March, 1921—*continued.*

Lines of Railway.	Total Expenditure by General Government to 31st March, 1920.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1920-21.					Expenditure under Special Acts during Year 1920-21.*	Amounts previously charged to "Surveys of New Lines" now charged to Individual Lines.	Total Expenditure by General Government to 31st March, 1921.	Valuation of Works constructed by Provinces and Midland Railway Company.
			New Works.			Work on Open Lines.	Land Claims and other Old Liabilities.				
			Construction and Surveys.	Permanent-way.	Total New Works.						
	£	£	£	£	£	£	£	£	£	£	£
Stratford to Okahukura (East End) ..	251,362	..	31,962	..	31,962	..	..	..	..	283,324	..
Stratford to Okahukura (West End) ..	725,284	..	27,203	2,138	29,341	23	..	..	..	754,648	..
Nelson to Greymouth—											
Nelson to Inangahua	361,422	150	9,197	..	9,197	115	..	..	..	370,584	78,307
Stillwater to Inangahua	204,093	..	..	..	..	5,813	..	..	..	209,906	279,685
Ngahere to Blackball	147,532	..	..	..	..	..	..	..	..	147,532	..
Westport to Ngakawau	188,009	..	..	..	..	345	..	..	..	188,354	..
Westport to Inangahua	152,820	..	*Cr.* 197	..	*Cr.* 197	..	..	..	..	152,623	..
Greymouth to Rewanui	255,076	..	..	..	..	..	..	..	..	255,076	..
Point Elizabeth Branch	197	..	19,550	502	20,052	..	..	..	..	20,249	..
Greymouth to Ross and Mikonui	339,048	..	..	..	..	202	..	..	..	339,250	..
Picton to Waipara—											
Picton Southwards	654,372	..	88	..	88	2,669	..	..	..	657,129	..
Waipara Northwards	373,877	..	..	..	..	285	..	..	..	374,162	..
Christchurch to Greymouth—											
Rolleston to Bealey	815,722	..	..	..	..	936	13	..	..	816,671	61,579
Whitecliffs Branch	25,021	..	..	..	..	..	..	..	..	25,021	..
Greymouth to Bealey	1,071,154	..	80,708	29,708	110,416	30,226	..	..	..	1,211,796	263,889
Hurunui to Waitaki—											
Main Line (Waiau to Waitaki)	1,976,367	..	1,239	..	1,239	32,153	..	1,471	..	2,011,230	316,135
Oxford Branch (Rangiora to Oxford West)	52,782	..	..	..	..	58	..	..	..	52,840	..
Eyreton Branch (Kaiapoi to Bennett's) ..	44,277	..	..	..	..	..	..	..	..	44,277	..
Lyttelton Branch	80,908	..	..	..	..	..	..	..	..	80,908	340,500
Southbridge Branch (Hornby to Southbridge)	91,377	..	..	..	..	..	..	..	..	91,377	..
Little River Branch (Lincoln to Little River)	108,524	..	..	..	..	237	..	..	..	108,761	..
Rakaia to Methven	74,640	..	..	..	..	31	..	..	..	74,671	..
Ashburton to Springburn	61,639	..	..	..	..	103	..	..	..	61,742	..
Orari to Geraldine	..	..	321	..	321	..	..	..	..	321	..
Fairlie Branch (Washdyke Junction to Fairlie)	66,801	..	..	..	..	314	..	..	..	67,115	75,124
Waimate Branch	73,120	..	7,976	..	7,976	245	..	..	..	81,341	..
Canterbury Interior Main Line—											
Oxford to Malvern	54,240	..	..	..	..	8	..	..	..	54,248	..
Whitecliffs to Rakaia	542	..	..	..	..	..	..	..	..	542	..
Temuka to Rangitata	5,152	..	..	..	..	..	..	..	..	5,152	..
Waitaki to Bluff—											
Main Line, including Port Chalmers Branch	3,314,597	..	..	..	..	9,012	..	2,447	..	3,326,056	82,259
Duntroon Branch (Pukeuri to Kurow) ..	97,099	..	..	..	..	212	..	..	..	97,311	37,500
Ngapara Branch (Waiareka Junction to Ngapara)	26,090	..	..	..	..	..	..	..	..	26,090	58,009

* Railways Improvement Authorization Act 1914 Account.

TABLE No. 3—*continued.*

EXPENDITURE ON RAILWAYS TO 31ST MARCH, 1921—*continued.*

Lines of Railway.	Total Expenditure by General Government to 31st March, 1920.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1920–21.					Expenditure under Special Acts during Year 1920–21.*	Amounts previously charged to "Surveys of New Lines" now charged to Individual Lines.	Total Expenditure by General Government to 31st March, 1921.	Valuation of Works constructed by Provinces and Midland Railway Company.
			New Works.			Work on Open Lines.	Land Claims and other Old Liabilities.				
			Construction and Surveys.	Permanent-way.	Total New Works.						
Waitaki to Bluff—*continued.*	£	£	£	£	£	£	£	£	£	£	£
Livingstone Branch (Windsor to Tokarahi)	82,785	..	..	..	..	..	..	..	..	82,785	..
Waihemo Branch (Palmerston to Dunback)	33,191	..	..	..	..	..	..	..	..	33,191	..
Fernhill Railway	1,415	..	..	..	..	..	..	..	..	1,415	..
Brighton Road Branch	6,474	..	..	..	..	..	..	..	..	6,474	12,829
Outram Branch (Mosgiel to Outram) ..	11,951	..	..	..	..	..	..	..	..	11,951	29,691
Lawrence Branch	305,334	..	1,884	..	1,884	..	..	..	..	307,218	..
Balclutha to Tuapeka Mouth	1,943	..	7	..	7	..	..	..	..	1,950	..
Catlin's River Branch (Balclutha to Tahakopa)	462,691	..	..	..	..	..	35	..	..	462,726	..
Heriotburn Branch (Waipahi to Edievale) ..	123,788	..	..	..	..	300	..	..	..	124,088	..
Waikaka Branch (McNab to Waikaka) ..	68,423	..	..	..	..	..	..	..	..	68,423	..
Gore to Lumsden	111,966	..	..	..	..	81	..	..	..	112,047	..
Edendale to Glenham	53,328	..	..	..	..	..	..	..	..	53,328	..
Riversdale to Switzers	82,304	..	..	..	..	..	..	..	..	82,304	..
Kelso to Gore	..	..	..	..	..	..	..	..	..	..	..
Seaward Bush to Catlin's (Appleby to Tokanui)	184,881	..	..	..	..	104	..	..	..	184,985	..
Otago Central (Wingatui to Cromwell) ..	1,404,067	..	25,390	283	25,673	..	..	..	..	1,429,740	..
Invercargill to Kingston—											
Main Line	359,008	..	..	..	..	843	..	..	..	359,851	91,937
Mararoa Branch (Lumsden to Mossburn) ..	27,217	..	..	..	..	..	..	..	..	27,217	..
Winton to Heddon Bush	231	..	..	..	..	..	..	..	..	231	..
Makarewa to Orepuki and Waiau	251,899	..	9,543	..	9,543	30	..	..	..	261,472	37,097
Thornbury to Wairio	85,885	..	..	..	..	58	..	..	..	85,943	23,200
Forest Hill (Winton to Hedgehope)	22,984	..	..	..	..	353	..	..	..	23,337	..
Expenses of Railway Commissions and other Expenditure not chargeable to Individual Lines	10,337	..	..	..	..	..	..	..	..	10,337	..
Surveys of New Lines—											
North Island	35,900	..	27	..	27	..	..	..	..	35,927	..
Middle Island	5,752	..	..	..	..	..	..	..	..	5,752	..
Rolling-stock	6,848,285	..	..	..	..	198,990	..	*Cr.* 651	..	7,046,624	..
Stock of Permanent-way Materials, 31st March, 1920 .. .. £75,888	75,888	..	..	..	..	..	..	..	..	..	..
	37,757,204										
Stock of Permanent-way increased by £5,512	5,512	..	..	..	..	..	..	..	..	..	..
Stock of Permanent-way Materials, 31st March, 1921 .. .. £81,400	..	..	..	..	..	..	..	..	..	81,400	..
Total	37,762,716	388	838,800	99,445	938,245	421,315	394	63,078	..	39,185,360	1,787,741†

* Railways Improvement Authorization Act 1914 Account. † Includes value for £150,000 paid to debenture-holders under the Midland Railway Petitions Settlement Act Amendment Act. 1903.

TABLE No. 4.

EXPENDITURE OUT OF SEPARATE ACCOUNTS ON WORKS UNDER THE CONTROL OF THE PUBLIC WORKS DEPARTMENT.

Year.	Loans to Local Bodies Account. Roads to open up Crown Lands.	Opening up Crown Lands for Settlement Account. Roads to open up Crown Lands.	Land for Settlements Account. Opening up Crown Lands for Settlement Account. Roads to open up Crown Lands.	National Endowment Account. Roads to open up National-endowment Lands.	Land for Settlements Account. Roads to open up Land for Settlements.	Waihou and Ohinemuri Rivers Improvement Account. Waihou and Ohinemuri Rivers Improvement.
	£	£	£	£	£	£
1890-91	25,000					
1891-92	64,000					
1892-93	800					
	89,800*					
1891-92	8,000†					
1892-93	29,833†					
1893-94	30,000†					
1894-95	6,114†					
1894-95	42,971‡					
1895-96	30,057‡					
1896-97	31,017					
1897-98	18,770					
1898-99	16,972					
1899-1900	31,363					
1900-1	37,390					
1901-2	31,979					
1902-3	18,578					
1903-4	25,753					
1904-5	28,895					
1905-6	38,801					
1906-7	47,371					
1907-8	38,524					
1908-9	54,713					
1909-10	40,507	..	..	4,975	..	
	607,608§					
1910-11	..	45,691	..	5,619	..	..
1911-12	..	49,739	..	6,554	..	3,769
1912-13	..	47,951	..	2,689	..	9,555
1913-14	..	63,245	..	4,282	..	9,632
1914-15	..	..	92,975	9,151	..	10,004
1915-16	..	..	47,974	13,344	..	9,225
1916-17	..	..	24,730	6,787	..	10,407
1917-18	..	..	..	..	43,996	12,025
1918-19	..	..	..	..	51,355	27,402
1919-20	..	..	..	..	61,692	34,806
1920-21	..	..	..	..	28,920‖	62,249
	697,408	206,626	165,679	53,401	185,963	189,074

* Payment to the Public Works Fund under section 31 of the Government Loans to Local Bodies Act, 1886, in reduction of expenditure under Class "Roads."

† Paid into the Public Works Fund, reducing the expenditure under Class "Roads."

‡ Paid into the Lands Improvement Account (now included in Public Works Fund under Class "Roads"), reducing the expenditure on roads.

§ Expenditure under the Government Loans to Local Bodies Act Amendment Act, 1891.

‖ Inclusive of £24 charged to "Unauthorized."

TABLE No. 5.

DEVELOPMENT OF WATER-POWER.

STATEMENT OF ACCOUNTS AT 31ST MARCH, 1921.

GENERAL BALANCE-SHEET AT 31ST MARCH, 1921, COMPARED WITH POSITION AT 31ST MARCH, 1920.

1919–20.	*Liabilities.*	1920–21.		1919–20.	*Assets.*	1920–21.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
	Consolidated Fund—				Lake Coleridge scheme—		
	Interest on Lake Coleridge expenditure to			445,025 17 5	Assets as per separate balance-sheet ..	567,704 2 8	
27,147 0 7	31st March, 1921	19,155 3 5			Profit and loss appropriation (accumulated		
	Interest on Waikato expenditure to 31st			34,120 14 7	loss to date)	30,673 18 4	
..	March, 1921	1,417 2 3					598,378 1 0
			20,572 5 8	479,146 12 0			
	Public Works Fund—				Waikato scheme—		
					Horahora assets as per separate balance-		
9,253 13 0	Electric supply	..	..	220,974 1 7	sheet	294,848 8 7	
					Profit and loss appropriation (accumulated		
				2,122 8 0	loss to date)	8,404 3 3	
	Aid to Water-power Works and Electric						303,252 11 10
	Supply Accounts—			223,096 9 7			
449,000 0 0	Debentures issued—				Mangahao River scheme—		
..	At 4 per cent. interest	405,000 0 0		22,748 10 9	Works at Mangahao	..	
..	At 4½ per cent. interest	64,000 0 0		..	Lands and easements	5,680 10 4	
			469,000 0 0	..	Headworks, dams, and tunnels	8,408 1 6	
	Bonds issued (due 1930) at 5 per cent.			..	Roads, trams, and sidings	21,213 11 10	
..	interest	..	56,500 0 0	..	Pipe-lines	3,902 13 2	
	Inscribed stock issued (due 1930) at 5 per			..	Buildings	6,919 2 2	
..	cent. interest	..	1,331,010 0 0	..	Power plant and machinery	3,815 17 0	
				..	Construction plant, tools, and equipment ..	51,092 8 8	
				..	Accommodation of workmen	10,003 9 7	
	Lake Coleridge scheme—				Surveys, engineering, and preliminary ex-		
35,389 4 2	Depreciation reserve	44,750 17 9		..	penses	12,437 8 3	
3,825 12 6	Sundry creditors	7,590 7 4		..	Stocks of material on hand	19,636 10 7	
			52,341 5 1				143,109 13 1
				5,984 15 10	Arapuni scheme (Waikato River)	..	11,276 0 10
	Waikato scheme—						
	Waihi Gold-mining Company: Purchase			723 1 7	Waikaremoana scheme	..	2,906 17 4
	price of Horahora plant taken over 1st						
212,500 0 0	November, 1919	212,500 0 0			Other schemes, surveys, &c.—		
6,415 4 10	Sundry creditors	3,673 14 5			North Island—		
1,628 8 0	Depreciation reserve	5,653 4 9		376 13 11	Aratiatia (Waikato River)	376 13 11	
			221,826 19 2	403 9 6	Huka Falls (Waikato River)	413 9 6	
				2,802 19 3	Hutt River (including dam-site) ..	2,778 17 3	
..	Interest on securities held by Investment Fund	..	6 17 0	38 9 0	Makuri River	38 9 0	
				1,108 4 7	Rotoiti-Kaituna	1,216 19 7	
				879 16 8	Tauherenikau River	879 16 8	
				236 6 8	Wairua River	236 6 8	
							5,940 12 7
				5,845 19 7			
745,159 3 1	Carried forward	..	2,151,257 6 11	737,545 9 4	Carried forward	..	1,064,863 16 8

TABLE No. 5—*continued.*

DEVELOPMENT OF WATER-POWER—*continued.*

STATEMENT OF ACCOUNTS AT 31ST MARCH, 1921—*continued.*

GENERAL BALANCE-SHEET AT 31ST MARCH, 1921, COMPARED WITH POSITION AT 31ST MARCH, 1920—*continued.*

1919–20.	*Liabilities.*	1920–21.		1919–20.	*Assets.*	1920–21.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
745,159 3 1	Brought forward	..	2,151,257 6 11	737,545 9 4	Brought forward	..	1,064,863 16 8
					Other schemes, surveys, &c.—*continued.*		
					South Island—		
				803 1 9	Clarence River	803 1 9	
				5 0 0	Lake Kanieri	5 0 0	
				..	Nelson–Marlborough	129 15 9	
				92 18 0	Timaru to Oamaru	96 1 0	
				519 12 7	Opihi River	519 12 7	
				17 7 0	Toaroha River	17 7 0	
				255 17 9	Teviot River	543 0 5	
				11 19 0	Upper Taieri River	11 19 0	
				286 7 11	Lake Hawea	475 5 8	
				1,992 4 0			2,601 3 2
				4,117 5 10	General expenditure not chargeable to any individual scheme	..	4,259 15 4
							1,071,724 15 2
					Balance in the Electric Supply Account at 31st March, 1921—		
				929 9 2	Cash in Public Account	40,495 8 9	
				574 14 9	Imprests and advances outstanding ..	1,517 0 0	
				..	Amount in hands of Government officers in London	36,760 3 0	
							78,772 11 9
				..	Investment Account (funds invested until actually required for use)	..	1,000,760 0 0
£745,159 3 1		..	£2,151,257 6 11	£745,159 3 1			£2,151,257 6 11

The balance-sheet has been duly audited with the various supporting books and documents, and found to correspond therewith.

ROBERT J. COLLINS,
Controller and Auditor-General.

P. S. WALDIE,
Accountant, Public Works Department.

LAKE COLERIDGE HYDRO-ELECTRIC-POWER SUPPLY.

Profit and Loss Account for Year ended 31st March, 1921, compared with Year ended 31st March, 1920.

Gross Revenue Account.

1919–20.	——	1920–21.		1919–20.	——	1920–21.	
£ s. d.	To Generating expenses, headworks, and power-house—	£ s. d.	£ s. d.	£ s. d.	By Sale of energy—	£ s. d.	£ s. d.
2,857 19 10	Salaries	2,366 8 7		42,424 4 5	Wholesale	47,874 0 10	
835 17 9	Wages	1,562 1 5		1,952 7 10	Retail	1,767 8 5	
108 10 1	Supplies	118 9 7		44,376 12 3			49,641 9 3
631 2 2	Transport of stores, &c.	764 0 9					
	Maintenance and repairs—						
50 5 3	Headworks	67 11 0		11 6 9	Discounts forfeited	..	18 5 2
16 13 5	Pipe-lines	41 9 4					
131 8 1	Power-house building	26 12 8					
310 3 5	Power-house machinery	649 18 7					
168 18 10	Roads and fences	133 0 2			Rents—		
192 6 2	Staff residences, &c.	272 19 3		620 19 5	Lands and buildings	630 0 10	
5,303 5 0			6,002 11 4	152 15 0	Electric lines	157 10 0	
				20 14 9	„ plant	63 7 0	
	Transmission-line—			794 9 2			850 17 10
477 10 0	Salaries	544 2 4					
79 8 11	Wages	..					
	Transport, including upkeep of horses, traps, cars, and cycles	747 4 4					
625 9 8	Repairs to power-lines	1,645 19 2					
793 1 3	Repairs to roads	200 0 0		183 13 0	Fees for testing and repairing electrical appliances	..	341 10 0
..							
1,975 9 10			3,137 5 10				
	Substation, Addington—			160 0 0	Stand-by provision: Fees from wholesale consumers	..	160 0 0
1,159 0 2	Salaries	1,270 12 2					
688 19 3	Wages	749 12 7					
171 3 10	Supplies	156 7 7		30 0 0	Supervision charges on works not connected with Lake Coleridge, carried out by staff	..	30 0 0
	Maintenance and repairs—			29 17 6	Royalty on shingle sold	..	31 8 6
269 3 8	Buildings and yards	285 11 0			Interest from local bodies in respect of reticulations sold on deferred payment ..	..	22 16 1
124 6 5	Machinery	113 14 5		104 15 7			
2,412 13 4			2,575 17 9	140 17 10	Earnings motor-vehicles	..	276 18 9
	Distribution—						
209 10 3	Salaries	225 9 11					
4 11 7	Wages	1 16 0					
138 14 6	Transport, including upkeep of motor lorry and car	96 1 2					
1,559 14 7	Maintenance of feeder cables, transformer stations, and tools ..	1,405 3 2					
662 16 4	Maintenance of secondary distribution	761 10 11					
313 16 8	Maintenance of and testing meters ..	534 13 7					
2,889 3 11			3,024 14 9				
	Carried forward	..	14,740 9 8	45,831 12 1	Carried forward	..	51,373 5 7

LAKE COLERIDGE HYDRO-ELECTRIC-POWER SUPPLY—*continued.*

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1921, COMPARED WITH YEAR ENDED 31ST MARCH, 1920—*continued.*

Gross Revenue Account—continued.

1919–20.	——	1920–21.		1919–20.	——	1920–21.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
	Brought forward	..	14,740 9 8	45,831 12 1	Brought forward	..	51,373 5 7
	Stand-by provision—						
	Payment to Christchurch Tramway	1,350 0 0					
1,350 0 0	Board						
	Payment to Christchurch Tramway	1,337 13 2					
438 10 11	Board, for energy supplied ..		2,687 13 2				
1,788 10 11							
	Management and general expenses—						
1,762 6 6	Salaries	2,112 4 8					
280 3 6	Sick and holiday pay to workmen ..	215 16 1					
73 7 4	Travelling-expenses	156 18 5					
200 0 0	Office-rent	200 0 0					
45 15 0	Rent of other buildings	45 12 6					
97 11 9	Postages and telegrams	144 5 4					
86 17 1	Telephone subscriptions	85 3 8					
161 5 4	Printing and stationery	129 0 1					
44 12 0	Advertising	62 7 4					
9 6 8	Accident insurance	4 7 7					
27 1 6	Fire insurance	71 1 10					
2 8 0	Legal expenses	5 5 0					
89 6 8	Audit fees	59 0 0					
260 18 6	Meter-reading and line-inspection ..	319 18 10					
77 15 6	Commission on collection of accounts ..	70 5 1					
161 8 8	Electrical testing	222 15 8					
2 3 4	Bad debts	..					
7 8 10	Miscellaneous trade expenses ..	9 4 4					
			3,913 6 5				
3,389 16 2							
			21,341 9 3				
17,758 19 2							
28,072 12 11	Balance to Net Revenue Account ..	..	30,031 16 4				
£45,831 12 1			£51,373 5 7	£45,831 12 1			£51,373 5 7

Net Revenue Account.

£ s. d.		£ s. d.	£ s. d.			£ s. d.
7,623 11 2	To Depreciation at 2 per cent. per annum on completed work ..	7,946 2 5	28,072 12 11	By Balance from Gross Revenue Account		30,031 16 4
16,863 2 3	Interest for year ended 31st March, 1921	18,638 17 8				
3,585 19 6	Balance to Profit and Loss Appropriation Account ..	3,446 16 3				
£28,072 12 11		£30,031 16 4	£28,072 12 11			£30,031 16 4

LAKE COLERIDGE HYDRO-ELECTRIC-POWER SUPPLY—*continued.*

Profit and Loss Appropriation Account.

1919–20.	——	1920–21.	1919–20.	——	1920–21.
£ s. d.		£ s. d.	£ s. d.		£ s. d.
37,706 14 1	To Balance from previous year's statement	34,120 14 7	3,585 19 6	By Balance from Net Revenue Account	3,446 16 3
			34,120 14 7	Balance to balance-sheet	30,673 18 4
£37,706 14 1		£34,120 14 7	£37,706 14 1		£34,120 14 7

Depreciation Reserve Account.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
723 11 0	To Renewals	..	27,393 9 7	By Balance from previous year's statement	35,389 4 2
35,389 4 2	Balance to balance-sheet	44,750 17 9	1,095 14 5	Interest at 4 per cent. per annum	1,415 11 2
			7,623 11 2	Amount set aside as per Profit and Loss Account	7,946 2 5
£36,112 15 2		£44,750 17 9	£36,112 15 2		£44,750 17 9

LAKE COLERIDGE HYDRO-ELECTRIC-POWER SUPPLY—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1921.

1919–20.	*Liabilities.*	1920–21.		1919–20.	*Assets.*	1920–21.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
35,389 4 2	Depreciation Reserve Account	..	44,750 17 9	4,229 16 4	Works at Lake Coleridge— Land, including fencing and planting ..	..	4,229 16 4
				5,317 4 6	Coalgate Gorge Road	..	5,317 4 6
	Sundry creditors—			7,566 3 8	Service roads	..	7,566 3 8
2,358 18 4	On open accounts	4,303 1 5		279 12 8	Service telephones	..	279 12 8
641 3 5	On contracts	2,478 4 5		17,392 17 2			
509 16 1	Wages accrued	430 16 2			Headworks—		
315 14 8	Payment for current in advance	..		73,789 4 4	Tunnel, including inlet and outlet works	78,543 17 9	
..	Consumers	313 5 4		24,125 17 4	Pipe-lines	44,444 1 5	
..	Guarantee deposits	65 0 0		1,974 12 10	Tram-line	1,996 16 2	
			7,590 7 4	410 17 7	Weir at lake-outlet, gauges, and fencing	410 17 7	
3,825 12 6				46 5 4	Harper River diversion works ..	12,778 19 1	
				100,346 17 5			138,174 12 0
	Balance carried to general balance-sheet—				Power-house—		
479,146 12 0	Total assets as *per contra*	598,378 1 0		23,028 0 6	Buildings, &c.	23,162 17 10	
39,214 16 8	Total liabilities as above	52,341 5 1		50,872 16 0	Machinery, &c.	54,861 8 0	
			546,036 15 11	333 19 3	Office furniture, fittings, &c.	178 4 9	
439,931 15 4				74,234 15 9			78,202 10 7
				12,771 17 11	Accommodation for staff and workmen— Buildings, fencing, &c.	..	14,181 13 1
					Transmission-line—		
				4,904 4 8	Land	4,044 4 8	
				39,043 5 1	Power-lines	44,766 0 4	
				2,356 15 6	Telephone-system	2,403 18 2	
				486 15 7	Linemen's cottages, depots, tools, and equipment	258 1 7	
				6,587 8 11	Alterations to public telegraph-lines ..	6,588 12 4	
				..	Point Switching Station	3,203 1 10	
				53,378 9 9			61,263 18 11
					Addington Substation—		
				3,078 14 11	Land, including cottages	3,480 9 0	
				3,889 2 3	Substation buildings	3,845 2 3	
				15,304 18 11	Machinery, &c.	16,170 6 1	
				2,458 4 6	Store buildings and workshops	3,599 0 4	
				24,731 0 7			27,094 17 8
479,146 12 0	Carried forward	..	£598,378 1 0	282,855 18 7	Carried forward	..	£336,310 19 5

ERRATA.

PAGE 16, column "Liabilities": Under "Sundry creditors" *read* "Payment for current in advance, £313 5s. 4d."; "Consumers' guarantee deposits, £65."

LAKE COLERIDGE HYDRO-ELECTRIC-POWER SUPPLY—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1921—*continued.*

1919–20.	*Liabilities.*	1920–21.	1919–20.	*Assets.*	1920–21.	
£ s. d.		£ s. d. £ s. d.	£ s. d.		£ s. d.	£ s. d.
479,146 12 0	Brought forward	.. 598,378 1 0	282,855 18 7	Brought forward	..	336,310 9 5
				Primary distribution—		
			6,882 12 7	Supply cables—Christchurch City ..	6,882 12 7	
			4,846 4 2	Christchurch Tramways ..	4,834 0 6	
			6,904 8 3	Lyttelton	6,913 8 7	
			14,737 5 10	Northern	16,354 5 7	
			7,683 8 5	Southern	7,729 4 6	
			..	Motukarara	1,406 8 4	
			622 9 9	Lightning-arresters	622 9 9	
			1,142 5 4	Tools and equipment	310 14 5	
			1,516 12 8	Alterations to public telegraph-lines ..	1,516 12 8	
			44,335 7 0			46,569 16 11
				Secondary distribution—		
			19,450 4 11	Supply cables and reticulation	19,052 0 9	
			7,779 2 11	Local substations	8,817 17 4	
			27,229 7 10			27,869 18 1
			12,593 15 0	Service transformers and meters	..	16,147 16 5
			5,429 12 6	Motor cars, lorries, and cycles, &c.	..	8,452 10 4
			74 16 10	Test-room equipment	..	93 15 10
			799 19 5	Loose plant, tools, and equipment	..	8,852 3 3
			1,654 6 2	Public telephones to the lake	..	1,729 3 9
			173 19 1	Telephones to Christchurch City Council and Tramway Board and local officers ..	..	173 19 1
			202 9 9	Christchurch office—Furniture and fittings ..	..	236 16 7
			17,788 19 3	Engineering, office, and general expenses on preliminary surveys and during construction..	..	19,423 8 4
			13,641 15 1	Salaries of Engineers and others on preliminary surveys and during construction	..	16,772 8 11
			411 17 7	Survey and investigation, Timaru line route ..	..	978 11 11
				Interest during construction—		
			14,291 13 7	On completed works	14,312 4 8	
			591 17 9	On uncompleted works	2,034 3 5	
			14,883 11 4			16,346 8 1
			422,075 15 5			499,957 6 11
			13,444 19 5	Stocks of material, &c., on hand at date ..	..	56,184 5 9
			116 14 11	Telephone subscriptions and fire insurance paid in advance	..	152 12 1
				Sundry debtors—		
			7,946 18 6	For current and rent	9,016 8 10	
			1,441 9 2	For work carried out, &c...	2,393 9 1	
			9,388 7 8			11,409 17 11
			445,025 17 5			567,704 2 8
			34,120 14 7	Balance from Profit and Loss Appropriation Account	..	30,673 18 4
£479,146 12 0		£598,378 1 0	£479,146 12 0			£598,378 1 0

The balance-sheet has been duly audited with the various supporting books, vouchers, and documents, and found to correspond therewith.

ROBERT J. COLLINS, Controller and Auditor-General.

WAIKATO ELECTRIC-POWER SUPPLY—HORAHORA SCHEME.

PROFIT AND LOSS ACCOUNT FOR TWELVE MONTHS ENDING 31ST MARCH, 1921.

Gross Revenue Account.

To	£ s. d.	£ s. d.	By	£ s. d.
Generating-expenses: Headworks and power-house—			Sales of electrical energy to wholesale consumers	14,719 8 5
Salaries	2,363 5 2		Rents of houses	85 10 1
Wages	433 8 2			
Supplies	281 11 4			
Transport of stores, &c.	93 1 8			
Maintenance and repairs—				
Headworks and buildings	259 9 10			
Power-house machinery	301 7 10			
Staff houses, &c.	111 7 10			
		3,843 11 10		
Transmission-line, Horahora to Waihi—				
Wages	748 16 10			
Supplies	36 16 10			
Repairs, &c.	35 10 11			
Transport	136 4 2			
		957 8 9		
Waikino Substation—				
Operating wages (half)	491 16 8			
Repairs to building, machinery, &c.	154 5 4			
		646 2 0		
Hire of plant		142 17 2		
Management and general—				
Management salaries	503 5 3			
Travelling-expenses	87 16 11			
Postages, telegrams, and telephones	35 10 1			
Fire insurance	41 8 10			
Accident insurance	60 12 4			
Legal expenses	27 6 0			
Printing, stationery, and advertising	34 15 5			
Office rent, cleaning, and lighting	60 7 0			
Miscellaneous expenses	10 18 2			
		862 0 0		
		6,451 19 9		
Balance to Net Revenue Account		8,352 18 9		
		£14,804 18 6		£14,804 18 6

Net Revenue Account.

To	£ s. d.	£ s. d.	By	£ s. d.
Interest on purchase-money for plant purchased from Waihi Gold-mining Company, and on advances from Treasury	10,675 0 0		Balance from Gross Revenue Account	8,352 18 9
Depreciation on completed works (2 per cent.)	3,959 14 0		Balance to Profit and Loss Appropriation Account	6,281 15 3
	£14,634 14 0			£14,634 14 0

Profit and Loss Appropriation Account.

To	£ s. d.	£ s. d.	By	£ s. d.
Balance from previous year	2,122 8 0		Balance to balance-sheet	8,404 3 3
Balance from Net Revenue Account	6,281 15 3			
	£8,404 3 3			£8,404 3 3

Depreciation Reserve Account.

To	£ s. d.	£ s. d.	By	£ s. d.
Balance to balance-sheet	5,653 4 9		Balance at 31st March, 1920	1,628 8 0
			Interest for year	65 2 9
			Amount set aside as per Net Revenue Account	3,959 14 0
	£5,653 4 9			£5,653 4 9

Balance-sheet at 31st March, 1921.

Liabilities.	£	s.	d.	£	s.	d.
Depreciation Reserve				5,653	4	9
Sundry creditors				3,673	14	5
Waihi Gold-mining Company (Limited)—						
Purchase price of Horahora plant				212,500	0	0
Balance carried to general Balance-sheet—						
Total assets as per contra	303,252	11	10			
Less total liabilities as above	221,826	19	2			
				81,425	12	8
				£303,252	11	10

Assets.	£	s.	d.	£	s.	d.
Works, &c., at Horahora—						
Roads and bridges	2,091	8	6			
Freehold land	876	13	1			
Accommodation for staff and workmen	7,436	3	5			
Headworks	86,307	11	5			
Generating-station	26,092	10	8			
Transformer building and machinery	20,896	0	3			
				143,700	7	4
Transmission-lines—						
Horahora–Waihi, 50,000-volt	43,890	8	6			
Linemen's cottages	804	15	9			
Horahora – Hamilton, 50,000-volt	71	3	3			
Mystery Creek – Te Awamutu, 50,000-volt	6	13	2			
Horahora – Frankton, 11,000-volt	14,304	3	6			
				59,077	4	2
Distribution-lines				535	16	1
Main substations—						
Hamilton	83	19	2			
Te Awamutu	131	6	4			
Transformer and oil-boiling plant and machinery at Waikino	17,724	9	0			
				17,939	14	6
Stores buildings and fittings and Railway-siding at Ruakura				1,532	12	4
Motor cars, lorries, and cycles				2,815	8	8
Loose tools and construction plant and equipment				2,368	14	7
Office furniture, Hamilton				363	0	0
Engineering, office, and general expenses on preliminary surveys and on construction				3,174	0	6
Salaries of officers on preliminary surveys and during construction				2,372	2	8
Interest during construction				15,619	13	8
General stocks of material on hand				44,023	17	2
Debtors—						
For current, &c.	1,276	8	7			
For insurance premiums, &c., paid in advance	49	8	4			
				1,325	16	11
				294,848	8	7
Balance from Profit and Loss Appropriation Account—Accumulated loss to date				8,404	3	3
				£303,252	11	10

The balance-sheet has been duly audited with the various supporting books, vouchers, and documents, and found to correspond therewith.

Robert J. Collins,
Controller and Auditor-General.

Table No. 6.

IRRIGATION AND WATER-SUPPLY.

SCHEDULE OF SCHEMES COMPLETED OR UNDER CONSTRUCTION.

Scheme.	Source of Supply.	River Discharge (Minimum).	Main Canal Discharge (Maximum).		Rainfall Average for Five Years.	Rainfall, 1920.	Area commanded (Gross).	Area Irrigated at Present.	Works Authorized.		Works completed ended 1920–21.		Expenditure to 31st March, 1921.	Estimate to complete.	Remarks.
			As per Design.	During 1920–21.					Main Canals.	Distributaries.	Main Canals.	Distributaries.			
		Cusecs.	Cusecs.	Cusecs.	Inches.	Inches.	Acres.	Acres.	M. ch.	M. ch.	M. ch.	M. ch.	£	£	
Steward Settlement	Waitaki River ..	..	110	..	18·4	20·0	18,000	..	14 60	50 31	14 60	50 31	12,115	..	Completed.
Otekaike ..	Otekaike River ..	9	15	..	22·1 (Duntroon)	22·8	1,500	800	14 37	3 47	14 37	3 47	3,631	..	Completed scheme. Mostly on east side of river. 1½ heads to west side for stock-race.
Ida Valley ..	Poolburn, Manorburn, and Moa Creek. (Storage Manorburn Dam)	..	109	42	25·5 (Manorburn Dam)	19·0	31,600	4,400	30 60	34 0	27 30	34 0	124,504	23,661	Further work consists of German Hill race extension.
Galloway ..	Manorburn Dam ..	..	15	8·3	14·0 (Clyde)	10·37	1,300	1,100	7 30	4 0	7 30	4 0	12,923	..	Completed.
Manuherikia – Alexandra–Clyde No. 1	Manuherikia River	65	100	..	14·5 (Clyde and Ophir)	13·19	11,000	..	21 58	41 0	21 58	..	106,718	43,788	Expected to be completed within year.
Ardgour	Lindis River ..	50	14	..	17·5	16·01	2,000	..	13 0	..	..	..	Nil	11,801	Under construction.
Fraser River, Earnscleugh	Fraser River and storage dam	8	10	10	16·5 (Clyde)	10·37	4,000 (Main), and 1,580 (Temp.)	..	..	..	..	..	1,678*	1,422	Main scheme from dam; temporary scheme from Sandy Point Mining Rights under construction.
Olrig Terrace ..	Manorburn Dam ..	..	..	..	14·0 (Ophir)	16·01	1,600	..	..	..	..	..	†	†	

* Includes £1,500 paid for Sandy Point mining rights. † Included in Ida Valley scheme.

SCHEDULES OF SCHEMES UNDER INVESTIGATION.

Scheme.	Source of Supply.	River Discharge (Minimum).	Main Canals Discharge (Maximum), as per Design.	Rainfall (Average for Five Years).	Rainfall, 1920.	Area commanded (Gross).	Length of Main Canals.	Length of Distributaries.	Expenditure to 31st March, 1921.	Estimate to complete.	Remarks.
		Cusecs.	Cusecs.	Inches.	Inches.	Acres.	Miles.	Miles.	£	£	
Last Chance Water-race	Shingle Creek Gorge, Chasm Creek	..	Not fixed	No records	No record	4,300	8½	..	1,139	..	
Maniototo	Taieri River and storage dam	10	500	18·95 (Eweburn)	17·02	100,000	60	..	..	..	Whole scheme depends on storage.
Cromwell Flat	Roaring Meg Stream ..	25	30	22·36 (Luggate)	14·53	8,250	8	..	..	..	About 4,000 acres irrigable. Private company now developing area by pumping water from Kawarau Stream.
Manuherikia – Alexandra–Clyde No. 2	Manuherikia River and storage dam	65	185	14·5 (Clyde and Ophir)	13·19	27,750	..	..	..	..	..
Manuherikia – Alexandra–Clyde No. 3	Dunstan River, Manuherikia River, &c.	..	79	22·38 (Blackstone Hills)	19·95	15,800	..	..	..	..	Total area, 37,850 acres Water available for 15,800 acres.

APPENDICES TO THE PUBLIC WORKS STATEMENT, 1921.

APPENDIX A.

AUDITED STATEMENT OF EXPENDITURE ON PUBLIC WORKS OUT OF THE PUBLIC WORKS FUND FOR THE YEAR 1920–21.

Prepared in compliance with Section 8 of the Public Works Act, 1908.

SIR,— Public Works Department, Wellington, 17th June, 1921.

In compliance with the 8th section of the Public Works Act, 1908, I enclose a statement of the expenditure during the preceding financial year on all works and services chargeable to the Public Works Fund.

I have, &c.,
J. G. COATES,
Minister of Public Works.

The Controller and Auditor-General, Wellington.

STATEMENT OF NET EXPENDITURE ON ALL WORKS AND SERVICES CHARGEABLE TO THE PUBLIC WORKS FUND FOR THE YEAR 1920–21.

Class.	Vote.	Summary.	Appropriation.	Expenditure.	Credits.	Net Expenditure
		PUBLIC WORKS FUND.	£	£ s. d.	£ s. d.	£ s. d.
XX	39	Public Works, Departmental ..	175,376	189,432 3 8	46,377 5 3	143,054 18 5
XXI	40, 41	Railways	1,250,000	1,408,147 10 2	42,681 19 2	1,365,465 11 0
XXII	42–50	Public Buildings	621,465	576,515 8 4	74,304 6 0	502,211 2 4
XXIII	51–53	Lighthouses, Harbour-works, and Harbour-defences	26,350	4,888 17 10	50 9 8	4,838 8 2
XXIV	54	Tourist and Health Resorts ..	31,000	19,043 0 8	2 10 3	19,040 10 5
XXV	55	Immigration	76,600	112,662 10 8	120,468 3 1	*Cr.*7,805 12 5
XXVI	56, 57	Roads, Bridges, and other Public Works	709,809	559,324 0 0	20,749 18 4	538,574 1 8
XXVII	58	Development of Mining	3,000	2,152 19 8	..	2,152 19 8
XXVIII	59	Telegraph Extension	500,000	412,129 5 7	75,660 19 4	336,468 6 3
XXIX	60	Contingent Defence	15,000	8,785 2 8	84 10 0	8,700 12 8
XXX	61, 62	Lands Improvement	12,000	2,770 14 11	708 2 5	2,062 12 6
XXXI	63	Irrigation and Water-supply ..	40,000	57,573 4 6	2,228 3 8	55,345 0 10
XXXII	64	Plant, Material, and Stores ..	200,000	257,876 9 0	87,964 19 10	169,911 9 2
..	..	Unauthorized	..	723 15 9	170 5 0	553 10 9
		Total, Public Works Fund ..	3,660,600	3,612,025 3 5	471,451 12 0	3,140,573 11 5

P. S. WALDIE,
Accountant.

F. W. FURKERT,
Engineer-in-Chief and Under-Secretary.

Examined and found correct.
ROBERT J. COLLINS,
Controller and Auditor-General.

APPENDIX A—*continued.*

	Name of Vote.	Appropriation.	Expenditure.	Credits.	Net Expenditure.
	PUBLIC WORKS FUND.	£	£ s. d.	£ s. d.	£ s. d.
39	Public Works, Departmental	175,376	189,432 3 8	46,377 5 3	143,054 18 5
	Railways—				
40	Railway-construction	800,000	984,348 14 9	40,198 11 7	944,150 3 2
41	Additions to Open Lines	450,000	423,798 15 5	2,483 7 7	421,315 7 10
	Public Buildings—				
42	General	52,000	39,524 19 2	20 12 4	39,504 6 10
43	Courthouses	7,500	1,400 5 4	0 6 0	1,399 19 4
44	Prisons	25,000	30,063 16 5	26 4 9	30,037 11 8
45	Police-stations	36,400	36,878 11 2	35 19 1	36,842 12 1
46	Postal and Telegraph	132,865	93,489 11 9	125 12 2	93,363 19 7
47	Agricultural	15,000	12,446 17 8	3,101 13 2	9,345 4 6
48	Mental Hospitals	50,000	27,390 19 6	22 16 2	27,368 3 4
49	Hospitals and Charitable Institutions	50,000	20,495 4 8	867 13 6	19,627 11 2
50	School Buildings	252,700	314,825 2 8	70,103 8 10	244,721 13 10
	Lighthouses, Harbour-works, and Harbour-defences—				
51	Lighthouses	8,000	758 12 0	..	758 12 0
52	Harbour-works	15,350	4,130 5 10	50 9 8	4,079 16 2
53	Harbour-defences	3,000	..	..	..
54	Tourist and Health Resorts	31,000	19,043 0 8	2 10 3	19,040 10 5
55	Immigration	76,600	112,662 10 8	120,468 3 1	*Cr.* 7,805 12 5
	Construction and Maintenance of Roads, Bridges, and other Public Works—				
56	Roads, &c.	687,909	548,273 18 11	20,749 18 4	527,524 0 7
57	Road and other Works on Goldfields and Mineral Lands	21,900	11,050 1 1	..	11,050 1 1
58	Development of Mining	3,000	2,152 19 8	..	2,152 19 8
59	Telegraph Extension	500,000	412,129 5 7	75,660 19 4	336,468 6 3
60	Contingent Defence	15,000	8,785 2 8	84 10 0	8,700 12 8
	Lands Improvement—				
61	Improved-farm Settlements	450	34 10 0	607 12 0	*Cr.* 573 2 0
62	Lands, Miscellaneous	11,550	2,736 4 11	100 10 5	2,635 14 6
63	Irrigation and Water-supply	40,000	57,573 4 6	2,228 3 8	55,345 0 10
64	Plant, Material, and Stores	200,000	257,876 9 0	87,964 19 10	169,911 9 2
	Unauthorized—Services not provided for	..	723 15 9	170 5 0	553 10 9
	Total, Public Works Fund	3,660,600	3,612,025 3 5	471,451 12 0	3,140,573 11 5

APPENDIX B.

ANNUAL REPORT ON PUBLIC WORKS BY THE ENGINEER-IN-CHIEF.

The Engineer-in-Chief to the Hon. Minister of Public Works.

Sir,—

I have the honour to submit the following report upon the various works under my control completed and in progress throughout the Dominion during the period from the 1st June, 1920, to the 31st July, 1921.

During the past year the improvement in the conditions of the employees, together with increased wages, has enabled us to obtain a better supply of labour. The labour-saving appliances which the Department procured have resulted in increased output, and generally the progress made in connection with public works has been much above the average of the last few years.

The prices for material and labour have not yet receded to any substantial extent, and consequently the cost of works still remains very much above what it was in pre-war times.

RAILWAYS.

Abstract.

The following table shows the expenditure on Government railways in New Zealand up to the 31st March, 1921:—

Name of Railway.	Total Length of Railway or Section.	Open for Traffic.	Expenditure to 31st March, 1921.
	M. ch.	M. ch.	£
Kaihu Valley	24 30	19 58	145,035
Otiria–Ngapuhi	45 25	16 25	125,771
Opua Wharf – Onerahi	58 6	58 6	525,771
Whangarei–Waiotira	19 79	5 28	334,335
North Auckland Main Trunk Railway (from Helensville)	84 24	54 27	1,369,470
Helensville – Te Awamutu, with Branches	163 48	150 39	2,778,187
Frankton Junction – Thames, with Branches	127 35	87 20	669,131
Thames Valley – Rotorua	69 33	69 33	376,579
Tauranga–Opotiki, with Branches	145 32	..	629,096
Gisborne–Opotiki	93 44	49 32	623,880
Napier–Gisborne	231 44	..	419,670
Wellington – Napier and Palmerston North (including Te Aro Extension and Greytown and Martinborough Branches)	249 44	233 12	2,646,743
Wellington–Waitara, with Branches	350 11	285 59	2,777,515
Stratford–Okahukura	112 47	42 26	1,037,972
North Island Main Trunk (Marton – Te Awamutu), including Raetihi Branch and Waipa Gravel-access Branch	225 79	218 39	2,868,179
Picton–Waipara (South Island Main Trunk Railway)—			
Picton southwards	92 38	56 6	657,129
Waipara northwards	90 45	44 14	374,162
Nelson–Greymouth	170 0	118 6	580,490
Greymouth–Arthur's Pass	49 78	49 78	1,211,796
Rolleston – Arthur's Pass (including Whitecliffs Branch)	92 59	84 45	841,692
Westport–Ngakawau	19 56	19 56	188,354
Westport – Ngakawau Extension to Mokihinui*	7 12	7 12	..
Mokihinui Colliery Line†	3 69	3 69	..
Westport–Inangahua	26 0	5 74	152,623
Ngahere–Blackball	3 40	3 40	147,532
Greymouth–Rewanui and Branches	8 70	8 70	275,325
Greymouth–Waitaha	50 32	38 68	339,250
Hurunui–Waitaki, with Branches	459 34	413 70	2,674,583
Canterbury Interior Main Line—Oxford–Temuka	83 0	11 44	59,942
Waitaki–Bluff, with Branches	600 21	546 12	4,982,342
Otago Central	182 51	134 78	1,429,740
Invercargill–Kingston, with Mararoa Branch	117 4	97 44	387,299
Forest Hill Railway—Winton–Hedgehope‡	12 40	12 40	23,337
Western Railways	94 8	70 31	347,415
Preliminary surveys	..	..	41,679
Miscellaneous	..	..	10,337
Stock of permanent-way on hand	..	..	81,400
Rolling-stock	..	..	7,046,624
Total	4,165 38	3,017 56	§39,180,385

* The funds for this extension—namely, £35,501 2s. 11d.—were provided by the Westport Harbour Board.
† The funds for purchase of this line, £15,745, were provided by the Westport Harbour Board.
‡ The expenditure on this line as a tramway was made by the Lands Department.
§ Includes expenditure on railways under Hutt Road and Railway Improvement, Railway Improvement Authorization Act and Railway Improvement Authorization Act 1914 Accounts.

ABSTRACT—*continued.*

Name of Railway.	Total Length of Railway or Section.	Open for Traffic.	Expenditure to 31st March, 1921.
PROVINCIAL GOVERNMENT LINES, ETC.	M. ch.	M. ch.	£
Canterbury (lengths included above)	..	..	731,759
Otago and Southland	..	..	372,522
Gisborne to Ormond Tramway	..	..	4,975
Midland Railway, valuation of works constructed by company ..	..	..	*683,460
Grand total	4,165 38	3,017 56	40,973,101

* Includes value for £150,000 paid to debenture-holders under the Midland Railway Petitions Settlement Act Amendment Act, 1903.

KAIHU VALLEY RAILWAY EXTENSION.

(19 m. 17 ch. to 23 m. 71 ch.; length, 4 miles 54 chains.)

The formation on this line has now been completed with the exception of two or three culverts. Permanent rails have been laid from 21 m. to 23 m. 55 ch., and temporary rails from there into Donnelly's Crossing station-yard. The laying of the station-yard cannot be put in hand until the plat-girder bridge now in hand at 23 m. 58 ch. is completed. Two other permanent bridges have yet to be constructed, and traffic is at present carried temporary bridges. The first lift of ballasting has been completed to 23 m. 55 ch., and the second lift from 19 m. 17 ch. to 22 m. Boxing-in has been completed to 21 m. Ballasting has been considerably hampered by shortage of plant, and we are at present carrying on with an outfit hired from the Railway Department. The construction of the station buildings has been delayed owing to shortage of timber, but this will now be supplied from our own mill which is being erected at Whatoro. A compressed-air tamping-machine for packing under the sleepers has been utilized on this work with satisfactory results.

A goods service from Tarawhati to Aranga was started in September, 1920, and settlers have taken full advantage of it. It is hoped to extend the service to Donnelly's Crossing in September, provided our own ballast-train is then available.

KAWAKAWA–HOKIANGA RAILWAY.

Ngapuhi Northwards – Okaihau Section (16 m. 25 ch. to 24 m. 45 ch.; length, 8 miles 20 chains).—The formation on this section has been finished, but continual trouble has been caused by slips due to the unstable nature of the country passed through. The large cutting at 19 m. 68 ch. and the embankment at 19 m. 53 ch. have been the most troublesome. A Marion shovel has been kept busy all the year shifting slips on this section. The embankment at 19 m. 53 ch. has required a lot of attention on account of the subsidence and the movement of the base; it was therefore decided to remove a large quantity of the soft material to form a berm farther out, and fill in with fresh material from volcanic deposits. This has very much reduced the movement.

All pipes and concrete culverts have been completed, and plans for the bridge over the Utakura Stream have been prepared, a temporary bridge being at present in use at this crossing. Ten miles of new fencing have been erected, in addition to alterations and repairs to existing fences. Platelaying has been completed to 26 m. 14 ch., leaving only a few chains and the Okaihu station-yard to complete the section, but the work has been delayed owing to shortage of material. A temporary ballast-line has been laid to the Utakura quarry, which has been opened up, and a quantity of stone got out in readiness for crushing and ballasting. The crushing plant has been erected, and is ready for operation.

Okoro Section (24 m. 45 ch. to 34 m. 18 ch.; length, 9 miles 53 chains).—Very little progress has been made on this section, owing to the shortage of labour, and the general reduction of men which took place toward the end of the period. Formation work between 25 m. 23 ch. and 25 m. 51 ch. was in hand, and about 15 chains were completed; an 8 in. culvert at 25 m. 2 ch. was completed, and about 11 chains of fencing erected.

WHANGAREI BRANCH RAILWAY.

Oakleigh Section (5 m. 27 ch. to 7 m. 60 ch.; length, 2 miles 33 chains).—Formation work on this section is now approaching completion; two steam-shovels and several plough and scoop teams have helped to show good progress. The summit cutting at 6 m. 19 ch. was completed, and the deviation from 6 m. 78 ch. to 7 m. 29 ch. is well in hand. Rails have been laid to 5 m. 18 ch., including the Portland station-yard, and the second lift of ballast completed. The piers of bridge at 7 m. 33 ch. have been completed in readiness for the permanent girders. The platelayer's cottage which was being erected in concrete in the Oakleigh station-yard has now been finished.

Tauraroa Section (7 m. 60 ch. to 14 m. 67 ch.; length, 7 miles 7 chains).—The only work on this section during the period has been the removal of slips and general maintenance, but there is still a considerable amount of slip material to remove. The ballast-quarry at Tauraroa has been vigorously worked, and a large quantity of metal quarried and crushed for ballasting, road-metalling, and concrete-work on other sections. A goods service has been run over this section, and in addition a regular wharf gang has been employed to deal with plant, material, and stores arriving at Oakleigh by sea from Auckland.

Waiotira Section (14 m. 67 ch. to junction at Waiotira with the North Auckland Main Trunk Railway at 19 m. 67 ch.; length, 5 miles 12 chains).—The main work on this section during the period has been the removal of slips from a number of bad cuttings, and the completion of two small deviations between 16 m. 40 ch. and 17 m. 10 ch. A Marion steam-shovel has been engaged on this

work for about seven months, and has shifted over 18,000 cubic yards, but the section of line between 16 m. and 17 m. 10 ch. is much the worst for slips in the whole length, and will fully occupy at least two shovels for a considerable time. In fact, it would have been exceedingly difficult to keep the line open without the steam-shovels. The shovel-work has been somewhat hampered by the shortage of wagons, but the position has been considerably eased by the arrival of some of the American dump wagons recently ordered, fourteen of the latter being now in commission, in addition to a number built locally. Four small Dinky locomotives have also been received, and are working in conjunction with the steam-shovels, enabling the work to be carried out more expeditiously and efficiently. A considerable amount of stone and tile drains will be required to drain the various slips and cuttings before finality is reached in this work. Fifty single huts and twelve married men's houses have been built.

Waipu Branch Railway.

Ruakaka Section (0 m. to 9 m. 20 ch.; length, 9 miles 20 chains).—Formation was well in hand on this section, and an Erie steam-shovel was engaged in completing the banks across the mud-flats between 0 m. and 2 m. 45 ch. when work was stopped. This work has, however, been recently restarted.

North Auckland Main Trunk Railway.

Paparoa Section (88 m. 21 ch. to 92 m. 6 ch.; length, 3 miles 65 chains).—The formation of this section has been completed, and all pipes, culverts, &c., are also completed. The big bank at 91 m. 30 ch. which gave so much trouble last year has now consolidated, and no further movement took place this winter. The excavation and lining of the Huarau Tunnel has been finished under very adverse conditions, the last section of lining being heavily reinforced to withstand the pressure, and conditions all through being such that progress was necessarily slow. The permanent rails have been laid to the end of the section, but the Paparoa station-yard sidings are still in hand. Ballasting operations were resumed during the period, and a first lift of ballast placed up to 92 m. 6 ch., omitting the bank at 91 m. 30 ch. Two platelayers' cottages were completed and occupied, and arrangements were entered into for four additional cottages and the Stationmaster's house.

Mareretu Section (92 m. 6 ch. to 96 m. 45 ch.; length, 4 miles 39 chains).—Trial surveys of these alternative tunnel routes and deviations beyond Golden Stairs and permanent surveys of the approved deviation were completed and plans submitted. A considerable amount of fencing on various portions of the section was erected, and arrangements were made with the settlers to enable work to be put in hand as far as 96 m. 2 miles 12 chains of service road was constructed to serve the Golden Stairs Tunnel, and 40 chains of this will ultimately be used as the Golden Stairs to McCarroll's Road. Good progress has been made with the formation and culverts, but great difficulty has been experienced in keeping the section between Paparoa Station and Golden Stairs Tunnel free from slips and open for the service-train traffic. The clearing of slip at 92 m. 30 ch. and formation of bank at 92 m. 55 ch. is being carried out with a Marion steam-shovel; this work is almost complete, and the machine will then be transferred to cutting at 96 m. 37 ch. An Osgood shovel is being assembled, and will be utilized at 94 m. 25 ch. Platelaying is now complete to 93 m. 41 ch.; ballasting operations were recommenced during April, and a contract let for procuring metal from the Hoteo quarry; a first lift of ballast has been placed from 92 m. 13 ch. to 93 m. 41 ch. During the year forty-nine 8 ft. by 10 ft. huts, a new boardinghouse to seat fifty men, a recreation-hall, canteen, and water-supply have been constructed at Golden Stairs.

Waikiekie Section (96 m. 45 ch. to 107 m. 28 ch.; length, 10 miles 63 chains).—Work has, as far as possible, been concentrated on this section during the year, and good progress has been made. From 100 m. to 102 m. 25 ch. the formation is practically complete, though several slips are developing, and will require removal. From 102 m. 41 ch. to the end of the section the formation, with the exception of the widening of the Waikiekie station-yard, has been completed. The cutting at 104 m. 18 ch. has, however, slipped badly, but a Marion shovel has been placed here and will soon have it cleaned up. Between 102 m. 40 ch. and 103 m. 5 ch. a Marion shovel has dug 21,000 cubic yards, and is still occupied on slips. A Bucyrus has been occupied at 106 m. 72 ch. in order to complete the bank to the Waiotira station-yard, but slips have again been troublesome.

Every endeavour was made to finish the Waikiekie Tunnel during the period, and it was finally completed in April. Very great difficulty was experienced throughout in the construction of this tunnel, the ground being treacherous and unstable for the whole length. Owing to heavy slips at the northern end it became necessary to adopt a special reinforced section to enable the timber-work to be started, and particularly close and heavy timbering had to be used throughout. All material for the south end of the tunnel and for works ahead was hauled over the top of the tunnel by means of a rope tramway. This proved economical, and enabled preparations to be put in hand for the Mareretu Tunnel. As soon as the north end of the Waikiekie Tunnel was completed a start was made with the Mareretu Tunnel; and, as preparatory work and accommodation, including boardinghouse, recreation-hall, and water-supply, were well in hand, it was possible to transfer the men on the north end of Waikiekie to Mareretu while the men on the south end of the former were completing the last length. At the end of the period 3 chains of the Mareretu Tunnel were completed, and it is anticipated that the remaining 13½ chains will be completed by the end of next June. A certain amount of difficulty was experienced in driving through the soft ground near the approaches, and it was necessary to use two sections for the concrete lining, but as both headings are now in fairly soft ground no further trouble is anticipated.

The piers for bridges at 104 m. 1 ch. and 104 m. 35 ch. have been completed, and temporary superstructures placed pending the arrival of the steel girders, which will be placed in position as soon as received. Preparatory work for the erection of bridges over the Mangawai River and Kikowhiti Stream is in hand.

The small crushing plant at 104 m. 4 ch. has turned out 12,000 cubic yards of metal for various purposes.

The permanent rails have been laid from 106 m. to 104 m. 26 ch., and the temporary track is being gradually replaced with permanent line. A light service line has been put in from 104 m. 6 ch. to 102 m. 20 ch. in order to get materials to Marеretu Tunnel. Ballasting has been in hand between 106 m. 60 ch., and fair progress was made. Between 104 m. and 102 m. 30 ch. 1¼ miles of road has been metalled and 4¼ miles of fencing erected.

The Stationmaster's house at Waiotira station-yard has been completed. Difficulty was experienced during the year in obtaining timber for the construction of workmen's huts and other buildings, while a shortage of carpenters delayed erection. The opening of the sawmill has, however, eased matters considerably, 268,000 ft. of timber for huts, temporary sleepers, and tunnel-work having been supplied; 105 single huts, fifteen married men's houses, and three cookhouses have been built; and, although each individual has not been provided with a hut, still a great improvement has been effected in the housing of workmen.

A survey of a deviation from the Mareretu station-yard to 99 m. has been completed, and as soon as a steam-shovel is available it will be transferred to the cuttings on this portion.

Kirikopuni Section (107 m. 28 ch. to 121 m. 40 ch.; length, 14 miles 12 chains).—Comparatively little work has been carried out on the southern end of this section, as operations were stopped in January in order to concentrate on the Waiotira Southwards Section. A Bucyrus steam-shovel was in operation for five months, and dug 9,600 cubic yards to bank. On the northern end of this section a tramway has been constructed from the Wairoa River to the Omana Tunnel, a distance of 2 miles 60 chains. A limestone-quarry has been opened up, and it is intended to lightly ballast this tramway in order to allow a locomotive to be operated between the river and the tunnel. The northern approach to this tunnel has been commenced, and a new Osgood shovel will be started in here very shortly. 140 chains of permanent fencing were erected.

Waiuku Branch Railway.

Glenbrook Section (5 m. to 8 m.; length, 3 miles).—Platelaying, and the first and second lift of ballast, have been completed on this section. Cattle-stops and road-crossings have been completed, and the station buildings at Glenbrook erected. The completed portion between Patumahoe and Mauku Station has been maintained, and the goods service has been extended to Glenbrook.

Waiuku Section (8 m. to 12 m. 15 ch.; length, 4 miles 15 chains).—Formation work and platelaying have been completed, also the first lift of ballast to the end of the section, and the second lift to 10 m. Ballasting operations have been greatly hampered by the uncertainty of supplies from the Railway Department, who have only been able to supply at irregular and infrequent intervals. Concrete overbridge at 10 m. 74 ch. has been completed, and that at 11 m. 30 ch. is well in hand. Station buildings at Pukeoware and Fernleigh, as well as the Stationmaster's house at Waiuku, are finished, while the goods-shed and platelayers' cottages at Waiuku are nearing completaion.

Huntly–Awaroa Railway.

(7 m. 20 ch. to 10 m.; length, 2 miles 60 chains.)

Formation work is in hand between 7 m. 26 ch. and 8 m. 62 ch. Ten culverts have been built, and the fencing has been commenced. Road-widening on the right-hand side between 8 m. 22 ch. and 8 m. 34 ch., as well as access road at 8 m. 46 ch., has been completed. Further surveys in order to provide for station-yard and mine sidings have been made, and permanent line relocated and pegged.

East Coast Main Trunk Railway.

Waihi Eastwards – Athenree Section (0 m. to 8 m. 68 ch.; length, 8 miles 68 chains).—Practically all the formation on this section has been completed with the exception of a few very minor works such as the completion of several bridge approaches. The erection of the Mangatoetoe Bridge was commenced in June, and nine pier excavations have been finished, of which three have been concreted to ground-level. This work necessitated the removal and re-erection of the public footbridge over the Mangatoetoe Creek.

Katikati Section (8 m. 68 ch. onwards).—Fair progress has been made with the formation and culverting, and this is now complete from 8 m. 71 ch. to 10 m., with the exception of a small block in cutting at 9 m. 18 ch. The formation is also complete between 11 m. 65 ch. and 12 m.

Tauranga Westwards – Tauranga Section (36 m. to 41 m. 5 ch.; length, 5 miles 5 chains).—About 1½ miles of formation, together with fencing and drainage, have been completed between 36 m. and 39 m. 55 ch. The toes of banks between 35 m. 50 ch. and 36 m. 10 ch., where abutting on tidal water, have been protected with fascines, and a quarry has been opened up on the Wairoa River about 3 miles above the traffic-bridge, in order to supply stone for facing banks on this section. The erection of three platelayers' cottages in the Tauranga station-yard has been commenced.

Tauranga Eastwards – Matapihi Section (41 m. 5 ch. to 45 m.; length, 3 miles 75 chains).—Good progress has been made on the bank between 41 m. 27 ch. and 41 m. 74 ch.: this has been extended about 4 ft. below formation-level to 41 m. 38 ch. and stone-pitched to the same point. The stone riprap wall has been carried out to the Tauranga Bridge pier. All cylinders for the Tauranga Bridge have been completed, and twenty-four have been sunk to the proper depths. Staging has been erected for seven piers, and a total of 442 ft. of reinforced cylinder constructed, of which 386 ft. has been sunk. Considerable extra work was entailed in the sinking of the cylinders owing to the very soft material met with, thus entailing extra lengths of cylinder over and above that anticipated. However, with the exception of abutment P all cylinders are now on a satisfactory bottom.

Mount Branch (0 m. to 4 m. 7 ch.; length, 4 miles 7 chains).—The regular goods and passenger service has been carried on over this section in a satisfactory manner, and the line has been well maintained.

A considerable amount of work has been carried out in connection with the restoration and extension of the workshops; the filling-in for yard-extension has been completed, and platelaying is in hand. The new mill and carshop is almost completed, and the blacksmith's shop is in hand. A considerable amount of new heavy-duty machinery has been installed, and the shop is now well equipped and efficient.

In addition to the steelwork for the Tauranga Bridge and seven smaller bridges, a great deal of timber and iron work has been carried out, including the manufacture of an orange-peel grader, three large piling-derricks, concrete buckets, earth wagons and trucks, dredge-punts, and the assembly of steam-shovels, caterpillar tractors and trailers, &c. The general machine repairs and maintenance to locomotives and rolling-stock have been a heavy item; nearly all the M ballast-wagons having had new underframes, and their wheels turned up. A new water-supply, including engine and pump, was erected at the workshop to serve locomotive and workshop boilers, and provide a domestic supply for workmen.

Te Puke Section (45 m. to 54 m.; length, 9 miles).—This section has been kept open for traffic, and, in addition to ordinary maintenance, all the bridges have been repainted, and the Mangatawa drain cleaned out, deepened, and extended. About 10,000 yards of metal has been quarried and crushed, part being supplied to local bodies and part used for ballasting and concrete-work by the Department.

Paengawa Section (54 m. to 59 m. 67 ch.; length, 5 miles 67 chains).—This section has been maintained for traffic, and additional waterway has been provided at Wairi Bridge.

Pongakawa Section (59 m. 67 ch. to 64 m.; length, 4 miles 13 chains).—No work has been done on this section beyond maintenance for traffic.

Otarawakau Section.—This section is not yet completed, but is open for traffic. The embankments generally, which have subsided, have been raised, and a steam-shovel has been started in the widening of the Otaramakau cutting. A large number of concrete posts, strainers, and house-blocks have been made at the depot.

Matata Section (71 m. 5 ch. to 79 m. 16 ch.; length, 8 miles 11 chains).—This section is also open to traffic, though uncompleted, and consequently the maintenance has been considerable; the principal work carried out has been the raising and widening of banks, fencing, and the erection of temporary bridges off the centre-line to enable the permanent structures to be put in hand without interfering with traffic.

Rangitaiki Section (79 m. 16 ch. to 87 m. 71 ch.; length, 8 miles 55 chains).—Similar work is being carried out on this section in raising banks and erecting temporary bridges. A steam-shovel is engaged at the Awakaponga pit, and during the period dug 71,000 cubic yards. The permanent reinforced-concrete bridge at 79 m. 24 ch. is in hand, and temporary trestle bridges have been built over the Tarawera and Rangitaiki Rivers. The permanent rails have been laid throughout the section, with short sidings at Awakaponga, Tarawera, and Rangitaiki Stations, and the section was opened for traffic in September.

Awakeri Section (87 m. 71 ch. to 92 m.; length, 4 miles 9 chains).—Work on this section has consisted mainly of widening at Awakeri station-yard, fencing generally, and construction of temporary bridges. Platelaying has been completed, and this section was also opened for traffic in September.

Taneatua Section (92 m. onwards).—All clearing has been completed to 97 m., and earthworks to 95 m. Fencing is in hand to 94 m. 20 ch., and culverts and side drains to 96 m. A steam-shovel is being assembled for cutting at 96 m. 20 ch., and a service road has been extended over the summit 65 chains, having been constructed during the year, including two bridges. The permanent rails have been laid to 93 m. 23 ch.

General.—Seventy-seven double and fifty-eight single huts have been erected on all sections, a cookhouse at the Mount, and bathhouse at Te Puke quarry.

Gisborne–Napier (North End).

Ngatapa Section (0 m. to 10 m. 29 ch.; length, 11 miles 18 chains).—The principal work on this section has been the raising of the Ngatapa station-yard, construction of stream-diversions, and ballasting, which has been completed to 9 m. 40 ch. Metal for ballasting has been obtained from the Repongaere quarry, which has also supplied a considerable amount of pulverized lime for agricultural use in the surrounding district. The permanent-way has been maintained and a regular goods and passenger service maintained.

Waikura Section (10 m. 29 ch. onwards).—Formation is in hand to 13 m. 15 ch., the principal works being bank and cutting, 12 m. 10 ch. to 12 m. 24 ch.; big cutting at 12 m. 30 ch.; banks at 12 m. 39 ch. and 12 m. 53 ch., cutting at 12 m. 48 ch., widening and raising bank at 12 m. 59 ch., and tunnel approach at 13 m. 15 ch. A Marion shovel was occupied on slips and did good work. Bridge at 11 m. 55 ch. was completed. Platelaying is complete to 11 m. 55 ch., first lift of ballast to 10 m. 60 ch., and second lift to 10 m. 55 ch.

Frasertown Section (0 m. onwards).—Very little work has been done on this section; the approach road to Wairoa station-yard has been formed, and earthwork generally completed to 1 m. 72 ch. Contracts were let for the erection of three platelayers' cottages and a Stationmaster's house, but owing to difficulty in procuring supplies of timber the work has been somewhat delayed; two cottages are almost complete.

Waikokopu Branch Railway.

Nuhaka Section (0 m. to 17 m. 12 ch.; actual length, 18 miles 65 chains).—This section includes a short piece, 1 mile 53 chains long, between the Wairoa station-yard and the 0 m. on the original starting-point of the Nuhaka Section. The formation of this portion is practically complete. The remainder of the formation on this section, with the exception of the large cutting at 0 m. 40 ch., is complete. The contractors in this large cutting have not made satisfactory progress, but a steam-shovel was started in the other end, and better progress is now being maintained. In the lighter formation an average of seventy scoop teams was employed, and progress was good.

Protection work has been carried out at Whakahi Lake, and fencing is in hand.

Waikokopu Section (17 m. 12 ch. onwards).—Formation is in hand up to 22 m. 40 ch. In the earlier portion of the year labour was scarce, but by the end of March cuttings were fully manned, and steady progress has been made.

Gisborne–Napier (South End).

Eskdale Section (0 m. to 10 m. 51 ch.; length, 10 miles 51 chains).—The whole of the formation on this section, with the exception of the river-gaps at 0 m. 24 ch. and 0 m. 55 ch., has been completed, and is ready for trimming and platelaying. The portion between 0 m. 49 ch. and 1 m. 69 ch. was carried out by the Napier Harbour Board under contract. One platelayer's cottage in concrete blocks at Eskdale station-yard is completed, and two others, together with a Stationmaster's house are in hand.

Tutira Section (10 m. 51 ch. onwards).—Formation and culverting is complete from 10 m. 51 ch. to 12 m. 13 ch., and is well in hand to 14 m. 29 ch. A Thew steam-shovel is in use on this section, being at present engaged at 14 m. 5 ch. Road-diversions are complete at 11 m. and 11 m. 30 ch. A 14 ft. service road has been constructed from 13 m. 45 ch. to 17 m., and metalled from 13 m. 45 ch. to 17 m. A start is being made with the bridge at 11 m. 45 ch., reinforcing-steel for the piles being now to hand. Three married quarters and thirty-one single huts for workmen have been built. Two cookhouses, one canteen, and one substore have been erected, and construction headquarters shifted to Eskdale.

STRATFORD MAIN TRUNK RAILWAY.

(West End.)

Tahora Section (42 m. 26 ch. to 47 m. 40 ch.; length, 5 miles 14 chains).—Formation and platelaying are now practically complete, but no ballast has been procurable during the period. Previously all ballast was secured from the Railway Department's ballast-pit at Mount Egmont, but, as they have not been able to supply for some time, and as future supplies are indefinite, it has been decided to open up a shell-rock pit at Te Wera and crush for ballast. The station buildings are well in hand, all material being on the ground and several of the buildings completed.

Raekohura Section (47 m. 40 ch. onwards).—Work on this section has been mainly confined to the completion of works actually in hand and to service-road formation. Permanent rails were laid to 47 m. 59 ch., and a stacking-ground for plant and construction-yard established at the rail-head, to which a great proportion of material and plant has been shifted. Engine-sheds, washout-tanks, &c., were also established here. Work was stopped on the railway formation in February, and the other works are being gradually cleaned up and closed down.

(East End.)

Matiere Section (0 m. to 10 m. 21 ch.; length, 10 miles 21 chains).—Good progress has been made on this section, and the earthworks are complete with the exception of approach banks to bridges. The Okahu Tunnel, 2 m. 22 ch. to 3 m. 17·5 ch., and tunnels at 6 m. 12 ch. (length, 4 chains) and at 7 m. 55 ch. (length, 7 miles 69 chains) have been completed. The fabrication of the steel for bridge at 0 m. 7 ch. has been almost completed, and a start has been made with the erection, which it is anticipated should be completed before the end of the year. The reinforced piles for the Ohura River bridges have been made and carted to the site, and a start has been made with the erection. Two overbridges have been built and two subways are in hand. Additional sidings have been laid in the Okahukura station-yard and locomotive and plant for handling material installed. Formation is being trimmed in readiness for platelaying, and 22,000 sleepers are to hand and are being adzed. Fifty-four workmen's huts have been erected for the accommodation of workmen.

Ohura Section (10 m. 21 ch. to 19 m. 70 ch.; length, 9 miles 49 chains).—Formation is partially completed to 12 m. 25 ch., but no new formation has been commenced.

OPUNAKE BRANCH RAILWAY.

Kapuni Section (0 m. 6 ch. to 7 m.; length, 6 miles 74 chains).—Work on this section has been confined to the completion of the Waingongoro Bridge and the prosecution of the Kapuni River Bridge. The early delivery of rails and sleepers is expected, and a start will then be made with the platelaying.

Auroa Section (7 m. to 12 m.).—At the start of the period the construction of culverts was being vigorously prosecuted, but owing to the shortage of cement this work was brought to a standstill and largely restricted the prosecution of earthwork, which temporarily stopped in March. In June the section was again manned as relief work, and both culverts and earthwork were vigorously pushed on. Formation is now well in hand up to 11 m. 68 ch.

Pihama Section (12 m. to 16 m. 42 ch.; length, 4 miles 42 chains).—A start was made with unemployed labour on this section in the latter part of July, and camps were provided for twenty men.

Manaia Section (0 m. to 5 m. 49 ch.; length, 5 miles 49 chains).—Formation work on this section is now complete with the exception of cutting and bank from 2 m. 71 ch. to 3 m. 52 ch. This will very shortly be finished, and the section will then be ready for platelaying. A start is being made with the opening-up of a ballast-pit in the Kaupokonui River. Seven huts and a four-roomed cottage have been erected for the accommodation of workmen.

South Island Main Trunk Railway.

Kekerangu Section (56 m. 6 ch. to 63 m. 6 ch.; length, 7 miles).—No work has been done on this section during the year.

Midland Railway.

Nelson–Westland (North End).

Kawatiri Section (59 m. 17 ch. to 63 m. 8 ch.; length, 3 miles 7 chains).—Work was recommenced on this section in January, 1920, and a start has been made with the excavation of the tunnel at 62 m. 43·85 ch. Excavation has been carried in a distance of 200 ft. by hand, but, a compressor plant having been erected, work will be carried out more expeditiously. The diversion of the Hope River has been completed, and the erection of bridge at 62 m. 54 ch. is well in hand. A temporary bridge has been erected across the Hope River, and tramway laid to take spoil from the tunnel. A cookhouse, canteen, school, and huts for the accommodation of workmen have been erected.

Arthur's Pass Tunnel.

Otira End.—Good progress has been made, the top headings being joined up and 23 chains of lining completed.

Bealey End.—18 chains of lining were completed, and 6·12 chains still remain, so that this work should be completed very shortly.

A large quantity of permanent-way material has arrived, and a start is being made with the platelaying. Contracts have been placed with British firms for the equipment and locomotives required for the electrical operation of the railway between Otira and Arthur's Pass Stations. The contracts include the supply and erection of steam boilers and turbo-generators, workshop equipment, poles and overhead wire construction, and the electric lighting of the tunnel. The materials under manufacture in England are well advanced, and a commencement has been made with the installation of the cables in the Arthur's Pass Tunnel.

Greymouth – Point Elizabeth Railway.

Extension to Seven-mile (3 m. 45 ch. to 6 m. 10 ch.; length, 2 miles 45 chains).—Formation, including fencing and creek-diversion, is almost completed. Bridge at 3 m. 60 ch. is completed, and bridges at 4 m. 50 ch. and 5 m. 42 ch. are in hand. All culverts and pipes are completed. Platelaying has been completed to 4 m. 75 ch.

Waimate Branch Railway Extension.

Waihao Downs – Serpentine Section (0 m. to 2 m. 65 ch.; length, 2 miles 65 chains).—40 chains of formation were carried out during the period, and there are still 55 to complete the section. Considerable difficulty was experienced with embankment between 1 m. 13 ch. and 1 m. 22 ch., and it may be necessary to deviate in order to avoid a large slip.

Serpentine–Kelcher's Section (2 m. 65 ch. to 4 m. 60 ch.; length, 1 mile 75 chains).—60 chains of formation was carried out, but work was closed down early in March.

Otago Central Railway.

Cromwell Section (44 m. 52 ch. to 57 m. 6 ch.; length, 12 miles 34 chains).—All work on this section was completed during the year, and the line was handed over to the Working Railways Department on the 9th July. The principal works carried out during the period were the provision of concrete flood-channels at 48 m. 38 ch., 48 m. 52 ch., 50 m. 17 ch., 51 m. 23 ch., and 51 m. 42 ch., which were found necessary in order to cope with the flood-water from cloud-bursts along this section, which appear to be of comparatively frequent occurrence. Road-bridges were also constructed over these channels, and a 25 ft. span plate-girder bridge was completed at 51 m. 42 ch. A final lift of ballast, boxing-up and trimming, &c., was completed immediately before handing over. The goods and passenger service was continued up to the date of taking over by the Railways Department.

Lawrence–Roxburgh Railway.

Beaumont – Miller's Flat Section (34 m. 80 ch. to 49 m. 70 ch.; length, 15 miles).—Work was started in April, 1921, to provide relief work, and good progress was made with formation and culverting between 34 m. 70 ch. and 36 m. 60 ch. Ten hutments for married men were erected.

Orepuki–Waiau Railway.

Orawia Section (48 m. 23 ch. to 56 m. 47 ch.).—Formation is in hand and approaching completion between 48 m. 23 ch. and 54 m. 19 ch., and since June provision has been made for relief workers. A 10 ft. arched culvert was erected at 50 m. 56·62 ch.

SURVEYS OF RAILWAYS UNDER CONSTRUCTION, NEW LINES OF RAILWAY, ETC.

North Island Main Trunk Railway.

Mareretu Section.—Trial-line surveys of three alternative tunnel routes and deviations were run, and permanent pegging and plans of the approved deviation has been completed.

Shelly Beach Branch.—A flying survey of various routes between Helensville and Shelly Beach, a distance of about 12 miles, was made to ascertain the possibilities as regard route and cost of constructing a branch line to the southern end of Kaipara Harbour.

Waikokowai Branch Railway.

The permanent-line survey has been completed from 0 m. to 8 m. 21 ch., and plans have been prepared.

East Coast Main Trunk Railway.

Waihi Eastwards.—Land-plan surveys were completed from 4 m. to 12 m., trial surveys were run between 15 m. and 18 m., and a permanent deviation pegged, 14 m. and 15 m.

Tauranga Westwards.—Land-plan surveys were completed from 36 m. 32 ch. to 39 m. 27 ch. Further trial lines were run between Waipapa Stream and the Wairoa River, and a permanent location determined on. Permanent pegging has been completed from 31 m. to 35 m.

Tauranga Eastwards.—Land-plan surveys have been made from 83 m. to 91 m. 20 ch. Permanent pegging has been completed between 94 m. 40 ch. and 97 m. 40 ch. Trial lines were run from 98 m. to 99 m. 77 ch. via upper crossing over Whakatane River. A further trial line through the Waimana Gorge has been pegged and levelled from 100 m. 16 ch. to 104 m. 66 ch.

Gisborne–Napier (South End).

Tutira Section.—Permanent-line survey has been completed from 14 m. to 30 m., including trial lines and road surveys.

Whakatane Branch Railway.

Trial survey was completed to 7 m. 50 ch., and a length of 4 miles 10 chains was permanently pegged. A number of trial surveys were also made in connection with the Katikati milling proposal.

Stratford Main Trunk Railway.

Heao Section.—The permanent survey was completed to 54 m.

Te Wera Ballast-pit.—Trial surveys have been made for a branch line to tap a new shell-rock ballast-pit at Te Wera.

Wellington–Napier Railway.

Rimutaka Deviation.—Various trial lines have been run, old lines picked up, and general information obtained from which a definite location may be made.

Lawrence–Roxburgh Railway.

Beaumont – Miller's Flat Section.—Trial surveys were run from 34 m. 70 ch. to 47 m. 26 ch., and permanent location and pegging was completed to 40 m.

Balclutha – Tuapeka Mouth Railway.

Lovell's Flat – Hillend Section.—Trial survey was completed from 0 m. to 10 m. 11 ch., and plans were prepared.

CONSTRUCTION, MAINTENANCE, AND SUPERVISION OF ROADS AND BRIDGES.

During the year there has been greater activity and greater expenditure on roads and bridges than has been the case for several years past. The principal works, as well as those on which the largest expenditure has been incurred, are as under:—

Whangarei District.

Mangamaku to Victoria Valley.—3 miles 48 chains of widening and 28 chains new formation, together with construction of 440 lineal feet of culverts, have been carried out on this important link in the Great North Road. These works have been partly carried out by relief labour.

Awakino Valley to Dargaville.—2 miles 40 chains dray-road formation almost completed, and 3 miles additional put in hand.

Tangowahine Valley Road.—1½ miles formation, 2 miles metalling, and 240 lineal feet bridging completed.

Maungatapere to Tangiteroria.—1 mile heavy formation completed.

Auckland District.

Ohinemuri River Bridge, Waihi.—Bridge, consisting of four 25 ft. and one 61 ft. span, in hardwood on concrete piers, completed.

Waikato River Bridge, Horotiu.—Bridge, consisting of 126 ft. central arch, three-hinged, and in concrete, together with six 21 ft. approach spans, all in concrete, has been completed, and will be open for traffic as soon as the approaches are finished.

Waipa River Bridge, Ngaruawahia.—Bridge, consisting of three 110 ft. and two 25 ft. end spans, in hardwood, and on hardwood pile piers, in hand.

Waikato River Bridge.—Bridge, consisting of three 123 ft., one 43 ft., and one 20 ft. span, completed; total length, 436 ft. The two river piers are on 6 ft. concrete cylinders sunk 37 ft. below normal water-level; other piers are of reinforced concrete on concrete piling. Superstructure is of Australian hardwood timber.

Engineering Surveys.—Engineering surveys have been carried out at Bombay and Rangiriri Hills.

Tauranga District.

Pukihina to Otamarakau.—2 miles 40 chains of formation, 16 ft. wide, has been completed, together with draining, culverting, and fencing.

Rotorua to Taupo, via Waiotapu.—56 miles of road has been repaired and maintained, including a certain amount of metalling and pumice repairs.

Lake Rotoma to Teteko.—Maintenance 18 miles main road.

Gisborne District.

Opotiki to Matawai, via Waioeka.—1 mile 28 chains of dray-road, 16 ft. wide, has been completed.

Waiawa River Bridge and Approaches (Willow-tree Crossing).—Bridge, three 61 ft., two 25 ft., and one 16 ft. span, in Australian hardwood, almost completed.

Rotokautuku Bridge.—All materials for a bridge of four 140 ft. hardwood spans on concrete abutments and cylinder piers have been procured.

Waiapu River Bridge, Tikitiki.—Three sets of concrete cylinders were sunk in piers 16 ft. to 20 ft. below bed of river, and reinforced-concrete piers erected thereon. Seven original piers were strengthened, three 80 ft. spans added, and the whole decked 3 ft. higher than originally proposed. Owing to flood damage, work has been suspended.

Pakarae River Bridge.—Hardwood piles have been driven, the strengthening of the piers completed, and superstructure of one 120 ft., two 40 ft., and one 20 ft. span is now in hand.

Taumarunui District.

Wanganui River Bridge and Approaches, Taumarunui.—This bridge, consisting of two 27 ft. and five 82 ft. spans, on pile piers, together with 16 chains of approaches, has been completed.

Stratford District.

Awakino Valley (Lower).—1 mile 35 chains has been widened from 12 ft. to 18 ft. by steam-shovel. There is yet 6 miles to be widened and about 4 miles of new formation to be completed.

Mimi to Mokau.—Metalling has been completed to within 20 chains of the main saddle at Mount Messenger. During the period 1 mile 40 chains of new metal was laid, and 6 miles between Uruti and Mount Messenger repaired.

Wanganui District.

Mangapurua Valley Road.—1 mile 32 chains of widening in difficult country has been completed by relief labour.

Mangatiti East.—1 mile 61 chains of widening in difficult country has been completed by relief labour.

Raetihi to Ohura (Manganui-o-te-ao to Retaruke).—3 miles 77 chains of widening has been completed.

Erua.—5 miles 15 chains has been widened and handed over to the local authority.

Te Mata Block Roads.—1 mile 36 chains has been widened.

Kauaraparoa.—2 miles 68 chains has been widened by relief labour.

Napier District.

Waikare to Mohaka.—A very large amount of work has been done on this important main road, including 9 miles 30 chains of formation 18 ft. wide, and 8 miles of metalling, 12 ft. by 9 ft.; three 25 ft. span bridges, and one 5 ft. circular concrete culvert. An Erie steam-shovel is operating near Mohaka River.

Dartmoor Road (Hakowhai to Ngaroto).—1 mile 50 chains of metalling and one 25 ft. bridge have been completed.

Tutira to Waikare.—3 miles of metalling has been completed, and 33 miles of main road maintained.

Mohaka to Turangakumu.—3 miles of metalling has been completed.

Tukituki River Bridge (Patangata).—This is a reinforced-concrete bridge consisting of twenty-four 52 ft. spans. Up to date nine 52 ft. spans have been completed, and nine additional pier foundations have been placed.

Wellington District.

Makairo to Coonoor.—71 chains of widening and 140 lineal feet of culverting have been completed, and 5 miles 30 chains maintained.

Waingawa River Bridge (Main Road).—Bridge consisting of ten 42 ft. spans in reinforced concrete completed.

Ruakokopatuna Bridge.—This bridge, consisting of a concrete arch of 60 ft. clear span, with deck 94 ft. by 12 ft., has been completed.

Tauherenikau Bridge.—This bridge, consisting of ten 32 ft. spans, 18 ft. wide between kerbs, all in ferro-concrete, is nearing completion.

Waikanae to Upper Hutt.—55 chains formation has been completed in difficult country, 3 miles maintained, and foundations for two bridges are in hand. Relief labour has been employed on this road.

Nelson District.

Riwaka Bridge and Approaches.—Four 40 ft. spans in reinforced cement completed.

Lindsay Bridge and Approaches.—Bridge, consisting of three 52 ft. and two 51·6 ft. truss spans and one 20 ft. end span, all in timber, completed.

Blenheim District.

Kaikoura–Parnassus Road.—25 miles of main road between Kaikoura and Conway River have been maintained.

Greymouth District.

Little Wanganui to Karamea.—11½ miles of re-formation and patch metalling has been carried out, and the road between Te Namu and Kongahu maintained.

Westport–Greymouth Coast Road (Barrytown to Seven-mile).—1 mile 20 chains formation and 60 chains metalling have been completed, all in very difficult country.

Little Wanganui Bridge (South Westland).—This proposed bridge is to consist of six 60 ft. spans. A large quantity of material is being prepared at the site.

Christchurch District.

Conway River Bridge and Approaches (Waiau–Kaikoura Road).—The formation of 73 chains of approach road on the south side of the Conway River is nearing completion.

Parnassus to Kaikoura.—A considerable amount of widening has been carried out on this line of road; several groynes have been strengthened, and 6 miles of road maintained.

Mount Pleasant Road.—The formation of 2 miles of road in heavy rocky country has been completed.

Evans Pass Road.—Much heavy rockwork has been done here—54½ chains have been formed 18 ft. wide, and this length is now partially metalled. Several cement and stonework retaining and parapet walls have been constructed at specially dangerous places.

Dunedin District.

Balclutha Protective Works.—1 mile 43 chains of stone bank has been strengthened and widened.

Catlin's Valley Extension and Catlin's Valley to Table Hill.—3 miles re-formation and 1 mile metalling have been completed.

Houipapa to Kahiuka.—2 miles 60 chains widening and 60 chains metalling have been completed.

Green Island – Taieri Mouth.—3 miles metalling has been completed.

Invercargill District.

Gore Protective Works.—An additional 34 chains of protective stop-bank along left bank of Mataura River up-stream from Gore Town Bridge has been constructed, making a total completed length of 2 miles 76 chains. Traffic-bridge at Gore has been lengthened by the addition of five 40 ft. reinforced-concrete spans.

IRRIGATION.

Ida Valley Scheme.

The syndicate race has been extended a farther 2 miles 76 chains; the completion of the German Hill race is in hand, and the German Hill race extension was started in order to provide relief work late in the year. About forty miles of constructed races were maintained, and about 4,400 acres were irrigated.

Galloway Flat Scheme.

All construction work for the main scheme, including the diverting-weir at Dip Creek and the main race, 7½ miles long, was completed except for a few minor details. Eighteen settlers were supplied with water.

Olrig Terrace Scheme.

No further work was done on this scheme, one settler being supplied through an old existing race.

Manuherikia Scheme.

All work, with the exception of 4 chains of lining and gravel-trap in connection with the intake tunnel, has been completed, and good progress has been made with the main race. The material for the Chatto Creek siphon, except certain of the hardwood, is now on the ground ready for erecting, which will be commenced immediately the balance of hardwood is received. The distribution races have been commenced, and are progressing satisfactorily. Twenty-five hutments for the accommodation of workmen are in course of erection.

Ardgour Settlement Scheme.

This work has just been commenced in order to provide employment; trial surveys of the main race have been completed for 13 miles, and 94 chains of construction has been completed.

Earnscleugh Irrigation Scheme.

Plans and estimates for a comprehensive scheme to irrigate Earnscleugh Flat with water from the Fraser River have been completed.

Mangahao Hydro-electric Scheme.

Tunnel No. 1: A contract was let for the 40 chains of this tunnel at the Mangahao end, and the contractors commenced operations at the beginning of April; progress, 443 ft. Tunnelling at the outlet end was commenced by hand drills in April and machine drills in June, under co-operative contract; progress, 267 ft. Total progress, 710 ft. A great deal of preliminary work was done in making tram-lines to give access to this tunnel.

Tunnel No. 2: A start was made at the inlet end in January, and over 700 ft. driven with hand drills, the country being soft and easily drilled. Machine rock-drills were installed in June; progress, 908 ft. At the surge-chamber end a start was made in April with the excavation of one of the twin tunnels for pipe-lines, and has been driven 17½ ft. beyond the centre of the surge-chamber; progress, 193½ ft. Total progress, 1,101½ ft. At the inlet end 132 ft. of invert has been concreted and 36 ft. completed. 59 chains of 6 ft. track has been completed to give access to the adits of No. 2 tunnel.

Mangahao dam: The foundations on the line of spillway as at first set out proved on testing not to be what was expected, and further test-pits have been sunk on another line.

Tokomaru dam: The same remarks as above apply to the foundations of this dam.

Pipe-line: Fair progress has been made with the excavation, 3,100 ft. having been formed. The tram-line by means of which the pipes and cement, &c., will be conveyed is also nearly completed.

Surge-chamber: A start was made with the excavation of the top portion in April; progress to date, 1,404 cubic yards.

Power-house: Fair progress has been made with the excavation; progress to date, 2,833 cubic yards.

Transmission-line: Poles have been delivered at the railway-stations between Shannon and Wellington for the main transmission-lines.

Construction plant, Mangaore: A 250 kw. steam set supplied by two Babcock and Wilcox boilers has been in operation since the end of May. The work was delayed by the fact that the generator did not arrive from England until the 2nd May. An air-compressor of 600 cubic feet per minute displacement has been installed to supply air to the works in that vicinity and as far as the second adit of the Arapeti Tunnel. A workshop has been erected and fitted with various machine tools for the purpose of keeping the plant in running-order.

A transmission-line has been erected from Mangaore via the surge-chamber and Arapeti to Mangahao. The necessary transformers have been provided, so that practically all the machines will eventually be driven by electricity.

Owing to the delay in obtaining the machinery for the main power-house it was necessary, in order to get a start with the Mangahao Tunnel, to install a 60-h.p.-boiler Marshall engine, and air-compressor of 300 cubic feet displacement, at the bottom of the gorge. Considerable difficulty was experienced in getting this heavy plant into such an out-of-the-way locality. A jig-line with a fall of 460 ft. and an average inclination of about 40° was erected for the purpose of lowering material into the gorge. The Marshall engine has now been replaced by a 60 h.p. motor, and the boiler is being used to provide steam for drying-rooms, showers, &c.

Staff accommodation: Four permanent cottages, a bachelors' quarters, and an office have been built, and a sewerage system installed, to which the above buildings have been connected.

Workmen's accommodation: The following have been built: Drying-rooms at Arapeti and Mangahao; cookhouses at Mangahao, sawmill, and Arapeti; recreation-hall at Arapeti; married men's cottages—Nine at Arapeti, eight at Mangaore, and seven under construction, also one at sawmill; single men's huts—Nine eight-men huts at Arapeti and two at Mangaore, also two four-men huts and two two-men huts at Arapeti, and eight two-men huts at the sawmill.

Service buildings: In addition to the buildings housing the plant, a large bulk store has been built at Mangaore, and a smaller one at Arapeti. A garage for six lorries at Mangaore and an explosives magazine at Arapeti have been built.

Sawmill: The output of the mill for several months was very costly and poor, but now better bush has been opened up, and costs should show a rapid decline. For the twelve months 651,505 superficial feet of timber was cut. A total of 142 chains of tram-lines have been formed to enable logs to be got from the bush to the mill.

The average number of men employed on the works has been 201·673.

Waikaremoana Power Scheme.

A considerable amount of widening and metalling has been done on the main road from Wairoa to Waikaremoana in anticipation of the heavy traffic anticipated in connection with the construction of this scheme. Material has been ordered, and preparations are being made for rebuilding most of the smaller bridges on this road. The formation of roads to give access to the power-house and to the headworks has been completed, and material for two bridges over the Waikaretaheke River has been ordered. Contracts have been let for the supply of the pipe-lines and machines for two 500 kw. units, which will supply power for construction purposes on the main scheme, and also supply power to the Wairoa Power Board in the meantime. The delivery of this material is expected about the end of 1921, and it is hoped to have it in operation before the end of 1922.

Lake Coleridge Power Scheme.

During the year further deepening was carried out in the lake at the tunnel intake. A start was made with the work of diverting a portion of the Harper River into the lake, and a channel, 1¼ miles long, from the Harper River to the lake was excavated, and the water was turned into the channel in March, 1921. Preparation is now being made for the construction of a large groyne in the river-bed to permanently divert the river on to the bank from which the channel leads to the lake.

The fifth unit (3,000 kw.) was completed during the year, but the machine could not be put into operation until the third pipe-line was completed. This work is now well in hand, and it is anticipated that this machine will be in operation shortly.

As part of the scheme for transmission of power to Timaru, the poles have been erected from the power-house to the Point, a distance of about 12 miles, and the material for the balance of the line to Timaru has been ordered, and work on the erection will commence at an early date.

A further length of 4 miles of 11,000-volt distribution-line has been erected in the North Canterbury district.

Arapuni Power Scheme.

A series of drives on the sides of the gorge under the river and along the line of the proposed diversion-channel have been completed. A considerable amount of prospecting and excavation for possible quarry-sites in the neighbourhood has been carried out. The question of the feasibility of erecting a dam of the dimensions required at the site in question was referred to a committee of engineers and geologists, who visited the site and examined all excavations and data and reported favourably. This scheme has now been definitely adopted as the main running-power for the northern portion of the North Island.

Horahora Power Development.

During the year transmission-lines were erected from Horahora to Cambridge, Hamilton, and Te Awamutu. Material has been ordered and preparations made for erection of substations at Te Awamutu, Waikino, Hamilton, and Waihou. Houses for accommodation of staff have been erected at Hamilton and at Horahora. Plans are in preparation for the extension of this installation by the addition of 50 per cent. more machinery and the completion of a permanent diverting-weir.

MARINE.

Lighthouses.

Cape Campbell.—Two new residences are being erected by day labour.

Chetwode Islands, Ninepin Rock.—A steel tower has been constructed, and an Aga automatic light installed on this rock.

East Cape Lighthouse.—Owing to the dangerous position of this light, due to the fretting-away of the cliffs, arrangements are being made to transfer the lighthouse to the mainland. A new site has been procured, and the construction of tracks, boat-landings, and the erection of cottages is in hand. Plans have been prepared for the new lighthouse, and arrangements are being made for its erection.

Jackson's Head.—A new steel tower has been constructed for this light.

Kaipara Heads.—Lightkeeper's dwelling has been repaired.

North Rock Light.—New davits for handling lighting-cylinders have been completed.

Gable End Foreland.—Survey has been made and a suitable site selected for this light. During the year an Aga automatic light was procured, and it is hoped to erect this during the coming year.

Ohuia Island.—An Aga automatic light has been procured and crane constructed, but has not yet been erected, as it is required for a temporary light on East Cape while the permanent tower is being shifted from the mainland.

Cape Maria van Diemen.—The erection of two new lightkeepers' cottages is in hand.

Wharves.

Bulwer.—Plans have been prepared for a new wharf.

Grove.—Wharf has been repaired.

General.

Various works have been inspected, and proposals by local bodies and harbour authorities examined and reported on.

TRAMWAYS.

Auckland.—Proposals for duplication in Lower Symonds Street and general minor matters were examined and approved. Inspections were made from time to time, and inquiries made in respect to several accidents.

Gisborne.—Proposals for an extension were examined and approved, and Order in Council has been issued.

Napier.—Plans have been approved for Dickens and Shakespeare Streets duplications, and the work has been inspected and passed.

Wanganui.—Several new cars have been tested, proposals for extensions examined, and Order in Council issued.

New Plymouth.—Proposals for the use of one-man cars have been investigated and approved by Order in Council, subject to certain conditions.

Wellington.—Proposals for renewals have been examined, a number of cars have been tested, and inspection made of work being carried out.

Christchurch.—A number of proposals have been received from this Board, including the Manchester Street line, Riccarton Road duplication, Papanui balloon loop, Coronation Street extension, junction at Broadway's corner, loop at Metropolitan trolly-track. These were examined, and, as some of the matters were in dispute between the Tramway Board and the City Council, a Commission was appointed to decide the points at issue. A number of inspections have been made, and cars tested.

Dunedin.—Proposals were received and examined in respect of the Rattray Street balloon loop, the Anderson's Bay duplication, and Maori Hill line. Inspections have been made and cars tested both on the City Corporation lines and the Mornington Tramway.

Invercargill.—Proposals have been submitted for the provision of one-man cars; these have been examined, and Order in Council authorizing their use is in course of preparation.

WAIHOU AND OHINEMURI RIVERS IMPROVEMENT.

This work has been carried on during the year, and the following are the principal operations:—

Rotokohu Drainage.—The dipper dredge has been employed on this work practically continuously, and continues to give good results. 158 chains of drain have been excavated during the year.

Ngahina Bridge Extension.—Timber is on hand for the extension of the bridge on the right bank.

Tirohia–Ngararahi Stop-bank.—Left bank: 68 chains of this stop-bank have been built by the Waihou suction dredge during the year. Right bank: 131 chains have been made during the present year.

Ngahina–Wainarie Bend Stop-banks.—Stop-banks have been in hand on this section of the Waihou River, and a considerable portion raised to preliminary level. This work was done by Cletrac, by hand and by horse.

Culverts.—A two-barrel concrete culvert with flood-gates and sluices has been built on the right bank of lower Waihou River, 45 chains below Ngahina Bridge.

Ngahina Wharf.—A loading-bank has been added to this wharf.

Surveys.—During the year surveys have been in hand on the upper and lower Waihou River, and also on the Komata Creek and Hikutaia Stream.

F. W. Furkert, M.Inst.C.E., Assoc.M.I.Mech.E.,
Engineer-in-Chief.

Enclosure to Appendix B.

Table of Lengths of Government Lines Authorized, Constructed, and Surveyed up to 31st March, 1921.

NORTH ISLAND.

Note.—Column 11: For detail information as to dates of openings of such portions of lines as are not given in this table see tables of lengths of lines in Public Works Statements, 1904–17.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	—	1917–18.	1918–19.	1919–20.	1920–21.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		M. ch.		M. ch	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch	M. ch.	M. ch.	M. ch.
Kawakawa-Grahamtown (Onerahi)	Kawakawa ..	7 16	Opua Wharf - Kawakawa	7 16	0 57	7 73	..	..	..	..	..	..	..	..	..	7 16
	Kawakawa-Kamo ..	41 48	Kawakawa-Towai ..	21 18	0 61	21 79	..	..	..	12 April, 1911	..	..	..	..	..	21 18
			Towai-Hukerenui ..	4 30	0 33	4 63	..	..	..	2 May, 1910	..	..	..	..	..	
			Hukerenui-Kamo ..	16 0	3 29	19 29	..	..	..	..	..	..	..	..	..	27 2
	Kamo-Grahamtown	9 22	Kamo-Kioreroa ..	6 52	2 27	8 79	..	..	..	..	..	..	..	..	..	
			Kioreroa-Onerahi ..	2 50	1 16	3 66	..	..	..	2 Oct., 1911	..	..	..	..	..	2 50
	Kawakawa-Hokianga	45 25	Otiria-Kaikohe ..	16 25	1 45	17 70	..	..	..	1 May, 1914	..	..	..	..	..	16 25
			Kaikohe-Hokianga ..	29 0	2 40	31 40	18 0	4 0	7 0	..	..	..	..	..	..	..
Kaihu Valley	Kaihu Valley ..	24 30	Dargaville-Booms ..	17 21	0 75	18 16	..	..	..	..	..	..	..	..	..	
			Booms-Tarawhati ..	2 37	0 25	2 62	..	..	..	1 June, 1914	..	..	..	..	..	19 58
			Tarawhati-Donnelly's Crossing	4 52	0 38	5 10	..	0 25	4 24	..	..	..	..	..	..	..
North Auckland Main Trunk Railway	Kaipara Northwards	84 24	Extension	23 57	3 7	26 64	10 57	11 67	1 13	..	..	..	..	..	..	..
			McCarrol's - Paparoa	4 30	0 25	4 55	1 05	2 0	1 25	..	..	..	..	..	..	..
			Paparoa-Huarau ..	1 70	0 36	2 26	..	..	1 70	..	..	..	..	..	..	..
			Huarau-Maungaturoto	2 05	0 38	2 43	..	..	2 05	1 April, 1920	..	..	..	..	2 05	2 5
			Maungaturoto-Ranganui	4 25	0 61	5 06	..	..	4 25	1 April, 1920	..	..	..	..	4 25	4 25
			Ranganui Kaiwaka ..	2 35	0 62	3 17	..	..	..	1 Aug., 1914	..	..	..	..	..	2 35
			Kaiwaka - Te Hana ..	8 65	1 03	9 68	..	..	..	18 Mar. 1913	..	..	..	..	..	
			Te Hana-Wellsford ..	3 27	0 58	4 5	..	..	..	16 May, 1910	..	..	..	..	..	
			Wellsford-Wayby ..	3 18	0 28	3 46	..	..	..	1 April, 1909	..	..	..	..	..	
			Wayby-Hoteo ..	3 40	0 13	3 53	..	..	..	13 May, 1908	..	..	..	..	..	
			Hoteo-Kaipara Flats	2 45	0 13	2 58	..	..	..	11 June, 1907	..	..	..	..	..	45 42
			Kaipara Flats-Woodcock's	3 5	0 16	3 21	..	..	..	17 Nov., 1905	..	..	..	..	..	
			Woodcock's-Ahuroa	2 41	0 16	2 57	..	..	..	18 May, 1905	..	..	..	..	..	
			Ahuroa-Helensville ..	18 41	1 75	20 36	..	..	..	..	..	..	..	..	..	

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued.*

NORTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	—	1917–18.	1918–19.	1919–20.	1920–21.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
Whangarei Branch Railway	Whangarei Branch..	19 79	Kioreroa-Portland ..	5 23	0 37	5 60	..	..	..	3 April, 1920	..	..	..	..	5 23	5 23
			Portland-Waiotira ..	14 56	1 39	16 15	..	2 40	12 16	..	..	..	..	..	..	..
Waipu Branch	Waiapu Branch Rly.	16 45	Oakleigh-Waipu ..	16 45	0 25	16 70	5 45	11 0	..	..	..	..	..	..	..	..
Kaipara-Waikato	Kaipara-Newmarket	35 73	Helensville-Newm'rk't	35 73	6 66	42 59	..	..	..	..	..	..	..	..	..	35 73
	Onehunga Branch ..	2 73	Penrose - Onehunga Wharf	2 73	1 70	4 63	..	..	..	..	..	..	..	..	..	2 73
	Auckland-Waikato ..	100 13	Auckland-Te Awamutu	100 13	16 66	116 79	..	..	..	..	..	..	..	..	..	100 13
	Auckland-Penrose—Deviation via Beach	6 50	Deviation via Beach	6 50	..	6 50	6 50	..	..	..	..	..	..	..	..	..
	Auckland City Branch—Kingsland Station to Auckland Station via Western Park and Freeman's Bay	2 60	Auckland City Branch	2 60	..	2 60	2 60	Prelim.	..	..	..	..	..	..	..	..
Waiuku Branch	Waiuku Branch Railway	12 69	Paerata-Patumahoe	4 20	0 78	5 18	..	..	..	10 Dec., 1917	..	4 20	..	..	..	4 20
			Patumahoe-Waiuku	8 49	1 3	9 52	..	7 23	1 26	..	..	..	..	..	..	..
Huntly-Awaroa	Huntly-Awaroa ..	9 0	Huntly-Awaroa ..	9 0	..	9 0	..	0 55	..	..	..	..	..	..	..	7 20
Surveys, new lines	Paeroa-Pokeno ..	40 15	Paeroa-Pokeno ..	40 15	..	40 15	40 15	..	..	..	..	..	..	..	..	..
Waikato-Thames	Waikato-Thames ..	62 58	Frankton Junction-Thames	62 58	10 17	72 75	..	..	..	..	..	..	..	..	..	62 58
Hamilton-Cambridge	Hamilton-Cambridge	12 2	Ruakura Junction-Cambridge	12 2	3 14	15 16	..	..	..	..	..	..	..	..	..	12 2
Paeroa-Waihi	Paeroa-Waihi ..	12 40	Paeroa-Waihi ..	12 40	1 30	13 70	..	..	..	9 Nov., 1905	..	..	..	..	..	12 40
East Coast Railway	Waihi - Opotiki, or East Coast Railway	145 32	Waihi-Tauranga ..	41 60	..	41 60	8 0 15 0*	18 60	..	..	..	..	..	..	..	..
			Tauranga-Te Maunga Junction	3 20	..	3 20	..	..	3 20	..	..	..	..	..	..	..
			Te Maunga Junction-Te Puke	8 65	1 23	10 8	..	..	8 65†	..	..	..	..	..	..	..
			Te Puke-Paengaroa..	5 65	1 16	7 01	..	..	5 65	..	..	..	..	..	..	..
			Paengaroa - Pongakawa	4 30	0 47	4 77	..	..	4 30	..	..	..	..	..	..	..
			Pongakawa-Otamarakau	6 72	0 26	7 18	..	..	6 72‡	..	..	..	..	..	..	..
			Otamarakau-Matata	9 8	0 43	9 51	..	..	9 8§	..	..	..	..	..	..	..

* Trial survey. † Te Maunga survey. ‡ Otamarakau. § Matata yard.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued.*

NORTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	—	1917–18.	1918–19.	1919–20.	1920–21.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
East Coast Railway—*contd.*	Waihi-Opotiki—*ctd.*		Matata-Taneatua ..	20 0	..	20 0	1 20* / 2 0†	3 51	13 9	..	..	..	..	..	..	..
			Taneatua-Opotiki ..	30 0	Prelim. Survey	30 0	14 0	Prelim.	..	..	..	..	..	..	..	..
	Branch Lines ..	..	Mount Maunganui - Te Maunga Junction	4 27	0 67	5 14	..	..	4 27	..	..	..	..	..	..	..
			Te Puke Quarry ..	3 0	0 20	3 20	..	..	3 0	..	..	..	..	..	..	..
			Moturiki Quarry‡ ..	1 0	0 10	1 10	..	..	..	..	..	..	..	..	..	..
			Whakatane Branch	7 5	..	7 5	7 5†	..	..	..	..	..	..	..	..	..
Thames Valley - Rotorua	Thames Valley-Rotorua	69 33	Morrinsville-Rotorua	69 33	5 27	74 60	..	..	..	..	..	..	..	..	..	69 33
Gisborne-Rotorua	Gisborne-Opotiki ..	92 44	Gisborne Wharf-Kaiteratahi	13 10	2 45	15 55	..	..	..	..	..	..	..	..	..	49 32
			Kaiteratahi-Karaka	5 5	0 71	5 76	..	..	..	13 April, 1905	..	..	..	..	..	
			Karaka-Puha ..	1 75	0 24	2 19	..	..	..	20 May, 1907	..	..	..	..	..	
			Puha-Waikohu Bridge	3 29	..	3 29	..	..	..	28 May, 1908	..	..	..	..	..	
			Waikohu Bridge-Waikohu	0 35	0 32	0 67	..	..	..	1 April, 1909	..	..	..	..	..	
			Waikohu-Otoko ..	7 75	0 32	8 27	..	..	..	6 April, 1912	..	..	..	..	..	
			Otoko-Rakauroa ..	6 60	0 32	7 12	..	..	..	2 Nov., 1914	..	..	..	..	..	
			Rakauroa-Matawai ..	5 65	0 50	6 35	..	..	..	2 Nov., 1914	..	..	..	..	..	
			Matawai-Motuhora	4 78	0 61	5 59	..	..	..	26 Nov., 1917	..	4 78	..	..	..	
			Motuhora-Motu ..	2 10	..	2 10	2 10	..	..	..	..	..	..	..	..	..
			Motu-Opotiki ..	41 2	..	41 2	41 2	Estim.	..	..	..	..	..	..	..	..
New survey	Napier-Gisborne ..	130 01	Napier-West Shore ..	3 12	0 58	3 70	..	3 12	..	..	..	..	..	..	..	..
			West Shore-Petane ..	3 63	..	3 63	..	3 63	..	..	..	..	..	..	..	..
			Petane-Eskdale ..	4 65	..	4 65	2 18†	4 65	..	..	..	..	..	..	..	..
			Eskdale-Tutira ..	17 47	..	17 47	12 0*	3 29	..	..	..	..	..	..	..	..
			Tutira-Wairoa ..	28 54	..	28 54	18 65	Prelim.	..	..	..	..	..	..	..	..
			Wairoa River-Gisborne	72 0	..	72 0	44 0	2 17	..	..	..	..	..	..	..	..
	Gisborne-Napier ..	76 51	Gisborne Station - Makaraka	3 5	..	3 5	..	..	..	..	..	..	..	..	..	..
			Makaraka-Patutahi	4 66	0 40	5 26	..	..	4 66	..	..	..	..	..	..	..
			Patutahi-Ngatapa ..	6 50	0 69	7 39	..	..	6 50	..	..	..	..	..	..	..
			Ngatapa-Waikura ..	12 0	..	12 0	8 13	2 17	1 50	..	..	..	..	..	..	..

* Permanent. † Preliminary. ‡ Rails taken up.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued*.

NORTH ISLAND—*continued*.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	—	1917-18.	1918-19.	1919-20.	1920-21.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
New survey —*contd.*	Napier-Gisborne—*ctd.*		Waikura-Waterfall	5 0	..	5 0	5 0	..	..	..	..	..	..	..	..	..
			Waterfall-Hangaroa	4 0	..	4 0	4 0	..	..	..	..	..	..	..	..	..
			Hangaroa-Te Reinga	17 11	..	17 11	17 11	Prelim.	..	..	..	..	..	..	..	..
			Te Reinga-Marumaru	12 40	..	12 40	9 40	Prelim.	..	..	..	..	..	..	..	..
			Marumaru - Wairoa River	7 0	..	7 0	7 0	..	..	..	..	..	..	..	..	..
			Wairoa Wharf Siding	1 64	..	1 64	1 64	..	..	..	..	..	..	..	..	..
			Wairoa-Napier ..	2 55	..	2 55	0 55	2 0	..	..	..	..	..	..	..	..
	Wairoa-Waikokopu..	24 72	Wairoa-Nuhaka ..	18 65	..	18 65	..	18 65	..	..	..	..	..	..	..	..
			Nuhaka-Waikokopu	6 7	..	6 7	..	6 7	..	..	..	..	..	..	..	..
Napier-Woodville and Palmerston North	Napier-Woodville ..	96 65	Napier Spit-Woodville	96 65	15 5	111 70	..	..	..	..	..	..	..	..	..	96 65
	Woodville-Palmerston North	17 21	Woodville-Palmerston North	17 21	0 51	17 72	..	..	..	..	..	..	..	..	..	17 21
Wellington-Woodville	Woodville-Wellington	115 79	Woodville-Wellington [Te Aro]	115 79	21 73	137 72	..	..	..	..	..	..	..	..	..	115 79
	Greytown Branch ..	3 7	Woodside-Greytown	3 7	0 64	3 71	..	..	..	..	..	..	..	..	..	3 7
	Featherston-Martinborough	11 50	Featherston-Martinborough	11 50	..	11 50	11 50	..	..	..	..	..	..	..	..	..
	Greytown-Martinborough	4 62	Greytown-Martinborough	4 62	..	4 62	4 62*	..	..	..	..	..	..	..	..	..
Rimutaka Incline Deviation Surveys	Coach road Route ..	9 0	Kaitoke-Featherston	9 0	..	9 0	9 0	Prelim.	..	..	..	..	..	..	..	..
	Tauherenikau Route	21 30	Upper Hutt-Woodside	21 30	..	21 30	21 30	..	..	..	..	..	..	..	..	..
	Wainui-o-mata Route	31 40	Petone-Pigeon Bush	31 40	..	31 40	31 40	..	..	..	..	..	..	..	..	..
	Coast Route ..	52 0	Petone-Pigeon Bush	52 0	..	52 0	52 0	..	..	..	..	..	..	..	..	..
	Coast Route ..	70 0	Petone-Carterton, via Martinborough	70 0	..	70 0	70 0	..	..	..	..	..	..	..	..	..
	Wellington-Manawatu	83 37	Wellington-Longburn	83 37	15 76	99 33	..	..	..	7 Dec., 1908†	..	..	..	..	..	83 37
Foxton-New Plymouth	Foxton-Patea ..	120 44	Foxton-Patea ..	120 44	14 75	135 39	..	..	..	..	..	..	..	..	..	120 44
	Route Improvement Surveys	26 7	Turakina-Matarawa	11 67	..	11 67	11 67	..	..	..	..	..	..	..	..	..
			Aramoho-Goat Valley Tunnel	7 40	..	7 40	7 40	..	..	..	..	..	..	..	..	..
			Kai Iwi-Okehu ..	3 60	..	3 60	3 60	..	..	..	..	..	..	..	..	..
			Nukumaru-Waitotara	3 0	..	3 0	3 0	Prelim.	..	..	..	..	..	..	..	..

* Trial survey. † Date of purchase.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued.*

NORTH ISLAND—*continued.*

Appropriation.	Division	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	—	1917–18.	1918–19.	1919–20.	1920–21.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
Foxton-New Plymouth —*contd.*	Patea - Waitara and New Plymouth	72 29	Patea-New Plymouth Breakwater	72 29	11 52	84 1	..	..	..	..	..	..	..	..	..	72 29
	Bull's Branch ..	3 79	Bull's Branch ..	3 79	..	3 79	3 79	Prelim.	..	..	..	..	..	..	..	..
	Wanganui Branch ..	3 29	Aramoho-Wanganui	3 29	2 23	5 52	..	..	..	..	..	..	..	..	..	3 29
Stratford-Main Trunk	Stratford-Main Trunk	112 47	Stratford-Toko ..	6 26	0 40	6 66	..	..	..	..	..	..	..	..	..	
			Toko-Ororu ..	4 72	0 36	5 28	..	..	..	1 Mar., 1905	..	..	..	..	..	
			Ororu-Huiroa ..	4 50	0 35	5 5	..	..	..	1 April, 1908	..	..	..	..	..	
			Huiroa-Te Wera ..	6 77	1 16	8 13	..	..	..	20 June, 1910	..	..	..	..	..	
			Te Wera Pohokura ..	8 55	0 65	9 40	..	..	..	1 Aug., 1912	..	..	..	..	..	42 26
			Pohokura - Whangamomona	6 13	0 45	6 58	..	..	..	1 July, 1914	..	..	..	..	..	
			Whangamomona-Kohurutahi	4 53	0 29	5 02	..	..	..	7 Jan., 1918	..	4 53	..	..	..	
			Kohurutahi-Tahora	5 14	0 37	5 51	..	0 32	4 62	..	..	..	..	..	..	..
			Tahora-Raekohua ..	3 20	..	3 20	1 46	1 54	..	..	..	..	..	..	..	..
			Raekohua-Heao ..	6 20	..	6 20	3 40	..	..	..	..	..	..	..	..	..
			Heao Matiere ..	35 57	..	35 57	35 57	Prelim.	..	..	..	..	..	..	..	..
			Okahukura-Matiere ..	10 23	0 75	11 18	..	10 23	..	..	..	..	..	..	..	..
			Matiere-Ohura ..	9 47	..	9 47	7 47	2 0	..	..	..	..	..	..	..	..
	Stratford - Ongarue—Deviations	33 40	Mangaroa-Puketutu	33 40	..	33 40	33 40	Prelim.	..	..	..	..	..	..	..	..
		14 0	Aramatai-Hangatiki	14 0	..	14 0	14 0	Prelim.	..	..	..	..	..	..	..	..
	Puketutu - Mangaroa Deviation	30 0	..	30 0	..	30 0	30 0	Prelim.	..	..	..	..	..	..	..	..
	Opunake-Mountain Rd.	23 10	Opunake-Eltham ..	23 10	..	23 10	23 10	..	..	..	..	..	..	..	..	..
	Te Roti-Moturoa ..	55 65	Te Roti-Kapuni ..	7 0	1 19	8 19	..	7 0	..	..	..	..	..	..	..	..
			Kapuni-Auroa ..	5 0	0 33	5 33	5 0	5 0	..	..	..	..	..	..	..	..
			Auroa-Pihama ..	4 42	..	4 42	4 42	..	..	..	..	..	..	..	..	..
			Pihama Opunake ..	5 68	..	5 68	5 68	..	..	..	..	..	..	..	..	..
			Opunake-Stony River	18 70	..	18 70	18 70	..	..	..	..	..	..	..	..	..
			Stony River-Moturoa	14 45	..	14 45	14 45	..	..	..	..	..	..	..	..	..
	Manaia Branch ..	5 50	Manaia-Kapuni ..	5 50	0 78	6 48	..	5 50	..	..	..	..	..	..	..	..
	Mount Egmont Branch	8 77	Manganui Section ..	5 74	2 3	7 77	..	..	..	1 April, 1908	..	..	..	..	..	6 0
			Quarry Section ..	3 3	0 60	3 63	..	1 58	1 25	..	..	..	..	..	..	..

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued.*

NORTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line								
							Surveyed.	Under Formation.	Under Platelaying.	Opened.					
										Date.	—	1917–18.	1918–19.	1919–20.	1920–21.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
North Island Main Trunk Railway	Marton-Te Awamutu	209 69	Marton Junction-Mangaweka	31 67	4 61	36 48	..	..	..	..	..	..	..	..	..	50 58
			Mangaweka-Taihape	13 1	1 61	14 62	..	..	..	10 Sep., 1904	..	..	..	..	..	
			Taihape-Mataroa ..	5 70	0 61	6 51	..	..	..	1 June, 1907	..	..	..	..	..	
			Mataroa-Waiouru ..	18 10	12 50	97 28	..	..	..	30 June, 1908	..	..	..	..	..	84 58
			Waiouru-Erua ..	30 63			..	..	..	13 Feb., 1909	..	..	..	..	..	
			Erua-Taumarunui ..	35 65			..	..	..	9 Nov., 1908	..	..	..	..	..	
			Taumarunui-Te Awamutu	74 33	6 20	80 53	..	..	..	..	..	..	..	..	..	74 33
	Waipa Gravel Access Branch	7 40	Otorohanga ..	7 40	..	7 40	..	..	..	..	..	..	..	..	..	..
	Raetihi Branch ..	8 50	Raetihi Section ..	8 50	1 7	9 57	..	..	..	18 Dec., 1917	..	8 50	..	..	..	8 50
	Central Route Deviation Surveys	30 0	Ohakune to Mokau-Retaruke Divide	30 0	..	30 0	30 0	Prelim.	..	..	..	..	..	..	..	..
		34 0	Makatote Gorge-Marae-Kowhai	34 0	..	34 0	34 0	Prelim.	..	..	..	..	..	..	..	..
		20 0	Marae-Kowhai-Ohura Valley	20 0	..	20 0	20 0	Explor.	..	..	..	..	..	..	..	..
	Ngaire-Ongarue ..	103 58	Ngaire Section ..	38 73	..	38 73	38 73	..	..	..	..	..	..	..	..	..
			Tangarakau Section	26 0	..	26 0	26 0	..	..	..	..	..	..	..	..	..
			Heao Section ..	10 70	..	10 70	10 70	..	..	..	..	..	..	..	..	..
			Ohura Section ..	27 75	..	27 75	27 75	..	..	..	..	..	..	..	..	..
	Waitara-Tangarakau	46 75	Waitara Section ..	46 75	..	46 75	46 75	..	..	..	..	..	..	..	..	..
	Urenui Route ..	12 0	Urenui to Tangitu River	12 0	..	12 0	12 0	Prelim.	..	..	..	..	..	..	..	..
	Hastings-Te Awamutu	170 0	Hastings-Te Awamutu	170 0	..	170 0	170 0	Prelim.	..	..	..	..	..	..	..	..
	Totals ..	2754 55	..	2754 55	210 25	2965 0	1150 41	142 13	113 33	..	1255 65	22 41	..	..	11 53	1289 79

NOTE.—Taonui and Lichfield Branches not mentioned above, as the rails have been taken up.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued.*

SOUTH ISLAND.

NOTE.—Column 11: For detail information as to dates of openings of such portions of lines as are not given in this table see tables of lengths of lines in Public Works Statements, 1904-17.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line									
							Surveyed.	Under Formation.	Under Plate-laying.	Opened.						
										Date.	—	1917-18.	1918-19.	1919-20.	1920-21.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
Nelson-Roundell	Nelson-Belgrove ..	22 73	Nelson-Belgrove ..	22 73	2 52	25 45	..	..	..	..	..	..	..	..	..	22 73
Midland Railway	Stillwater - Belgrove (via Tadmor)	147 7	Stillwater-Reefton S.	37 30	4 79	42 29	..	..	..	..	..	..	..	..	..	
			Reefton S.-Reefton N.	1 30	1 0	2 30	..	..	..	31 Mar., 1907	..	..	..	..	..	
			Reefton N.-Cronadun	5 38	0 56	6 14	..	..	..	7 Aug., 1908	..	..	..	..	..	57 32
			Cronadun-Landing ..	8 40	0 45	9 5	..	..	..	June, 1914	..	..	..	..	..	
			Landing-Inangahua	6 0	0 10	6 10	1 26	..	..		..	..	..	..	..	
			Inangahua-Kawatiri	46 43	..	46 43	46 43	..	..	..	..	..	..	..	..	..
			Glenhope-Kawatiri ..	4 5	0 15	4 20	4 5	3 11	..	..	..	..	..	..	..	..
			Glenhope-Tui ..	9 42	0 55	10 17	..	..	..	2 Sep., 1912	..	..	..	..	..	
			Tui-Kiwi	3 17	0 34	3 51	..	..	..		..	..	..	..	..	
			Kiwi-Tadmor ..	5 9	0 29	5 38	..	..	..	18 Dec., 1908	..	..	..	..	..	37 61
			Tadmor-Kohatu ..	10 29	0 69	11 18	..	..	..	7 Aug., 1906	..	..	..	..	..	
			Kohatu-Belgrove ..	9 44	0 62	10 26	..	..	..	..	..	..	..	..	..	
	Brunner-Springfield	92 68	Brunner-Otira ..	42 27	2 68	45 15	..	..	..	..	..	..	..	..	..	42 27
			Rolleston Section ..	1 2	..	1 2	..	..	1 2	..	..	..	..	..	..	..
			Tunnel Contract ..	8 0	..	8 0	..	7 12	..	1 July, 1914	..	..	..	..	..	
			Tunnel Contract-Cass	13 79	0 20	14 19	..	..	..	1 July, 1914	..	..	..	..	..	
			Cass-Broken River ..	15 22	1 29	16 51	..	..	..	10 Dec., 1910	..	..	..	..	..	
			Broken River - Otarama	7 40	0 30	7 70	..	..	..	29 Oct., 1906	..	..	..	..	..	42 27*
			Otarama-Springfield	4 58	0 16	4 74	..	..	..	29 Oct., 1906	..	..	..	..	..	
Blackball Railway	Ngahere-Blackball ..	3 40	Ngahere-Blackball ..	3 40	1 20	4 60	..	..	..	16 July, 1910	..	..	..	..	..	3 40
Greymouth-Nelson Creek	Greymouth - Nelson Creek	7 51	Greymouth-Brunnerton-Stillwater	7 51	6 18	13 69	..	..	..	..	..	..	..	..	..	7 51
Westport-Ngakawau	Westport-Ngakawau	19 56	Westport-Ngakawau	19 56	8 12	27 68	..	..	..	..	..	..	..	..	..	19 56
Westport-Ngakawau Extension	Ngakawau - Mokihinui	7 12	Ngakawau-Mokihinui	7 12	1 18	8 30	..	..	..	..	..	..	..	..	..	7 12
	Mokihinui Colliery Line	3 69	Mokihinui-Seddonville	3 69	0 25	4 14	..	..	..	..	..	..	..	..	..	3 69
Westport-Inangahua	Westport-Inangahua Junction	26 0	Westport-Te Kuha ..	5 74	0 10	6 4	..	..	..	1 April, 1912	..	..	..	..	..	5 74
			Te Kuha - Inangahua Junction	20 6	..	20 6	13 6	4 0	..	..	..	..	..	..	..	..

* Including 8 chains of tunnel contract.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued.*

SOUTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.										
							Surveyed.	Under Formation.	Under Platelaying.	Opened.							
										Date.	—	1917-18.	1918-19.	1919-20.	1920-21.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
State Colliery, or Coal Creek Railway	Greymouth - Point Elizabeth Collieries	5 1	Greymouth-Runanga Colliery	5 1	2 10	7 11	..	..	..	1 Dec., 1904	..	..	..	..	..	5 1
	Extension ..	3 69	Runanga Colliery-Point Elizabeth Collieries	3 69	2 20	6 9	..	..	..	21 Jan., 1914	..	..	..	..	..	3 69
	" ..	2 44	Runanga to Seven-mile	2 44	..	2 44	..	2 44	..	..	..	..	..	..	..	..
Greymouth-Hokitika	Greymouth-Hokitika	24 37	Greymouth-Hokitika	24 37	2 10	26 47	..	..	..	..	..	..	..	..	..	24 37
Kumara Branch	Kumara Branch ..	4 10	Kumara Branch ..	4 10	..	4 10	4 10	..	..	..	..	..	..	..	..	..
Hokitika-Ross	Hokitika-Ross ..	15 75	Hokitika-Ruatapu ..	7 10	0 61	7 71	..	..	..	9 Nov., 1906	..	..	..	..	..	7 10
			Ruatapu-Ross ..	7 21	0 69	8 10	..	..	..	1 April, 1909	..	..	..	..	..	7 21
			Survey to Ross Township	1 44	..	1 44	1 44	..	..	..	..	..	..	..	..	..
New survey	Ross-Waitaha ..	10 0	Ross-Waitaha ..	10 0	..	10 0	2 54	..	..	..	..	..	..	..	..	..
Picton-Waipara	Picton - Kaikoura ..	92 38	Picton-Seddon ..	33 45	3 26	36 71	..	..	..	..	..	..	..	..	..	
			Seddon-Kaparu ..	6 30	0 76	7 26	..	..	..	13 April, 1911	..	..	..	..	..	
			Kaparu-Ward ..	8 15	1 20	9 35	..	..	..		..	..	..	..	..	56 6
			Ward-Mirza ..	3 38	0 30	3 68	..	..	..	4 Dec., 1915	3 38	..	..	..	..	
			Mirza-Wharanui ..	4 38	0 34	4 72	..	..	..		4 38	..	..	..	..	
			Wharanui-Kekerangu	7 0	..	7 0	7 0	1 18	3 20	..	..	..	..	..	..	..
			Kekerangu - Hapuka River	29 32	..	29 32	29 32	..	..	..	..	..	..	..	..	..
	Hapuka River-Mendip Hills	40 50	Hapuka River-Limestone Creek	23 0	..	23 0	23 0	Prelim.	..	..	..	..	..	..	..	..
			Limestone Creek-Conway River	7 0	..	7 0	..	..	..	..	..	..	..	..	..	..
			Conway River - Mendip Hills	10 50	..	10 50	..	..	..	..	..	..	..	..	..	..
	Mendip Hills - Parnassus	5 61	Mendip Hills ..	5 61	..	5 61	2 0	3 61	..	..	..	..	..	..	..	..
	Parnassus-Waipara	44 14	Parnassus-Mina ..	8 43	1 14	9 57	..	..	..	1 Sept., 1912	..	..	..	..	..	
			Mina-Domett ..	3 63	0 70	4 53	..	..	..	1 Aug., 1910	..	..	..	..	..	
			Domett-Tormore ..	3 10	0 66	9 24	..	..	..	14 Nov., 1906	..	..	..	..	..	44 14
			Tormore-Ethelton ..	5 28			..	..	..	21 Mar., 1907	..	..	..	..	..	
			Ethelton-Scargill ..	8 51	0 51	9 22	..	..	..	3 Nov., 1905	..	..	..	..	..	
			Scargill-Waipara ..	14 59	1 2	15 61	..	..	..	..	..	..	..	..	..	
Hurunui-Waitaki	Main Line.. ..	206 7	Culverden-South Waitaki	206 7	64 68	270 75	..	..	..	..	..	..	..	..	..	206 7
		13 0	Culverden-Achray ..	5 23	0 10	5 33	..	..	..							
			Achray-Rotherham ..	1 75	0 43	2 38	..	..	..	15 Dec., 1919	..	..	..	13 0	..	13 0
			Rotherham-Waiau ..	5 62	1 3	6 65	..	..	..							

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued.*

SOUTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	—	1917–18.	1918–19.	1919–20.	1920–21.	Total.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.		M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.
Hurunui-Waitaki —*contd.*	*Branches,—*															
	Rangiora - Oxford	21 76	Rangiora-Oxford West	21 76	2 36	24 32	..	..	..	..	..	..	..	..	..	21 76
	Eyreton (from Main Line)	20 7	Main Line - West Eyreton-Bennett's	20 7	1 61	21 68	..	..	..	..	..	..	..	..	..	20 7
	Lyttelton ..	6 26	Lyttelton - Christchurch	6 26	..	6 26	..	..	..	..	..	..	..	..	..	6 26
	Southbridge ..	25 31	Hornby-Southbridge	25 31	3 17	28 48	..	..	..	..	..	..	..	..	..	25 31
	Little River-Akaroa	42 10	Lincoln-Little River	22 46	2 5	24 51	..	..	..	..	..	..	..	..	..	22 46
			Reconnaissance ..	19 44	..	19 44	19 44	Prelim.	..	..	..	..	..	..	..	..
	Springfield ..	30 60	Rolleston-Springfield	29 63	3 7	33 67	..	..	..	..	..	..	..	..	..	30 60
			Springfield-Coal-mine	0 77												
	Whitecliffs ..	11 38	Darfield-Whitecliffs	11 33	1 53	13 11	..	..	..	..	..	..	..	..	..	11 38
			Whitecliffs to Bridge	0 5												
	Rakaia - Ashburton Forks	22 20	Rakaia-Methven ..	22 20	2 65	25 5	..	..	..	..	..	..	..	..	..	22 20
	Ashburton ..	29 46	Tinwald-Springburn	27 29	1 52	29 1	..	..	..	..	..	..	..	..	..	27 29
			Extension ..	2 17	..	2 17	2 17	..	..	..	..	..	..	..	..	..
	Opawa and Albury to Fairlie Creek and Burke's Pass	55 8	Washdyke-Eversley	36 5	2 45	38 50	..	..	..	..	..	..	..	..	..	36 5
			Preliminary survey ..	19 3	..	19 3	19 3	Prelim.	..	..	..	..	..	..	..	..
	Waimate ..	17 43	Studholme-Waimate	4 42	1 3	5 45	..	..	..	..	..	..	..	..	..	12 63
			Waimate-Waihao Downs	8 21	0 54	8 75	..	..	..	..	..	..	..	..	..	
			Waihao Downs-Serpentine	2 65	..	2 65	..	2 65	..	..	..	..	..	..	..	..
			Sepentine-Kelcher's	1 75	..	1 75	..	1 75	..	..	..	..	..	..	..	..
Canterbury Interior Main Line	Oxford-Temuka ..	83 0	Oxford-Sheffield ..	11 44	0 27	11 71	..	..	..	..	..	..	..	..	..	11 44
			Surveyed ..	21 7	..	21 7	21 7	..	..	..	..	..	..	..	..	..
			Reconnaissance ..	50 29	..	50 29	50 29	Prelim.	..	..	..	..	..	..	..	..
Waitaki-Bluff and Branches	Main Line ..	246 69	South Waitaki-Bluff	246 69	59 13	306 2	..	..	..	..	..	..	..	..	..	246 69
	Branches,—															
	Duntroon - Hakateramea	37 33	Pukeuri-Duntroon ..	21 75	1 35	23 30	..	..	..	..	..	..	..	..	..	21 75
			Duntroon - Hakateramea	15 38	1 5	16 43	..	..	..	..	..	..	..	..	..	15 38
	Ngapara ..	14 76	Waiareka-Ngapara ..	14 76	1 31	16 27	..	..	..	..	..	..	..	..	..	14 76
	Livingstone ..	16 40	Windsor-Tokorahi ..	12 0	0 50	12 50	..	0 5	..	..	..	..	..	..	..	11 75
			Survey (trial) ..	4 40	..	4 40	4 40	Prelim.	..	..	..	..	..	..	..	..
	Palmerston - Waihemo	8 55	Palmerston-Dunback	8 55	0 54	9 29	..	..	..	..	..	..	..	..	..	8 55
		0 65	Surveyed ..	0 65	..	0 65	0 65	..	..	..	..	..	..	..	..	..

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued*.

SOUTH ISLAND—*continued*.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	—	1917-18.	1918-19.	1919-20.	1920-21.	Total.
1	2	3 M. ch.	4	5 M. ch.	6 M. ch.	7 M. ch.	8 M. ch.	9 M. ch.	10 M. ch.	11	12 M. ch.	13 M. ch.	14 M. ch.	15 M. ch.	16 M. ch.	17 M. ch.
Waitaki-Bluff and Branches—*contd.*	*Branches*—contd.															
	Inch Valley Railway	2 29	Inch Valley-Lime Kiln	2 29	0 23	2 52	..	..	..	..	..	..	..	..	..	2 29
	Port Chalmers ..	1 9	Glendermid - Port Chalmers	1 9	3 40	4 49	..	..	..	..	..	..	..	..	..	1 9
	Green Island ..	2 44	Burnside-Saddle Hill	2 44	0 52	3 16	..	..	..	..	..	..	..	..	..	2 44
	Green Island to Brighton	4 65	Surveyed	4 65	..	4 65	4 65	..	..	..	..	..	..	..	..	..
	Fernhill Colliery Line	1 60	Abbotsford to Fernhill Colliery	1 60	0 24	2 4	..	..	..	..	..	..	..	..	..	1 60
	Kaikorai Valley Railway	2 60	Surveyed	2 60	..	2 60	2 60	..	..	..	..	..	..	..	..	..
	Outram ..	8 78	Mosgiel-Outram ..	8 78	0 68	9 66	..	..	..	..	..	..	..	..	..	8 78
	Lawrence ..	21 76	Clarksville-Lawrence	21 76	2 2	23 78	..	..	..	..	..	..	..	..	..	34 65
	Lawrence - Roxburgh	37 10	Lawrence-Big Hill ..	7 33	0 44	7 77	..	..	..	1 Aug., 1910	..	..	..	..	..	
			Big Hill-Beaumont..	5 36	0 45	6 1	..	..	..	15 Dec., 1914	..	..	..	..	..	
			Beaumont-Roxburgh	24 21	..	24 21	24 21	..	..	..	..	..	..	..	..	..
	Lovell's Flat - Tuapeka Mouth	23 20	Surveyed	23 20	..	23 20	23 20	..	..	..	..	..	..	..	..	..
	Balclutha - Tuapeka Mouth	22 0	Surveyed	7 0	..	7 0	..	..	..	..	..	..	..	..	..	..
			Trial Survey ..	15 0	..	15 0	..	..	..	..	..	..	..	..	..	..
	Crichton-Tuapeka Mouth	11 60	Surveyed	11 60	..	11 60	11 60	..	..	..	..	..	..	..	..	..
	Balclutha - Appleby Junction or Catlin's - Seaward Bush	105 49	Balclutha-Owaka ..	19 20	1 63	21 3	..	..	..	..	..	..	..	..	..	42 67
			Owaka-Catlin's ..	3 38	0 30	3 68	..	..	..	1 Aug., 1904	..	..	..	..	..	
			Catlin's-Houipapa ..	2 30	0 9	2 39	..	..	..	17 Dec., 1909	..	..	..	..	..	
			Houipapa-Puketiro..	7 11	0 43	7 54	..	..	..	1 Feb., 1915	..	..	..	..	..	
			Puketiro-McLennan	5 29	0 59	6 8	..	..	..	1 Feb., 1915	..	..	..	..	..	
			McLennan-Tahakopa	5 19	0 38	5 57	..	..	..	1 Feb., 1915	..	..	..	..	..	
			Tahakopa-Marinui ..	23 63	..	23 63	23 63	Prelim.	..	..	..	..	..	..	..	..
			Marinui-Tokanui ..	6 0	..	6 0	6 0	..	..	..	..	..	..	..	..	..
			Tokanui-Waimahaka	8 27	0 64	9 11	..	..	..	20 Sept. 1911	..	..	..	..	..	32 79
			Waimahaka-Appleby	24 52	1 50	26 22	..	..	..	..	..	..	..	..	..	
	Waipahi - Heriot Burn	26 23	Waipahi-Heriot ..	20 3	2 3	22 6	..	..	..	..	..	..	..	..	..	26 23
			Heriot-Edievale ..	6 20	0 45	6 65	..	..	..	15 Feb., 1905	..	..	..	..	..	
	Extension to Roxburgh, via Rae's Junction and Ettrick	28 10	Surveyed ..	28 10	..	28 10	28 10	Prelim.	..	..	..	..	..	..	..	..
	Via Spylaw ..	25 70	Surveyed ..	25 70	..	25 70	25 70	Prelim.	..	..	..	..	..	..	..	..

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1921—*continued.*

SOUTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	—	1917–18.	1918–19.	1919–20.	1920–21.	Total.
1	2	3 M. ch.	4	5 M. ch.	6 M. ch.	7 M. ch.	8 M. ch.	9 M. ch.	10 M. ch.	11	12 M. ch.	13 M. ch.	14 M. ch.	15 M. ch.	16 M. ch.	17 M. ch.
Waitaki-Bluff and Branches—*contd.*	*Branches*—contd.															
	Waimea Plains District Ry.	36 39	Gore-Lumsden ..	36 39	1 34	37 73	..	..	..	..	..	..	..	.	..	36 39
	Kelso-Gore ..	24 0	Surveyed ..	9 58	..	9 58	9 58	..	..	..	..	..	..	.	..	..
			Preliminary survey ..	14 22	..	14 22	14 22	Prelim.	..	..	..	..	..	..	..	..
	Gore-Waikaka ..	12 65	Waikaka Section ..	12 65	1 51	14 36	..	..	..	26 Nov., 1908	..	..	..	..	..	12 65
	Riversdale-Switzers	13 70	Riversdale-Waikaia	13 70	1 40	15 30	..	..	..	1 Oct., 1909	..	..	..	..	..	13 70
	Edendale-Toitois ..	19 30	Edendale-Glenham	9 36	0 72	10 28	..	..	..	..	..	..	..	..	..	9 36
			Surveyed ..	9 74	..	9 74	9 74	..	..	..	..	..	..	..	..	..
Otago Central	Waitaki Bluff Main Line to Lake Hawea	182 45	Wingatui-Ida Valley	98 18	5 62	104 0	..	..	..	..	..	..	..	..	..	134 78
			Ida Valley-Omakau	13 20	1 16	14 36	..	..	..	1 Sept., 1904	..	..	..	..	..	
			Omakau-Chatto Creek	7 36	0 34	7 70	..	..	..	14 July, 1906	..	..	..	..	..	
			Chatto Ck.-Alexandra	10 39	1 6	11 45	..	..	..	15 Dec., 1906	..	..	..	..	..	
			Alexandra-Clyde ..	5 45	0 77	6 42	..	..	..	27 Mar., 1907	..	..	..	..	..	
			Clyde-Cromwell ..	12 29	0 69	13 18	..	..	12 29	..	..	..	..	..	..	..
			Surveyed ..	35 18	..	35 18	..	..	..	..	..	..	..	..	..	..
Invercargill-Kingston and Branch, Lumsden-Mararoa	Invercargill-Kingston	87 4	Invercargill-Kingston Wharf	87 4	5 15	92 19	..	..	..	..	..	..	..	..	..	87 4
	Lumsden-Mararoa ..	30 0	Lumsden-Mossburn	10 40	1 0	11 40	..	..	..	..	..	..	..	..	..	10 40
			Surveyed	8 20	..	8 20	8 20	..	..	..	..	..	..	..	..	..
			Reconnaissance ..	11 20	..	11 20	11 20	Prelim.	..	..	..	..	..	..	..	..
	Winton-Heddon Bush	11 0	Surveyed	11 0	..	11 0	11 0	..	..	..	..	..	..	..	..	..
Forest Hill Railway	Winton to Hedgehope	12 40	Winton-Hedgehope	12 40	0 65	13 25	..	..	..	..	..	..	..	..	..	12 40
Western Railways, Orepuki-Waiau River	Orepuki-Waiau ..	60 73	Makarewa-Orepuki ..	35 41	6 37	41 78	..	..	..	..	..	..	..	..	..	48 16
			Orepuki-Waihoaka ..	4 48	0 58	5 26	..	..	..	..	..	..	..	..	..	
			Waihoaka-Tuatapere	8 7	1 10	9 17	..	..	..	1 Oct., 1909	..	..	..	..	..	
			Tuatapere-Orawia ..	8 17	..	8 17	3 40	4 57	..	..	..	..	..	..	..	
			Orawia-Clifden ..	4 40	..	4 40	4 40	..	..	..	..	..	..	..	..	
	Otautau Branch ..	22 15	Thornbury-Wairio ..	22 15	..	22 15	..	..	..	..	..	..	..	..	..	22 15
	Orawia Branch ..	11 0	Surveyed	11 0	..	11 0	11 0	..	..	..	..	..	..	..	..	..
	Totals ..	2339 49	..	2339 49	257 56	2597 25	489 28	31 28	16 51	..	1714 57	..	..	13 0	..	1727 57

APPENDIX C.

ANNUAL REPORT ON BUILDINGS, BY THE GOVERNMENT ARCHITECT.

THE GOVERNMENT ARCHITECT TO THE HON. THE MINISTER OF PUBLIC WORKS.

SIR,—

I have the honour to submit the following report on the various building operations of the Department for the year ended 31st March, 1921.

NEW PARLIAMENT BUILDINGS.

During the year 5,622 cubic feet of stone was worked and 5,909 cubic feet was set, the principal stonework being the completion of the two north features on the Molesworth Street and Museum Street frontages, the columns and cornice over loggia, the columns and capital stones at the front entrance, and the balance of columns in the Legislative Council chamber. The corridors and rooms on the ground floor of the Museum Street front, the Speaker's suite, and the corridors and rooms on the ground and first floors have been completed. A considerable amount of brickwork was carried on, and the covering of the roofs of the loggia and post-office, as well as the making good of the holes in the floor and roof caused by dismantling the cranes, was completed, and the final asphalting of all roofs is well in hand. Electric light, power mains, and heating plant were installed in the newly finished portion of the building, and temporary partitions were erected at the main entrance to enable work to be carried on during the session with as little inconvenience to members as possible. A contract was let for the supply and fixing of the ornamental marble for entrance-hall and lounges. Good progress has been made during the latter part of the period, and it is anticipated that the building will be fully completed for the session of 1922.

VICE-REGAL RESIDENCES.

Auckland.—The interior of the residence has been altered and renovated, and the exterior and outhouses repainted. The promenade in front of residence has been renewed in concrete. New W.C. has been fitted at Lodge Cottage, and the yard has been asphalted. Two motor-garages and storeroom for meat and vegetables have been erected. New blinds have been provided. Men's quarters have been provided at the stables.

Wellington.—Extensive alterations were effected to this building, and considerable additional accommodation provided, principally with a view to furnishing offices for His Excellency the Governor-General and staff, and providing additional accommodation for the servants. Additions were made to the laundry, and a bath and additional lavatory accommodation was installed in the attic rooms. Arrangements were made for the heating of the linen-presses, and towel-rails and hot-water racks were installed in the bathroom and pantry. Twelve rooms were papered, and the head gardener's cottage was renovated, papered, and painted. Two rooms in the maids' cottage were papered. The upper and lower reservoirs were cleaned out and cement-washed, and the plumbing-work throughout the building was overhauled. A number of the rooms were subdivided to furnish additional accommodation. A shed with concrete floor was erected for the gardener's use, and the main drive was widened. A new floor was put down in the bathroom in the west wing, and the bath was refitted. The carpets in various rooms were taken up, cleaned, and relaid. New pipes for the hot-water service were put in to remedy the discoloration of the bathroom, and a new porch was erected at the entrance to the ball-room. A new strong-room was constructed. A skylight was put in in the ironing-room. Repairs were effected to various parts of the roof, and the drains were inspected quarterly. The road round the grounds was repaired and metalled, and the iron fence enclosing the asphalt tennis-court was removed at the request of the Governor-General. The whole building was cleaned up generally in preparation for the new Governor-General's occupation, and his furniture was unpacked and placed in position.

DEPARTMENTAL BUILDINGS.

Auckland.—General repairs have been carried out to exterior of Customs Buildings, and all wood and iron work painted. Yards have been repaired, tarred, and sanded.

Alterations have been carried out and a large range of fittings supplied to the Lands and Survey Department, North Auckland. The strong-room has also been altered.

The Public Works Stores Department have been removed to their new quarters in Shaw-Savill's Buildings, and all necessary alterations carried out.

Alterations have been carried out to the first floor of the Law Court Buildings to accommodate tenants who have been transferred from the third floor. Preparations are being made to accommodate the Valuation Department on the third floor.

Offices have been fitted up in the Tramway Buildings, and necessary fittings supplied to accommodate the Forestry Department, who are now in occupation.

General alterations have been carried out and office fittings supplied to Public Trust Office.

An addition in brick, about 70 ft. by 20 ft., has been completed, together with office fittings, and is now occupied by the Deeds Office staff. All brickwork in the additional story has been completed; the roof is on and the floor laid. The alterations for the Stamp Department have not yet been commenced. Providing plasterers can be obtained, the whole of the work authorized should be completed in about four months' time.

Offices have been fitted up in the Tramway Buildings, and necessary furniture and fittings provided for the accommodation of the Standard Survey Department, who are now in occupation.

Alterations and renovations have been carried out to Nurses' Home, St. Helens Hospital. The cottage on section for new building has been shifted and renovated, the section has been cleared for the contractor, and a start made with the erection of the new building. All the foundations are completed, and the brickwork is up to plinth-level.

Motuihi Island.—The erection of quarantine buildings has been completed, and storage-tanks and water-supply have been installed. The construction of a new wharf is being held over for the present.

Tauranga.—A contract has been let for a Meat Inspector's residence, Whakatane, but owing to difficulty in procuring materials, &c., the work was delayed considerably. For the Stock Department fittings, &c., have been provided and new premises arranged for.

Taumarunui.—Extensive repairs were effected to the Chief Clerk's residence. The tiles were removed from the roof and replaced with corrugated iron, the interior was papered and renovated, and the outside painted.

Napier.—A blue-print shed has been erected for the Public Works Department, the main building repainted, outbuildings renovated, and additional garage erected.

Tarawera.—The foundations of the bath-house have been strengthened.

Gisborne.—In Lands and Deeds Office 100 plan drawers were supplied and placed, also several articles of furniture supplied. A new door was placed on strong-room. The exterior of St. Helens Hospital, Townley, the operating-room, and the bathroom have been painted. The nurses' quarters have been altered and improved, and a storeroom has been constructed. An office in the Government Life Insurance Buildings has been renovated and furnished for the newly established branch

Waikaremoana.—A septic tank has been constructed at the Hostel, drainage installed, and improved sanitary arrangements effected. Additions and other very necessary improvements were made. Renovations to interior have also been carried out.

Morere.—Tenders have been invited for erection of caretaker's residence.

Whangamomona.—A small addition has been made to the Road Inspector's house, and the building has been painted and papered.

New Plymouth.—Additions, alterations, and repairs have been carried out to the Deeds Office, and new counter, grille, pigeonholes, &c., provided. Electric light was installed in the Customs Offices, and three electric-light radiators, linoleum, and furnishings were provided. Repairs have been effected to the Native Hostelry, the exterior painted, and electric light installed.

Stratford.—The roof of the Public Works Office has been repaired, one electric-light point installed, and one nest of pigeonholes provided. A new garage with concrete floor, iron walls and roof has been erected at the Stock Inspector's private residence.

Opunake.—Two rooms of the Stock Inspector's residence have been painted and papered, and general renovations carried out.

Patea.—New spouting and tank have been provided and fixed for the Customs Department.

Carterton.—The Agriculture Department's offices were painted and papered, and alterations effected.

Palmerston North.—Renovations were effected to the District Valuer's Office, Palmerston North.

Otaki.—The Hospital and Sanatorium and Farm Manager's cottage were renovated, painted, and papered.

Somes Island.—The "Delco" electric-light system was installed, also a new pumping plant. The road was repaired and metalled, and renovations were effected to a number of the buildings.

Trentham.—Alterations were effected to the Crippled Children's Ward, a cupboard and other furniture supplied, a heating copper and stove installed in the laundry, and fencing and verandas erected.

Wallaceville.—A new vaccine-table and other fittings were constructed for the Laboratory, and repairs were effected to the main building and the residence, and a water-supply installed.

Wellington.—The electric lights, bells, and domestic telephones in various offices in Government Building were attended to as required. A large addition was made to the motor-garage facing the Government Printing Office. A storage-bin for holding about 50 tons of coke was erected at the rear of the building. The foundations for the new electric lift were put in, and the ironwork was erected. The floor in one of the rooms in the south wing was strengthened, and a cement-testing machine was installed therein. The heating-system and the sanitary fittings throughout the building were overhauled. A helio-printing room was erected on the roof, and was fitted with the necessary appliances. The ladies' lavatories were cleaned and painted, and storage accommodation was provided for the Internal Affairs Department under the stairs at the north end. Hot-water radiators were installed in the Land and Survey Department's offices. Extensive alterations were effected to the offices on the ground floor vacated by the Land and Income Tax Department to suit the requirements of the various Departments who were transferred thereto. Renovations were effected to the ladies' retiring-room attached to the Stamp Duties Department, to room 16 of the Education Department, to a number of the rooms in the Internal Affairs Department, and to various rooms in the Public Works and Mental Hospitals Departments. Considerable alterations were effected to various offices throughout the building, including the Treasury offices, the Public Works Accountant's office, the Native Trust office, and the State Advances office.

Extensive alterations were carried out in the Government Insurance Buildings to suit the Department's requirements, and a considerable number of pigeonholes and other items of office furniture were supplied. Galleries were erected round the offices occupied by the Lands and Deeds Department. Repairs were effected to the heating-boilers, and a number of the rooms were renovated. Alterations were effected to the water-supply for fire-prevention, and to the hot-water pipes, and the sanitary fittings were repaired. The electric lights and bells in various offices were repaired and altered as required.

The heating-system in old Parliament Buildings was overhauled. The electric lights, bells, and telephones in various offices were attended to and altered as required, the bathrooms painted, rooms cleaned, repaired, and painted, and the installation of the Vigilant fire-alarm system completed. The rooms occupied by the Public Works District Office were distempered, and the furniture and fittings cleaned. Steps were taken to provide ventilation in the offices occupied by the Health Department with a view to providing additional accommodation, and a number of the rooms were renovated.

Extensive alterations were carried out on the ground and first floors of Public Trust Office, and a number of the rooms were distempered, painted, and renovated. New boilers were installed for the heating-system, and repairs were effected to the sanitary fittings. The exterior wood and iron work was painted. The electric lights, bells, and telephones were attended to as required.

A considerable amount of work was done to the Government Printing Office in connection with the strengthening of the foundations under the south wing, and the substitution of concrete foundations for the decayed piles. A new steam heater was installed in the paper-store, and repairs were effected to the steam-pipes and the sanitary fittings. The roofs were painted, a considerable quantity of shelving erected, a gas-compressor installed in the monotype-room, and electric light installed in the motor-garage.

A gas heating-system was installed in Fletcher's Buildings for the Education and Immigration Departments, and the offices were fitted up to suit the Departments' requirements.

The Hemp Grader's offices were renovated. The celler and offices in the Dominion Farmers' Building were fitted up to suit the Department's requirements.

Electric light was installed in the Biological Laboratory, and the building altered and fitted up. Alterations were effected in Base Records Building to suit the requirements of the Native Trust Office. A large quantity of shelving was erected in the W.F.C.A. building for use in connection with the taking of the census, and alterations were effected to suit the Department's requirements. Alterations were effected to provide accommodation for the School Dental and Medical Officers, and a portion of the rooms was fitted up as a Dental School. Four rooms were papered and painted for the use of External Affairs Department. Private letter-boxes were constructed in the Public Works Workshops for the Samoa Post Office. One room was papered and painted for the Compiler of Statutes.

A portion of the Pipitea Store was partitioned off to form a canteen store, and a considerable amount of shelving was erected and skylights were put in. Renovations were effected to various parts of the s.s. "Tutanekai." Repairs were effected to the sanitary fittings, &c., of St. Helens Hospital, and the lift was tested weekly. The exterior of the Customs Buildings was painted; the windows frosted; alterations effected to the drains and waste pipes, and various of the rooms renovated. The Tourist offices on Lambton Quay were renovated.

Repairs were effected to the basement of the Dominion Museum and the cellers cleaned out. The outbuildings were papered, and new lights installed in the studio and workshop. Alterations and renovations were carried out in the Housing Branch, Labour Department. The store constructed for Curtis Island was painted. Alterations were effected to the Official Assignee's offices, a portion being partitioned off to provide accommodation for the Repatriation Department. Alterations and renovations were effected to the offices in the Whitmore Street Building taken over by the Land and Income Tax Department. A domestic-telephone system was installed in the Board of Trade's offices.

Nelson.—Two new offices have been erected, congoleum and feltine laid, office furniture provided, and gas heaters fixed for the Land and Deeds Registry Office. Pigeonholes have been provided and sun-hoods fixed to the windows of the Clerk of Court's office. The Public Works Department workshop has been extended, and a combined planer and mortizer machine installed. A new close-boarded fence has been erected on three sides of the Customhouse section. The offices now occupied by the State Forest Service have been papered, and congoleum and feltine laid on floors; plan-drawers, two office-desks, bookcase, tables, pigeonholes, and counter have been constructed, and new gas fittings fixed.

Greymouth.—The Explosives Magazine has been completed. The repair work at the Otira Hospital is well in hand. Repairs and renovations have been carried out as required to the various Government buildings in the district.

Christchurch.—The office arrangements in the Stamps Department were altered, counter extended and partition erected, and additional fittings provided. Shelving was erected in this Department's cellar. The Valuation Department was removed from the first floor to top floor, and many items of new furniture and fittings were supplied. Renovations were carried out in the ladies' retiring-room, and several small furniture items supplied.

Alterations were carried out to provide an office for the Housing Branch of the Labour Department. Three new steel-wire ropes were fitted to the electric elevator. Additions have been made to the Public Works Workshops. A cement shed was erected, also a shed for petrol. The electric lighting was completed. New machinery is now being purchased to be placed in the new portion of workshops. Electric light was installed in the Public Works Workshops cottage.

The nurses' quarters at Quail Island were renovated and necessary repairs effected. New water-tanks and stands were provided. A sanitary block and leper-hut were erected by our own staff.

For the Public Trust Department eight advertising-posters were fixed in various Government buildings. Three window-sashes were made for the temporary building. Furniture was provided for the Inspector's office, and six typewriter silencers were made and supplied. New runners for the stairs were purchased and put in position. Several minor repairs were attended to.

New offices were located for the Prices Tribunal Committee, and completely furnished. The installation of electric lighting in St. Helens Hospital was completed, and the interior of the building was renovated.

A large hut with dining-room, kitchen, and twenty-two cubicles and other outbuildings were erected for housing soldiers employed at the Avonhead Demonstration Farm. Several buildings, laying-houses, and poultry-runs were built. Additional tanks, pump, and electric motor were provided to augment the water-supply. An apiary-house was also erected. A new drainage-system was provided and some repair work attended to at the Amberley Stock Inspector's residence.

The erection of a new building has been commenced in Carlyle Street for the use of the Customs Examiners. A quantity of new furniture was supplied to the Lands and Survey Department. Alterations were carried out in the Lands and Deeds Office, and additional furniture and fittings supplied. The five rooms occupied by the Crown Lands Office were thoroughly renovated. Extensive alterations were carried out in the Land Transfer Office, which was renovated, and the necessary fittings supplied. Electric light was installed through the building, an outside stairway erected, and several other alterations effected.

Ashburton.—The Crown Lands Ranger was supplied with several items of furniture. Shelving was erected, and gas fittings attended to.

Timaru.—Two new desks, file-cupboard, and counter were supplied to the Lands and Survey Department, the office thoroughly renovated, and electric light installed. An office was fitted out for the Housing Inspector, signboard provided, and counter repaired for general office.

Sydenham.—Public Trust Office was supplied with furniture and fittings.

Leeston.—Four chairs were provided for Public Trust Department.

Rakaia.—Office furniture was supplied.

Dunedin.—Fittings, &c., were supplied for Customs Inspector's office. Rooms 20, 21, and 23 to 26 of Government Life Insurance Buildings were renovated. Electric lighting was installed in Dominion Chambers, and rooms for Industries and Commerce Department renovated; a new rope was supplied for elevator, and shops renovated. Furnishings and fittings were supplied to Industries and Commerce and various other Departments. A new fence was erected round the Public Works new storeyard. Repairs were effected to St. Helens Hospital and a sterilizing plant was installed.

Balclutha.—Repairs to stable, coachhouse, gates, &c., at the Field Inspector's residence, including asphalting and gravelling, were completed.

Invercargill.—A storeroom was erected at St. Helens Hospital.

Post-offices.

Awanui.—The staff quarters in this building were repaired, and assistance was given towards a recreation-ground

Broadwood.—General repairs were carried out, and additional conveniences provided.

Kaikohe.—This building has been repainted.

Kaeo.—An additional room was provided and furnished.

Kawakawa.—The building has been painted and renovated, and a Wizard system installed.

Kaitaia.—Additions have been made to the private-box lobby, and further boxes provided.

Kamo.—New tanks, &c., have been erected.

Kohukohu.—A new lighting-system has been installed, and general repair work carried out.

Manganui.—A contract has been let and completed for painting and renovating the post-office and private quarters throughout.

Ohaeawai.—A new lighting-system has been installed, and the building painted.

Russell.—The private quarters were painted and renovated.

Rawene.—The building has been repainted throughout, and a new lighting-system has been installed.

Waipu.—The building has been repainted.

Auckland Chief Post-office.—The main roof has been covered with Neuchatel asphalt. Alterations have been effected to stamp-rotunda, and those in connection with the Money-order Branch are in hand.

Wellesley Street, Auckland.—Light-area has been covered and basement drained. Shelving and alterations have been effected in the basement.

Elliot Street, Auckland.—Office fittings have been removed, offices renovated, new plate glass provided, and building handed over to owner.

Newton.—Lamson wire-carrier has been installed, and interior of office painted.

Henderson.—A contract has been let for the erection of a new building, and a start has been made with the work.

Devonport Automatic Exchange.—The brickwork has been completed and the roof is on. Sashes are fixed, and the building ready for plastering.

Takapuna Automatic Exchange.—The erection of the new building is well in hand.

Onehunga Automatic Exchange.—The erection of this building is also well in hand.

Manurewa.—A new building in brick has been erected by contract. Fittings have been made and supplied by the Department.

Hikutaia.—Plans were prepared for a new post-office, and tenders invited. but as no offers were received the work is at present in abeyance.

Patetonga.—Plans were prepared for a new post-office and tenders invited, but as no offers were received the work is at present in abeyance.

Morrinsville.—Additional accommodation is being provided.

Cambridge.—A new Postmaster's room has been built in brick, and extensive alterations carried out in the mail-room to give additional counter accommodation, and the interior of building renovated. A new bay window has been fixed in dining-room of residential portion. A Lamson carrier has been fitted up for telegraph counter. Renovations have also been carried out to interior of Telephone Exchange.

Otorohanga.—An additional bedroom has been built to the residential portion of this office.

Mercer.—The whole of the exterior and a portion of interior of Postmaster's residence have been painted and renovated.

Okoroire.—This building has been painted and renovated.

Tirau.—The whole of the interior of this building has been renovated.

Putaruru.—The whole of the exterior and portion of the interior have been painted and renovated. Additional private boxes have been supplied.

Hamilton.—Extensive alterations have been carried out to the interior of this office, in order to accommodate the additional staff, &c., in connection with converting this to a chief post-office. Electric light has been installed. Additional private boxes have been supplied. Alterations have been made to public counter, and a wooden floor laid on portion of the concrete floor in basement.

Hamilton Savings-bank Branch.—New card-tables and other office furniture and fittings have been supplied to this new building, leased by Postal Department for Money-order and Savings-bank Branch.

Hamilton North Post-office.—A building having been leased at north end of town, the necessary alterations, renovations, and furnishings have been carried out, and electric light installed.

Ohaupo.—The additional section recently acquired for use of the Postmaster has been fenced. The exterior and portion of interior have been painted and renovated.

Glen Massey.—A new portable post-office has been erected.

Te Awamutu.—All the exterior wood and iron work has been repainted, and the interior of offices renovated.

Raglan.—A building has been erected to house the Crescent lighting plant, and minor additions and renovations have been carried out to office and quarters.

Taupiri.—A new office and quarters have been built, and all necessary furniture and fittings supplied.

Taupiri Old Office.—The alterations and renovations necessary to convert the office into a residence again, as it was when taken over by the Postal Department, have been carried out, and the building handed over to the lessor.

Tauranga.—The supply of fittings was arranged.

Rotorua.—A contract was let for repainting and repairs.

Matata.—The building has been painted and papered throughout.

Ngongotaha.—Additional accommodation has been provided at this office.

Taneatua.—A contract was let for certain additions, repairs, &c., and has since been completed.

Mokai.—A contract has been let for painting and renovating.

Maketu.—New tanks have been installed here.

Whakatane.—A heating-system was installed in the telephone exchange.

Whakatane Postmaster's residence.—Erection of this building is in hand.

Waitomo.—Minor repairs were done to this post-office. A new window-shade was built over the mail-room window, and all floors throughout the buildings were covered with congoleum.

Ohura.—Considerable repairs have been carried out; the interior was renovated, tanks cleaned out, paths metalled, fences repaired, and lockers built in the strong-room. The building has also been painted externally.

Lineman's Residence, Ohura.—A new residence was erected for the lineman.

Manunui.—A urinal and drainage has been installed here, and a number of minor alterations carried out.

Owhango.—A new post-office and residence has been erected, the work being completed on the 28th February last. The usual postal furniture was provided, and all necessary drainage, &c., carried out.

Ongarue.—The water-service was repaired in this office.

Mahoenui.—A new post-office of the D type was erected to take the place of the quarters previously hired from the store.

Taumarunui.—Thirty-five additional private letter-boxes have been fitted up.

Mangapeehi.—Considerable alterations have been made to this office. The whole of the inside of the old building recently purchased from Ellis and Burnand has been gutted and new fittings erected; conveniences have been erected, and a tank with all necessary water-pipes, &c.

Matiere.—A new E.C., urinal, and all necessary drainage has been installed.

Ormondville.—The new building has been completed and is now occupied.

Taradale.—The conveniences and fences destroyed by fire were re-erected.

Clive.—This building has been repainted.

Port Ahuriri.—Renovations consisting of distempering, cleaning down tables, varnishing-work, &c., were carried out, and electric light installed.

Porangahau.—Additional accommodation has been provided.

Greenmeadows.—Renovations have been completed.

Ongaonga.—Renovations have been completed.

Takapau.—Additional private-box accommodation has been provided.

Napier.—Additional private-box accommodation has been provided, also accommodation for staff in Exchange Building.

Hastings.—Renovations have been effected, and additional private boxes and two sound-proof bureau cabinets provided.

Waipawa.—Renovations to the exchange-room have been carried out.

Gisborne.—A new Telegraph Store has been erected to replace one damaged by fire.

Wairoa.—Additions to Telegraph Exchange have been completed, and renovations and additions to outbuildings are in progress.

Opotiki.—All exterior woodwork and the roof have been painted.

Paturahi.—Exterior woodwork and roof have been painted.

Nuhaka.—Two new tanks have been placed in position. The roof of the building has been painted, and several minor renovations have been effected.

Matawai.—The new post-office building has been completed, and is now open to the public. The joinery was made at Public Works workshops.

Tolaga Bay.—Additions to the main building are in course of construction.

Ruatorea.—A grill has been added to counter. A new tank has been provided and placed in position, and 11½ chains of fencing completed.

Tuparoa.—Several renovations have been carried out in the main building, and tanks and stands repaired.

Te Araroa.—The Postmaster's residence has been painted and renovated throughout.

New Plymouth.—Repairs had to be effected here owing to a chimney-fire.

Fitzroy.—A contract for the erection of this building is in hand.

Waitara.—Minor repairs and alterations have been carried out, and a new glazed partition across the mail-room provided and fixed. At the Postmaster's quarters several minor repairs have been effected.

Urenui.—A new galvanized-iron tank and stand have been installed here.

Uruti.—The interior of this building has been altered and painted, a new Dover stove put in, and the Wizard light overhauled.

Awakino.—This building has been painted and repaired.

Inglewood.—The interior of this building has been painted and papered, and minor repairs have been carried out.

Stratford.—New private boxes, shelving, pigeonholes, and new front steps have been provided. The Postmaster's quarters have been renovated, repaired, and painted.

Eltham.—A new lift has been provided in the instrument-room, new linoleum laid, and flooring repaired.

Hawera.—A contract has been let for alterations and additions. At the Postmaster's quarters minor repairs have been effected.

Manaia.—Five new galvanized-iron water-tanks have been erected and fixed, also a dado in the mail-room, public-box lobby, and exchange.

Opunake.—Painting, repairs, and renovations have been effected. The Postmaster's quarters have also been painted and repaired, and a new Orion range and hot-water service installed.

Pungarehu.—Painting, repairs, and renovations have been carried out.

Rahotu.—This building has been repaired and painted.

Toko.—Painting, repairs, and renovations have been effected.

Whangamomona.—This building has been painted, repaired, and renovated, and new private boxes provided.

Akiaiwa.—Minor repairs have been carried out.

Wanganui.—A new residence (in wood) has been erected in connection with St. John's Post-office.

Taihape.—A contract has been let for the erection of a large new building (in brick). The site has been cleared, and construction work has been started.

Paraparaumu.—This building was constructed by day labour out of material obtained by dismantling hutments at Featherston Camp.

Rangiotu.—This building also was constructed by day labour out of material obtained by dismantling hutments at Featherston Camp.

Lineman's Cottage, Featherston.—This building also was constructed by day labour out of material obtained by dismantling hutments at Featherston Camp.

Lineman's Workshop and Garage, Pahiatua.—This building also was constructed by day labour out of material obtained by dismantling hutments at Featherston Camp.

Woodville.—This building was painted and renovated by contract during the year, and a further contract has been commenced for the erection of the new exchange.

Tiraumea.—Alterations were effected to this building by contract.

Kelburn Automatic Exchange.—The building was erected by contract, and the electric-light installation was carried out by the Public Works staff.

Post and Telegraph Stores, Wellington.—A new roof was constructed for one of these buildings, and an electric hoist was transferred from Buckle Street and re-erected in the yard.

Post and Telegraph Workshops, Wellington.—Electric light and power were installed by the Public Works staff.

Lower Hutt.—Some renovations were undertaken.

General Post Office, Wellington.—The interior of the old portion of the building was renovated. The heating-service was overhauled and extended, and electric light and power was installed in the wireless cabin. Renovations were effected to the interior of the new building, and a number of rooms were painted and distempered.

Kaiwarra.—The exterior of the building was painted and minor repairs were effected to the interior.

Hawera.—Electric light was installed by the Public Works staff.

Pahiatua.—An outbuilding to the post-office was erected out of material obtained by dismantling hutments at Featherston Camp.

Eketahuna.—A motor-shed was erected out of material obtained from Featherston Camp.

Palmerston North.—Fire-proof doors and collapsible gates, &c., were installed in this building. Alterations were effected to the battery and engine rooms. Additional lavatory accommodation was provided, and a Lamson despatch tube was installed between the main building and the despatch-room.

Manakau.—New tanks were supplied and fixed, and general repairs were effected to the building.

Otaki.—A new pump and water-supply were installed, outbuildings were erected, and the building was renovated and painted.

Dannevirke.—Alterations were effected to the telephone exchange.

Masterton.—An electric-light plant was installed, additional lavatory accommodation provided, and new private letter-boxes put in. Extensive alterations were effected to the interior of the building.

Masterton Post-office Store.—A camp building was shifted from Featherston and re-erected at Masterton as a post-office store.

Seatoun.—The building was painted, papered, and renovated.

Te Aro.—Improvements were effected to the lavatory accommodation, and the roof was repaired.

Pongaroa.—A new outhouse was erected, and the office was painted, papered, and renovated.

Kilbirnie.—The living-quarters were renovated.

Greytown.—Alterations were effected to the Postmaster's room, and the building was painted and repaired.

Courtenay Place.—The interior of the building was painted and renovated, and a mess-room was erected.

Shannon.—Alterations were effected to the building, additional accommodation was provided, and new tanks were installed.

Nelson.—In the Money-order and Savings-bank Branch increased accommodation has been provided by altering and refixing counter, providing tellers' boxes, construction of ledger tray-stands, and removing and refixing telephone bureau.

Takaka.—The area in front of the post-office has been asphalted, lavatories painted, and new picket fencing erected facing the main street.

Rockville.—A new post-office (in wood) has been erected.

Stoke.—The conversion of cottage with addition from Port Nelson Post-office into post-office at Stoke has been completed, and the necessary office furniture provided.

Wakefield.—Lavatory accommodation is in course of construction, the septic tank, effluent pits, drainage, and tank-stand are completed, and other work is in hand.

Tapawera.—A new post-office (in wood) has been erected.

Tasman.—The existing post-office has been altered and enlarged, and provision made for public space, Postmaster's room with fireplace, private letter-box lobby, and telephone bureau.

Christchurch Postmaster's and Mail Branch.—The floors were repaired and a partition erected in the retiring-room; also one in the mail branch. Alterations were carried out to the stamps counter. An emergency lighting-system was installed, and several fire-extinguishers supplied. In the money-order office alterations and minor repairs were attended to. In the telegraph department the staircase floor was covered, and repairs to the windows of the Engineer's office carried out. Additional lockers were supplied. A tea-room was fitted out and alterations effected to give additional accommodation for the staff. In the parcels branch repairs were effected to the cartway entrance and the social-room floor. Alterations were made to give accommodation for post-office store and Customs officers.

Christchurch Post-office Additions.—The contractors commenced work during the year, and satisfactory progress is being made. The reinforced-concrete columns, beams, and floors have all been fixed for the basement and first floor. The white-stone front has been carried up to the sill. A large quantity of material required for further progress has been received by the contractors.

Amberley.—This building was thoroughly renovated and a stationery-cabinet provided. Plans were prepared for a lineman's cottage. Tenders were invited and the contract let.

Ashburton.—Improvements to drainage were effected.

Anama.—A set of private letter-boxes was provided.

Avoca.—Fittings and furniture were supplied.

Culverden.—Repainting and repairs were attended to.

Darfield.—A chimney was repaired in the lineman's residence, and new windmill installed.

Duvauchelle's Bay.—Tenders were invited and received for this new building.

Fairlie.—Additions were carried out and satisfactorily completed.

Ferry Road.—Doors and window-frames were repainted.

Geraldine.—A convenience was provided for the female staff.

Hororata.—A tender was accepted for the erection of new post-office, and the work will be put in hand at an early date.

Kaiapoi.—This building was renovated. Stationery-cabinet and table were supplied.

Linwood.—Thorough renovations were carried out.

Leeston.—Repairs were effected, new blinds supplied, and two new tanks put in position.

New Brighton.—Improvements to the water-supply were carried out, and an artesian well sunk.

Oxford.—These buildings were thoroughly renovated.

Papanui.—The erection of a new post-office is well under way and should be completed early. The work has been undertaken by our own workshops staff, on account of the tender received being far in excess of the Department's estimate.

Rakaia.—General repairs to buildings were carried out and new fire-grate was supplied.

Rangiora.—An addition was made to this building. Electric lighting was installed, and foundations and brickwork were repaired. Fittings and furniture for the new portion were supplied.

Shirley.—This building was completed and occupied. New fittings were supplied.

Sumner.—This building was thoroughly renovated and a strong-room built. A sorting-case was supplied.

Sydenham.—Renovations were carried out and a gas heater supplied to the Telegraph School.

Taitapu.—The fence of post-office site was set back to proper boundary-line at the request of the Halswell County Council.

Temuka.—A bicycle-shed was erected and linoleum laid in post-office.

Timaru.—Exceedingly good progress has been made during the year. The whole of the brickwork has been completed and roof erected. Plastering, exterior and interior, will be finished at an early date. The drainage-work was carried out, and a considerable amount of flooring laid; this was delayed on account of the wet state of the timber. The electric wiring has been commenced by the Post and Telegraph Department. Alterations were also effected to old portion of building to make same suitable for additions. The bulk of the work yet to be done is in the interior portion of the building.

Upper Riccarton.—A new building has been erected. Furniture and fittings were supplied by this Department.

Waddington.—A set of letter-boxes was provided.

Waiau.—Improvements to water-supply were effected. A well was sunk, piping and tank fixed. New blinds were supplied for the private quarters. Renovations and necessary repairs to lineman's quarters and store were attended to.

Waimate.—Additions to this building were satisfactorily completed by the contractor. A public telephone was provided and fixed.

Woolston.—Renovations were carried out and new linoleum laid.

Chatham Islands Wireless Station.—The s.s. "Rama" sailed from Lyttelton on the 30th March with materials, accompanied by Inspector Hemsley and three carpenters, and a start has been made with the additions to post-office and new residence.

Alexandra.—The contract for the erection of new post-office was started in October, 1920. Considerable delay was experienced in the earlier stages through difficulty in procuring timber and joinery, but it is now proceeding satisfactorily.

Ranfurly.—Tenders having proved unsatisfactory for this, it was decided to construct it by day labour. A start was made in April, 1921, and for a time difficulty in procuring timber delayed progress, but it is now proceeding well.

Clinton.—The provision of a new bath and tank, repairs to spouting, and cutting down of trees have been completed.

Crookston.—The erection of new office has been completed.

Dunedin.—Alterations have been made to money-order branch; new strong-room, &c. New cork linoleum has been provided for money-order branch, and stairs and Postmaster's room renovated.

North Dunedin.—The private quarters have been renovated and repaired.

Telegraph-office, Dunedin.—A Lamson despatch-tube has been installed, and the premises generally renovated.

Kaitangata.—The bureau room has been painted, and general repairs have been completed.

Miller's Flat.—The alterations and additions have been completed.

Owaka.—The erection of telephone bureau and conveniences for staff, and general repairs, have been completed.

Port Chalmers.—This building has been repaired and renovated.

Ravensbourne.—The private quarters have been renovated.

Sutton.—The erection of new office has been completed.

Tapanui.—Ten additional private boxes have been put in. The yard at the Postmaster's residence has been asphalted.

Invercargill.—Extensive alterations were carried out in the money-order and savings-bank branch.

Waikaka.—Extensive alterations and additions were made at this office.

Lumsden.—A new post-office has been erected by day labour.

Garston.—A new post-office has been erected by day labour.

Nightcaps.—A new post-office is under construction by contract.

Tuatapere.—This building has been repainted and repaired.

Gore.—A storage-shed for telegraph material has been erected, and grates renewed in the post-office.

Bluff.—Miscellaneous repairs were carried out.

Wyndham.—Additional private letter-boxes have been supplied, and general repairs carried out.

Wairio.—Additional accommodation has been provided.

Riverton.—Building has been painted, and new water-supply tanks provided.

Queenstown.—The Postmaster's residence has been extensively renovated.

Edendale.—The official quarters have been repaired and renovated.

COURTHOUSES.

Whangarei.—General repairs have been carried out.

Kaikohe.—Building has been repainted.

Supreme Court, Auckland.—Caretaker's quarters have been renovated, and additional electric light installed.

Raglan.—The whole of the exterior of this building has been painted and renovated.

Pukekohe.—Foundations of new building are in, and damp-course laid for commencing brickwork.

Ormondville.—Building has been repainted.

Hastings.—Electric light has been installed.

Waipukurau.—The new building is practically completed.

Gisborne.—The exterior of building has been painted, and an office has been fitted up in this building for the Inspector of Machinery.

Opunake.—The exterior of this building has been painted and repaired.

Manaia.—Electric light has been installed in this building.

Stratford.—A contract has been let for painting and renovating.

Levin.—Furniture and fittings for this office were constructed in the Public Works Workshops.

Foxton.—Repairs were effected throughout the building.

Dannevirke.—Repairs and alterations were effected throughout the building, and the yard was asphalted.

Supreme Court, Wellington.—A number of rooms were renovated.

Magistrate's Court, Wellington.—The exterior of the building was painted.

Masterton.—Alterations were effected to the interior of the building, and roller-shutter cases and other office furniture and fittings were supplied.

Pahiatua.—The building was painted and repairs were effected throughout.

Takaka.—A wired-paling fence was erected on three sides of the section.

Magistrate's Court, Christchurch.—New spouting was fixed and minor repairs attended to.

Supreme Court, Christchurch.—A quantity of shelving was erected, and better accommodation provided for the jury.

Rangiora.—Electric light was installed.

Amberley.—This Courthouse was thoroughly renovated, interior and exterior.

Akaroa.—Renovations were attended to.

Methven.—This building was painted and repair works were carried out.

Lyttelton.—Alterations and the removal of fittings were attended to.

Timaru.—The spouting was renewed, and renovations commenced.

Law Courts, Dunedin.—Repairs, &c., to skylights have been carried out.

Lawrence.—Repairs to asphalt and plaster on walls have been completed.

Middlemarch.—Macrae's Courthouse was removed to Middlemarch, and re-erection has been completed.

Outram.—The exterior of this building has been painted.

Bluff.—Repairs and renovations have been carried out.

GAOLS.

Gisborne.—The erection of a concrete wall and kerbing and channeling to main gate is in hand.

New Plymouth.—The yards and footpaths in exercise portions have been tarred and sanded, and the concrete paths have been repaired. A new cast-iron boiler provided for boiling pig-feed, leaks in the roof repaired, &c. Electric-light extensions were installed in the dome for the convenience of church services. One warder's cottage was repapered and repainted, and electric light installed.

Terrace Gaol, Wellington.—The police residence was converted into flats, and bath, sink, and gas cooker, and water-supply were installed in each.

Wi Tako.—A "Delco" lighting plant was installed by the Public Works Workshops staff.

Addington.—The kitchen was overhauled and gas-cooking appliances installed. An electric motor and pump was provided to pump water from artesian well. An electric-lighting system was installed, and six register grates substituted for open fireplaces.

Timaru.—Electric light was installed and repair work carried out.

Paparua.—Now that sufficient supplies of cement are coming to hand more readily, good progress should be made with the various buildings connected with the prison. An iron hand-railing has been erected on the balcony of the west cell range, and the padded cell has been completed. Good progress has been made with the porches and floor; temporary divisional exercise-yards have been erected. The kitchen block is completed with the exception of the baker's oven. The divisions in the bath-rooms have been erected. A large iron tank has been erected at the back of the block. A 50 ft. well has been sunk, and the water-supply for the buildings is assured when the motor-pump is installed. The excavations for a large septic tank are nearly ready for cementing. Work on the construction of the east cell range has been progressing steadily. Work on No. 1 temporary block has been proceeding. These buildings are being converted into an up-to-date farm-steading. A handsome stable with sixteen stalls and one loose-box is completed with the exception of the floor. A large motor-garage has been completed. A shearing-shed with two shearing-stands has been erected, with sheep-yards adjoining. Cow-byres with sheds and dairy have been built, and the shed is being erected round three sides of the enclosure. The new piggery, containing twenty sties, is almost completed. A large number of blocks and tiles have to be manufactured for the various building-works. The Gaoler's residence has been completed. The seventh block cottage is nearing completion. No. 2 cottage was removed to a better position on the Church Road. The kitchen has been removed from No. 1 Division to No. 2 Division, and a double hot-water service installed.

POLICE-STATIONS.

Hikurangi.—A new bath and basin have been installed, and various repairs carried out.

Kaikohe.—A new range, hot-water supply, and tanks have been provided.

Mangonui.—New bathroom, &c., has been provided.

Auckland Central.—Accommodation has been provided for female cook. Gymnasium has been renovated. Roof has been repainted, also all wood and ironwork of old buildings.

Takapuna.—Extensive repairs and renovations have been carried out.

Otahuhu.—Extensive repairs and renovations have been carried out.

Helensville.—Drains have been laid, and various renovations carried out.

Mercer.—Renovations and additions have been carried out to this building.

Otorohanga.—A well has been sunk, windmill and new tank-stand provided, also tanks to provide high-pressure water-supply to this station.

Taumarunui.—A new shower-bath was installed at the sergeant's residence, and the kitchen painted.

Ongarue Police-barracks.—The windows of the cells were covered with heavy wire gauze.

Tokaanu Police-barracks.—The main building and outhouses have been painted externally, also the picket fence.

Tauranga.—Repairs and renovations were carried out to this station.

Gisborne.—Furniture and fittings were supplied for offices, and store-room altered.

Wairoa.—This residence has been renovated and a small addition completed.

Napier.—Electric light has been installed at the Inspector's residence, and general renovations carried out. A motor-garage has been erected at the Byron Street Station.

Port Ahuriri.—Electric light has been installed, and renovations and alterations have been effected.

New Plymouth.—A new porcelain bath has been installed, and sundries provided.

Fitzroy.—The exterior of this building has been painted and renovated, new lavatory-basin fixed, &c.

Hawera.—The exterior of the lock-up has been painted and repaired, and the interior of the station painted. Electric light has been installed in both station and quarters.

Normanby.—The interior has been repapered and painted throughout, two new galvanized-iron tanks have been fixed, and spouting repairs effected.

Whangamomona.—A new range and hot-water service has been installed.

Bull's.—A contract has been let for the erection of a new residence, with lock-up and outbuildings. The work is well in hand.

Palmerston North.—The Inspector's residence was painted, papered, and renovated by contract. The police's sergeant's residence was also erected by contract.

Wellington.—At the Central Police-station a new gas cooker was installed in the kitchen, repairs were effected to the " Roberts " cooker and the kitchen waste-pipes, and alterations were effected to the water-supply and the sanitary fittings with a view to reducing the excessive water-consumption. At the Chief Detective's residence electric light was installed in one room, repairs were effected to the range and washing-copper, and a new sink and copper were installed. The residence at the back of the departmental buildings, formerly occupied by the Internal Affairs Department, was transferred to Buckle Street and re-erected as a police sergeant's residence. General repairs were effected at the Training-depot, Wellington South, and portions were papered and painted.

Kilbirnie.—The building was papered, and repairs were effected to the water fittings.

Lyall Bay.—The building was renovated, and additions were erected.

Dannevirke.—The police-station, sergeant's residence, and lock-up were erected by contract.

Masterton.—A new roof has been constructed over the lock-up.

Johnsonville.—The exterior of the building was painted, the interior renovated, and the site fenced.

Eastbourne.—The lock-up was transferred from Lower Hutt and was re-erected at Eastbourne.

Upper Hutt.—The building was painted and repaired, and the site was fenced.

Pongaroa.—The building was renovated by contract.

Weraroa.—The building was painted, papered, and renovated.

Lower Hutt.—The building was renovated by contract.

Petone.—Repairs were effected throughout the building.

Pahiatua.—Additions were erected by contract.

Eketahuna.—New stables were erected by contract.

Nelson.—The police-station, quarters, and outbuildings were painted externally. Two cottages, together with outbuildings, were painted externally.

Richmond.—The police-station and quarters, outbuildings, and lock-up have been painted externally.

Hokitika.—The erection of the police-station and sergeant's residence is now about complete.

Christchurch.—Electric light was installed in the Inspector's residence.

Bealey Flat.—A new range was supplied and minor repairs attended to.

Cheviot.—A hot-water system was installed here.

Papanui.—Repairs and renovations were attended to.

Timaru.—Some initial repairs and alterations and improvements to drainage have been carried out, and hot-water supply has been provided.

Lyttelton.—The painting and renovating of this building was completed.

Sumner.—Repairs and painting have been carried out.

Cheviot.—New tanks have been provided, and painting and repairing has been completed.

Okawa.—Painting and repairs generally have been put in hand.
Addington Reformatory.—Repairs to roof, well, and grates have been carried out.
Temuka.—Extensive repairs and renewals have been completed.
Amberley.—The main buildings and outhouses have been thoroughly repaired and repainted.
Riccarton.—Building has been repainted.
Glenavy.—A new hot-water service has been provided, the building repainted and papered, and fences renewed.
New Brighton.—This building has been papered throughout, the exterior painted, and general repairs effected.
Sydenham.—This building has been painted and generally overhauled.
Kurow.—The paths at this station have been asphalted.
Hampden.—Improved drainage has been completed.
Dunedin.—At the Central Station wardrobes have been supplied, spouting repaired, &c. Alterations at the Mornington Station, and alterations and renovations at the St. Kilda and Woodhaugh Stations, have been completed.
Balclutha.—A close-boarded and picket fence has been completed.
Clinton.—A hot-water service has been installed, and paths have been asphalted.
Lawrence.—Alterations and additions to the sergeant's residence have been carried out.
Milton.—A hot-water service has been installed, and a new tank, bath, and range have been supplied.
Outram.—This station has been repaired and renovated.
Owaka.—Renovations and repairs have been carried out.
Ravensbourne.—This station has been repaired and renovated.
Tapanui.—Back yard and paths have been asphalted, and laying of channel-pipes completed.
Waitahuna.—This station has been painted and renovated.
Wyndham.—New shelter-porch has been erected and water-supply provided.
Invercargill.—A hot-water supply and various fittings have been provided.
Nightcaps.—This building has been painted and repaired.

Mental Hospitals.

Avondale.—This work is progressing satisfactorily.
Tokanui.—The sashes have been reglazed where required, and the old paint-work on external doors burnt off and repainted three coats. The whole of the fire-extinguishers have been examined and recharged, and twenty-one additional extinguishers were charged and fixed. The progress of construction during the period under review has been very seriously retarded, owing to the difficulty of obtaining continuous supplies of material and labour, particularly bricklayers. The greater portion of brickwork on the male-block has been carried on by one bricklayer.
Avondale.—The window frames and sashes were constructed and glazed in the Public Works workshops for this work.
Nelson.—The new reception block (in brick) is in course of erection at a cost of £6,647, and is only progressing slowly. The drainage, brickwork, roofs, floor-joists, and wooden partitions are completed, and the woodwork, plastering, and plumbers' work is partly completed.

Native Schools.

Kirioke.—A new class-room is in course of erection.
Te Rawhiti.—This building has been repainted and repaired.
Waikare.—This building has been repainted and repaired.
Whirinaki.—This building has been repainted and repaired.
Matata.—A contract has been let for this school and residence, but progress has been slow owing to the shortage of materials.
Papamoa.—Painting and repairs have been completed.
Waiohau.—Timber is being pit-sawn for this building.
Manutahi.—The contract for the erection of a new school and teacher's residence has been completed.
Wharekahika.—An additional room has been added to the school.
Rangitukia.—Additions to the teacher's residence have been completed, and an open-air class-room has been added to the school. The joinery was supplied by the Public Works workshop.
Horoera.—The exterior of this building has been painted.
Waimarama.—Renovations have been effected.

Education.

Mount Albert Home.—The yard and footpaths have been tarred and sanded, and a shelter-shed with wash-basins has been provided.
Greenmeadows Receiving-home.—Renovations have been carried out and furniture provided.
Wellington.—A dental laboratory has been fitted up in the Normal School.
Receiving-home, Wellington.—One of the rooms has been papered.
School Dental Clinic, Nelson.—Two forms, wash-hand basin, towel-rails, and window-screens have been provided.
Sumner Deaf-mute's Institute.—The fire-hose has been renewed and fire-extinguishers have been provided.

Te Oranga Home.—The electric motor has been attended to at regular periods, and repair work done.

Receiving-home, Christchurch.—Minor works in connection with maintenance have been attended to.

Probation Officers' Home.—A new wash-basin has been supplied and fixed, also repairs to the house have been carried out.

DEFENCE DEPARTMENT.

Whangarei.—The erection of the new rifle range has been completed.

Auckland.—Accommodation has been provided at the drill-hall for a motor. The roof of the main building has been repaired and repainted. Four T.B. shelters have been erected for soldier patients.

Narrow Neck Camp.—Repairs have been carried out to married men's quarters.

Cambridge.—The whole of the exterior woodwork of the drill-hall and outbuildings has been painted and renovated.

Ruakura Experimental Farm.—A new building for the purpose of housing the electric-light engine and plant has been erected. A duplication of No. 1 Block as far as the quarters are concerned has been carried out, and an additional building for recreation-room and store-room has been built. An additional kitchen-room has been provided to cope with the extra number of soldiers. A store, 90 ft. by 30 ft. in concrete is in course of erection and is close to completion. A transformer-house, 30 ft. by 20 ft., also in concrete, is in course of erection. The building of two cottages in concrete blocks is in hand, and one is nearly completed.

New Plymouth.—The floors of the Coronation Hall have been repaired, and a miniature rifle range has been installed at one end of this building. General repairs have been effected to the Rewa Rewa Rifle Range.

Napier.—Electric light has been installed, and general repairs have been effected to floors and sashes. The iron for reroofing the building is in hand. The yard at the Artillery Barracks has been re-formed and metalled. The window-opening at the magazine has been bricked up and the door strengthened.

Roy's Hill Rifle Range.—Repairs to targets, &c., have been effected.

Hastings.—The renovations at the drill-hall are practically completed.

Pukeora Sanatorium, Hospital Ward.—Good progress has been made with the erection of this building out of material taken from Featherston Camp.

Masterton.—Alterations have been effected to the drill-hall offices.

Wellington.—Extensive alterations to Buckle Street offices are being effected to provide accommodation for the Base Records and War Expenses Branches. At headquarters a skylight was installed, a number of rooms were renovated, and repairs were effected to the drains and sanitary fittings. The heating system in the Whitmore Street office was overhauled; the roofs were painted and improvements were effected to the ventilation. T.B. shelters for Korokoro and Wadestown were erected by the Public Works staff. At Alexandra Barracks repairs were effected to the heating-boiler and kitchen-sink. The Kaiwarra Magazine buildings and cottage were painted and renovated. Five of the Naval offices in Harcourt's Building were renovated. The exterior of the Ordnance Stores was painted, and repairs were effected to the workshop furnace. The electric-light gear at Karori School grounds, which were formerly used for parade purposes, was dismantled. Repairs to the Garrison Hall were carried out. At Polhill Gully rifle range a gas cooker was put in in the caretaker's cottage.

Nelson.—The inside walls and ceiling of the 12th Regimental Store have been covered with beaver-boards, rifle-racks constructed, and the building painted externally. A veranda for the use of invalided soldiers was enclosed with boarding to a certain height and then filled in with hinged sashes.

Stoke.—A portion of the target-gallery embankment has been turfed.

Christchurch.—Many T.B. huts and tents have been erected and fitted out in various parts of the district, as requested by the Defence Department.

Duvauchelle's Bay.—General repairs to the rifle range have been carried out.

Kaiapoi.—General repairs to the rifle range were also carried out here.

Hanmer.—At Queen Mary Hospital minor repairs and supplies were attended to.

Erskine Point Magazine.—This building has been repaired.

Hanmer Pipe-line.—Various repairs have been effected to this line.

Kensington Drill-hall.—The caretaker's residence has been renovated.

Central Battery.—Alterations to the garage have been carried out.

Invercargill.—Defence Department's offices were shifted from Defence Buildings to new offices. Several collapsible shelters were repaired and others erected for T.B. patients.

Winton Drill-hall.—Repairs to the floor have been carried out.

JOHN CAMPBELL, F.R.I.B.A.,
Government Architect.

APPENDIX D.

ANNUAL REPORT OF CHIEF ELECTRICAL ENGINEER.

The Chief Electrical Engineer to the Hon. Minister of Public Works.

Sir,—

I beg to report on the position of the electric-power developments of the Dominion for the past year as follows:—

General Power Requirements.

The general scheme of hydro-electric development for the Dominion as laid out by my predecessor is based on an estimated demand of one horse-power delivered to each five head of population. In estimating the generating-power required to deliver this amount an allowance is made to cover losses amounting to 23 per cent. of the power delivered.

On the basis of the 1916 census the following total power is thus required for the supply of the whole Dominion:—

	North Island.	South Island.	Total.
Population	650,000	450,000	1,100,000
Horse-power delivered	130,000	90,000	220,000
Horse-power generated	160,000	110,000	270,000

The 1921 census indicates an increase on these population figures of 14 per cent. for the North Island and 6¼ per cent. for the South Island, including all returned soldiers not included in the 1916 census. As the schemes already worked out in detail on the basis of the 1916 census allow a reasonable margin for development, it is not desirable to recast them at this stage, but the more rapid increase in the North Island than in the South Island must be taken into account.

At the same time, the estimate of 0·2 h.p. per head of population must not be considered as an ultimate limit to the demand, which, owing to the favourable opportunities for cheap hydro-electric developments in the Dominion, will ultimately reach a much higher figure. Canada already has an installed capacity of 0·274 h.p. per head. California has an installed capacity of 0·53 h.p. per head, and it is estimated that by 1930 this will have been increased to 0·8 h.p. per head of population. The proposed hydro-electric developments in New Zealand are as economical as those in Canada, and generally more economical than most of those in California, and developments may therefore be anticipated here at least to the same capacity as in Canada. But in the meanwhile the basis of 0.2 h.p. per head is fairly ample, being approximately twice the power now used in Christchurch and Dunedin, which have been supplied with fairly cheap hydro-electric power for some years.

Main North Island Scheme.

In order to supply this power for the North Island a complete interconnected scheme was laid out by Mr. Parry, consisting of 1,112 miles of main transmission-lines and 309 miles of branch lines. For the main transmission-lines the distances and quantities of power to be transmitted involved the adoption of a pressure of 110,000 volts, and for the branches a pressure of 33,000 volts, except for the Waikato branch, where a pressure of 50,000 volts was already in operation from the Horahora power plant.

This network is to be fed from three main points, viz.:—

	Proposed Development. Horse-power.	Ultimate Capacity. Horse-power.
Mangahao River	24,000	24,000
Waikaremoana	40,000	136,000
Arapuni	96,000	162,000
Totals	160,000	322,000

This system is to be connected up ultimately with the existing hydro-electric-power stations at Horahora (8,400 h.p.), New Plymouth (1,000 h.p.), and Wairua Falls (2,600 h.p.). The estimated cost of the whole North Island system, based on 12 per cent. excess over pre-war prices, was as follows:—

	Amount. £	Per Horse-power. £
Power-stations—		
Mangahao (24,000 h.p.)	438,654	18·30
Waikaremoana (40,000 h.p.)	544,369	18·16
Arapuni (96,000 h.p.)	1,078,700	10·80
Total power-stations (160,000 h.p.)	2,061,723	12·88
Main transmission-lines: 1,112 miles at £1,400 per mile ..	1,553,880	11·22
Branch transmission-lines: 309 miles at £780 per mile ..	241,360	
Main substations	838,808	5·24
Distribution-lines and secondary substations	2,086,000	13·04
Interest during construction	271,271	1·69
Working capital	250,000	1·56
Totals	£7,303,042	£45·63

It was estimated that it would take ten years to carry out this work, and that the annual cost, allowing 7½ per cent. for capital charges (interest, depreciation, and sinking fund) and £220,000 per year working-expenses, would be £5·9 per horse-power year—practically £8 per kilowatt-year.

The present actual costs are proving to be over 50 per cent. in excess of pre-war costs instead of 12 per cent., and the following statutory authorizations have been made enabling this whole North Island scheme to be undertaken :—

	£
Electric Power Works Loan Act, 1919—	
Arapuni Electric-power Works	4,500,000
Mangahao Electric-power Works	1,600,000
Horahora Electric-power Works	412,500
Waikaremoana surveys	30,000
Finance Act, 1920—	
Waikaremoana Electric-power Works..	2,600,000
Kaituna River Electric-power Works	150,000
Other surveys and investigations	30,000
	£9,322,500

Towards the carrying-out of this programme the position at the end of the financial year under review is as follows :—

The Horahora plant (8,400 h.p.) and main transmission-line to Waihi (50 miles) have been purchased from the Waihi Gold-mining Company for £212,500, and the extensions of the lines to Cambridge, Hamilton, and Te Awamutu have been carried out. It is also proposed to extend the Horahora power plant by the addition of another two units of 2,600 h.p. (2,000 kw.) capacity each, bringing the total capacity of the plant up to 13,600 h.p., for which capacity water will be available except for limited periods in exceptionally dry years.

Supply was commenced to Cambridge on the 28th April, 1921, to Hamilton on the 31st May, 1921, and to Paeroa (through the Thames Valley Power Board) on the 29th March, 1921. Lines have also been erected to Te Awamutu and Te Aroha, and the necessary material is on order for the first of the main 110,000-volt lines to Auckland. This will be supplied in the meanwhile by power from Horahora, giving an emergency supply for the essential industries of the city. Negotiations for a substation site near Penrose are in hand.

Mangahao.—The Mangahao headworks have been pushed on during the year. Tenders were invited for the pipe-lines, but owing to the falling market it was decided to call fresh tenders closing on the 1st November, 1921. Specifications for the balance of the plant have been ready for some time, but for the same reason were held back until it was anticipated more reasonable prices would be available, and tenders were invited accordingly, and closed on the 29th November, 1921. The transmission-lines poles are being delivered. The land for the main substation for the Wellington District has been secured.

Arapuni.—At Arapuni Gorge further investigations and exploration drives have been carried on throughout the year. The results were submitted to a committee of engineers, on whose suggestions the quantity of concrete in the proposed dam has been increased to render it safe as a gravity dam apart from its strength as an arch dam, and this work is now ready to be proceeded with. Suitable deposits of sand, shingle, and rock have been located for the necessary concrete.

Waikaremoana.—At Waikaremoana the approach roads and bridges are in hand, and the power house surveys carried on. The two permanent exciter units of 500 h.p. each have been ordered, and it is proposed to erect these in a temporary power-house as soon as they arrive, and to utilize them for the construction of the permanent works and for commencing supply to the Wairoa Electric Power Board. Portions of this material have already arrived in the Dominion.

At Rotorua (Kaituna River scheme) surveys have been completed, but owing to the financial stringency and to the fact that the supply to Rotorua requires augmentation before this scheme could be completed, tenders have been called for a 200 h.p. Diesel engine plant for installation in the town.

The total expenditure on all the North Island schemes and surveys to the 31st March last is as follows :—

	Expended during the Year ended 31st March, 1921.	Total Expenditure to 31st March, 1921.
	£	£
Works—		
Horahora	73,768	294,742
Mangahao	120,361	143,110
Arapuni	5,291	11,276
Waikaremoana	2,184	2,907
Surveys and investigations—		
Hutt River (including purchase of land) ..	..	2,779
Tauherenikau River	..	880
Kaituna River	109	1,217
Aratiatia Rapids	..	376
Huka Falls	10	413
Wairua River	..	236
Makuri River	..	38
	£201,723	£457,974

South Island Schemes.

No comprehensive scheme has previously been drawn up for the South Island, and it has not been possible yet to bring the investigations to the stage of a final decision as to the sources of power, but sufficient information has been obtained to enable the general outlines of such a scheme to be laid down for the Canterbury, Otago, and Southland portions of the Island. It will consist ultimately of a completely interconnected transmission-system generally on the same lines as the North Island scheme, and supplied with power from four or five main power-houses and two or three subsidiary sources.

The population of the South Island according to the 1916 census was 448,377, and the amount of power required on the same basis as adopted for the North Island—viz., one to five—is 90,000 h.p. Allowing 22 per cent. of the power delivered for losses in distribution, the generated horse-power required is 110,000, as compared with 160,000 for the North Island. The growth of population is not so rapid in the South Island (only $6\frac{1}{4}$ per cent. for the five-years period since the 1916 census, as compared with 14 per cent. for the North Island). Moreover, the population in the South Island is more concentrated round certain definite centres, and the main power sources already in operation are nearer these centres of population than those proposed for the North Island. These considerations, combined with the smaller power to be transmitted, point to a lower standard voltage than the 110,000 volts adopted for the North Island. The transmission-pressure already adopted for the Lake Coleridge system and the proposed Southland (Lake Monowai) system is 66,000 volts. This is the highest pressure for which pin-insulator construction is reliable, and this type of construction has a great advantage in first cost over the 110,000-volt suspension-insulator type of construction which has been necessary for the larger powers and longer distances to be transmitted in the North Island. The minimum length of the pole is reduced from 52 ft. to 42 ft., and in this and other directions a saving of about £400 per mile is possible in standard transmission-line construction with the lower voltage. The present transmission-pressure from Waipori Falls to Dunedin, a distance of only 30 miles, is 35,000 volts, but this is too low to be extended economically into general transmission-system.

Surveys are sufficiently advanced to enable a comprehensive scheme to be drawn up for the Canterbury, Otago, and Southland Districts. For the other portions of the Island the surveys are still in hand, and definite proposals cannot yet be laid out. For Canterbury, Otago, and Southland the main 66,000-volt transmission-system proposed is shown on the map herewith, amounting to a total of 759 miles, made up roughly as follows :—

	Miles.
Lake Coleridge to Christchurch	63 (double).
Lake Coleridge to Waipara	70 (single).
Lake Coleridge to Timaru	95 (double).
Timaru to Oamaru	58 (double).
Oamaru to Dunedin	63 (double).
Dunedin to Waipori Falls	28 (double).
Oamaru via Alexandra and Roxburgh to Rae's Junction	133 (single).
Rae's Junction to Waipori Falls	30 (single).
Rae's Junction to Gore	37 (single).
Waipori via Balclutha to Gore	84 (single).
Gore to Winton	30 (single).
Winton to Lake Monowai	48 (double).
Winton to Invercargill	18 (single).

Total : Double line, 357 miles ; single line, 402 miles : equivalent to 1,116 miles of single line.

It will be noted that there are several large loops in this system, giving the advantages of a duplicate supply to the majority of districts even when a single line only runs through them.

From this main 66,000-volt system supply will be given to the various Power Boards or reticulating authorities, who will be responsible for the secondary 33,000-volt, 11,000-volt, or 3,300-volt feeders and the low-tension distributors.

On the main 66,000-volt transmission-system substations will be located at intervals of 20 to 60 miles according to the demand ; but in general it will not be economical to tap the main line unless there is a demand, immediate or in view, for at least 300 h.p. from each such substation. From these main substations supply will be given to the Power Boards at 11,000 or 33,000 volts. At the former pressure the feeders will have an economical range of 20 to 25 miles, and at the higher feeder-pressure a range of 40 to 50 miles for small amounts of power. These ranges from the main 66,000-volt substations with the network described above will economically cover practically the whole districts concerned. There will remain a few isolated spots, such as Queenstown and Hanmer, which can be more economically dealt with by a small local water-power plant, but with the Power Board organization set out in my previous annual report the requirements of the whole Island are taken into account.

The balance of the South Island consists of the settled districts round Blenheim, Nelson, Westport, Greymouth, and Hokitika, with the very sparsely settled areas between.

Taking the whole of the population, both town and country, into account, the following is the total demand, based on the very ample allowance of one horse-power to five head of population ; and in these sparsely settled districts it will take many years to reach this stage of development :—

District.	Population.	Horse-power required.
Marlborough	16,507	3,300
Nelson	23,566	4,700
Buller	15,221	3,000
Grey	12,382	2,500
Westland	7,292	1,500
Totals	74,968	15,000

But these districts differ from the rest of the Dominion in that the demand is more concentrated near the towns. There is very little dairying except just round the centres of population; these centres are more widely separated; the connecting roads are very rough, mountainous, and difficult for transmission-line construction and maintenance, and, above all, there are local water-powers near each centre which, with one exception, can be developed very cheaply up to the capacity required for ordinary domestic and industrial purposes for many years to come. No doubt the completely interconnected scheme provided for the rest of the Island will ultimately be extended to these centres as well, but the above circumstances render it impossible to justify main interconnecting-lines between these small centres at present, and full surveys of each district are necessary. The local sources that have been proposed are as follows:—

	Ultimate Capacity. Horse-power.
Marlborough District—	
Clarence River	14,000
Waihopai River	2,000
Nelson District—	
Gowan River (Lake Rotoroa)	30,000
Lake Rotoiti	10,000
Boulder Lake	11,000
Wairoa River	1,400
Buller District: Four-mile Creek	5,000
Greymouth District: Kumara Water-race	2,000
Westland District—	
Toaroha River	10,000
Kanieri Lake	3,000

Of these, preliminary examinations have been made during the year of the Clarence River, Waihopai River, and a detailed survey of the Gowan River. It is proposed during the coming year to carry these surveys on to the stage at which a definite decision can be made of the most economical sources of supply for these districts.

Waikato Electric-power Supply.

The Horahora plant was acquired by the Department from the Waihi Gold-mining Company on the 1st November, 1919, and operated by the company for the five months ending 31st March, 1920, so that the year ended is the first complete year of operation by the Department.

Financial Results of Operation.

The capital outlay at the end of the year was £249,745, exclusive of stocks of material for new work, as compared with £215,064 on the 31st March last. This is analysed in Table A. Cost and load records are given in Table B.

Future Prospects.

A contract has been entered into with the Grand Junction Company under which the Department undertakes to supply the company with power during the night hours and when it is available during the day—that is, until the demand of other consumers, including the Waihi Company, grows approximately to 6,000 kw. When the load of the Department's ordinary consumers grows beyond the capacity of Horahora, the Grand Junction Company will supply power to the Department, generated at its steam plant at Waihi, up to an amount not exceeding 2,000 kw., above the requirements of the mine. Supply to this consumer commenced in January, and so far is only for a partial supply of about one-third of its total demand.

Another contract, with provision for use of standby plant, has been made with the Cambridge Co-operative Dairy Company, in connection with their plant at Hautapu. A contract has been made with the Thames Valley Power Board for supply to them at Waikino, and arrangements are being made to supply the Thames Valley Board at Horahora and Waihou, the Te Awamutu, Cambridge, and Central Power Boards, Hamilton Borough Council, and the Railway Department's factory at Frankton.

After providing for the requirements of the Waihi Gold-mining Company, and reserving 500 h.p. for special industries and 200 for the Arapuni works, and allowing for one spare unit of 1,400 h.p., there is left for allocation to the different Power Boards 2,400 h.p. out of a total of 8,400 h.p.

As far as possible the spare unit will be utilized to supply power to factories, &c., which already have steam plants installed and can be cut off in case of necessity without any great inconvenience. Such factories are the Hautapu Dairy Factory mentioned above, and the New Zealand Co-operative Dairy Company's factories at Frankton, Waitoa, Waharoa, and Te Awamutu.

Extensions.

Transmission-line construction was commenced in November on the Horahora–Hamilton 11,000-volt line, which has been completed to Cambridge and Hamilton.

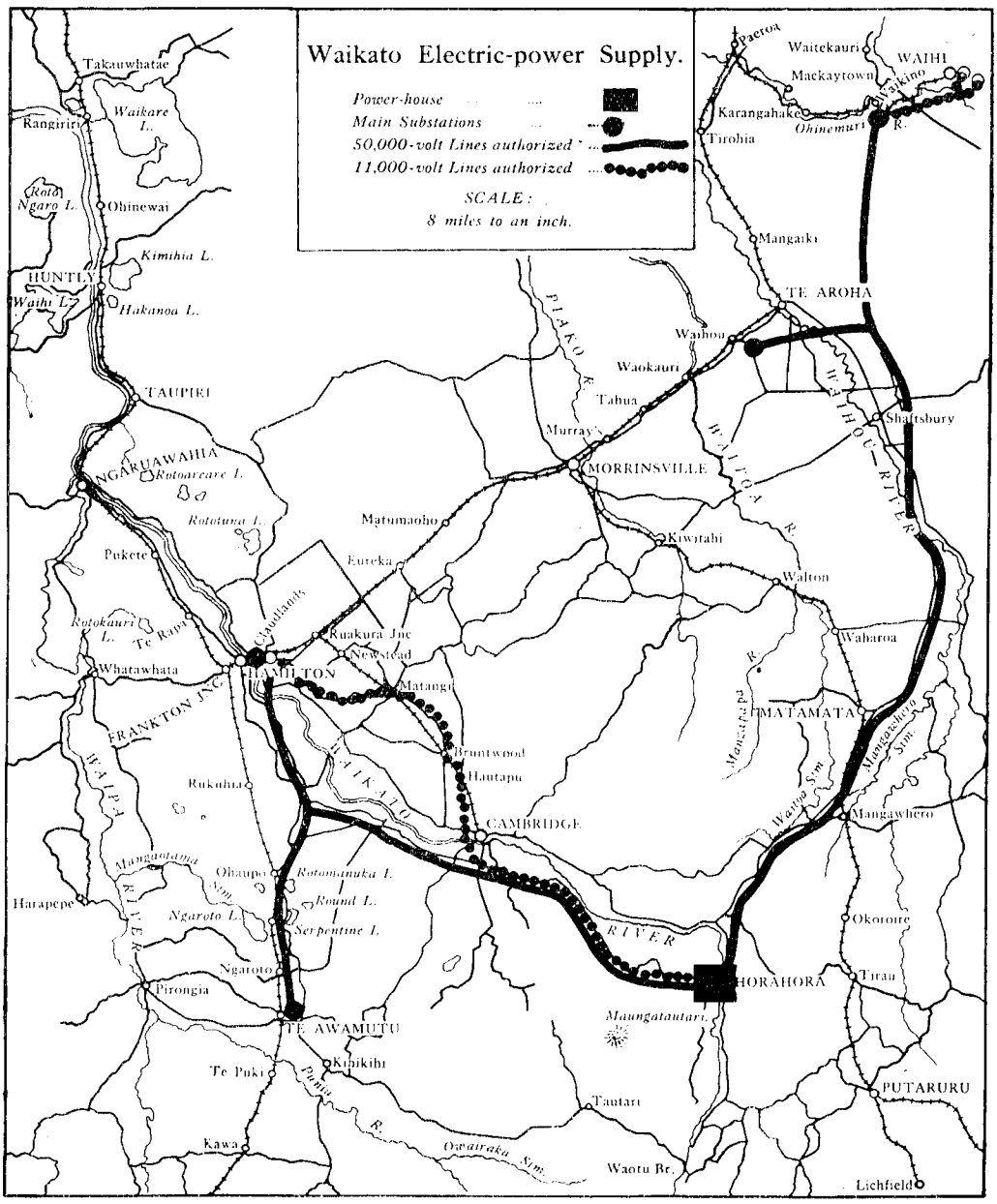
Orders have been placed for material for the following extensions, all of which should be completed within the next year:—

Horahora Power-station.—Additional transformers and switch gear required to supply at 11,000 volts.

Transmission-lines.—11,000-volt lines to Cambridge, Hamilton, and Te Awamutu, a total of 32 miles (approximately); 50,000-volt lines from Horahora to Hamilton and Te Awamutu, and from Waiorongomai, on the Horahora–Waikino line, to Waihou, a total of 46 miles (approximately).

Substations.—50,000-volt to 11,000-volt equipment for substations at Waihou, Hamilton, Waikino, and Te Awamutu.

These lines and substations are shown on the map below.



Power-house Extensions.—Designs have been prepared for extensions (two 2,000 kw. units) to the power-station at Horahora, and tenders for the supply of the plant for these extensions are closing early in 1922.

Operation Headworks and Power-house.

During the Christmas shut-down the opportunity was used to examine the race, and to alter the screens to prevent them being choked by weed and pumice, of which a considerable amount is brought down in flood-time. The indications are that considerable improvement has been effected.

The turbines have all been overhauled, and adjustments made which have improved their operation and particularly the governing.

Tests have been made on the power-house working on artificial load up to its full capacity. When this was first tried, full load could be maintained only for a few minutes, owing to the badly blocked screens causing the water in the turbine-pits to drop. Since the alterations to the screens the plant has carried full load for several hours without any difficulty, but at extreme low water the most that can be carried is 5,700 kw., showing that to utilize the increased plant capacity at low water it will be necessary to extend the wing-dam and weir at the intake. Provision is being made for this work. Measurements made on the water left in the river at the time of this test indicate that the total power obtainable at Horahora, with reconstructed dam and increased head, is about 8,400 kw. at the low-water period.

Transmission-line.

Various defects in the transmission-line have been remedied with good results. Some of the towers have been tarred as a protection against the weather, but much remains to be done in this direction. This work is difficult to carry out, as the time during which the line can be made "dead" for this purpose is very short.

Interruptions to Service.

Apart from the shut-down for overhaul for 41 hours 7 minutes at Christmas, the total number of interruptions was twenty-three, for a total time of 45 hours 26 minutes; eight of these were of 1 hour duration or more, for a total time of 38 hours 14 minutes. Three breakdowns only were due to insulator trouble, the rest being due mostly to mechanical faults and defects in apparatus which have been remedied.

There have been no troubles on the Thames Valley Power Board's 11,000-volt line, Waikino to Paeroa, or on the 11,000-volt lines from Waikino to the Waihi Mine and the Junction Mine.

Table A.—Capital Outlay, Horahora.

The capital outlay at end of year was £249,744 19s. 11d., as compared with £215,097 5s. 9d. at the beginning of the year, distributed as follows :—

——	1920.	1921.	Increase.
	£ s. d.	£ s. d.	£ s. d.
Land, freehold	762 5 8	876 13 1	114 7 5
Service-roads, bridges, &c.	2,052 12 11	2,091 8 6	38 15 7
Tools and equipment	..	406 4 7	406 4 7
Headworks	86,190 2 7	86,395 4 2	205 1 7
Generating-station	25,874 8 1	26,004 17 11	130 9 10
Transformers, building, and machinery	14,914 1 8	20,896 0 3	5,981 18 7
Properties, dwellings, &c.	4,192 14 5	7,435 6 5	3,242 12 0
Transmission-lines—			
Horahora-Waihi (including lineman's house)	44,503 10 0	44,695 4 3	191 14 3
Branch line to Grand Junction	..	535 16 1	535 16 1
50,000-volt—			
Horahora-Hamilton	..	71 3 3	71 3 3
Mystery Creek-Te Awamutu	..	6 13 2	6 13 2
11,000-volt—			
Horahora-Leamington	..	11,858 7 6	11,858 7 6
Leamington-Hamilton	..	2,443 17 2	2,443 17 2
Hamilton-Frankton	..	1 18 10	1 18 10
Distribution tools and accommodation for line gangs	..	1,136 10 11	1,136 10 11
Substations—			
Waikino	17,724 9 0	17,724 9 0	..
Hamilton	..	83 19 2	83 19 2
Te Awamutu	..	131 6 4	131 6 4
Motor-cars, lorries, and cycles	100 0 0	2,804 19 8	2,704 19 8
Workshop tools and equipment	..	825 19 1	825 19 1
Supervision office and engineer	1,671 3 9	5,831 17 4	4,160 13 7
Stores buildings and fittings	..	1,400 11 10	1,400 11 10
Interest during construction	14,537 8 8	15,954 10 11	1,417 2 3
Stocks of materials on hand	2,541 5 6	..	..
Siding at Ruakura	..	132 0 6	132 0 6
	215,064 2 3	249,744 19 11	34,680 17 8

Table B.—Operating Results for Year ending 31st March, 1921, Horahora.

Capital outlay	£249,745
Costs—	
Working-costs	£6,354
Interest	£10,625
Depreciation (2 per cent.)	£4,025
Total costs	£21,004
Revenue—	
Wholesale consumers	£14,577
Miscellaneous (rents)	£86
Total revenue	£14,663
Accumulated depreciation fund	£5,653
Accumulated debit balance—Profit and loss account	£8,464
Maximum load (kilowatts)—	
Power-house	3,500
Average weekly	2,675
Waikino Substation	3,200
Average weekly	2,452
Waihi Gold-mining Company	2,800
Waihi Grand Junction Company	550
Output (units)—	
Power-house	16,729,050
Waikino Substation	15,390,600*
Sold (units)—	
Waihi Gold-mining Company	14,477,387*
Waihi Grand Junction Company	738,613
Other consumers	160,000*
Total units sold	15,376,000*
Losses (units)—	
Transmission losses	1,338,450*
Percentage	8*
Average weekly load factor (per cent.), power-house	71
Working-costs—	
Per kilowatt (power-house max.)	£1·765
Power-house average weekly max.	£2·376
Per kilowatt (substation max.)	£1·98
Substation average weekly max.	£2·59
Per unit generated	0·091d.
Per unit sold	0·099d.
Capital charges—	
Per kilowatt (power-house max.)	£4·07
Power-house average weekly max.	£5·47
Per kilowatt (substation max.)	£4·58
Substation average weekly max.	£5·97
Per unit generated	0·210d.
Per unit sold	0·228d.
Total cost—	
Per kilowatt (power-house max.)	£5·835
Power-house average weekly max.	£7·846
Per kilowatt (substation max.)	£6·56
Substation average weekly max.	£8·56
Per unit generated	0·301d.
Per unit sold	0·327d.
Revenue—	
Per kilowatt (power-house max.)	£4·07
Power-house average weekly max.	£5·48
Per kilowatt (substation max.)	£4·57
Substation weekly average max.	£5·94
Per unit generated	0·210d.
Per unit sold	0·229d.

* Estimated.

Table C.—Total Connected Load in Kilowatts, Horahora.

—	Light.	Heat.	Power.	Total.
Waihi Gold-mining Company	164	100	4,461	4,725
Grand Junction Company	38	38	884	960
Rising Sun Company	..	..	80	80
Miscellaneous	10	20	20	50
	212	158	5,445	5,815

Diversity factor $\left\{\begin{matrix}\text{Connected load} = 5{,}815 \\ \text{Max. P. H. load} = 3{,}600\end{matrix}\right\} = 1{\cdot}615.$

LAKE COLERIDGE HYDRO-ELECTRIC SUPPLY.

The year ending 31st March, 1921 (the sixth year of operation), has again closed with a credit balance after paying all charges.

The year was abnormally dry, and no serious snow troubles were experienced through the winter; nevertheless, considerable transmission-line trouble was experienced as a result of insulator-failures, the failures being approximately 50 per cent. more than in the previous year.

The plant, though operating under conditions of heavy overload for the major portion of the year, has stood up well to its work, and has been maintained in an efficient condition.

The revenue for the year was £51,373; working-expenses, £21,341; capital charges, £18,639; and allowing £7,946 for depreciation, this yielded a credit balance of £3,447 in excess of all charges.

Capital Outlay.

The capital outlay to the end of the year was £499,957, as against £422,076 for the previous year. Details of this expenditure are shown in Table E.

Financial Results of Operation.

Table D gives the financial results of operation and load records. It will be noted that the power-house maximum shows an increase of 6½ per cent., and units output of 10 per cent. over that of the previous year owing to the load factor being improved from 59·9 to 61·4 per cent.

The total generating-costs per unit generated and per unit sold show an increase respectively of 0·07d. and 0·05d. These increases are accounted for in the main by—(1) Increased interest payable; (2) increases in salaries and wages; (3) additional demand made on standby plant owing to line-failure; (4) transmission-line maintenance being 50 per cent. in excess of previous year.

Table F shows the operating-costs for the year under consideration as compared with those of the previous year, and Table G gives the gross financial results of distribution of energy.

Extensions.

No. 5 generator of 3,000 kw. capacity arrived and was placed in position and coupled up to its turbine.

All the material for the third pipe-line is to hand, and the contractors commenced erection in September, 1920, and completed it in August, 1921.

A start has been made on the erection of a switching-station at Windwhistle. This is the distribution station from which the South Canterbury line feeding Timaru and Oamaru (ultimately linking up Waipori), and the North Canterbury line to Kaiapoi via Sheffield and Oxford, will be fed. A small breakdown station is also being erected at this point for local reticulation.

The erection of the third main transmission-line between the power-house and Christchurch has also been started, and provisional surveys made on the North and South Canterbury routes.

Whilst the supply of power available has been limited, nevertheless 11,000-volt reticulation has increased from 72¾ miles to 77¼ miles, and the City Council has increased its 11,000-volt underground feeders from 18½ miles to 19 miles. No additions have been made by the Department to the 3,000-volt lines, but local bodies supplied by the Department have increased their 3,000-volt lines from 65 miles to 70¾ miles.

Connected Load (Table H).

The total connected load increased to 34,277 kw., or 12½ per cent. increase on that of the previous year. This load made a maximum demand on the substation of 6,712, which gives a diversity factor of 5·10, a very high figure, due to the encouragement of off-peak loads.

Operation.

The operation of the plant at Coleridge has, owing to the continuous heavy demands on it, entailed incessant care, and the greatest credit is due to the Superintendent and his staff for the excellent results obtained.

A considerable measure of anxiety was occasioned early in the year under review by the undue wear on turbine liner-rings of Nos. 3 and 4 units. This was brought about through the excessive fall in the lake, necessitating continuous work on the lip of the rock at the mouth of the intake. As a result, considerable quantities of sand and shingle were carried down through the machines. New liner-rings were made locally and installed with satisfactory results.

A test taken on the machines in March, 1921, gave an over-all efficiency, surge-chamber to tail-race, of 71 per cent., which under the circumstances can be regarded as satisfactory.

The maximum load recorded at the power-house was 7,420 kw., representing an overload of 24 per cent. on each of the four generators.

The transmission-line insulators have given every indication of progressive deterioration, and during the latter portion of the year, prior to completion of the annual overhaul, breakdowns occurred frequently. A rigorous overhaul and replacement of insulators showing signs of defect has resulted in a very pronounced improvement in this respect.

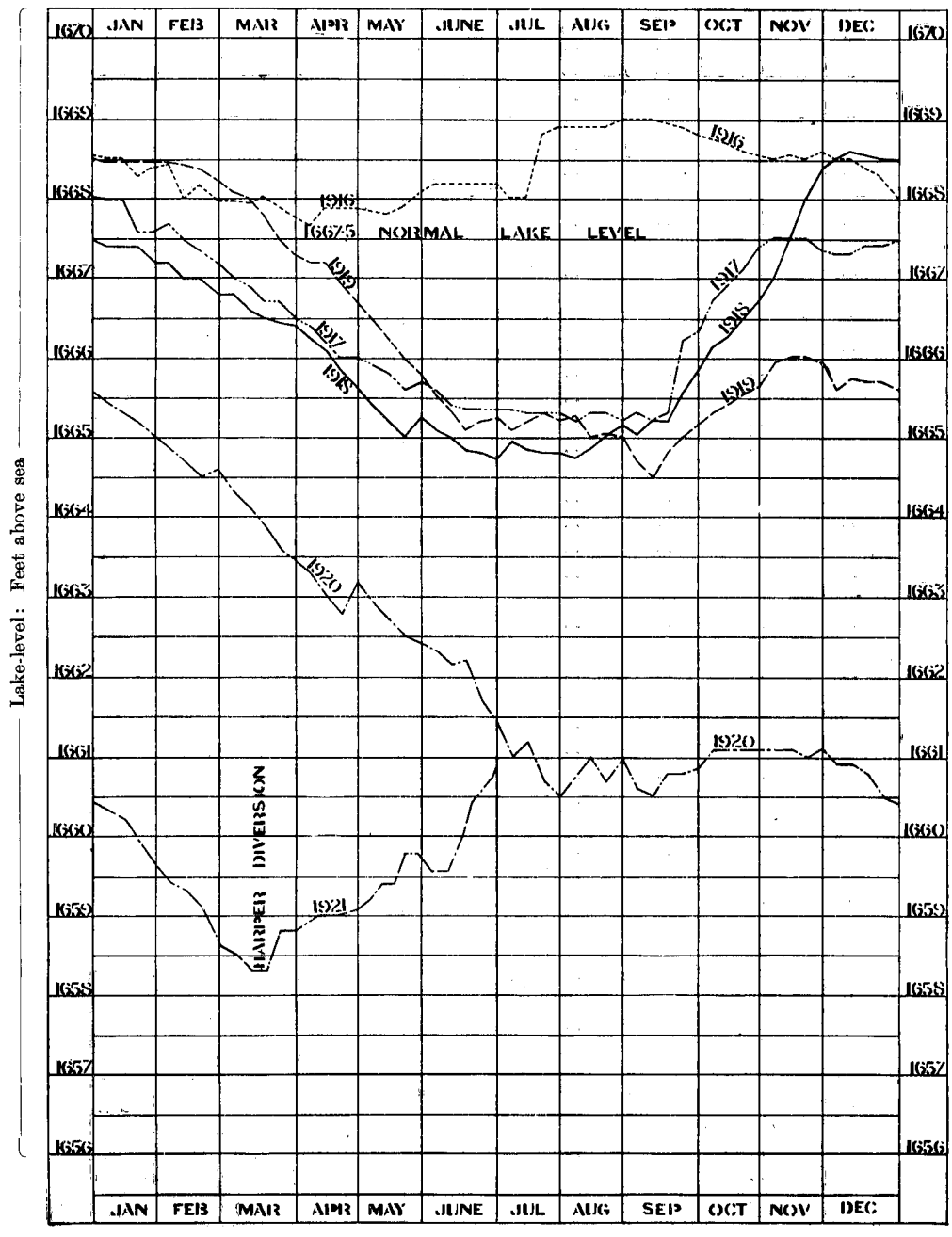
The year passed without any serious troubles occurring on the lines, and all operating equipment has worked satisfactorily.

Interruption to Service.

During the year two interruptions in service occurred exceeding a few seconds, one on the morning of the 15th June, the north line failing while the south line was under repair; the second line failed at 12.44 a.m. and was restored at 4.58 a.m. The second breakdown was on the morning of the 6th February, when, owing to line trouble, the emergency gear on the turbines came into operation and shut down the station. The failure took place at 12.3 a.m., and, owing partly to the time at which it occurred and partly to the fact that a very thorough investigation of the cause of shut-down was essential before again putting the plant into operation, supply was not resumed until 2.40 a.m.; thus a total interruption of two hours and forty minutes ensued, but fortunately at a period of light load and therefore with a minimum of inconvenience to consumers.

Water-storage.

After an abnormally dry year, and with the increased demand for power, the anticipated recovery in the lake-level in the spring of the year did not take place. The level fell at the beginning of March to 1,658·8, the lowest point so far reached, and only by concentrating on the lowering of the lip of rock at the entrance to the intake was the supply maintained. In the meantime the work of cutting the race and building of intake for the Harper diversion had been energetically pursued, and on the 3rd March, 1921, a small temporary diversion of the river was made. The immediate result was most gratifying in that the downward trend in the lake-level was stopped, and there is every indication that the position will be secure until such time as the permanent diversion of the river is completed. A graph showing the effect of the diversion on the lake-level is published herewith.



CURVES SHOWING VARIATIONS IN LAKE-LEVEL.

Selling-rates.

The selling-rates for supply have been slightly modified, and all additional consumers and those whose agreements expire are now placed on the standard rates.

Industrial Developments.

The shortage of power has restricted new industrial developments, and neither Messrs. Kempthorne-Prosser's new chemical works in Hornby nor the Kaiapoi Woollen Company's works in Woolston are as yet receiving power. Messrs. Waddell's steel-furnace has been operating fairly continuously during the last few months of the year, but in the meantime is confined to night supply only.

Table D.—Operating Results, Lake Coleridge.

Results of Operation.	Third Year, March, 1918.	Fourth Year, March, 1919.	Fifth Year, March, 1920.	Sixth Year, March, 1921.
Capital outlay	£389,754	£403,157	£422,076	£499,957
Costs—				
Working-costs	£14,449	£17,138	£17,759	£21,341
Interest, 4 per cent.	£14,871	£15,692	£16,863	£18,639
Depreciation, 2 per cent.	£7,013	£7,329	£7,624	£7,946
Total costs	£36,333	£40,159	£42,246	£47,926
Accumulated depreciation fund	£19,411	£27,393	£35,389	£44,751
Accumulated deficiency	£34,871	£37,707	£34,121	£30,674
Revenue—				
City Council	£11,338	£13,556	£16,029	£17,700
Tramways	£7,024	£6,885	£7,660	£7,835
Wholesale consumers	£10,804	£14,090	£18,735	£22,339
Retail consumers	£1,912	£1,529	£1,952	£1,785
Miscellaneous	£1,014	£1,264	£1,455	£1,714
Total revenue	£32,092	£37,324	£45,831	£51,373
Maximum load (kilowatts)—				
Power-house	5,438	5,900	7,066	7,412
Substation	4,800	5,340	6,260	6,712
City Council	2,260	2,625	2,966	3,601
Tramways	1,660	1,580	1,760	1,840
Units output—				
Power-house	22,403,660	27,495,720	33,010,130	36,309,580
Substation	20,539,430	24,548,554	29,572,160	32,588,320
Units sold—				
City Council	9,183,700	10,886,290	12,936,340	14,700,000
Tramways	5,634,403	5,485,370	6,417,900	6,379,717
Wholesale consumers and local bodies	4,719,283	6,770,488	8,348,174	10,051,734
Retail consumers	307,290	245,398	315,562	270,900
Total units sold	19,844,676	23,387,546	28,017,976	31,402,351
Losses (units)—				
Transmission-line losses	1,864,230	2,947,166	3,437,960	3,728,190
Percentage	8·3	10·7	10·1	10·27
Distribution losses	694,754	1,161,008	1,472,414	1,185,969
Percentage	3·4	4·7	4·4	3·64
Average weekly load factor (percentage)—				
Power-house	58·0	59·1	59·9	61·4
Substation	58·4	58·4	58·6	60·5
City	54·8	52·6	53·1	53·8
Working-costs—				
Per kilowatt (power-house max.)	£2·66	£2·90	£2·51	£2·87
Per kilowatt (substation max.)	£3·01	£3·21	£2·83	£3·17
Per unit generated	0·155d.	0·149d.	0·129d.	0·140d.
Per unit sold	0·175d.	0·176d.	0·152d.	0·163d.
Capital charges—				
Per kilowatt (power-house max.)	£4·04	£3·90	£3·46	£3·58
Per kilowatt (substation max.)	£4·56	£4·31	£3·91	£3·96
Per unit generated	0·234d.	0·201d.	0·178d.	0·174d.
Per unit sold	0·265d.	0·236d.	0·209d.	0·203d.
Total cost—				
Per kilowatt (power-house max.)	£6·7	£6·80	£5·98	£6·45
Per kilowatt (substation)	£7·57	£7·52	£6·75	£7·14
Per unit generated	0·389d.	0·350d.	0·307d.	0·314d.
Per unit sold	0·44d.	0·412d.	0·361d.	0·366d.
Revenue—				
Per kilowatt (power-house max.)	£5·9	£6·32	£6·48	£6·93
Per kilowatt (substation max.)	£6·69	£7·0	£7·32	£7·65
Per unit generated	0·344d.	0·326d.	0·333d.	0·337d.
Per unit sold	0·388d.	0·383d.	0·393d.	0·392d.
Per unit sold (city)	0·297d.	0·299d.	0·297d.	0·288d.
Per unit sold (trams)	0·30d.	0·301d.	0·286d.	0·294d.
Per unit sold (wholesale consumers)	0·55d.	0·5d.	0·538d.	0·533d.
Per unit sold (retail consumers)	1·50d.	1·50d.	1·50d.	1·58d.

Table E.—Details of Capital Outlay, Lake Coleridge.

Item.	Capital Outlay.		Increase.
	31st March, 1920.	31st March, 1921.	
	£	£	£
Land roading and fencing	17,393	17,393	..
Tunnel and headworks	100,347	138,175	37,828
Power-house and machinery	74,235	78,203	3,968
Staff village	12,772	14,182	1,410
Transmission-lines	53,378	61,264	7,886
Addington Substation	24,731	27,095	2,364
Primary distribution	44,335	46,569	2,234
Secondary distribution	27,229	27,869	640
Service transformers and meters	12,594	16,148	3,554
Vehicles and loose equipment	6,304	17,398	11,094
Telephone-lines	1,828	1,903	75
Office furniture	202	237	35
Surveys, preliminary expenses, &c.	31,843	37,174	5,331
Interest during construction	14,885	16,347	1,462
Totals	422,076	499,957	77,881

Table F.—Operating or Working Costs for the Year compared with Previous Year, Lake Coleridge.

Expenditure	1920.		1921.	
	Cost.	Per Unit sold.	Cost.	Per Unit sold.
	£	d.	£	d.
Generation	5,303	0·046	6,003	0·046
Transmission	1,975	0·017	3,137	0·024
Main distributing station	2,413	0·020	2,576	0·020
H.T. distribution	1,912	0·016	1,728	0·013
L.T. distribution	977	0·008	1,296	0·010
Standby plant	1,789	0·015	2,688	0·020
Management and general expenses ..	3,390	0·029	3,913	0·030
Totals	17,759	0·151	21,341	0·163

Table G.—Gross Financial Results of Distribution of Energy for Year ended 31st March, 1921.

Distributing Authority.	Number of Consumers.	Capital Outlay.	Revenue from Consumers.	Paid for Electricity.	Maintenance Expenses.	Interest.	Sinking Fund.	Depreciation.	Balance.	
									Profit.	Loss.
		£	£	£	£	£	£	£	£	£
Public Works Department ..	425	449,957	25,363*	..	21,341	18,639	..	7,946	3,447	..
Christchurch City Council ..	10,108	338,436	76,666*	P.W. 17,700	20,385	11,649	..	22,935	6,213	..
Halswell County Council ..	80	5,000	635	P.W. 299	67	141	50	100	..	22
Heathcote County Council ..	564	13,296	2,793	P.W. 1,262	373	412	79	..	667	..
Kaiapoi Borough Council ..	359	4,500	1,920	P.W. 790	638	236	45	..	211	..
Lyttelton Borough Council	154	5,000	2,028	P.W. 692	693	250	100	..	293	..
Riccarton Borough Council	428	6,000	1,961	C.C. 432 P.W. 250	646	269	150	340	..	126
Rangiora Borough Council ..	200	6,836	1,522	P.W. 618	267	345	55	274	..	37
Rangiora County Council ..	159	11,055	1,059	P.W. 452	243	289	50	..	25	..
Spreydon Borough Council	367	6,830	1,718	C.C. 614	722	300	60	..	22	..
Sumner Borough Council ..	398	6,682	1,851	P.W. 567	504	315	60	143	262	..
Tai Tapu Dairy Company ..	130	6,000	1,665	P.W. 800	360	420	60	150	..	125
Waimairi County Council ..	1,700	40,152	7,639	P.W. 88 C.C. 1,455	3,381	2,034	..	..	681	..
Woolston Borough Council	405	6,935	1,642	P.W. 671	955‡	338	70	..	..	392
Eyre County Council† ..	66	2,364	210	P.W. 89	27	67	15	35	..	23
Totals	15,543	959,043	128,672	26,779	50,602	35,704	794	31,923	11,821	725

* After deducting amount of sales to other distributing bodies. † From July, 1920, only. ‡ During 1920–21 no loan account, reticulation work therefore included in management expenses, &c. P.W. = Paid to Public Works Department. C.C. = Paid to Christchurch City Council.

Net profit of the whole Lake Coleridge system, £11,096.

Table H.—Total Connected Load in Kilowatts at 31st March, 1921, Lake Coleridge.

——	Light.	Heat.	Power.	Total.
Direct Public Works Department wholesale consumers—				
Tramways	85·00	..	4,410·00	4,495·00
Freezing-works (4)	82·72	7·60	2,050·49	2,140·81
Flour-mills (6)	5·81	1·20	322·30	329·31
Dairy factories (2)	4·00	2·00	56·10	62·10
Quarry (1)	1·06	1·00	123·50	125·56
Tanneries, fellmongeries, &c. (6)	27·40	7·00	602·95	637·35
Seed-cleaning (4)	4·32	1·00	157·33	162·65
Brickyard (1)	3·80	0·60	93·50	97·90
Railway workshops (1)	25·10	..	209·90	235·00
Harbour Board (1)	37·56	..	99·00	136·56
Institutions (6)	118·02	232·60	146·10	496·72
Soapworks (1)	3·00	..	22·40	25·40
Steelworks (1)	2·60	1,200·00	20·80	1,223·40
Glueworks (1)	3·10	..	86·90	90·00
Sawmill (1)	..	0·60	22·50	23·10
Woollen-mill (1)	0·20	..	3·70	3·90
Aviation Company (1)	5·40	9·60	6·00	21·00
Twine-mill (1)	..	..	60·50	60·50
Railway-stations (2)	53·11	1·00	42·97	97·08
	462·20	1,464·20	8,536·94	10,463·34
Local-body reticulations—				
Christchurch City Council	6,344·31	1,275·88	12,758·25	20,378·44
Riccarton Borough Council	44·30	61·40	50·70	156·40
Lyttelton Borough Council	111·60	44·00	192·40	348·00
Lyttelton Pumping Station	0·30	..	115·90	116·20
Sumner Borough Council	126·80	153·20	53·80	333·80
Woolston Borough Council	114·20	130·00	29·50	273·70
Kaiapoi Borough Council	89·20	142·60	34·90	266·70
Rangiora Borough Council	92·87	52·40	100·70	245·97
Heathcote County Council	172·49	224·50	30·10	427·09
Paparua County Council	105·65	133·80	47·25	286·70
Halswell County Council	41·70	44·60	30·00	116·30
Eyre County Council	18·47	33·60	26·50	78·57
Tai Tapu District	59·16	93·20	76·50	228·86
Rangiora County Council	35·65	58·00	104·60	198·25
Lake Coleridge	17·30	155·40	15·13	187·83
Power-station and substation	20·20	37·20	113·90	171·30
	7,394·20	2,639·78	13,780·13	23,814·11
Totals	7,856·40	4,103·98	22,317·07	34,277·45

Maximum-load substation output, 6,712 kw.; diversity factor, 5·1.

Local Electric-supply Systems.

Apart from the two main Government supply systems there are fifty-five power-supply stations in the Dominion, as detailed in Tables I and J herewith. Seven additional licenses for local electric-supply plants (Fairlie, Kaikoura, Murchison, Whakatane, Motueka, Havelock North and Opunake) have been issued during the year, and construction is in hand, but, owing mainly to the financial stringency, no additional stations have been completed during the year under review, and very slight additions have been made to the total plant capacity. A license has also been issued to Te Puke Town Board for taking bulk supply from the Tauranga Borough Council. The additional power proposed in the seven main installations of the Dominion, as detailed in last year's report, amounts to 45,000 h.p., at an estimated cost of £1,582,000. These are all well in hand, but, owing to the delays in the delivery of material and to the financial stringency, none of these extensions have yet been completed.

The total maximum output has increased during the year from 30,716 kw. to 42,157 kw. The total installed capacity in the fifty-seven power-stations amounts to 49,630 kw. of main plant and 5,831 kw. of subsidiary or standby plant, made up as follows:—

——	Number.	Capacity in Kilowatts.	Proportion per Cent.
Main plant—			
Water-power	26	23,895	48·10
Steam-engines	10	21,820	44·00
Gas-engines	19	3,195	6·45
Oil-engines	2	720	1·45
Totals	57	49,630	100·00
Subsidiary plant—			
Steam-engines	3	3,503	60·00
Gas-engines	3	184	3·16
Oil-engines	6	2,016	34·60
Water-power	3	128	2·24
Totals	**15**	**5,831**	**100·00**

The total of the maximum loads was 42,157 kw., as compared with a total installed main capacity (apart from special auxiliary plants) of 49,630 kw., showing a margin of 7,473 kw., or 15 per cent. of spare plant, and this in spite of the fact that many of the stations have been seriously overloaded—pointing again very strongly to the advantage of interconnecting all available power sources, thus increasing the working-capacity of the system as a whole by reducing the margin of spare plant required and enabling every station connected to the system to come to the assistance of any other that is in trouble. Definite plans are in hand for the interconnecting of the Thames and Te Aroha plants with Horahora, and Akaroa with Lake Coleridge. Several other proposals for interconnection have been made, including Lake Coleridge and Waipori Falls, and the interconnection of the whole of the six Taranaki power-stations and of the three Bay of Plenty stations. Pending the completion of the large Government hydro-electric stations this policy of interconnection of the existing smaller plants will be of the utmost assistance in enabling the present small plants to carry on to the best effect until the larger sources of power are in operation.

With regard to the seventy-four authorities operating the fifty-seven stations and seventeen distribution systems taking bulk supply from a larger power authority, these are distributed as follows :—

Ownership.	Number.	Capacity in Kilowatts.	Proportion per Cent.
Government Departments	3	12,500	22·60
City Councils	4	17,610	31·70
Borough Councils	41	8,194	14·70
County Councils	5	Bulk	..
Town Boards	8	436	0·79
Private	2	113	0·19
Electric-supply companies	6	1,408	2·55
Industrial companies	2	2,700	4·87
Tramways	3	12,500	22·60
Totals	74	55,461	100·00

The total number of consumers at the end of the year was 73,151, as compared with 58,449 at the beginning of the year, an increase of 25·2 per cent.

The total length of reticulation-line in the Dominion is about 2,260 route-miles, and of trans mission-lines about 360 route-miles, totalling 2,620 route-miles.

The average number of consumers per mile of reticulation is thus 32·3.

The population, according to the 1921 census, of the districts already supplied amounts to 684,175 out of a total population of the Dominion of 1,218,270; but the population already supplied consists almost entirely of residents in the cities and boroughs, and the important function of supply ing the farming and country consumers is only now being taken up by the Electric-power Boards.

The units generated during the year in the fifty-seven power plants amounted to 149,476,379, of which 124,446,459 were sold or accounted for to 73,151 consumers, and 25,029,920 were lost or unaccounted-for, showing an overall efficiency of distribution amounting to 16·7 per cent. The units sold per consumer, after deducting 33,278,932 units for tramway supply, were 1,246, and the units sold per head of population supplied were 133. The maximum demand (42,157 kw.) was 0·576 kw. per consumer, or 0·061 kw. per head of population supplied. The aggregate of eight tramway peak loads was 13,240 kw. and is included in the total of 42,157 kw. The present demand in Canterbury is 0·063 kw. (0·084 h.p.) per head, and in Dunedin 0·082 kw. (0·109 h.p.) per head. These figures are important owing to their bearing on the estimate of the future demand from the large Government schemes under construction which is taken as 0·15 kw. (*i.e.*, 0·2 h.p.) per head of population—practically double the present supply per head in Canterbury and Dunedin.

Although the industry, as a whole, yielded a net profit of £68,106 for the year after paying interest and sinking fund of £233,078, it will be noted from Table G herewith that out of the seventy four systems thirty worked at a loss. This is due mainly to the increasing costs of supply, and the difficulty in raising the charges to keep pace with these increases. Several applications were received during the year for increases in the maximum charges permitted by license, and in most cases were justified by the circumstances. In other cases, such as Auckland and Wellington, the increased cost of coal has necessitated increasing the charges, though still below the limits allowed by the license. It is hoped that costs have already passed their maximum, and will shortly show a falling tendency, enabling those stations which have been operating at a loss to recover their financial position, and with increasing output and improved economies to offer a reduction in charges to the consumers.

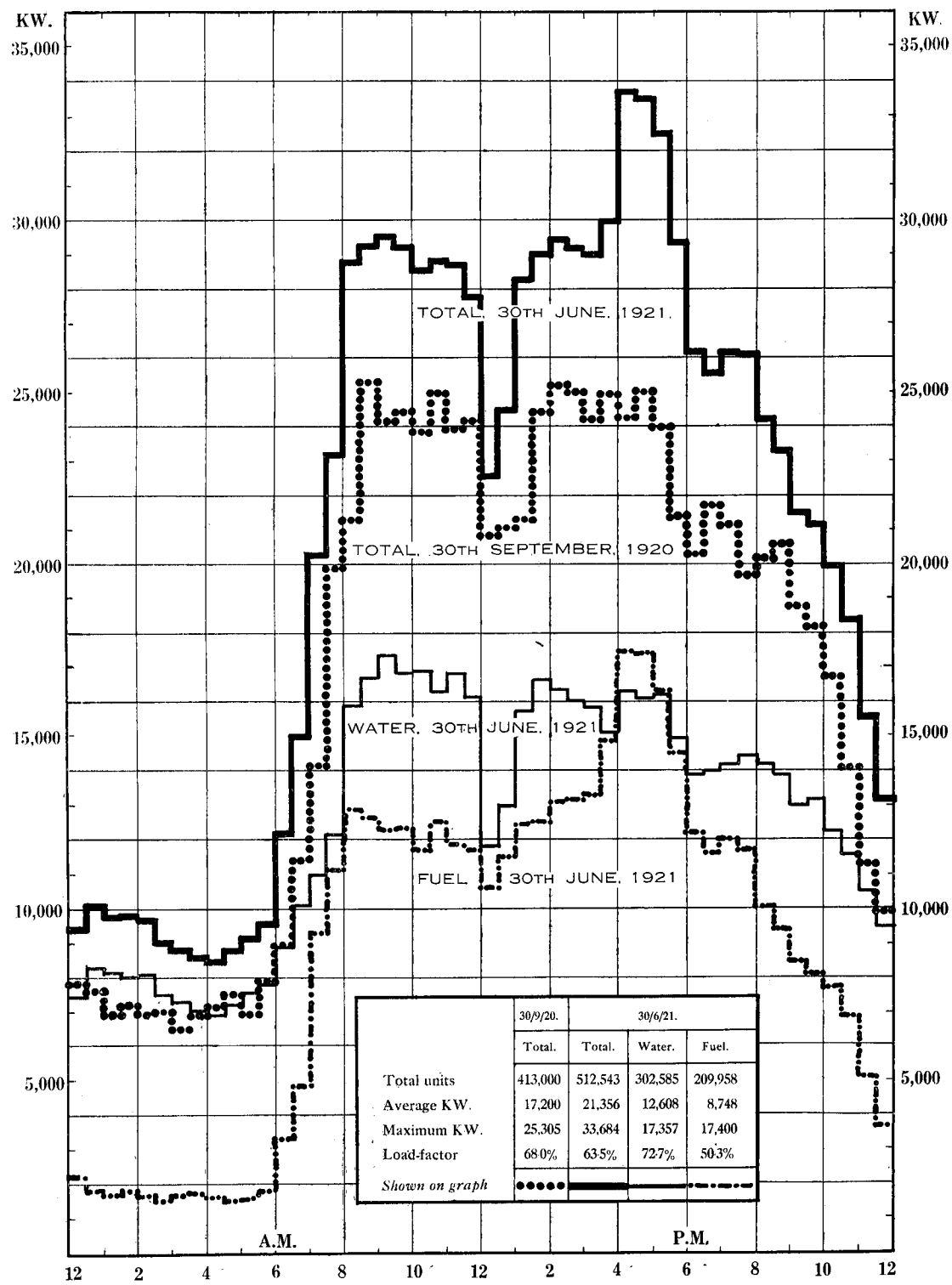
With regard to the standardization of the systems of supply there has been practically no change during the year, but several of the older installations are preparing to change over to the standard three-phase 50-cycle system, which now includes 29,980 kw., or 54·3 per cent., of the generating plant installed in the Dominion (55,461 kw.).

The annual load-factor of the whole output of the fifty-seven stations for the year, amounting to 149,476,379 units, with a maximum demand of 42,157 kw., has been 40·4 per cent. This is the average

result of all classes of generating plant. The load-factor is, of course, higher for water-power plants than for fuel plants, the figures for each type being as follows :—

—	Units Output.	Maximum.	Annual Load-factor.
		Kilowatts.	Per Cent.
Water-power	91,334,719	21,661	47·8
Steam-engines	50,848,365	17,587	32·9
Gas-engines	5,616,528	2,157	29·3
Oil-engines	1,676,767	530	36·2

In order to determine exactly the day load-curve—*i.e.*, the distribution of the load over the various hours of the day—arrangements were made with the engineers of the fifteen largest power-stations, comprising 78 per cent. of the plant capacity of the Dominion, to take half-hourly observations of the loading on the 30th September, 1920, and the 30th June, 1921, as representing typical equinoctial and midwinter loading. These figures were very courteously supplied, and the total results have been plotted in the graph herewith. These curves show a very large difference between the summer and winter demand, although the normal growth in the demand over a period of nine months is also



	30/9/20.	30/6/21.		
	Total.	Total.	Water.	Fuel.
Total units	413,000	512,543	302,585	209,958
Average KW.	17,200	21,356	12,608	8,748
Maximum KW.	25,305	33,684	17,357	17,400
Load-factor	68·0%	63·5%	72·7%	50·3%
Shown on graph	●●●●●	———	———	———

CURVES SHOWING HALF-HOURLY OBSERVATIONS OF LOADING.

taken into account. The curves show an increase in demand of about 4,000 kw. in the daytime and 8,500 kw. in the afternoon between 4 and 5 p.m. The relative shapes of the summer and winter curves are also important, the winter curves showing a peak between 4 and 5 p.m., and the summer curve between 8 and 9 a.m. It is rather surprising to note that even under present New Zealand conditions the all-day demand is so high, and with the large development of hydro-electric power and the consequent increasing industrial and cooking load the evening demand will become a still smaller proportion of the daily peak load. The two curves show the following results :—

Date.	Units Output.	Maximum Load.	Daily Load-factor.
		Kilowatts.	Per Cent.
30th September, 1920	413,000	25,305	68·0
30th June, 1921	512,543	33,684	63·5

For the latter date the total load curve of the five large water-power plants has been separated from the ten fuel-plants and each plotted separately, showing the following results :—

——	Units Output.	Maximum Load.	Daily Load-factor.
		Kilowatts.	Per Cent.
Water-power	302,585	17,357	72·7
Fuel-power	209,958	17,400	50·3

It will be noted that the fuel plants with their higher average charge per unit show a distinct evening lighting peak load, and consequently a much lower daily load-factor (50·3 per cent.), than the water-power plants (72·7 per cent.), for which the peak load occurs in the daytime.

Coming now to the general technical and financial results of the operation of the whole of the electric-supply systems of the Dominion analysed according to the source of supply, they give the following results :—

——	Water.	Steam.	Gas.	Oil.	Total.
Number of stations	26	10	19	2	57
Number of consumers	37,647	23,509	8,752	3,243	73,151
Installed capacity (kilowatts)	28,883	22,120	3,648	810	55,461
Maximum load (kilowatts)	21,661	17,587	2,379	530	42,157
Units generated	91,334,719	50,848,365	5,616,528	1,676,767	149,476,379
Units sold	74,686,598	44,478,349	3,869,188	1,412,324	124,446,369
Total capital outlay	£2,379,530	£881,481	£336,145	£72,125	£3,669,518
Capital outlay per kilowatt installed* ..	£82·4	£72·8	£92·1	£90·0	£81·0
Total annual working-costs	£181,425	£205,401	£72,403	£20,019	£479,248
Annual working-costs per unit sold ..	0·58d.	2·46d.	4·48d.	3·4d.	1·15d.
Annual working-costs per kw. p.h. max. ..	£8·35	£22·5	£30·4	£37·9	£14·5
Total annual capital charges	£157,801	£50,891	£20,190	£4,196	£233,078
Annual capital charge per unit sold ..	0·505d.	0·61d.	1·25d.	0·71	0·56d.
Annual capital charge per kw. p.h. max. ..	£7·3	£5·58	£8·48	£7·9	£7·05
Total annual costs	£339,226	£256,292	£92,593	£24,215	£712,326
Total annual costs per unit sold	1·08d.	3·07d.	5·73d.	4·1d.	1·71d.
Total annual costs per kw. p.h. max. ..	£15·65	£28·08	£38·88	£45·8	£21·55
Total annual revenue	£383,449	£283,899	£87,151	£27,440	£781,939
Total annual revenue per unit sold ..	1·23d	3·39d.	5·4d.	4·65d.	1·87d.
Total annual revenue per k.w. p.h. max. ..	£17·7	£31·0	£36·5	£51·6	£23·65
Net profit	£44,223	£27,607	£6,949†	£3,225	£68,106

* Includes distribution. † Loss.

Inspections.

During the year the following electric-supply systems were inspected, viz.: Patea, Waverley, Feilding, Bull's, Hawera, Stratford, Waitara, New Plymouth, Kaponga, Inglewood, Eketahuna, Pahiatua, Hastings, Napier, Reefton, Picton, Tai Tapu, Brightwater, Hokitika, Westport Company (Denniston), Westport-Stockton Company (Ngakawau), Bluff, Mataura, Winton, Gore, Oamaru, Timaru, and Ashburton. These were done as opportunity offered, and represent less than half the number of systems.

Hitherto the duties of Inspecting Electrical Engineer have been performed by one officer, but with the increase in the amount of inspection work it has not been possible to get round all the systems during the year as has previously been done. With the inception of the Electric-power Boards, together with new supply-stations, the demands on the Inspecting Electrical Engineer are rapidly increasing, and proposals are being made for the delegation of some of the routine inspections to District Engineers, but still subject to control from this office.

In order to reimburse the Department for the expenses in connection with inspection work a schedule of fees has been drawn up and is now in force.

Table I.—Electric-supply Stations of New Zealand at 31st March, 1921.

Station.	Ownership.	Population supplied.	Number of Consumers.	Capacity in Kilowatts.			Units generated or purchased.	Units sold or used.	Units non-productive.	Per Cent. of Non-productive Units.	System of Supply.	Supply Voltage.	Static Head, in Feet.	Route-miles of Lines.
				Main Plant.	Stand-by Plant.	Maximum Load.								
Steam Stations.														
1. Auckland (lighting)	City	108,000	6,180	6,500	..	4,148	13,046,420	10,496,060	2,550,360	19·5	D.C. & A.C.	460/400/230	..	90·0
(tramways)	..	..	..	6,000	..	5,950	13,191,365	13,191,365	..	..	D.C.	550	..	..
2. Wellington (lighting)	City	92,300	12,242	3,500	..	3,000	8,402,670	6,530,220	1,872,450	22·0	A.C.	105 S.P.	..	190·0
(tramways)	..	..	418	4,000	..	3,180	12,272,808	11,064,596	1,208,212	10·0	D.C.	550	..	..
3. Invercargill	Borough	24,000	1,762	975	..	630	2,310,450*	1,908,388	402,062	17·4	A.C.	400/230	..	74·5
4. Gisborne	Borough	14,477	1,726	350	300 (oil)	410	1,087,105*	858,863	228,242	20·9	D.C.	440/220	..	33·0
5. Hamilton	Borough	11,439	634	170	..	185	416,575†	333,259	83,316	20·0	D.C.	460/230	..	34·0
6. Huntly	Town Board	2,500	277	225	..	42	62,753	49,125	13,628	21·7	D.C.	460/230	..	7·0
7. Bluff	Borough	1,599	270	50	..	37	58,219	46,473	11,746	20·1	D.C.	460/230	..	6·5
8. Kaitangata	Borough	1,681	..	50	..	5	..	..	..	..	A.C.	230	..	2·0
Totals	..	255,996	23,509	21,820	300	17,587	50,848,365	44,478,349	6,370,016	16·9	..	..	..	437·0
Gas Stations.														
1. Napier	Borough	15,000	2,000	850	100 (oil)	620	1,627,696*	1,420,667	207,029	12·7	D.C.	460/230	..	27·5
2. Wanganui	Borough	16,492	24	485	..	290	759,735*	123,000‡	..	..	D.C.	550	..	2·0
3. Timaru	Borough	14,500	1,048	425	..	300	934,000	525,106	408,894	43·5	D.C.	460/230	..	46·0
4. Ashburton	Company	6,172	710	186	165 (oil)	205	480,441	384,352†	96,089	20·0	D.C. & A.C.	400/230	..	62·6
5. Devonport	Company	9,304	1,067	200	..	190	551,300	407,765	143,535	26·0	D.C.	460/230	..	18·0
6. Feilding	Borough	4,500	897	160	150 (oil)	148	318,342	274,321	44,021	13·8	A.C.	230 S.P.	..	24·2
7. Te Kuiti	Borough	2,240	440	180	..	86	198,210	166,622	31,588	16·0	D.C.	460/230	..	10·0
8. Picton	Borough	1,371	250	82·5	7·5 (water)	72	157,680†	126,144†	31,536	20·0	D.C.	460/230	266	9·0
9. Pukekohe	Borough	1,890	280	74·0	..	79	56,740†	45,393	11,347	20·0	D.C.	460/230	..	6·3
10. Waitara	Borough	1,500	305	62	23 (water)	66	96,200	63,070	33,130	34·4	D.C.	460/230	200	8·0
11. Opotiki	Private	1,150	250	86	..	55	68,128	55,672	12,456	18·3	D.C.	460/230	..	10·0
12. Winton	Borough	600	146	53	..	25	23,718	19,339	4,379	18·0	A.C.	400/230	..	4·0
13. Wairoa	Borough	1,915	310	56	..	60	85,498	73,888	11,610	13·6	D.C.	460/230	..	6·5
14. Ngaruawahia	Borough	1,120	185	70	..	31	64,656	38,438	26,218	40·5	D.C.	460/230	..	7·0
15. Martinborough	Town Board	932	210	27·5	..	31	68,395	42,639	25,756	37·7	D.C.	230	..	10·0
16. Pahiatua	Borough	1,340	189	85	..	45	45,171	41,909	3,262	7·0‡	D.C.	460/230	..	9·2
17. Eketahuna	Borough	874	205	62·5	7·5 (water)	30	41,300	29,870	11,430	29·0	D.C.	230	230	5·0
18. Bull's	Private	580	140	27	..	24	25,975	18,702	7,273	28·0	D.C.	230	..	5·0
19. Waiuku	Town Board	730	96	23·5	..	22	13,343	12,291	1,052	7·9‡	D.C.	460/230	..	4·0
Totals	..	82,210	8,752	3,195·0	453	2,379	5,616,528	3,869,188	1,110,605	23·0	..	..	..	274·3
Oil Stations.														
1. Hastings	Borough	9,106	2,000	575	..	344	1,254,662	1,119,456	135,206	10·8	D.C.	460/230	..	35·0
Havelock North	Town Board	1,176	240	Bulk supply	..	(31)	59,065	53,583	5,482	9·3‡	A.C.	400/230	..	11·0
2. Stratford	Borough	3,100	1,003	145	90 (water)	186	363,040	239,285	123,755	34·1	A.C.	250/100 S.P.	27	24·0
Totals	..	13,382	3,243	720	90	530	1,676,767	1,412,324	264,443	15·8	..	..	..	70·0

* Including tramways. † Assessed from incomplete returns. ‡ Assessed by local authority, excluding tramways.

Table J.—Summary of Returns of Operating Results for the Year ending 31st March, 1921.

Station.	Capital Outlay at 31st March, 1921.	Revenue.	Working-expenses.*	Capital Charges.†	Total Annual Costs.	Net Result.		Average Revenue.		Working-costs.		Capital Charges.†		Total Costs.		Retail Net Selling-rates.	
						Profit.	Loss.	Per Unit sold.	Per Kw. P.H. Max.	Per Unit sold.	Per Kw. P.H. Max.	Per Unit sold.	Per Kw. P.H. Max.	Per Unit sold.	Per Kw. P.H. Max.	Lighting.	Power.
Steam Stations.	£	£	£	£	£	£	£	d.	£	d.	£	d.	£	d.	£	s. d.	s. d.
1. Auckland (lighting) ..	493,484	109,359	67,935	24,343	92,278	17,081	...	2·50	26·5	1·55	16·4	0·56	5·90	2·11	22·30	0 6	0 2½
(tramways) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2. Wellington (lighting) ..	235,090	112,318	91,911	17,326	109,237	3,081	..	4·14	37·5	3·37	30·5	0·63	5·80	4·00	36·30	0 6	0 2½
(tramways)..	(206,289)	(113,251)	(98,893)	(18,870)	(117,763)	..	(4,512)	2·46	35·5	2·15	31·0	0·41	5·95	2·56	36·95	..	0 3
3. Invercargill	71,536	23,410	16,676	3,594	20,270	3,140	..	2·94	37·2	2·08	26·4	0·45	5·70	2·53	32·10	0 7½	0 2½
4. Gisborne	45,806	21,421	14,672	3,373	18,045	3,376	..	6·00	52·2	4·10	35·8	0·94	8·20	5·04	44·00	0 9	0 4
5. Hamilton	22,487	13,291	10,022	969	10,991	2,300	..	9·60	71·8	7·24	54·2	0·70	5·20	7·94	59·40	0 9	0 5
6. Huntly	8,600	2,010	2,386	1,079	3,465	..	1,455	9·84	47·8	11·65	56·6	5·27	25·70	16·92	82·30	0 8	0 4
7. Bluff	4,163	2,090	1,799	207	2,006	84	..	10·8	56·7	9·3	48·6	1·07	5·6	10·37	54·20	0 7½	0 4
8. Kaitangata	315	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals	881,481	283,899	205,401	50,891	256,292	29,062	1,455	3·39	31·0	2·46	22·5	0·61	5·58	3·07	28·08	..	..
Gas Stations.																	
1. Napier	75,766	24,549	14,989	6,059	21,048	3,501	..	4·15	39·5	2·53	24·2	1·02	9·8	3·55	34·0	0 7½	0 4
2. Wanganui	10,407‡	1,507‡	..	..	..	..	..	2·95	..	..	..	..	..	..	..	..	0 4
3. Timaru	54,600	12,562	14,339	3,749	18,088	..	5,526	5·75	41·7	6·60	47·8	1·7	12·5	8·30	60·3	1 1	0 5
4. Ashburton	35,049	7,645	6,816	720	7,536	109	..	4·78	37·2	4·27	33·2	0·45	3·5	4·72	36·7	0 8	0 4
5. Devonport	21,865	8,206	7,980	2,034	10,014	..	1,808	4·84	43·0	4·70	42·0	1·2	10·7	5·90	52·7	0 6	0 3
6. Feilding	27,608	8,082	6,269	1,588	7,857	225	..	7·07	54·5	5·50	42·3	1·39	10·7	6·89	53·0	1 0	0 5
7. Te Kuiti	14,777	4,438	3,147	970	4,117	321	..	6·40	51·5	4·54	36·5	1·4	11·2	5·94	47·7	0 9	0 4
8. Picton	8,970	1,921	2,268	450	2,718	..	797	3·65	26·7	4·33	31·5	0·85	6·3	5·18	37·8	Flat rate.	
9. Pukekohe	8,547	1,690	1,429	261	1,690	..	..	9·00	21·4	7·62	18·1	1·38	3·3	9·00	21·4	0 8	0 4
10. Waitara	8,311	1,692	2,134	504	2,638	..	946	6·44	25·6	8·10	32·4	1·92	7·6	10·02	40·0	0 10	0 5
11. Opotiki	6,522	2,643	2,373	270	2,643	..	..	11·40	47·9	10·20	43·0	1·2	4·9	11·40	47·9	0 10	0 5
12. Winton	4,245	955	644	371	1,015	..	60	11·80	38·1	8·00	25·8	4·6	14·8	12·6	40·6	0 9	..
13. Wairoa	11,600	3,274	2,288	748	3,036	238	..	10·54	54·5	7·43	38·1	2·43	12·4	9·86	50·5	0 10	0 6
14. Ngaruawahia ..	9,076	1,334	1,077	393	1,470	..	136	8·40	43·0	6·75	34·7	2·45	12·6	9·20	47·3	0 11	0 5
15. Martinborough ..	6,993	1,843	1,642	298	1,940	..	97	10·35	59·5	9·24	52·9	1·67	9·6	10·91	62·5	0 10	0 5
16. Pahiatua	10,596	1,250	1,036	1,025	2,061	..	811	7·17	27·8	5·95	23·0	5·90	22·8	11·85	45·8	0 9	0 4
17. Eketahuna	7,230	1,543	1,919	252	2,171	..	628	12·40	51·5	15·40	64·0	2·03	8·4	17·43	72·4	0 10	0 6
18. Bull's	6,000	1,188	895	343	1,238	..	50	15·20	49·5	11·50	37·4	4·40	14·3	15·90	51·7	1 3	0 9
19. Waiuku	7,983	829	1,158	155	1,313	..	484	16·20	37·6	22·60	52·7	3·02	7·0	25·62	59·7	0 11	0 11
Totals.. ..	336,145	87,151	72,403	20,190	92,593	4,394	11,343	5·4	40·2	4·48	33·5	1·25	9·35	5·73	42·85	..	..
Oil Stations.																	
1. Hastings	50,842	19,679	14,582	2,139	16,721	2,958	..	4·25	57·2	3·14	42·40	0·46	6·20	3·60	48·60	0 8½	0 3
Havelock North ..	3,710	1,426	1,000	210	1,210	216	..	6·40	45·8	4·48	32·15	0·94	6·75	5·42	38·90	0 7	0 4
2. Stratford	17,573	6,335	4,437	1,847	6,284	51	..	6·36	34·0	4·45	23·80	1·85	9·92	6·30	33·72	0 8	0 4
Totals.. ..	72,125	27,440	20,019	4,196	24,215	3,225	..	4·65	51·6	3·4	37·9	0·70	7·90	4·1	45·8	..	..

* Includes wages, fuel, and maintenance of generating and distribution system. † Includes interest, depreciation, and sinking fund. ‡ Excluding tramways. (Note.—Tramway figures shown in parentheses are not included in totals.)

TABLE I—*continued*.—ELECTRIC-SUPPLY STATIONS OF NEW ZEALAND AT 31ST MARCH, 1921—*continued*.

Station.	Ownership.	Population supplied.	Number of Consumers.	Capacity in Kilowatts.			Units generated or purchased.	Units sold.	Units non-productive.	Per Cent. of Non-productive Units.	System of Supply.	Supply Voltage.	Static Head, in Feet.	Route-miles of Lines.
				Main Plant.	Stand-by Plant.	Maximum Load.								
Hydro Stations.														
1. Coleridge	Public Works Dept.	..	425	6,000	..	7,412	36,545,169	31,402,351	5,142,818	14·1§	A.C.	400/230	480	281·0
Christchurch ..	City Council ..	67,292	10,108	Bulk supply	750 (steam)	(3,601)	(14,894,620)	(12,541,431)	2,353,189	15·8	A.C.	400/230	..	220·0
	Tramway Board ..	..	..	Bulk supply	2,500 (steam)	(1,840)	(6,120,366)	..	..	..	D.C.	550	..	..
Eyre	County	1,918	66	Bulk supply	..	(40)	(40,698)	(32,558)†	8,140	20·0	A.C.	400/230	..	7·0
Halswell ..	County ..	1,743	80	Bulk supply	..	(66)	(86,158)	(68,926)†	17,232	20·0	A.C.	400/230	..	18·0
Heathcote ..	County	4,000	564	Bulk supply	..	(143)	(543,247)	(434,597)†	108,650	20·0	A.C.	400/230	..	30·0
Kaiapoi	Borough ..	1,693	359	Bulk supply	..	(99)	(345,580)	(276,464)†	69,116	20·0	A.C.	400/230	..	10·0
Lyttelton ..	Borough ..	3,776	154	Bulk supply	..	(51)	(163,912)	(131,129)†	32,783	20·0	A.C.	400/230	..	9·0
Riccarton ..	Borough ..	3,251	428	Bulk supply	..	(93)	(173,032)	(155,032)	18,000	10·4	A.C.	400/230	..	15·3
Rangiora ..	Borough ..	2,000	200	Bulk supply	..	(70)	(131,730)	(109,053)	22,677	17·2	A.C.	400/230	..	11·0
Rangiora.. ..	County	1,500	159	Bulk supply	..	(40)	(213,407)	(170,725)†	42,682	20·0	A.C.	400/230	..	36·0
Spreydon ..	Borough ..	4,961	474	Bulk supply	..	(90)	(111,790)	(89,432)†	22,358	20·0	A.C.	400/230	..	10·0
Sumner	Borough ..	3,232	398	Bulk supply	..	(58)	(301,708)	(241,366)†	60,342	20·0	A.C.	400/230	..	12·2
Tai Tapu.. ..	Company ..	5,000	130	Bulk supply	..	(132)	(400,369)	(320,295)†	80,074	20·0	A.C.	400/230	..	35·0
Waimairi.. ..	County	12,394	1,700	Bulk supply	..	(210)	(797,400)	(637,920)†	159,480	20·0	A.C.	400/230	..	120·0
Woolston ..	Borough ..	4,000	405	Bulk supply	..	(90)	(239,340)	(191,472)†	47,868	20·0	A.C.	400/230	..	25·0
2. Dunedin (Waipori) ..	City	76,000	10,034	6,000	860 (oil)	6,250	23,184,800*	16,338,291	6,846,509	29·5	A.C.	400/230	675	300·0
3. Horahora	Public Works Dept.	67,062	3	6,300	..	3,600	16,729,050	15,376,000	1,353,050	8·1§	A.C.	400/230	26	47·0
4. Wairua	Company ..	..	29	2,000	..	1,640	6,838,900	5,590,598	1,248,302	18·2	A.C.	400/230	130	31·0
Whangarei ..	Borough ..	4,500	843	Bulk supply	..	(171)	(371,019)	(347,100)	23,919	6·5‡	A.C.	400/230	..	42·5
5. New Plymouth ..	Borough ..	15,000	3,022	850	..	875	3,117,095*	2,131,160	985,935	31·5	A.C.	440/220	120	150·0
6. Hawera	Company ..	6,500	1,578	445	154 (oil)	338	1,079,900	863,920†	215,980	20·0	A.C.	400/230	57	51·3
7. Rotorua	Government ..	3,886	938	200	..	180	640,321	366,188	274,133	42·8	A.C.	200/115	14	28·0
8. Tauranga	Borough ..	4,656	715	160	..	190	787,000	584,300	202,700	25·7	A.C.	400/230	108	51·0
9. Taihape	Borough ..	1,800	343	100	75 (gas)	151	406,485	370,713	35,772	9·0‡	D.C.	460/230	29	6·0
10. Thames	Borough ..	4,768	727	105	100 (oil)	105	259,296	246,661	12,635	4·9‡	D.C.	460/230	132	13·0
11. Te Aroha	Borough ..	2,109	399	135	187 (oil)	150	190,080†	152,065	38,015	20·0	A.C	400/230	560	9·2
12. Gore..	Borough ..	3,679	568	240	..	170	311,440	265,274	46,166	14·7	A.C.	400/230	23	30·0
13. Reefton	Company ..	1,449	211	75	103 (steam)	80	201,600†	141,120†	60,480	30·0	D.C.	220	27	4·5
14. Oamaru	Borough ..	7,500	500	120	..	98	260,478	204,615	55,863	21·4	A.C.	400/230	250	22·0
15. Inglewood	Borough ..	1,300	372	120	..	62	191,620	171,680	19,940	10·4	A.C.	400/230	38	11·0
16. Patea	Borough ..	1,600	231	50	45 (gas)	44	59,686	54,260	5,426	9·1‡	A.C.	100 S.P.	72	13·0
17. Raetihi	Borough ..	4,500	221	68	..	54	100,647	86,418	14,229	14·15	A.C.	400/230	360	95·0
18. Ohakune	Borough ..	1,535	212	96	..	47	83,900†	67,125†	16,775	20·0	A.C.	400/230	42	6·5
19. Kaponga	Town Board ..	500	120	40	..	32	65,815†	52,654	13,161	20·0	D.C.	230	31	4·0
20. Brightwater ..	Company ..	2,141	355	40	40 (gas)	48	90,160	72,128†	18,032	20·0	A.C.	230 S.P.	10	44·0
21. Waverley	Town Board ..	640	150	40	..	16	34,385†	26,307	8,078	20·0	A.C.	400/230	60	4·0
22. Akaroa	Borough ..	605	130	30	..	32	66,633	55,558	11,075	16·5	D.C.	230	310	8·0
23. Mataura	Borough ..	1,170	168	75	..	42	38,154	29,256	8,898	23·0	A.C.	440/220 S.P.	23	5·5
24. Mangaweka.. ..	Town Board ..	360	80	36	24 (gas)	32	25,825	16,932	8,893	34·6	A.C.	400/230	37	7·0
25. Havelock South ..	Town Board ..	267	48	20	..	13	26,280†	21,024†	5,256	20·0	D.C.	460/230	270	2·0
26. Hokitika (Kanieri) ..	Company ..	2,300	..	550	150 (steam)	..	..	..	..	..	A.C.	400/230	250	14·2
Totals	..	332,587	37,647	23,895	4,988	21,661	91,334,719	74,686,598	16,648,121	19·6	..	..	..	1,839·2

* Including tramways. † Assessed from incomplete returns. ‡ Assessed by local authority. § Includes transmission losses only. (Note.—Units shown in parentheses are not included in totals.)

TABLE J—*continued.*—SUMMARY OF RETURNS OF OPERATING RESULTS FOR THE YEAR ENDING 31ST MARCH, 1921—*continued.*

Station.	Capital Outlay at 31st March, 1921.	Revenue.	Working-expenses.*	Capital Charges.†	Total Annual Costs.	Net Result.		Average Revenue.		Working-costs.		Capital Charges.†		Total Costs.		Retail Net Selling-rates.	
						Profit.	Loss.	Per Unit sold.	Per Kw. P.H. Max.	Per Unit sold.	Per Kw. P.H. Max.	Per Unit sold.	Per Kw. P.H. Max.	Per Unit sold.	Per Kw. P.H. Max.	Lighting.	Power.
Hydro Stations.	£	£	£	£	£	£	£	d.	£	d.	£	d.	£	d.	£	s. d.	s. d.
1. Coleridge	499,957	51,373	21,341	26,585	47,926	3,447	..	0·39	6·93	0·16	2·87	0·20	3·58	0·36	6·45	..	..
Christchurch (T.B.) ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
(C.C.) ..	338,436	81,882	39,085	36,584	75,669	6,213	..	1·56	22·70	0·75	10·85	0·70	10·15	1·45	21·00	0 5	0 1½
Eyre	2,364	210	116	117	233	..	23	1·54	5·27	0·86	2·92	0·86	2·95	1·72	5·87	Flat rate.	
Halswell	5,000	635	366	291	657	..	22	2·22	9·60	1·28	5·50	1·02	4·40	2·30	9·90	Flat rate.	
Heathcote	13,296	2,793	1,635	491	2,126	667	..	1·54	19·50	0·91	11·40	0·27	3·40	1·18	14·80	Flat rate.	
Kaiapoi	4,500	1,920	1,428	281	1,709	211	..	1·66	19·40	1·24	14·50	0·24	2·85	2·48	17·35	Flat rate.	
Lyttelton	5,000	2,028	1,385	350	1,735	293	..	3·70	39·50	2·54	27·20	0·64	6·88	3·18	34·08	0 6	..
Riccarton	6,000	1,961	1,328	759	2,087	..	126	3·03	21·10	2·06	14·30	1·17	8·15	3·23	22·45	0 5	0 3
Rangiora (Borough) ..	6,836	1,522	885	674	1,559	..	37	3·34	21·70	1·95	12·65	1·48	9·64	3·43	22·29	0 6	0 3
(County) ..	11,055	1,059	695	339	1,034	25	..	1·49	26·50	0·98	17·40	0·48	8·50	1·46	25·90	Flat rate.	
Spreydon	6,162	1,570	1,165	600	1,765	..	195	4·20	17·50	3·15	13·00	1·62	6·70	4·77	19·7	0 5	..
Sumner	6,682	1,851	1,071	518	1,589	262	..	1·84	32·00	1·06	18·40	0·52	8·90	1·58	27·30	0 6	0 2
Tai Tapu	6,000	1,665	1,160	630	1,790	..	125	1·25	12·60	0·87	8·80	0·47	4·75	1·34	13·55	Flat rate.	
Waimairi	40,152	7,639	4,924	2,034	6,958	681	..	2·88	36·30	1·86	23·40	0·77	9·65	2·63	33·05	0 6	0 3
Woolston	6,935	1,642	1,626	408	2,034	..	392	2·06	18·20	2·05	18·10	0·51	4·53	2·56	22·63	Flat rate.	
2. Dunedin (Waipori) ..	582,760	95,925	37,016	42,007	79,023	16,902	..	1·41	15·30	0·54	5·92	0·62	6·72	1·16	12·64	0 5½	0 2
3. Horahora	249,745	14,663	6,354	14,650	21,004	..	6,341	0·23	4·11	0·10	1·78	0·23	4·06	0·33	5·84	..	..
4. Wairua	83,642	10,594	4,804	2,505	7,309	3,285	..	0·45	6·45	0·21	2·93	0·11	1·53	0·32	4·46	0 5½	0 3
Whangarei	21,828	7,782	3,698	1,268	4,966	2,816	..	5·40	45·50	2·55	21·60	0·88	7·45	3·43	29·05	0 5½	0 3
5. New Plymouth ..	137,194	24,023	6,468	8,633	15,101	8,922	..	2·71	27·50	0·73	7·40	0·97	9·85	1·70	17·25	0 7	0 2
6. Hawera	59,240	15,199	7,498	4,516	12,014	3,185	..	4·24	45·00	2·08	22·20	1·25	13·35	3·33	35·55	0 7	0 4
7. Rotorua	38,018	6,833	5,079	—	5,079	1,754	..	4·47	37·90	3·33	28·20	..	..	3·33	28·20	0 6	0 3
8. Tauranga	34,316	4,956	2,221	2,279	4,500	456	..	2·05	26·00	0·92	11·70	0·94	12·00	1·86	23·70	0 8	0 2
9. Taihape	13,402	5,837	5,206	630	5,836	1	..	3·78	38·60	3·37	34·50	0·41	4·17	3·78	38·67	0 8	0 1½
10. Thames	19,647	5,851	2,941	2,948	5,889	..	38	5·70	55·70	2·86	28·00	2·87	28·10	5·73	56·10	0 10	0 3
11. Te Aroha	15,574	3,268	1,583	846	2,429	839	..	5·18	21·80	2·50	10·60	1·33	5·60	3·83	16·20	0 7	0 3
12. Gore	19,078	6,008	3,959	836	4,795	1,213	..	5·45	35·20	3·57	23·30	0·76	4·90	4·33	28·20	0 7	0 3
13. Reefton	6,597	2,388	2,420	—	2,420	..	32	4·08	29·80	4·11	30·30	..	..	4·11	30·30	Flat rate.	
14. Oamaru	29,587	3,419	2,034	1,390	3,424	..	5	4·01	35·00	2·38	20·80	1·63	14·20	4·01	35·00	0 9	0 3
15. Inglewood	8,500	3,913	2,885	510	3,395	518	..	5·47	63·10	4·05	46·50	0·71	8·20	4·76	54·70	0 7	0 2
16. Patea	4,443	1,794	2,068	131	2,199	..	405	7·94	40·80	9·15	47·00	0·58	3·00	9·73	50·00	0 8½	..
17. Raetihi	17,364	2,469	718	1,500	2,218	251	..	6·86	45·70	2·00	13·30	4·17	27·80	6·17	41·10	0 10	0 3
18. Ohakune	9,501	2,310	1,582	665	2,247	63	..	8·25	48·60	5·65	33·30	2·38	14·00	8·03	47·30	0 9	0 6
19. Kaponga	6,668	1,136	555	344	899	237	..	5·18	35·50	2·53	17·35	1·57	10·75	4·10	28·10	0 9	0 4
20. Brightwater	9,100	856	496	370	866	..	10	2·86	17·70	1·66	10·20	1·23	7·60	2·89	17·80	0 9	..
21. Waverley	4,931	883	495	291	786	97	..	8·00	55·00	4·52	30·90	2·66	18·20	7·18	49·10	0 10	0 2
22. Akaroa	7,760	1,902	1,521	457	1,978	..	76	8·25	58·50	6·60	46·80	1·98	14·00	8·58	60·80	0 9	0 4
23. Mataura	3,600	733	691	120	811	..	78	6·00	17·40	5·68	16·40	0·99	2·90	6·67	19·30	0 6	0 2½
24. Mangaweka	4,784	419	427	160	587	..	168	5·95	13·00	6·10	13·30	2·28	5·00	8·38	18·30	1 0	0 6¾
25. Havelock South ..	1,925	538	496	84	580	..	42	6·15	41·50	5·65	38·20	0·96	6·50	6·61	44·70	Flat rate.	
26. Hokitika (Kanieri) ..	31,951	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0 8	0 3
Totals	2,379,530	383,449	181,425	157,801	339,226	52,338	8,115	1·23	17·7	0·58	8·4	0·51	7·3	1·09	15·7	..	..

* Includes wages, fuel, and maintenance of generating and distribution system.

† Includes interest, depreciation, and sinking fund.

Electric-power Districts.

The organization of electric-power districts under the Electric Power Boards Act of 1918 has proceeded vigorously during the year, although the number of power districts actually constituted has only increased from the ten previously recorded to fourteen, as set out herewith, Westland, Reefton, Dannevirke, and Opunake Power Districts having been formed.

The total area covered by these fourteen districts is 18,869 square miles, being 18·1 per cent. of the total area of the Dominion, and the total population included is 158,157, being 12·95 per cent. of the population of the Dominion. Nine of the Boards have laid out their reticulation systems and submitted the necessary loans to the ratepayers for approval. Of these, one (Southland) includes a generating-station at Lake Monowai, and the other eight provide for taking power in bulk from the Public Works Department.

The total amount of the loans authorized by the ratepayers of these nine districts amounts to £2,950,000. This is £21·6 per head of population concerned, and 6·7 per cent. of the unimproved rateable value (£39,116,812).

Name of Electric-power District.	Proclamation constituting District gazetted.	Number of Members on Board.	Approximate Area of District.	Population.	Value of Rateable Property (unimproved).	Amount of Loan.	Voting for Loan Poll.	
							For	Against
			Sq. miles.		£	£		
Southland	19/11/19	12	9,986	65,450	13,600,471	1,500,000	6,516	415
Thames Valley ..	8/1/20	12	2,304	16,000	6,814,993	550,000	1,503	28
Te Awamutu ..	8/1/20	10	309	6,000	1,759,558	120,000	359	..
Cambridge	8/1/20	8	104	5,000	1,683,632	60,000	198	3
Banks Peninsula ..	8/1/20	7	372	3,500	3,430,817	100,000	331	23
Wairarapa	25/3/20	9	2,073	21,800	3,114,718	260,000	1,704	225
Central	8/7/20	7	300	9,110	3,667,904	200,000	515	19
Wairoa	29/7/20	10	1,369	3,900	2,417,251	100,000	504	31
Springs-Ellesmere ..	8/7/20	7	242	5,400	2,627,468	60,000	302	16
Teviot	22/7/20	7	120	1,800	169,137	Poll not yet taken.		
Westland	28/10/20	9	750	3,272	196,268	„	„	
Reefton	30/6/21	5	24	1,850	59,316	„	„	
Dannevirke.. ..	11/8/21	10	676	11,848	3,555,382	„	„	
Opunake	18/8/21	7	240	3,227	536,153	„	„	
Totals ..	..	..	18,869	158,157	43,633,068	2,950,000	11,932	760

In addition to the Power Boards that have already been constituted, petitions are in course of circulation in the following districts :—

	Population.	Area in Square Miles.
Horowhenua	11,795	630
Tararua	9,258	1,254
Waipawa	8,534	1,235
Tauranga	6,197	651
Buller	10,057	1,818
Marlborough	16,967	437
Ashburton	16,691	2,542
South Canterbury	40,657	5,100
Rangitikei-Wanganui	41,564	2,614
Manawatu-Oroua	38,330	1,301
Nelson	24,426	2,835
Hobson	6,831	773

In addition, committees have been formed and petitions are in course of preparation for the following districts: Auckland, Hawke's Bay, Bay of Plenty, Taranaki, Hutt Valley, Greymouth, Otago, and Waitaki.

The provisions of the Electric Power Boards Act are thus being widely adopted throughout the Dominion.

The boundaries of the proposed districts generally follow fairly close on those suggested in the last annual statement, but in several cases, particularly Auckland, Rangitikei-Wanganui, Taranaki, and Bay of Plenty, larger districts have proved advisable.

Some of the districts already constituted are proving too small for the greatest economy in construction and operation, and combinations of these districts are desirable. In order to enable each Power Board to deal effectively with its back-country reticulation it has been found essential that it should have greater financial strength than the smaller Boards can command, and should be so large that it is unlikely to be swayed by local or parochial influences, though in a few cases of entire isolation, such as Queenstown, Taupo, Murchison, and Reefton, local Power Boards may be advisable. The principles on which the boundaries of the electric-power districts should be determined are not set out in the Act, but under section 3 the responsibility of deciding whether the boundaries proposed by the Local Committee are advisable or otherwise is cast on the Government, and this responsibility has been accepted in several cases by proposing amendment to the draft petitions before they are issued for signature. It is essential that such draft petitions should be submitted for approval in each case, as great difficulty has arisen in some cases owing to petitions being signed

for districts with unsuitable boundaries. In order to decide the correct areas into which the Dominion should be divided for the purposes of the Act the following considerations should be taken into account :—

(*a.*) The district must be large enough to have financial strength. For this purpose the demand should be at least 1,000 h.p., yielding a revenue to the Board of about £15,000 per annum and involving a population of about five thousand persons. This is a minimum size in cases in which geographical and other considerations do not permit of a larger district. In the general case, where possible, the population should be over twenty thousand, requiring over 4,000 horse-power and yielding a revenue of over £50,000 per annum ; and in special cases, including large cities, the size may be even two or three times greater than this with advantage.

(*b.*) The district should include both town and country areas, but should have a distinct community of commercial and industrial interests. The country districts should be included with the town through which their produce is sold and their necessities purchased, and the whole of the back country trading through any one centre should be included with that centre. The boundaries must be designed to foster and encourage this natural community of trading interests.

(*c.*) The district must be designed to give convenient road access for the distribution-lines, to ensure both economical construction and for effective patrol and maintenance. From this point of view the boundaries will consist, whenever possible, of mountain-ranges or large impassable rivers.

(*d.*) The district must be designed to utilize as far as possible the points of distribution selected as most convenient for the purposes of the main Government transmission-system, and as far as possible the whole output of each of the main Government substations should be taken over by a single Power Board. This will not always be possible owing to the geographical configuration of the district, but should generally be complied with.

(*e.*) For rating and statistical purposes it will be advisable, as far as possible, to utilize existing county boundaries whenever they conform approximately to the above considerations.

In the light of these considerations and of the experience gained so far, a number of the districts are now combining, and the attached table gives the districts proposed as a result, the population having been revised in accordance with the 1921 census :—

List of Suggested Electric-power Districts.

This allocation of suggested power districts represents what is considered to be the minimum areas for the most economical distribution, but in some instances, where community of interest is proved, the merging of adjacent areas to form a larger district will be approved. The subdivision of these proposed areas should be avoided wherever possible unless substantial reasons are advanced

North Island.

No.	Name.	Population.	Estimated Horse-power.
1	Whangaroa	11,905	2,400
2	Hobson	6,814	1,400
3	Whangarei	13,796	2,800
4	Rodney	7,437	1,500
5	Waitemata	27,144	5,400
6	Auckland–Manukau	145,870	30,000
7	Franklin	16,959	3,400
8	Waikato	29,745	6,000
9	Thames Valley	34,816	7,000
10	Waitomo	17,430	3,500
11	Taumarunui	10,167	2,000
12	Waimarino	6,093	1,200
13	Taranaki	61,535	12,300
14	Rangitikei–Wanganui	39,888	8,000
15	Manawatu	36,642	7,300
16	Horowhenua	11,989	2,400
17	Wellington	93,030	19,000
18	Hutt Valley	22,594	4,500
19	Wairarapa	22,159	4,400
20	Tararua	10,090	2,000
21	Dannevirke	13,082	2,600
22	Waipawa	7,752	1,500
23	Hawke's Bay	36,810	7,400
24	Wairoa	4,368	800
25	Poverty Bay	25,057	5,000
26	Bay of Plenty	21,544	4,300
27	East Taupo	772	100
	Totals	735,488	148,200

Suggested Electric-power Districts.

North Island.

1. Whangaroa :—

	Population.
Whangaroa County	896
Mongonui County	3,907
Hokianga County	2,813
Bay of Islands County	4,289
	11,905

Horse-power—2,400.

No electric supply at present.

2. Hobson :—

Dargaville Borough	2,052
Hobson County	4,762
	6,814

Horse-power—1,400.

No electric supply at present. Proposal on foot for formation of electric-power district.

3. Whangarei :—

Whangarei Borough	4,014
Hikurangi Town District ..	838
Whangarei County	8,944
	13,796

Horse-power—2,800.

This district includes the Wairau Falls power plant (2,500 h.p.) belonging to Wilson's (N.Z.) Portland Cement Company, who hold a license to distribute over a large portion of the area.

4. Rodney :—

Warkworth Town District ..	423
Rodney County	3,372
Otamatea County	3,642
	7,437

Horse-power—1,500.

No electric supply at present.

5. Waitemata :—

Birkenhead Borough	2,516
Northcote Borough	2,037
Takapuna Borough	3,910
Devonport Borough	8,760
Helensville Town District ..	904
Waitemata County	9,017
	27,144

Horse-power—5,400.

Existing gas-power plant at Devonport, 260 h.p. Proposal on foot to form electric-power district.

6. Auckland-Manukau :—

Auckland City	81,718
Newmarket Borough	3,084
Mount Eden Borough	14,636
Mount Albert Borough ..	11,347
Onehunga Borough	7,072
Otahuhu Borough	2,813
New Lynn Town District ..	1,389
Ellerslie Town District	1,615
Manurewa Town District ..	751
Papatoetoe Town District ..	1,171
Eden County	14,267
Manukau County	6,007
	145,870

Horse-power—30,000.

Existing steam-power plant in Auckland City (two stations) (17,000 h.p.), to be consolidated and extended to 26,000 h.p. Proposal on foot for Power Board.

7. Franklin :—

	Population.
Pukekohe Borough	1,890
Waiuku Town District	730
Tuakau Town District	493
Papakura Town District ..	1,109
Franklin County	9,493
Waikato County (part) ..	2,044
Raglan County (part)	1,200
	16,959

Horse-power—3,400.

Small electric-power plants now in service in Pukekohe (110 h.p.) and Waiuku (32 h.p.).

8. Waikato :—

Hamilton Borough	11,439
Cambridge Borough	2,065
Ngaruawahia Borough	1,120
Huntly Town District	1,734
Raglan County (part)	3,537
Waikato County (part) ..	5,850
Waipa County (part)	4,000
	29,745

Horse-power—6,000.

This includes the existing Cambridge and Central Electric-power Boards' districts as well as Hamilton Borough, with the following electric-power plants: Hamilton (240 h.p.), Huntly (300 h.p.), and Ngaruawahia (100 h.p.).

9. Thames Valley :—

Thames Borough	4,768
Waihi Borough	3,957
Te Aroha Borough	2,109
Paeroa Borough	1,645
Morrinsville Borough	1,327
Matamata Town District ..	815
Thames County	1,787
Ohinemuri County	2,643
Piako County	6,095
Matamata County	4,170
Coromandel County	2,144
Hauraki Plains County ..	3,356
	34,816

Horse-power—7,000.

This coincides with the Thames Valley Electric-power District with the addition of Coromandel County, which should be taken in as an outer area. It includes existing power plants in Thames (280 h.p.) and Te Aroha (400 h.p.).

10. Waitomo :—

Te Awamutu Borough	1,521
Te Kuiti Borough	2,240
Waipa County (part)	3,862
West Taupo County (part) ..	1,679
Waitomo County	6,321
Kawhia County	1,034
Awakino County	773
	17,430

Horse-power—3,500.

This includes the existing Te Awamutu Electric-power District, which is supplied from Horahora power-station; also the existing 150 h.p. gas-engine plant at Te Kuiti Borough.

SUGGESTED ELECTRIC-POWER DISTRICTS—*continued.*

North Island—continued.

11. Taumarunui :—

	Population.
Taumarunui Borough ..	2,143
Manunui Town District ..	841
Ohura County	2,782
Kaiticke County	3,001
West Taupo County (part) ..	1,400
	10,167

Horse-power—2,000.

No existing electric-power supply.

12. Waimarino :—

Ohakune Borough	1,535
Raetihi Borough	848
Rangataua Town District ..	447
Waimarino County	3,263
	6,093

Horse-power—1,200.

Existing water-power plants at Ohakune (120 h.p.) and Raetihi (60 h.p.).

13. Taranaki :—

New Plymouth Borough ..	11,393
Waitara Borough	1,566
Inglewood Borough	1,184
Hawera Borough	4,148
Stratford Borough	3,079
Eltham Borough	2,022
Patea Borough	1,168
Manaia Town District	645
Waverley Town District ..	640
Inglewood County	3,136
Taranaki County	4,942
Clifton County	2,136
Hawera County	5,342
Egmont County	3,227
Waimate West County ..	2,350
Stratford County	5,187
Eltham County	3,526
Whangamomona County ..	1,323
Patea County	3,244
Waitotara County (part) ..	1,277
	61,535

Horse-power—12,300.

Existing water-power plant at New Plymouth (1,000 h.p.). License issued for extensions to 5,000 h.p. : Hawera (600 h.p., water), Stratford Borough (300 h.p.), Patea Borough (100 h.p., water), Waverley Town Board (150 h.p., water), Inglewood (160 h.p., water), Waitara (100 h.p., gas), Kaponga (50 h.p., water). Proposal on foot to form an electric-power district.

14. Rangitikei-Wanganui :—

Wanganui Borough	16,492
Marton Borough	2,597
Taihape Borough	2,097
Gonville Town District ..	3,312
Castlecliff Town District ..	1,629
Hunterville Town District ..	625
Bull's Town District	504
Mangaweka Town District ..	359
Wanganui County	2,636
Waitotara County (part) ..	1,500
Rangitikei County	8,137
	39,888

Horse-power—8,000.

Existing tramway gas plant at Wanganui (500 h.p.), and steam plant (2,000 h.p.) on order ; Taihape (240 h.p. , Mangaweka (40 h.p.), Bull's (40 h.p.). Proposal on foot to form an electric-power district.

15. Oroua-Manawatu :—

	Population.
Palmerston North Borough ..	15,648
Feilding Borough	4,510
Manawatu County	4,436
Kiwitea County	2,438
Oroua County	3,602
Pohangina County	1,341
Kairanga County	4,667
	36,642

Horse-power—7,300.

Existing electric plant at Feilding (400 h.p.). Palmerston North installing 1,350 h.p. Proposal on foot to form an electric-power district.

16. Horowhenua :—

Levin Borough	1,979
Otaki Borough	1,083
Shannon Borough	1,012
Foxton Borough	1,688
Horowhenua County	5,399
Hutt County (part)	828
	11,989

Horse-power—2,400.

No existing electric supply at present. Proposal on foot to form an electric-power district.

17. Wellington :—

Wellington City	88,876
Johnsonville Town District ..	1,013
Makara County	3,141
	93,030

Horse-power—19,000.

Existing steam plant in Wellington City (two stations) (10,000 h.p.), to be consolidated and extended to 13,000 h.p.

18. Hutt Valley :—

Petone Borough	7,979
Lower Hutt Borough	5,723
Eastbourne Borough	1,411
Upper Hutt Town District ..	1,651
Hutt County (part)	5,830
	22,594

Horse-power—4,500.

No existing supply plant. Proposal on foot to form an electric-power district.

19. Wairarapa :—

Masterton Borough	7,823
Carterton Borough	1,671
Greytown Borough	1,224
Featherston Borough	1,067
Martinborough Town District ..	932
Masterton County	2,915
Wairarapa County	3,013
Featherston County	3,514
	22,159

Horse-power—4,400.

Includes the existing Wairarapa Power District with small extensions. Existing gas plant in Martinborough (40 h.p.).

SUGGESTED ELECTRIC-POWER DISTRICTS—*continued.*

North Island—continued.

20. Tararua :—

	Population.
Pahiatua Borough	1,340
Eketahuna Borough	874
Pahiatua County	3,088
Eketahuna County	2,175
Mauriceville County	832
Castlepoint County	561
Akitio County	1,220
	10,090

Horse-power—2,000.

Existing borough gas-engine plants in Pahiatua (50 h.p.) and Eketahuna (90 h.p.). Proposal on foot to form an electric-power district.

21. Dannevirke :—

Dannevirke Borough	3,895
Woodville Borough	1,150
Dannevirke County	4,637
Woodville County	1,868
Weber County	428
Patangata County (part) ..	1,104
	13,082

Horse-power—2,600.

No existing supply plants. Electric-power district constituted.

22. Waipawa :—

Waipawa Borough	1,120
Waipukurau Borough	1,378
Waipawa County	3,260
Waipukurau County	994
Patangata County (part) ..	1,000
	7,752

Horse-power—1,500.

Proposal on foot to form an electric-power district.

23. Hawke's Bay :—

Napier Borough	14,302
Hastings Borough	9,106
Taradale Town District ..	1,007
Havelock Town District ..	1,176
Hawke's Bay County	11,219
	36,810

Horse-power—7,400.

Existing plants: Napier (gas, 1,400 h.p.) and Hastings (oil, 500 h.p.). Havelock North installing 240 h.p. water. Proposal on foot to form an electric-power district.

24. Wairoa :—

	Population.
Wairoa Borough	1,915
Wairoa County	2,453
	4,368

Horse-power—800.

Existing gas plant: Wairoa (80 h.p.). Electric-power district constituted.

25. Poverty Bay :—

Gisborne Borough	10,930
Mangapapa Town District ..	1,401
Cook County	6,123
Waikohu County	3,266
Waiapu County	1,726
Uawa County	949
Matakaoa County	662
	25,057

Horse-power—5,000.

Existing plant: Gisborne (oil and steam, 1,000 h.p.). License issued for whole area except Waiapu County to hydro-electric company.

26. Bay of Plenty :—

Whakatane Borough	1,709
Opotiki Borough	1,150
Rotorua Borough	3,883
Tauranga Borough	2,254
Te Puke Town District ..	852
Whakatane County	3,054
Opotiki County	2,080
Rotorua County	1,906
Tauranga County	4,656
	21,544

Horse-power—4,300.

Existing plant: Opotiki (120 h.p.). Proposal to develop 300 h.p. of water-power for Whakatane Borough, Okere Falls (200 h.p.). Proposal to extend this to ultimate capacity of 10,000 h.p. Tauranga Borough (250 h.p.). Large extensions proposed (800 h.p.). Proposal on foot to form an electric-power district.

27. East Taupo :—

East Taupo County	772

Horse-power—100.

Does not justify any general development at present.

SUGGESTED ELECTRIC-POWER DISTRICTS—*continued.*

South Island.

No.	Name.	Population.	Estimated Horse-power.
1	Nelson	24,661	5,000
2	Buller	14,014	2,800
3	Westland	19,357	4,000
4	Marlborough	18,024	3,600
5	Waipara	5,657	1,100
6	Rangiora	11,400	2,300
7	Canterbury	122,570	24,500
8	Banks Peninsula	3,839	800
9	Ashburton	17,224	3,400
10	South Canterbury	40,657	8,100
11	Waitaki	16,438	3,300
12	Otago	118,772	23,800
13	Southland	61,469	12,300
14	Queenstown	2,519	500
		476,601	95,500

SUGGESTED ELECTRIC-POWER DISTRICTS.

South Island.

1. Nelson:—

	Population.
Nelson City	9,285
Richmond Borough	1,022
Motueka Borough	1,487
Waimea County	9,804
Takaka County	1,948
Collingwood County	1,115
	24,661

Horse-power—5,000.

Power Board petition being prepared. Existing supply: Private company, water-power (60 h.p.). Motueka installing 60 h.p. (gas).

2. Buller:—

Westport Borough	3,802
Buller County	5,395
Murchison County	1,369
Inangahua County	3,448
	14,014

Horse-power—2,800.

Existing public supply: Reefton private company (150 h.p.). Murchison County installing 140 h.p. (water). Alternatively, the counties of Murchison and Inangahua might form separate districts. Reefton Electric-power District constituted. Proposals on foot for formation of Buller Electric-power District.

3. Westland:—

Greymouth Borough	4,986
Runanga Borough	1,233
Brunner Borough	527
Hokitika Borough	2,216
Kumara Borough	507
Ross Borough	464
Grey County	5,207
Westland County	4,217
	19,357

Horse-power—4,000.

Existing plant at Kanieri Forks, 700 h.p. (water). A Westland Electric-power District already constituted within Westland County.

4. Marlborough:—

	Population.
Blenheim Borough	4,347
Picton Borough	1,371
Marlborough County	7,314
Sounds County	1,176
Awatere County	1,655
Kaikoura County	2,161
	18,024

Horse-power—3,600.

Existing gas plant: Picton Borough (60 h.p.). Kaikoura installing small gas-electric plant.

5. Waipara:—

Cheviot County	1,230
Amuri County	2,103
Waipara County	2,324
	5,657

Horse-power—1,100.

No existing plants.

6. Rangiora:—

Rangiora Borough	2,004
Kaiapoi Borough	1,693
Rangiora County	3,017
Eyre County	1,918
Kowai County	1,994
Ashley County	774
	11,400

Horse-power—2,300.

Partly supplied from Lake Coleridge.

SUGGESTED ELECTRIC-POWER DISTRICTS—*continued.*

South Island—continued.

7. Canterbury :—

	Population.
Christchurch City	71,495
Lyttelton Borough	3,776
Sumner Borough	2,979
New Brighton Borough ..	3,793
Riccarton Borough	3,251
Waimairi County	13,540
Paparua County	5,083
Heathcote County	4,248
Halswell County	1,743
Oxford County	1,763
Selwyn County	1,538
Malvern County	2,933
Tawera County	901
Ellesmere County	3,696
Springs County	1,831
	122,570

Horse-power—24,500.

Already supplied from Lake Coleridge with 8,000 h.p. distributed by local bodies. Springs–Ellesmere Electric-power District already constituted.

8. Banks Peninsula :—

Akaroa Borough	619
Akaroa County	1,768
Wairewa County	1,011
Mount Herbert County ..	441
	3,839

Horse-power—800.

Electric-power Board constituted.

9. Ashburton :—

Ashburton Borough	4,825
Tinwald Town District ..	669
Ashburton County	11,730
	17,224

Horse-power—3,400.

Existing: Ashburton Borough gas plant (500 h.p.). Proposal on foot to form electric-power district.

10. South Canterbury :—

Timaru Borough	14,059
Temuka Borough	1,753
Geraldine Borough	956
Waimate Borough	2,100
Pleasant Point Town District ..	554
Levels County	5,127
Geraldine County	5,663
Waimate County	7,332
Mackenzie County	3,113
	40,657

Horse-power—8,100.

Existing: Timaru Borough gas plant (350 h.p.). Proposal on foot to form electric-power district.

11. Waitaki :—

Oamaru Borough	5,729
Hampden Borough	334
Waitaki County	10,375
	16,438

Horse-power—3,300.

Existing: Oamaru Borough water-power (100 h.p.).

12. Otago :—

	Population.
Dunedin City	59,198
Green Island Borough ..	1,962
Waikouaiti Borough	582
Palmerston Borough	808
Mosgiel Borough	1,761
St. Kilda Borough	6,085
West Harbour Borough ..	1,699
Port Chalmers Borough ..	2,713
Alexandra Borough	688
Cromwell Borough	623
Naseby Borough	229
Balclutha Borough	1,478
Kaitangata Borough	1,720
Tapanui Borough	308
Lawrence Borough	703
Milton Borough	1,363
Roxborough Borough	397
Peninsula County	1,777
Taieri County	5,718
Waikouaiti County	4,180
Maniototo County	2,592
Vincent County	3,810
Waihemo County	1,418
Clutha County	7,240
Bruce County	4,771
Tuapeka County	4,949
	118,772

Horse-power—23,800.

Existing: Dunedin City water-power plant at Waipori (8,000 h.p., capable of extension to 16,000 or 20,000 h.p.). Roxburgh district has set up small Power Board to develop 500 h.p. from Teviot River.

13. Southland :—

Invercargill Borough	15,204
Invercargill South Borough ..	1,834
Bluff Borough	1,599
Gore Borough	3,679
Mataura Borough	1,170
Riverton Borough	847
Winton Borough	612
Lumsden Town District ..	597
Nightcaps Town District ..	523
Otautau Town District ..	736
Wyndham Town District ..	693
Southland County	25,029
Wallace County	8,937
Fiord County	9
	61,469

Horse-power—12,300.

Power Board set up to develop Lake Monowai (12,000 h.p.) to 20,000 h.p. Portions of Clutha and Taieri Counties have been included in the Board, which should go with South Otago.

14. Queenstown :—

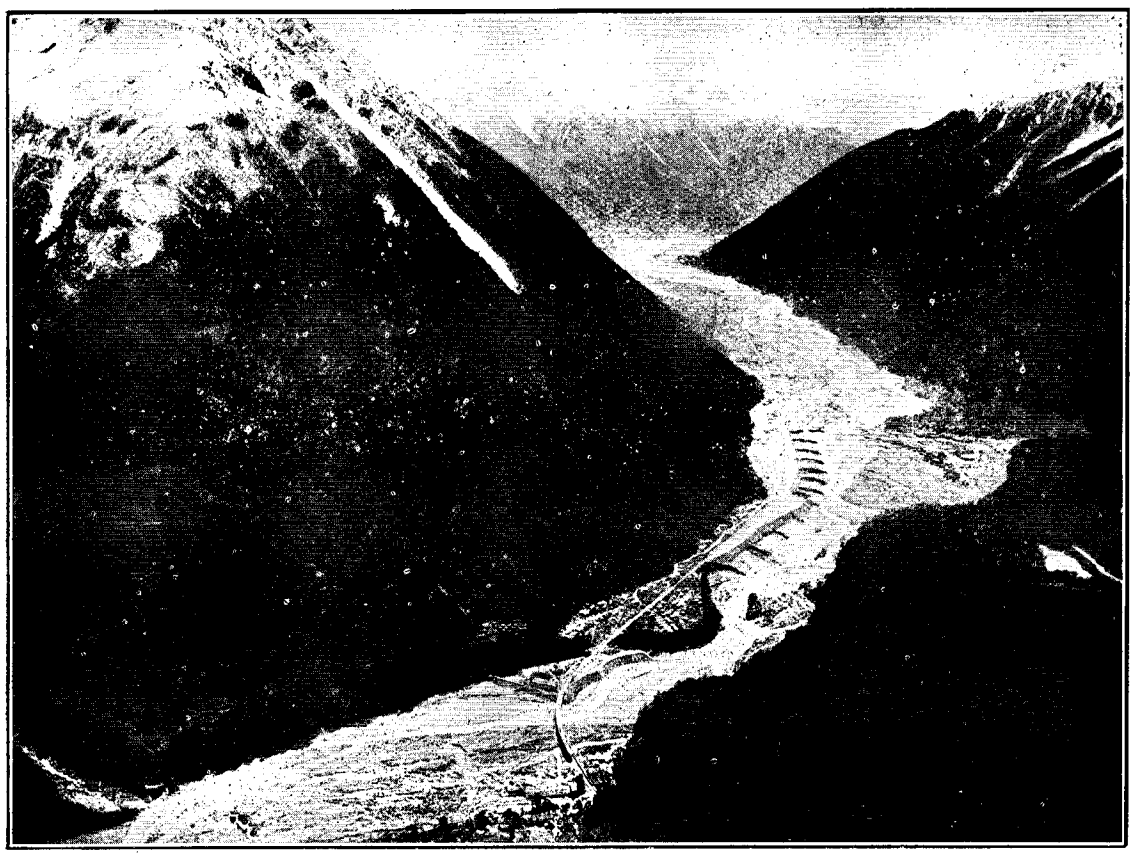
Queenstown Borough	571
Arrowtown Borough	317
Lake County	1,631
	2,519

Horse-power—500.

Queenstown Borough proposes to develop 100 h.p. locally.

L. BIRKS, B.Sc., M.Inst.C.E., M.I.E.E.,
Chief Electrical Engineer.

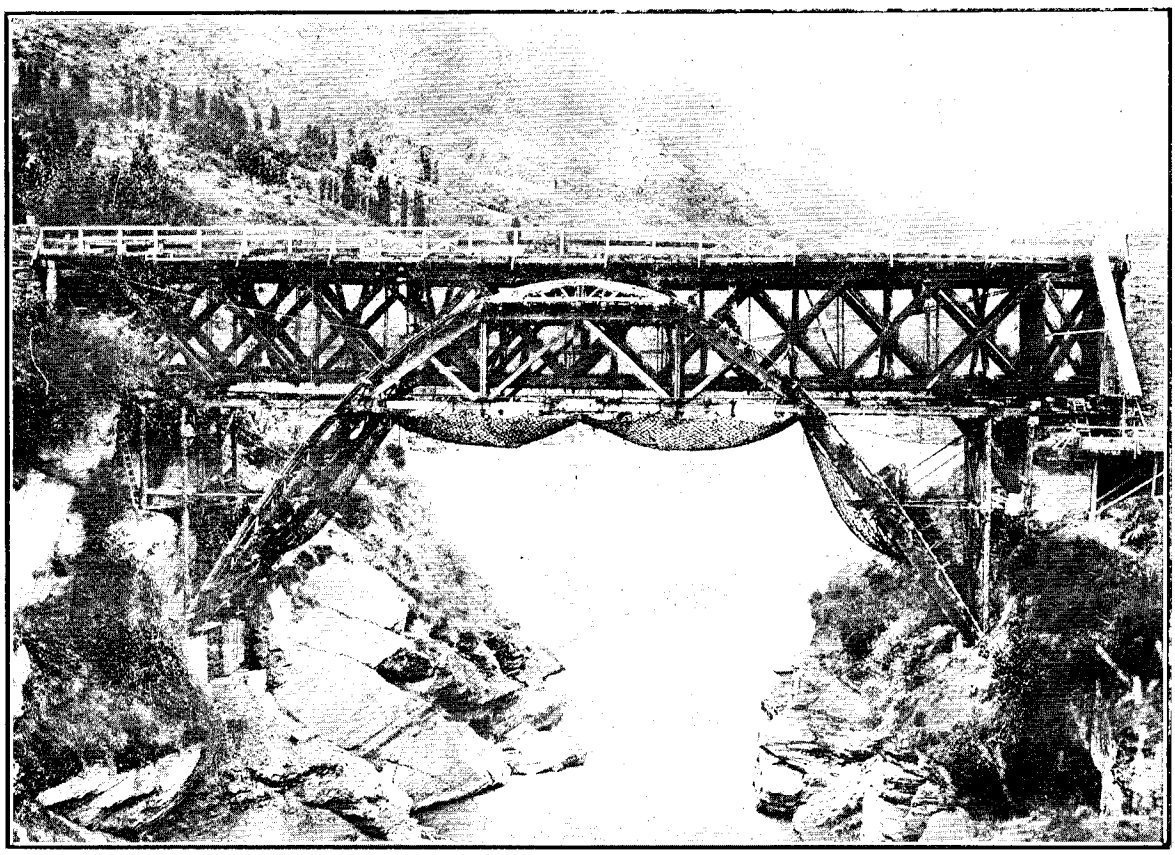
By Authority: MARCUS F. MARKS, Government Printer, Wellington.—1921.



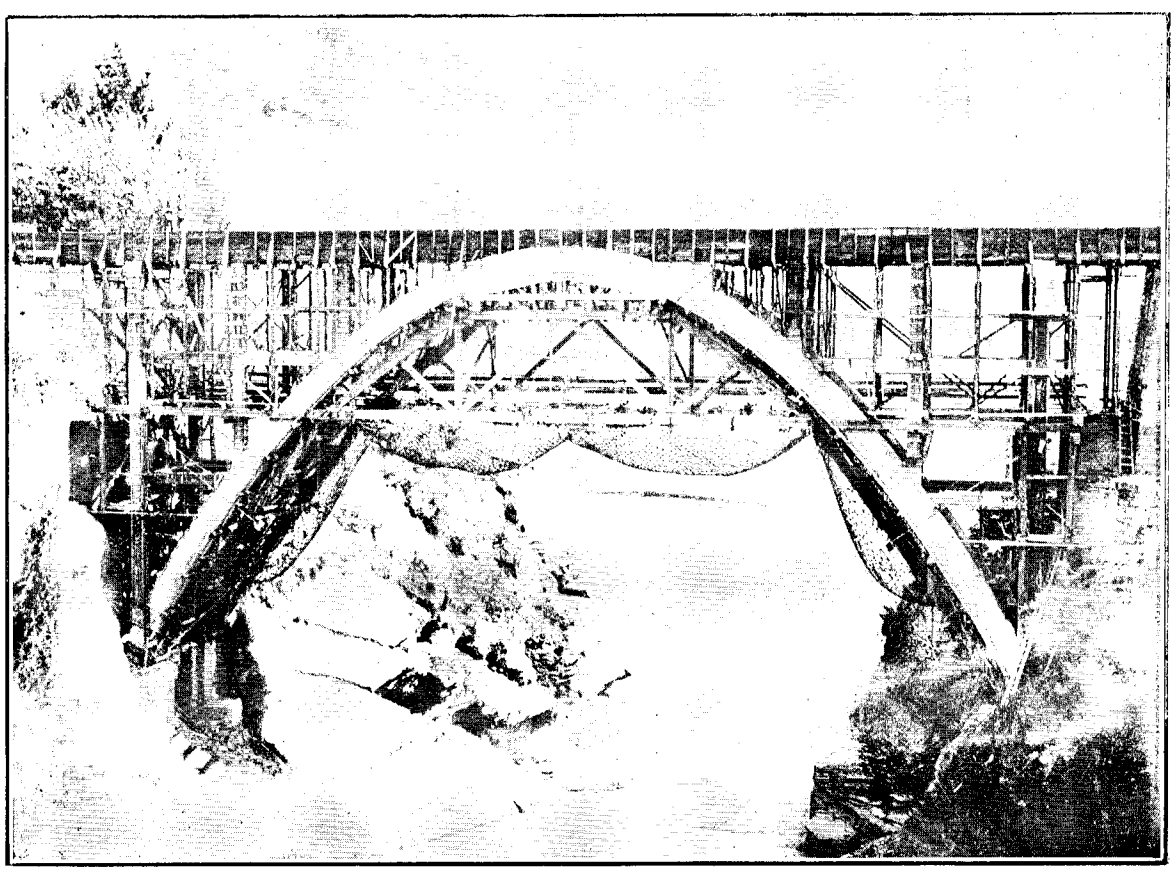
MIDLAND RAILWAY: OTIRA GORGE, WEST OF ARTHUR'S PASS TUNNEL, SHOWING PORTION OF MIDLAND RAILWAY.

MIDLAND RAILWAY: WESTERN END OF ARTHUR'S PASS TUNNEL.

Rolleston River and Bridge in foreground.

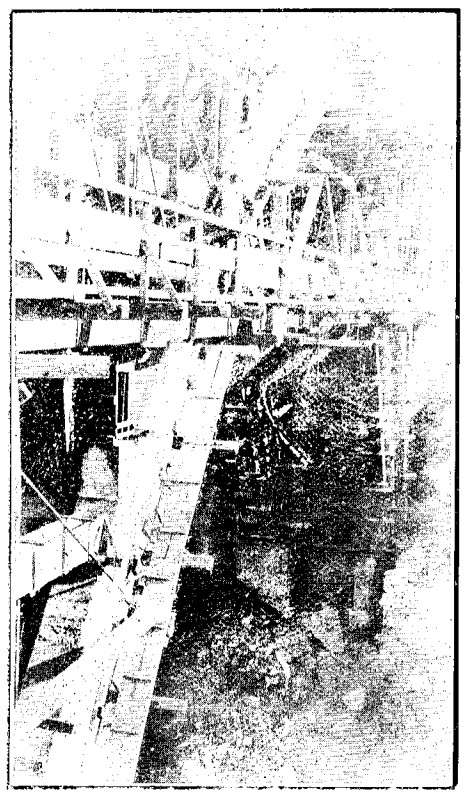


Shotover River Bridge, Arthur's Point: Old Bridge and Scaffold for New Arch.

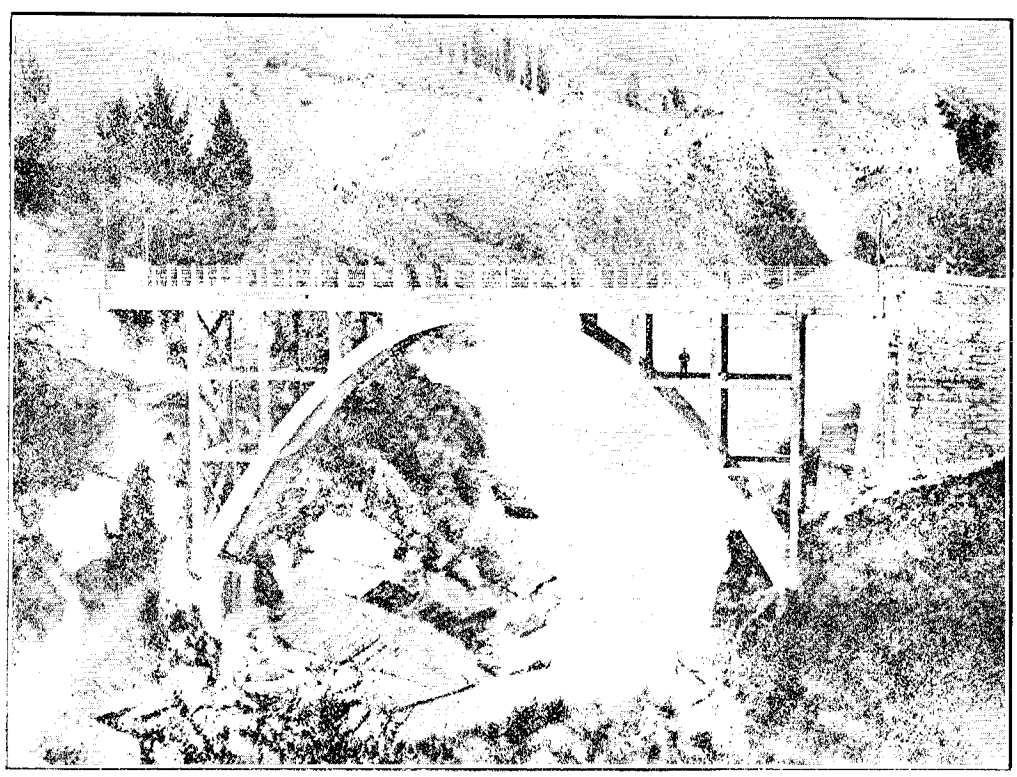


Shotover River Bridge, Arthur's Point: In Course of Construction.

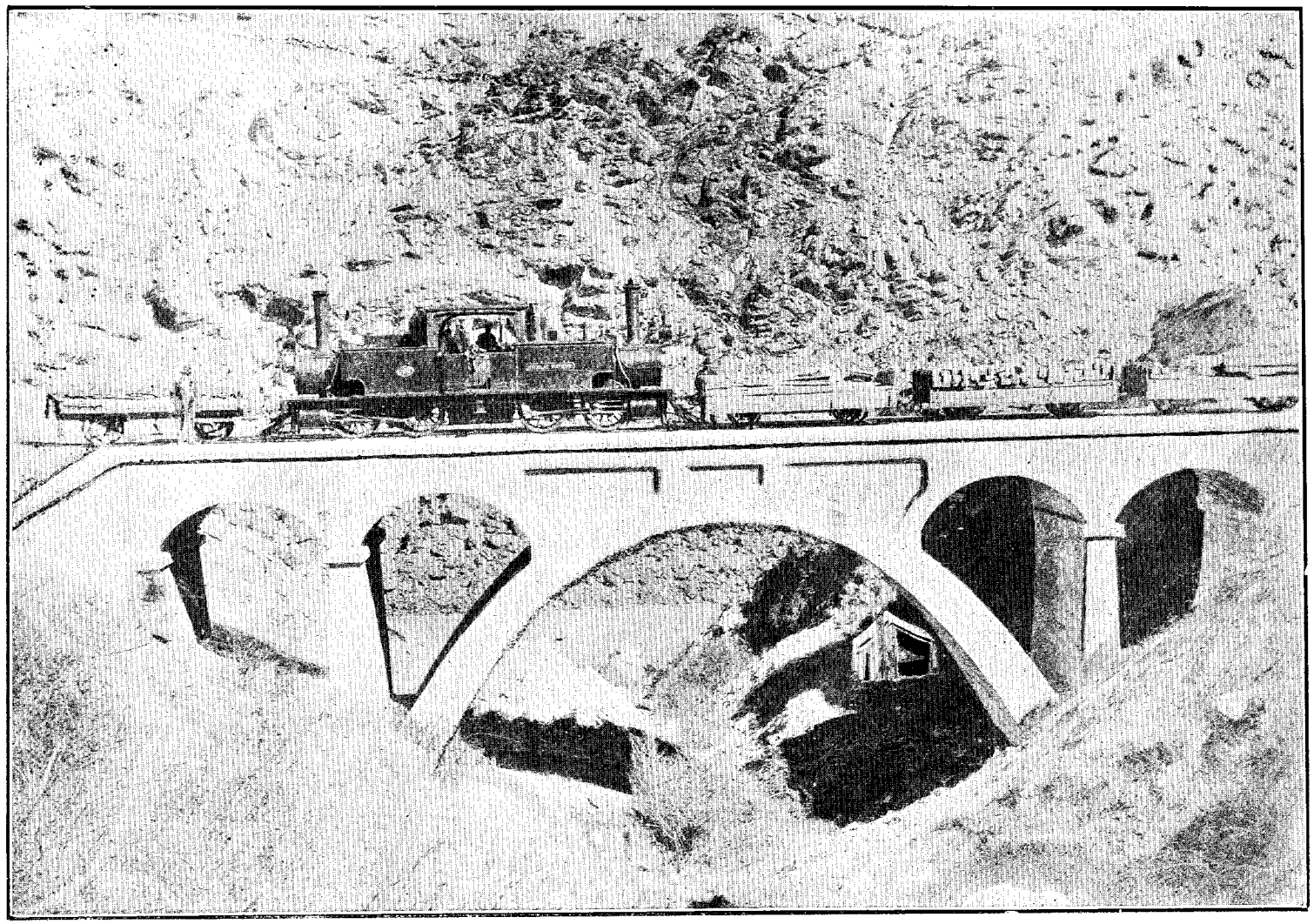
Arch carrying scaffolding; old bridge removed.



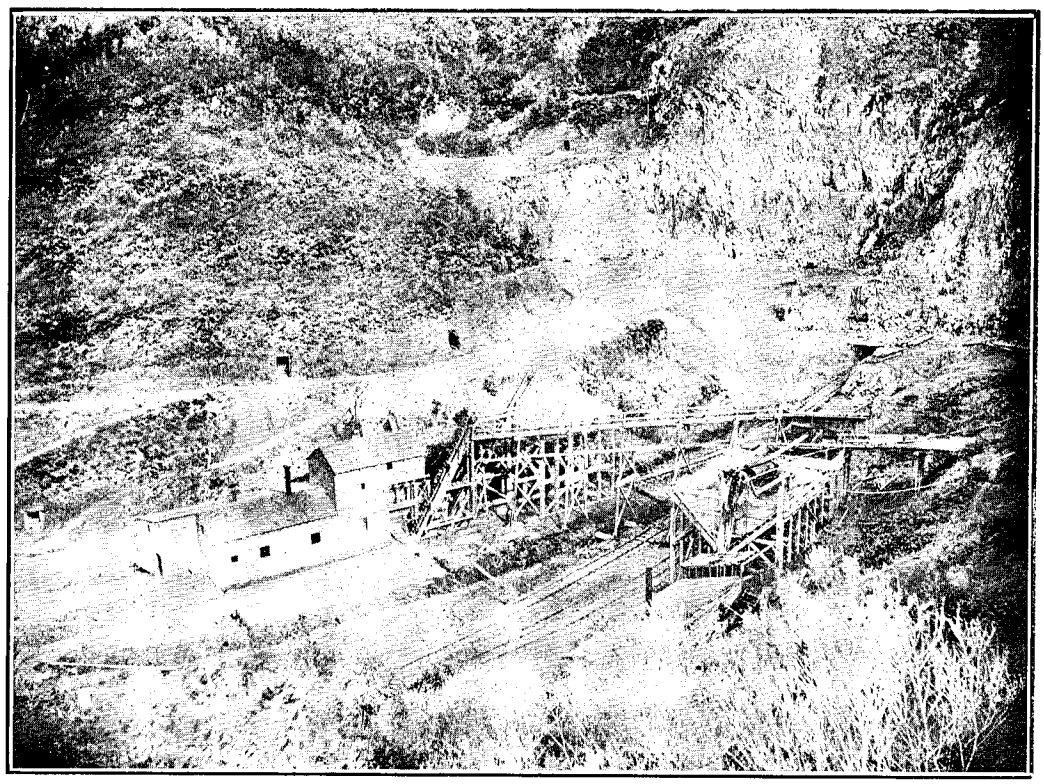
Shotover River Bridge, Arthur's Point: Arch under Construction.



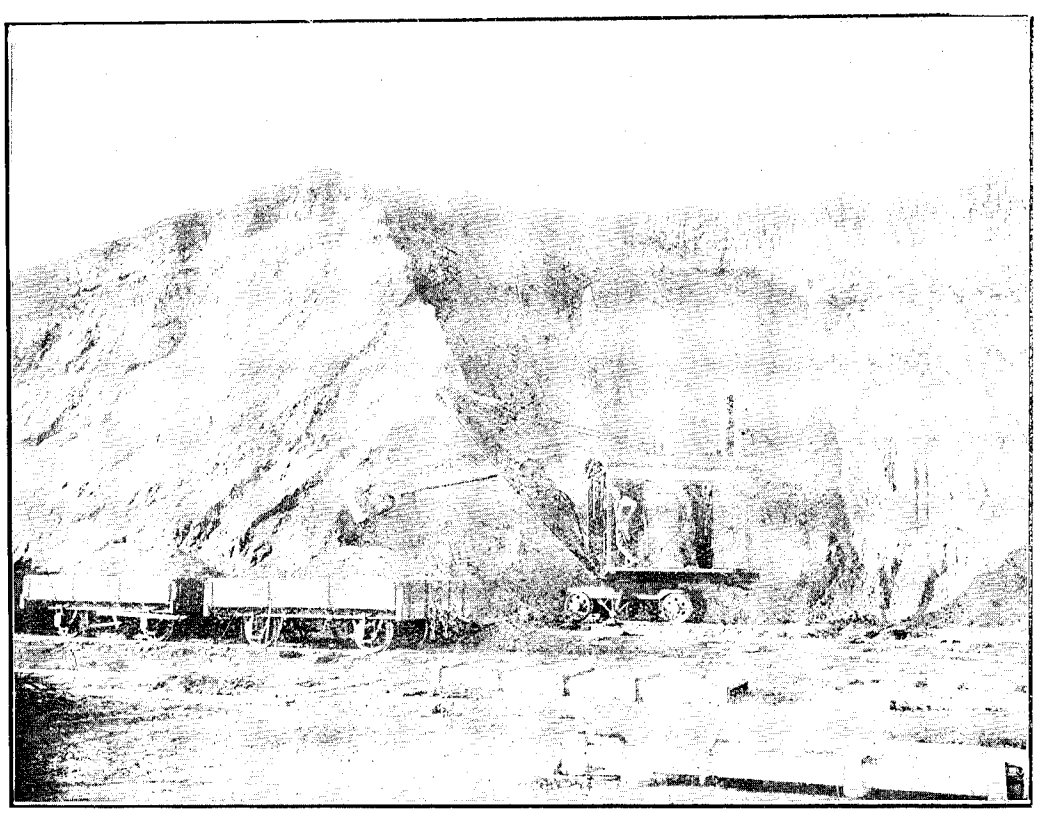
Shotover River Bridge, Arthur's Point: Finished Bridge.



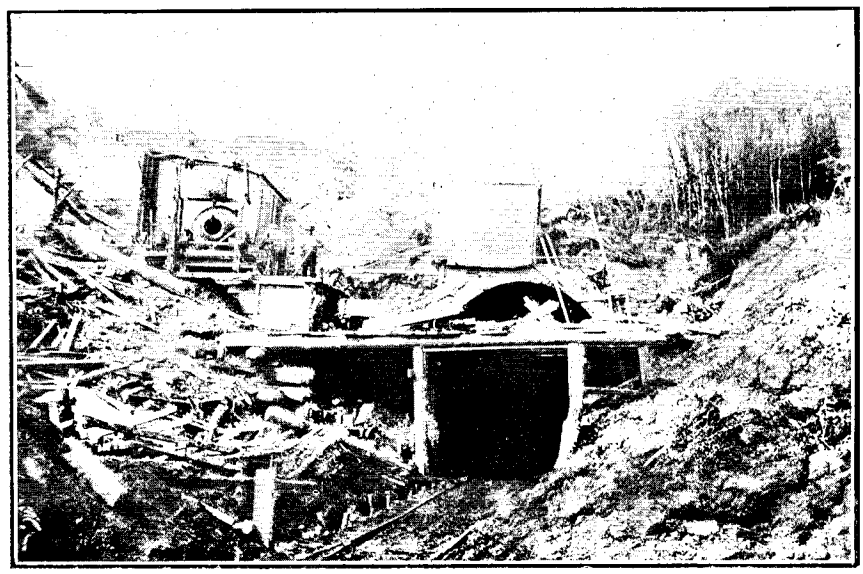
Leaning Rock Bridge, Otago Central Railway.



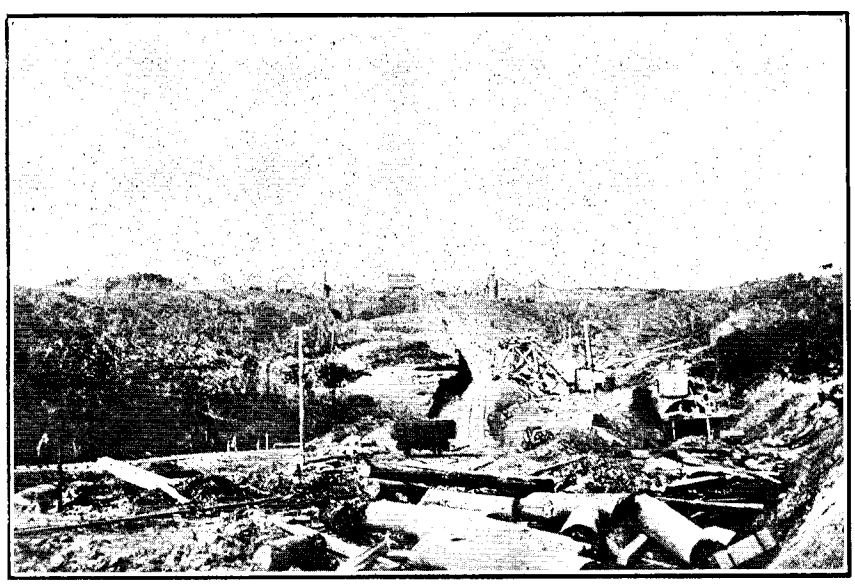
Te Puke Quarry.



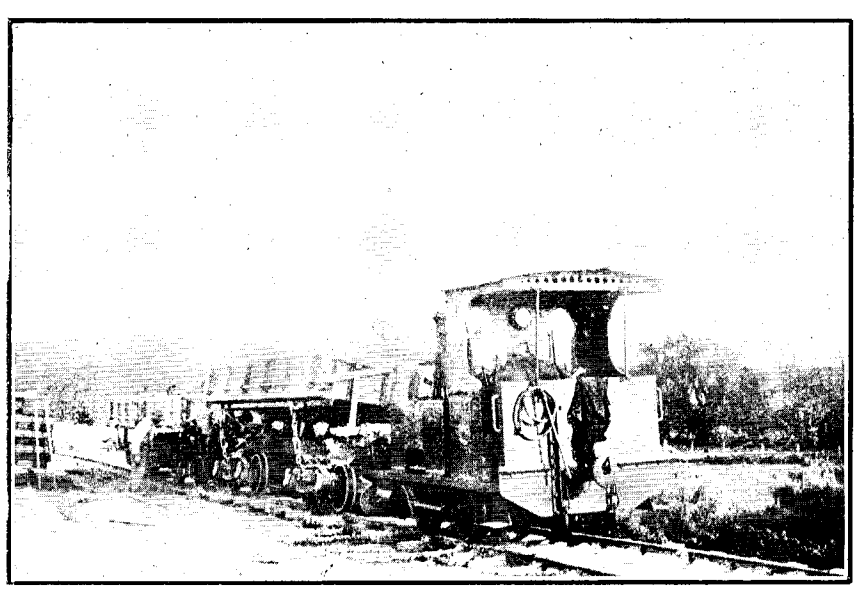
Steam-shovel in operation, Bay of Plenty District.



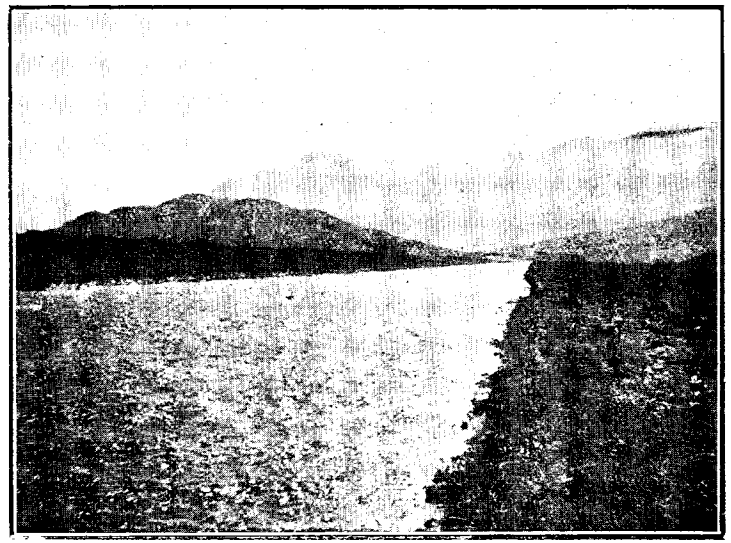
Entrance Mareretu Tunnel.



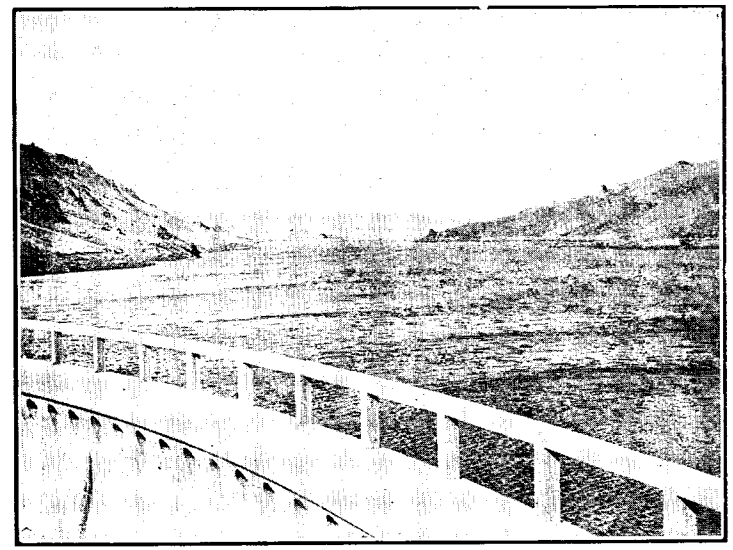
Jig-way over Mareretu Tunnel.



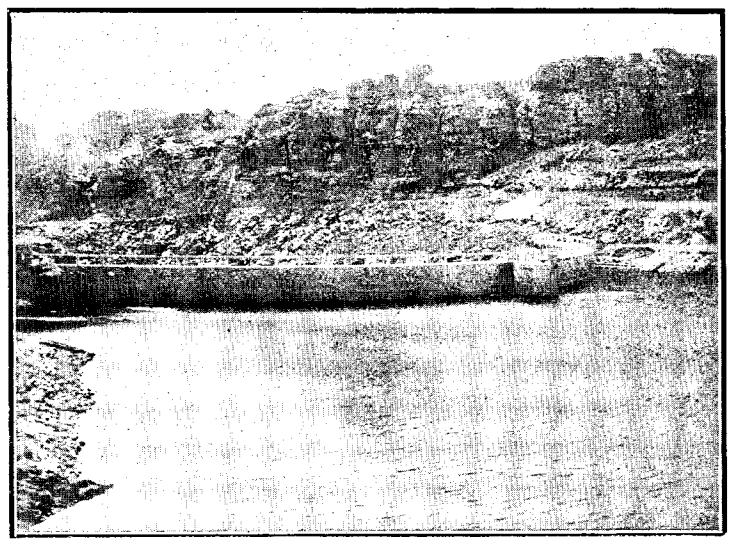
Typical Earthwork Train.



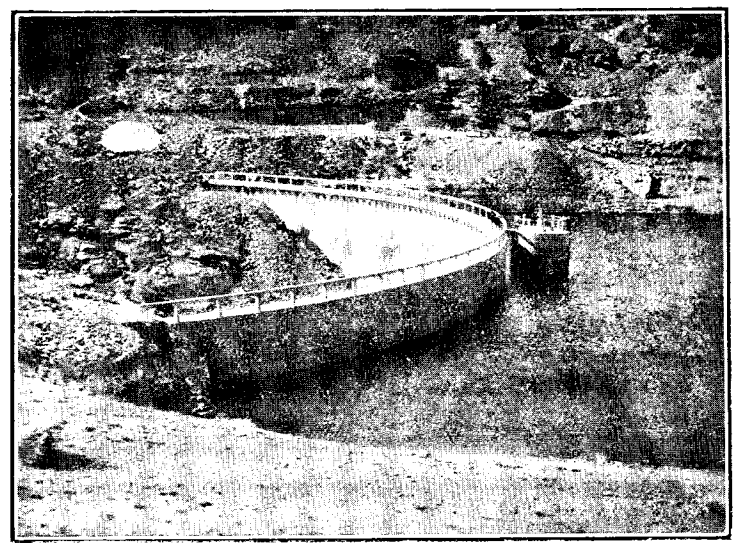
THE RACE FROM HARPER RIVER INTO LAKE COLERIDGE.



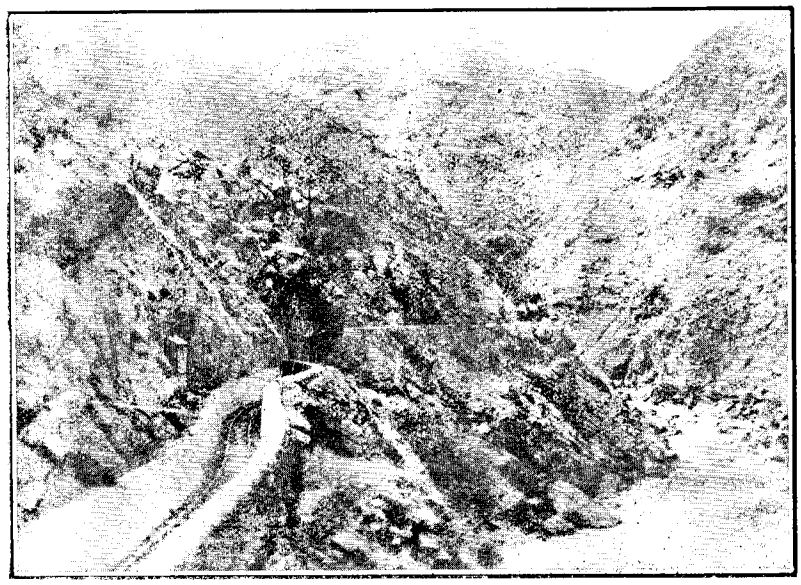
CENTRAL OTAGO IRRIGATION: MANORBURN DAM.



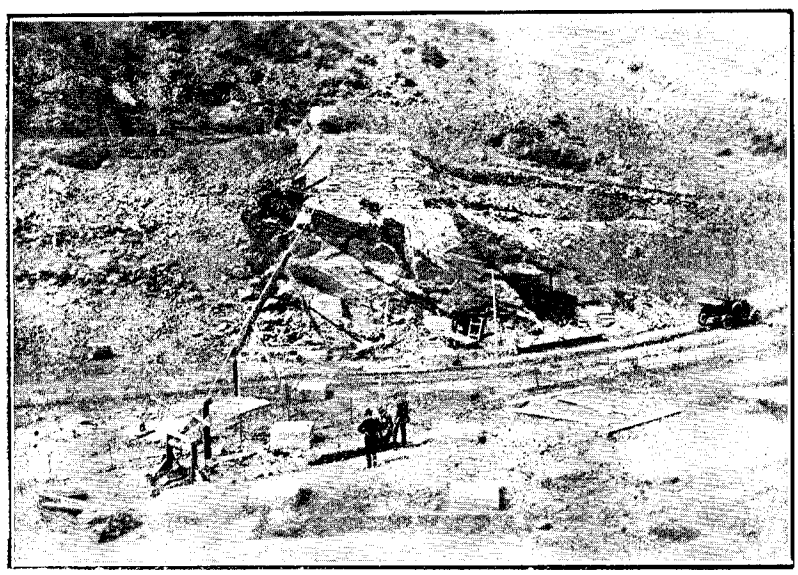
CENTRAL OTAGO IRRIGATION: MANORBURN DAM.



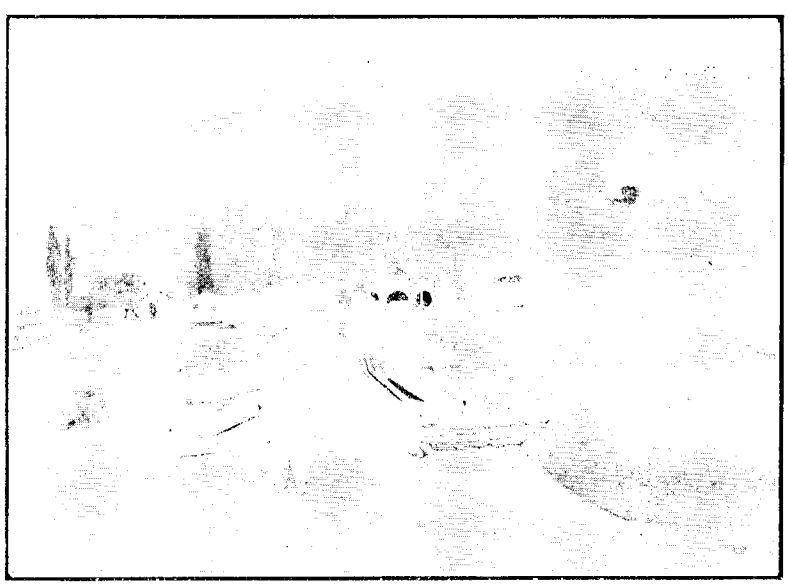
CENTRAL OTAGO IRRIGATION: MANORBURN DAM.



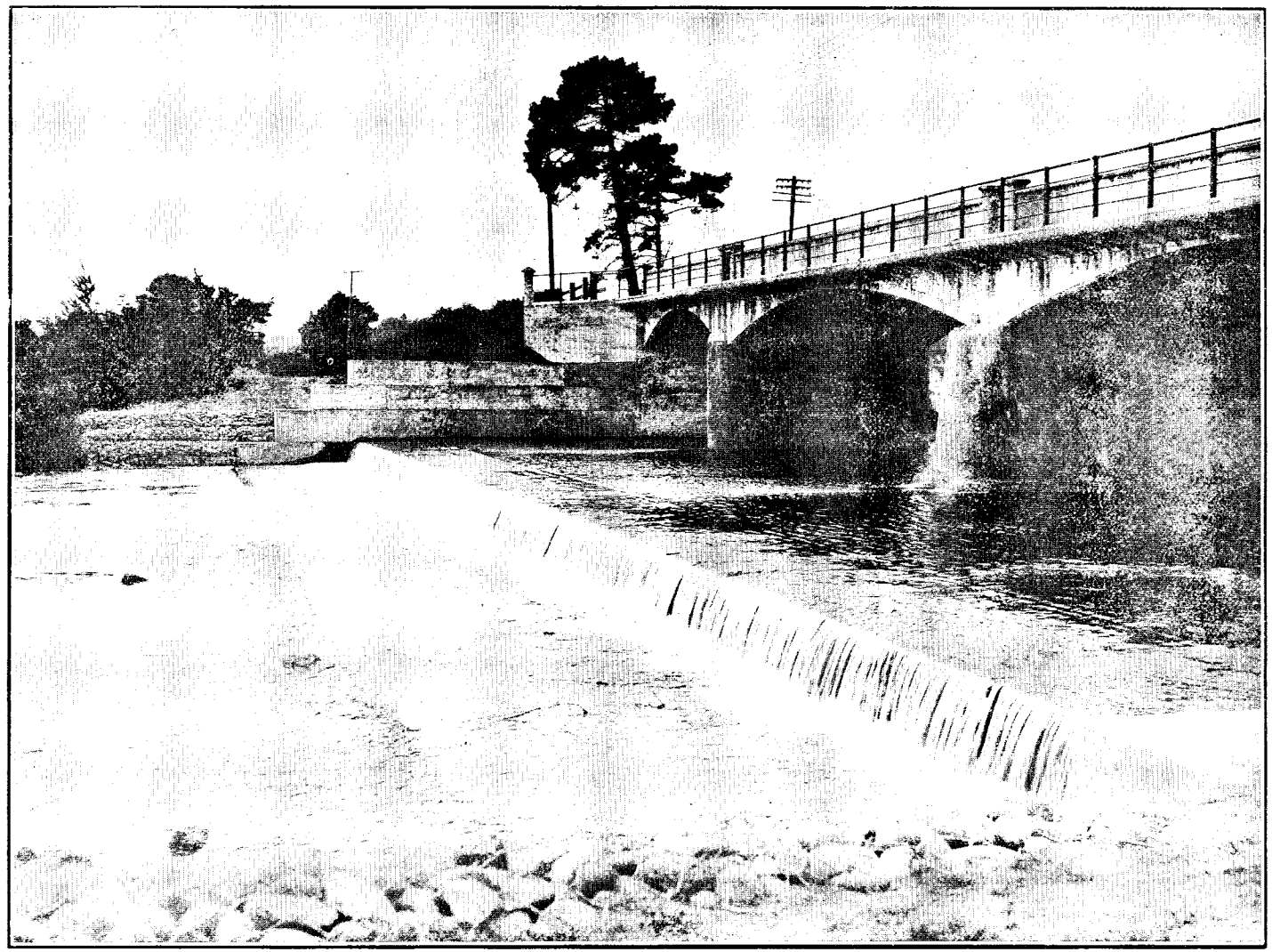
Central Otago Irrigation: Concrete-lined Water-race in Manucherikia Gorge.



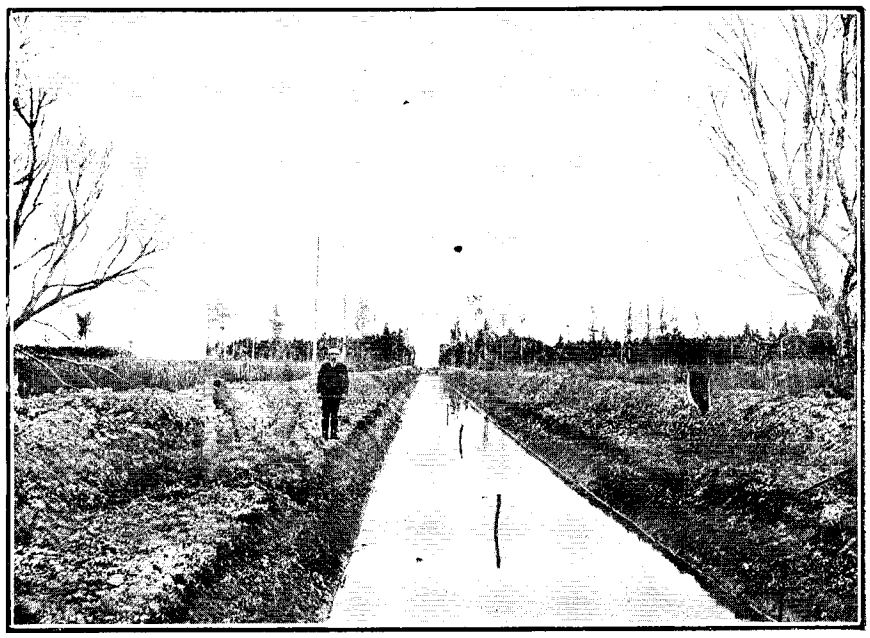
Central Otago Irrigation: Chinky Gully—Foundations for Flume.



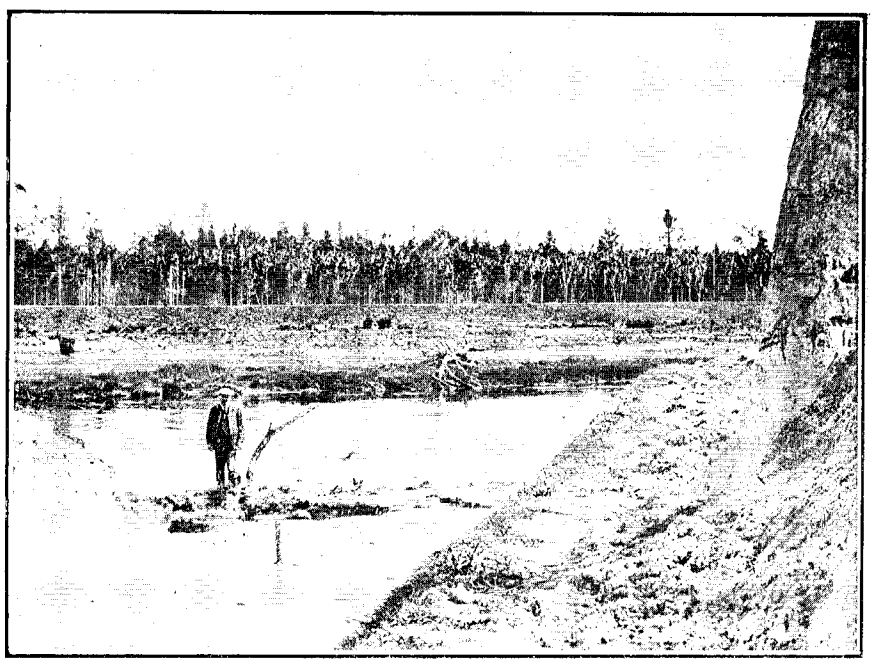
Central Otago Irrigation: Intake for Chatto Creek Siphon.



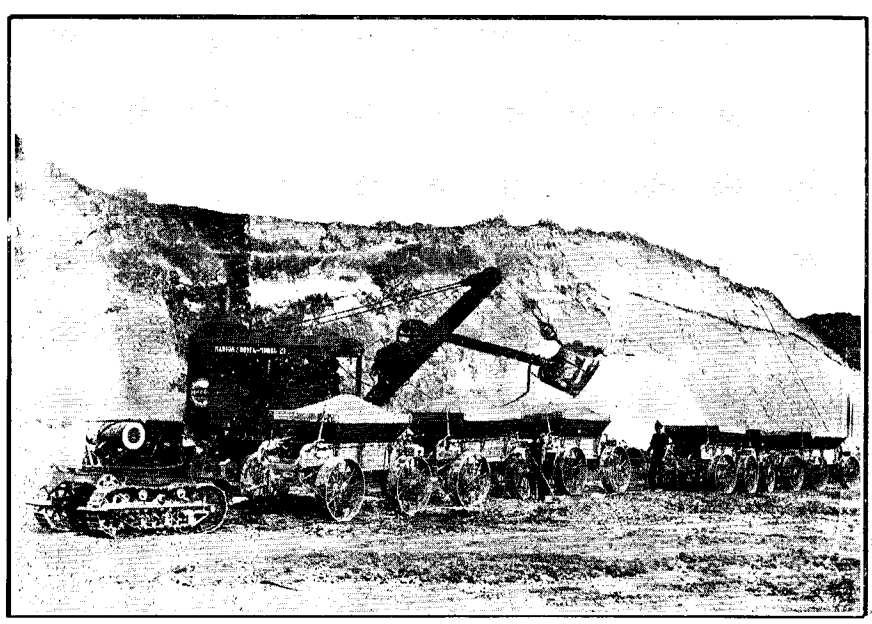
WAIWAKAIHO BRIDGE AND WEIR, NEW PLYMOUTH.



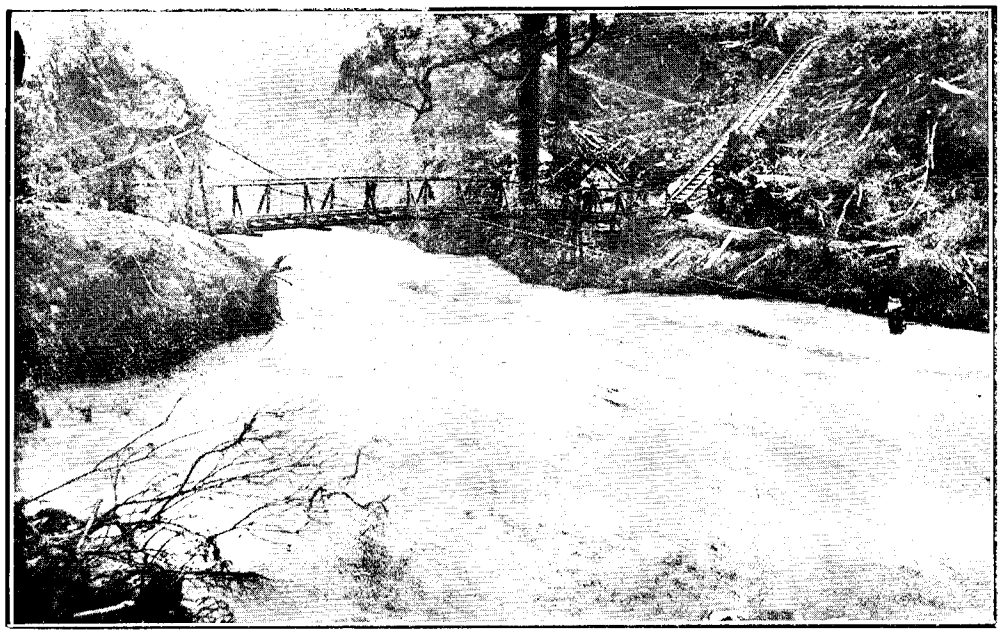
Waihou and Ohinemuri Rivers Improvement: Tiroihia Drain, Mill Road End.



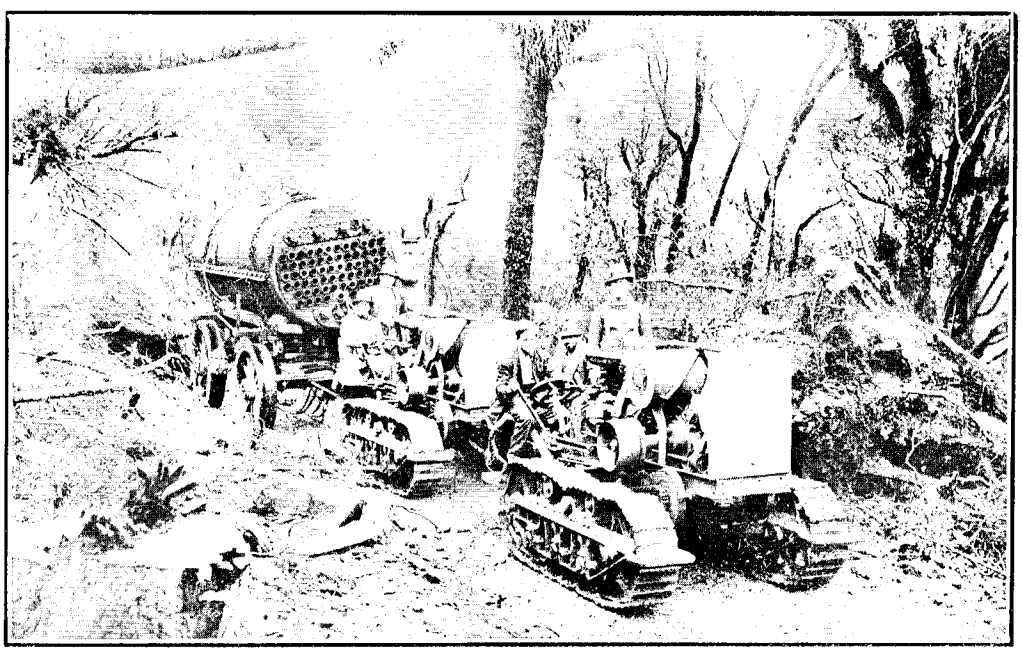
Waihou and Ohinemuri Rivers Improvement: Rotokohu Drain Inlet. Main levee visible across Waihou River.



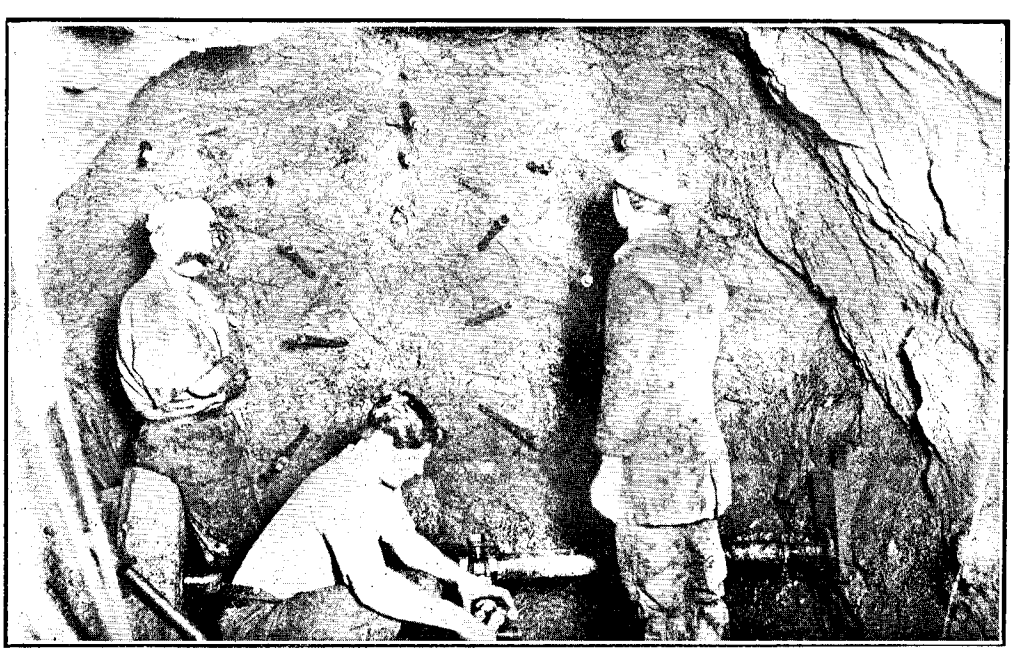
Moving Earth by Machinery.



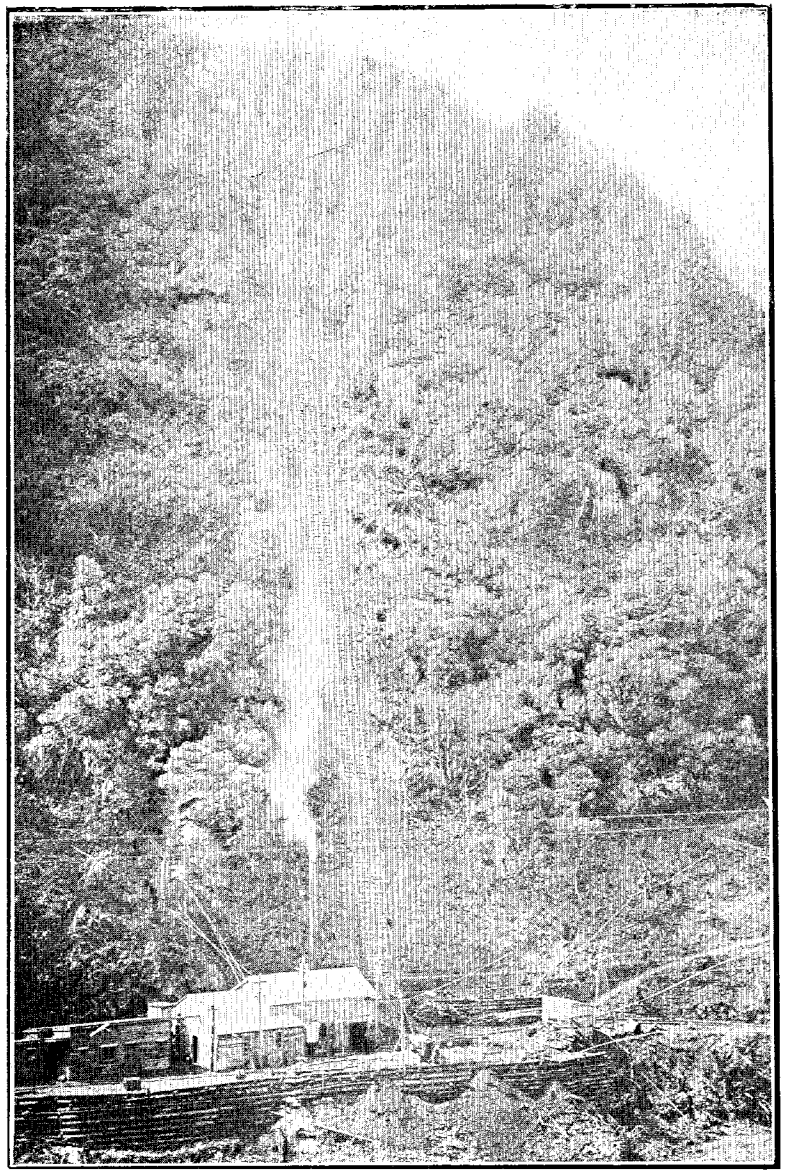
Mangahao Hydro-electric Scheme: Mangahao River in Flood.



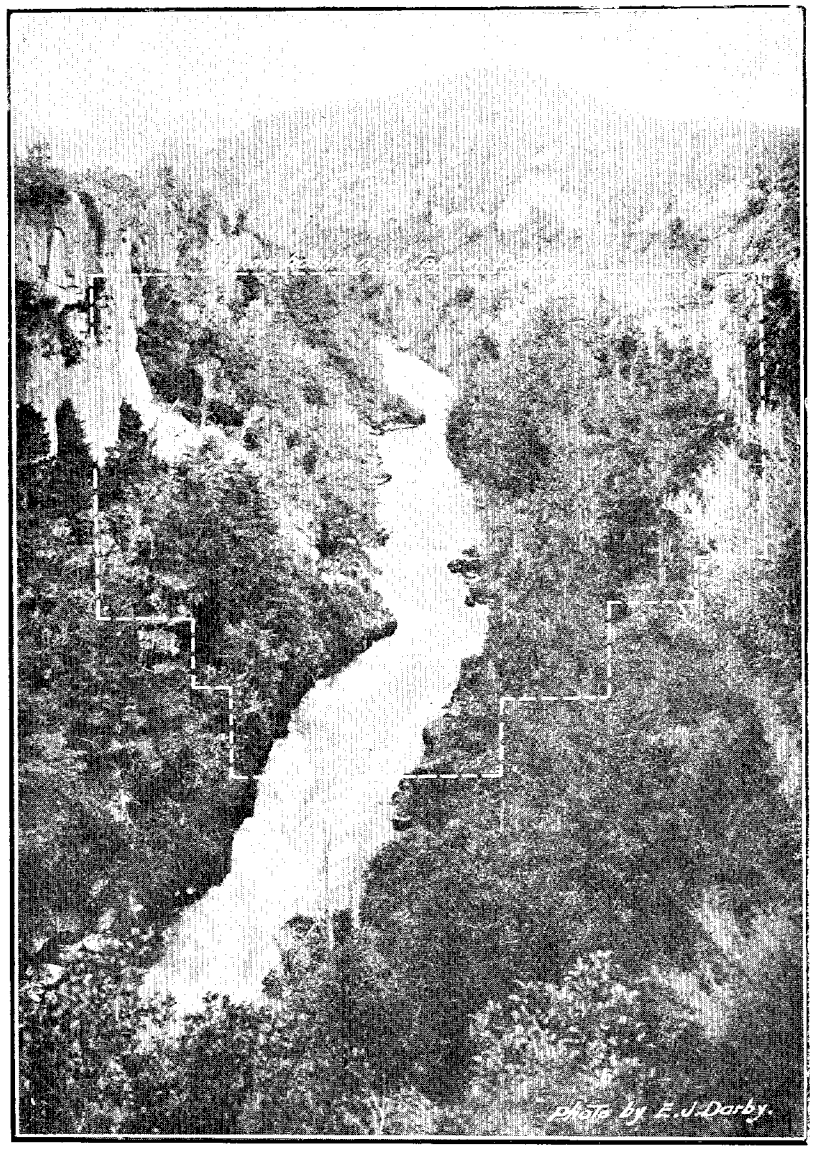
Mangahao Hydro-electric Scheme: Top Tararua Range—Tractors taking Boiler (weighing 7 tons) to Mangahao Dam-site.



Mangahao Hydro-electric Scheme: Inlet No. 1 Tunnel, showing some Boreholes in Tunnel for Blasting.



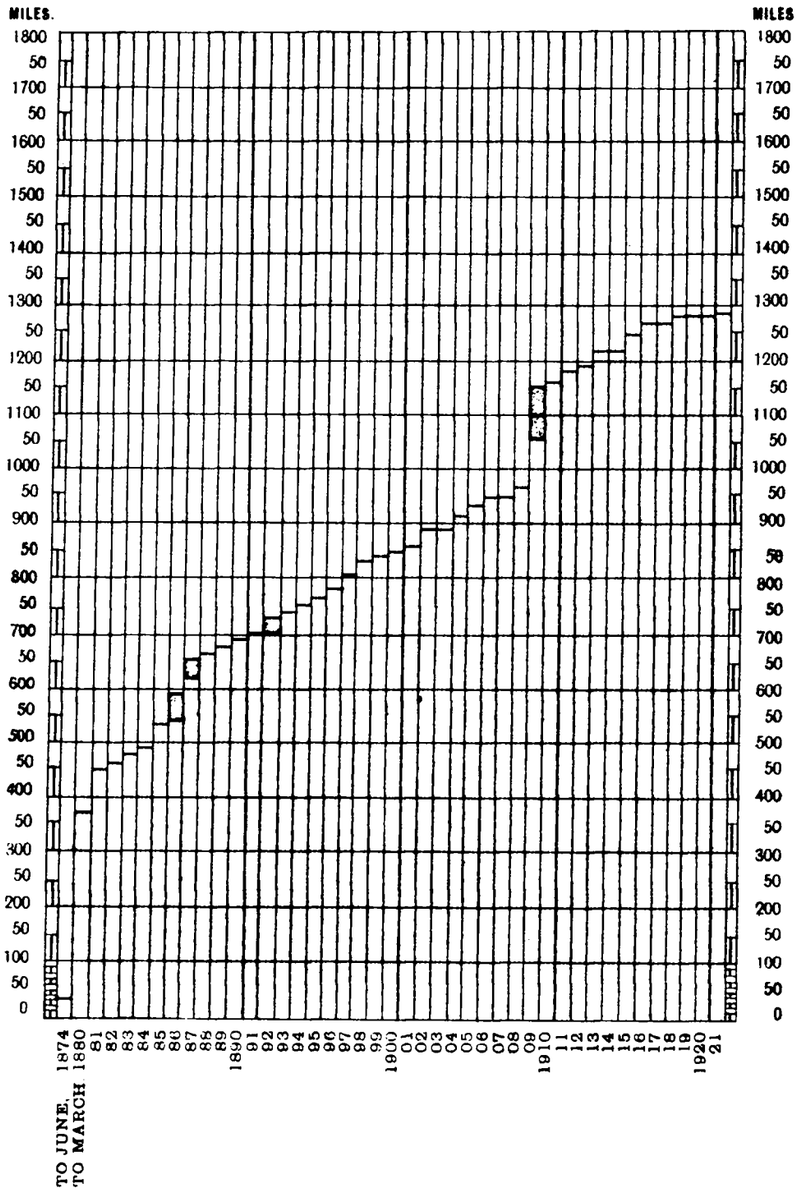
MANGAHAO HYDRO-ELECTRIC SCHEME: JIG-LINE FROM ROAD TO MANGAHAO DAM-SITE.



ARAPUNI HYDRO-ELECTRIC SCHEME: ARAPUNI GORGE, SHOWING DAM-SITE.

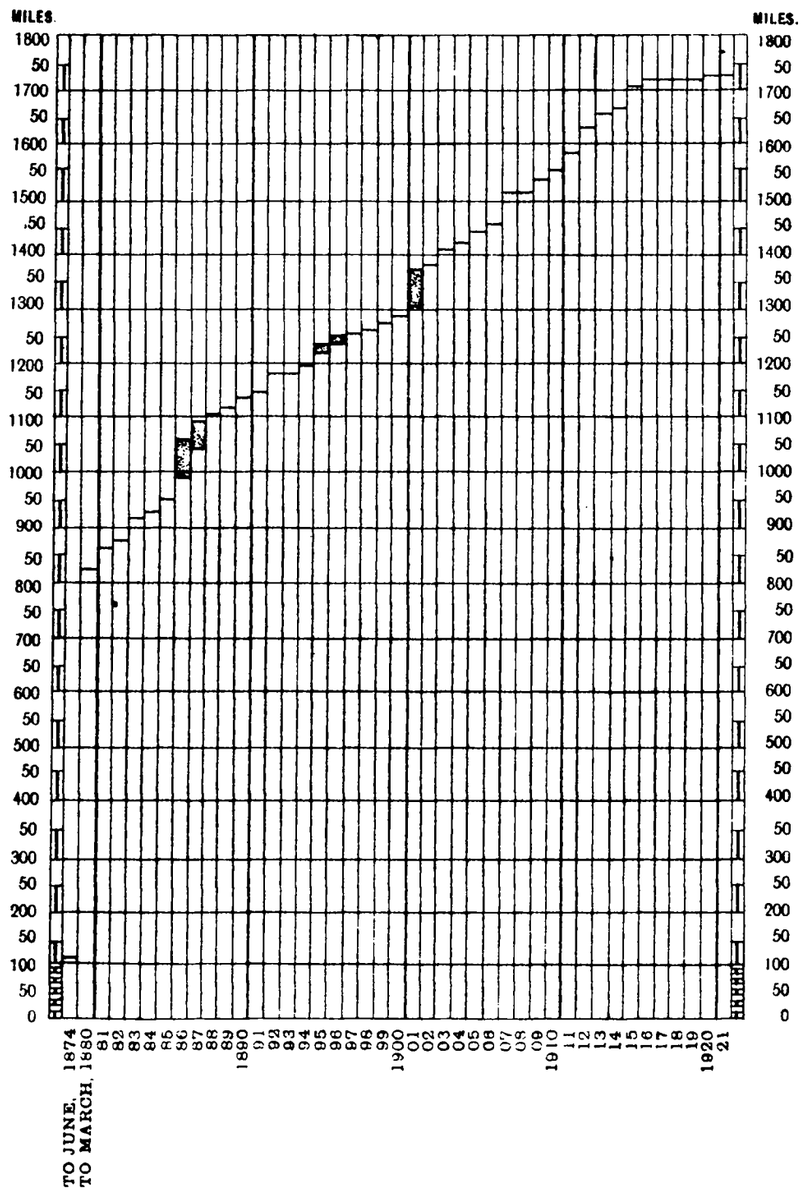
NUMBER OF MILES OPEN
OF
GOVERNMENT LINES.

NORTH ISLAND.



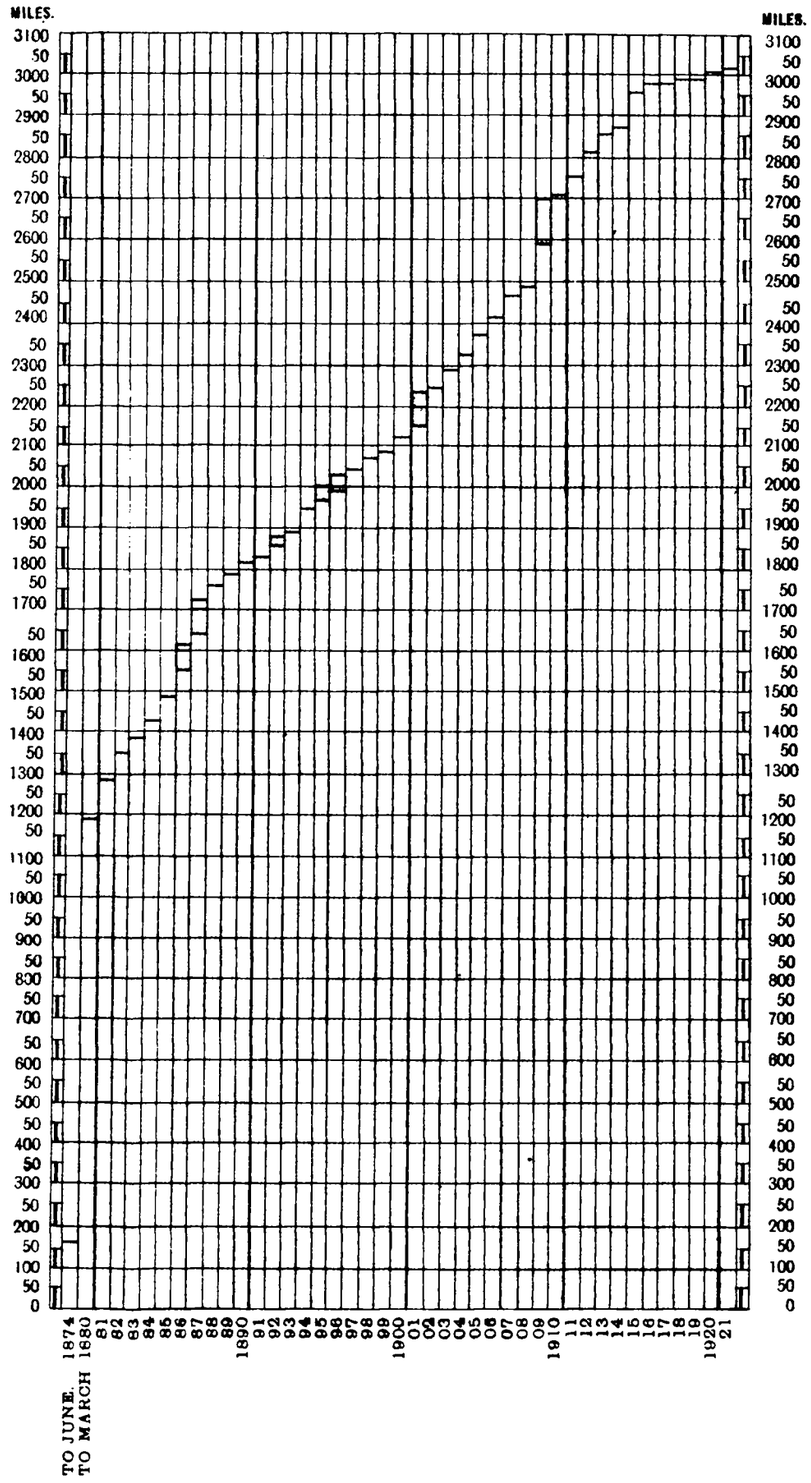
NUMBER OF MILES OPEN
OF
GOVERNMENT LINES.

SOUTH ISLAND.



NUMBER OF MILES OPEN
OF
GOVERNMENT LINES.

NORTH AND SOUTH ISLANDS COMBINED.



PRIVATE RAILWAYS ACQUIRED BY THE GOVERNMENT SHOWN

PUBLIC WORKS
Engineer's Department.
NEW ZEALAND.

F. W. FURKERT, M.INST.C.E.
ENGINEER-IN-CHIEF.

PUBLIC WORKS MAP
SHOWING THE RAILWAYS
NORTH ISLAND
OF
NEW ZEALAND
1921.

Scale of Miles

10 0 10 20 30 40 50 60 70 80

REFERENCE

GOVERNMENT RAILWAYS.

OPENED
UNDER CONSTRUCTION
PROPOSED
EXPLORED

PRIVATE RAILWAYS.

OPENED

DISTANCES BY RAILWAY BETWEEN PRINCIPAL PLACES.

Wellington to Palmerston North		87
Palmerston North to Wanganui (Aramoho Junction)		60
Aramoho to New Plymouth		104
Wellington to New Plymouth		**251**
Wellington to Palmerston North		87
Palmerston North to Woodville		18
Woodville to Napier (Spit)		97
Wellington to Napier via Manawatu		**202**
Wellington (Te Aro) to Woodville		116
Woodville to Napier (Spit)		97
Wellington to Napier via Wairarapa		**213**
Auckland to Onehunga		**8**
Auckland to Hamilton (Frankton Junction)		85
Hamilton to Ongarue		75
Ongarue to Taumarunui		15
Taumarunui to Ohakune		50
Ohakune to Waiouru		17
Waiouru to Marton		68
Marton to Wellington		116
Auckland to Wellington		**426**
Auckland to Hamilton (Frankton Junction)		85
Hamilton to Te Aroha		30
Te Aroha to Thames		33
Auckland to Thames		**148**
Auckland to Rotorua		**171**
Auckland to Ranganui		**86**
Dargaville to Tarawhati		**20**
Whangarei to Kawakawa		**46**
Gisborne to Motuhora		**49**
Thames to Waihi		**33**

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PUBLIC WORKS
Engineer's Department.
NEW ZEALAND.

F. W. FURKERT, M.INST.C.E.
ENGINEER-IN-CHIEF.

PUBLIC WORKS MAP
SHOWING THE RAILWAYS
SOUTH ISLAND
OF
NEW ZEALAND
1921.

Scale of Miles

10 0 10 20 30 40 50 60 70 80

REFERENCE

GOVERNMENT RAILWAYS.

OPENED
UNDER CONSTRUCTION
PROPOSED
EXPLORED

PRIVATE RAILWAYS.

OPENED

DISTANCES BY RAILWAY BETWEEN PRINCIPAL PLACES.

	Miles.	Miles.
Bluff to Invercargill	17	
Invercargill to Lumsden	50	
Lumsden to Kingston	37	
Bluff to Kingston		104
Invercargill to Gore	39	
Gore to Balclutha	47	
Balclutha to Milton	17	
Milton to Dunedin	36	
Invercargill to Dunedin		139
Invercargill to Tuatapere		56
Invercargill to Tokanui		34
Balclutha to Tahakopa		43
Dunedin to Clyde		143
Dunedin to Port Chalmers		8
Gore to Lumsden		37
Gore to Waikaka		16
Waipahi to Edievale		26
Milton to Big Hill		31
Dunedin to Oamaru	78	
Oamaru to Timaru	53	
Timaru to Ashburton	47	
Ashburton to Rolleston	38	
Rolleston to Christchurch	14	
Dunedin to Christchurch		230
Christchurch to Lyttelton		7
Oamaru to Hakataramea		43
Timaru to Fairlie Creek		39
Christchurch to Arthur's Pass		87
Christchurch to Little River		36
Christchurch to Waiau		82
Christchurch to Mina		76
Picton to Wharanui		56
Nelson to Glenhope		59
Greymouth to Reefton		47
Greymouth to Ross		30
Greymouth to Otira		51
Westport to Mokihinui Colliery		31

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

SOUTH ISLAND

NEW ZEALAND

showing proposed

ELECTRIC-POWER DISTRICTS.

Scale: 35 miles to an inch.

Reference

Cities ..... thus	NELSON
Provincial Centres	HOKITIKA
Boroughs	TEMUKA
Town Districts	CLINTON
Small Centres	Lyell
Railways	
Coach Routes	
Boundaries of Land Districts ..	

TASMAN SEA

SOUTH PACIFIC OCEAN

Canterbury Bight

Banks Peninsula

Otago Peninsula

Pegasus Bay

Stewart Island (Rakiura)

FOVEAUX STRAIT

South Latitude

167° 168° 169° 170° East Longitude 171° 172° 173° 174°

No.	Name.	Population.	Estimated Horse-power.
1	Nelson	34,661	5,000
2	Buller	14,014	2,800
3	Westland	19,357	4,000
4	Marlborough	18,024	3,600
5	Waipara	5,657	1,100
6	Rangiora	11,400	2,300
7	Canterbury	122,570	24,500
8	Banks Peninsula	3,839	800
9	Ashburton	17,224	3,400
10	South Canterbury	40,657	8,100
11	Waitaki	16,438	3,300
12	Otago	118,772	23,800
13	Southland	61,469	12,300
14	Queenstown	2,519	500
		476,601	95,500

SOUTH ISLAND.

NORTH ISLAND

NEW ZEALAND

showing proposed

ELECTRIC-POWER DISTRICTS.

Scale: 35 miles to an inch.

Reference

Cities	thus AUCKLAND
Provincial Centres	" NAPIER
Boroughs	" FEILDING
Town Districts	" MANAIA
Small Centres	" Tokomaru
Railways	"
Coach Routes	"
Boundaries of Land Districts	"

TASMAN SEA

SOUTH ISLAND

SOUTH PACIFIC OCEAN

North Taranaki Bight

South Taranaki Bight

Cook Strait

Golden Bay

Tasman Bay

Koramea Bight

Bay of Plenty

Hawke Bay

Mahia Peninsula

Haurak Gulf

Ile d'Haussez

Three Kings Is

North Cape

Cavalli Is

Bay of Islands

Poor Knights Is

Mayor Is

Whale Is

Mercury Bay

Great Barrier Is

Little Barrier Is

Aguilles Pt

Bream Bay

Bream Hd

Bream Tail

Mahia Peninsula

Table Cape

Portland Is

East C.

Gable End foreland

Poverty Bay

Hicks Bay

Te Araroa

Port Awanui

Tolaga Bay

Tokomaru Bay

Open Bay

Whitianga

Tauranga Har.

Whangarei Har.

Kaipara Har.

Manukau Har.

Whaingaroa Har.

Aotea Har.

Kawhia Har.

Albatross Pt

Raglan

Hokianga Har.

Ahipara B.

Reef Pt

Parengarenga Har.

C. Reinga

C. Maria Van Diemen

Rangaunu B.

C. Karikari

Doubtless Bay

Whangaroa B.

Whangaruru B.

Bay of Islands

C. Brett

Whangarei

Mangonui

Kaeo

Awanui

Orurua

Kaikohe

Kawakawa

Opua

Waimate

Kerikeri

Whangaroa

Whangape

Kohukohu

Omapere

Opononi

Waipoua

Waipoua R.

Kaihu

Arapohue

Maungaturoto

Paparoa

Te Kopuru

Tokatoka

Paparoa

Helensville

Kumeu

Waitakere

Onehunga

Otahuhu

Papakura

Manurewa

Drury

Pukekohe

Waiuku

Tuakau

Mercer

Rangiriri

Huntly

Ngaruawahia

Hamilton

Cambridge

Matamata

Morrinsville

Waihi

Paeroa

Waitoa

Te Aroha

Waikato R.

Firth of Thames

Thames

Kopu

Turua

Tairua

Whitianga

Coromandel

Kuaotunu

Whangamata

Waihi

Katikati

Te Puke

Tauranga

Te Puna

Omokoroa

Matakana

Whakatane

Thorn Har.

Opotiki

Waiotahi

Waiotahi R.

Te Kaha

Waiapu R.

Tokomaru

Waipiro

Tolaga

Matawai

Rakauroa

Ormond

Hangaroa

Patutahi

Gisborne

Tuahine Pt

Waikare Moana

Waikaremoana

Tiniroto

Rangitaiki

Taupo

Lake Taupo

Te Whaiti

Galatea

Murupara

Ruatahuna

Waimana

Whakatane R.

Rangitaiki R.

Waikare Moana

Motu R.

Waiau R.

Mohaka R.

Waikato R.

Waipa R.

Mokau R.

Awakino

Mokau

Urenui

Oakura

Egmont

Pihama

Hurworth

Waitara

Oikorangi

Tarata

Purangi

Inglewood

Okato

Waiwhakaiho R.

Stratford

Strathmore

Midhirst

Eltham

Kapuni

Normanby

Hawera

Manutahi

Patea

Waitotara

Waitotara R.

Waverley

Wanganui

Castlecliff

Kai Iwi

Matemateonga

Ohura

Taumarunui

Owhango

Raurimu

Waimarino

Ohakune

Raetihi

Karioi

Pipiriki

Hiruharama

Jerusalem

Moawhango

Rangitikei R.

Turakina R.

Wanganui R.

Manawatu R.

Oroua R.

Kaitieke

Rokaan

Tangiwai

Waiouru

Taihape

Mangaweka

Otingaiti

Hunterville

Marton

Bulls

Feilding

Kimbolton

Norsewood

Dannevirke

Ormondville

Pongaroa

Palmerston N.

Foxton

Shannon

Levin

Manakau

Otaki

Waikanae

Paekakariki

Paraparaumu

Te Horo

Waitohu

Waitohu R.

Kapiti I.

Mana I.

Porirua

Wellington

Lower Hutt

Upper Hutt

Te Marua

Featherston

Greytown

Carterton

Masterton

Opaki

Castle Point

Whakataki

Gladstone

Waiohine R.

Waipukurau

Waipawa

Otane

Takapau

Waipukurau

Ongaonga

Tikokino

Waipawa

Napier

Taradale

Meeanee

Clive

Havelock N.

Hastings

Te Pohue

Te Pohue R.

Tutaekuri R.

Ngaruroro R.

Tukituki R.

Tangoio

Pertane

Blackhead

Herbertville

Turanganui

Akitio R.

Wairoa R.

Wairoa

Clyde

Waikare Moana

Tiniroto

Rotorua

Ohinemutu

Mokoia I.

Tarawera

Tarawera R.

Te Teko

Te Whaiti

Matata

Whakatane

Kawerau

Galatea

Murupara

Ruatahuna

Waimana

Whakatane R.

Rangitaiki R.

Waikare Moana

Motu R.

Waiau R.

Mohaka R.

Waikato R.

Waipa R.

Mokau R.

Awakino

Mokau

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Manutahi

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Waitotara

Waitotara R.

Waverley

Wanganui

Castlecliff

Kai Iwi

Matemateonga

Ohura

Taumarunui

Owhango

Raurimu

Waimarino

Ohakune

Raetihi

Karioi

Pipiriki

Hiruharama

Jerusalem

Moawhango

Rangitikei R.

Turakina R.

Wanganui R.

Manawatu R.

Oroua R.

Kaitieke

Rokaan

Tangiwai

Waiouru

Taihape

Mangaweka

Otingaiti

Hunterville

Marton

Bulls

Feilding

Kimbolton

Norsewood

Dannevirke

Ormondville

Pongaroa

Palmerston N.

Foxton

Shannon

Levin

Manakau

Otaki

Waikanae

Paekakariki

Paraparaumu

Te Horo

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Waitohu R.

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Mana I.

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Wellington

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Upper Hutt

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Greytown

Carterton

Masterton

Opaki

Castle Point

Whakataki

Gladstone

Waiohine R.

Waipukurau

Waipawa

Otane

Takapau

Waipukurau

Ongaonga

Tikokino

Waipawa

Napier

Taradale

Meeanee

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Havelock N.

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Te Pohue

Te Pohue R.

Tutaekuri R.

Ngaruroro R.

Tukituki R.

Tangoio

Pertane

Blackhead

Herbertville

Turanganui

Akitio R.

Wairoa R.

Wairoa

Clyde

Waikare Moana

Tiniroto

Rotorua

Ohinemutu

Mokoia I.

Tarawera

Tarawera R.

Te Teko

Te Whaiti

Matata

Whakatane

Kawerau

Golden Bay

Tasman Bay

Nelson

Picton

Blenheim

Clouds Bay

Cape Farewell

D'Urville Is

Stephen Is

C. Stephen

C. Terawhiti

Palliser Bay

C. Palliser

C. Campbell

Westport

Wellington

Wairarapa

Hutt Valley

Wellington

Manawatu

Horowhenua

Rangitikei-Wanganui

Taranaki

Waimarino

Waitomo

Waikato

Auckland-Manukau

Waitemata

Rodney

Whangarei

Hobson

Whanganui

Franklin

Thames Valley

Tararua

Hawke's Bay

Wairoa

Poverty Bay

Bay of Plenty

East Taupo

1 Whanganui

2 Hobson

3 Whangarei

4 Rodney

5 Waitemata

6 Auckland-Manukau

7 Franklin

8 Waikato

9 Thames Valley

10 Waitomo

11 Taumarunui

12 Waimarino

13 Taranaki

14 Rangitikei-Wanganui

15 Manawatu

16 Horowhenua

17 Wellington

18 Wairarapa

19 Hutt Valley

20 Tararua

21 Dannevirke

22 Waipawa

23 Hawke's Bay

24 Wairoa

25 Poverty Bay

26 Bay of Plenty

27 East Taupo

172° 173° 174° 175° 176° 177° 178° East Longitude

34 35 36 37 38 39 40 41 South Latitude

Drawn by W.G. Hamilton

NORTH ISLAND.

No.	Name.	Population.	Estimated Horse power.
1	Whanganui	11,905	2,400
2	Hobson	6,814	1,400
3	Whangarei	13,796	2,800
4	Rodney	7,437	1,500
5	Waitemata	27,144	5,400
6	Auckland-Manukau	145,870	30,000
7	Franklin	16,959	3,400
8	Waikato	29,745	6,000
9	Thames Valley	34,816	7,000
10	Waitomo	17,430	3,500
11	Taumarunui	10,167	2,000
12	Waimarino	6,093	1,200
13	Taranaki	61,535	12,300
14	Rangitikei-Wanganui	39,888	8,000
15	Manawatu	36,642	7,300
16	Horowhenua	11,989	2,400
17	Wellington	93,030	19,000
18	Hutt Valley	22,594	4,500
19	Wairarapa	22,159	4,400
20	Tararua	10,090	2,000
21	Dannevirke	13,082	2,600
22	Waipawa	7,752	1,500
23	Hawke's Bay	36,810	7,400
24	Wairoa	4,368	800
25	Poverty Bay	25,057	5,000
26	Bay of Plenty	21,544	4,300
27	East Taupo	772	100
		735,488	148,200